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BIO-RAD

CE

Twister



User Guide

P/N 400-0172

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Contents

The information in this document may contain typographical errors or technical inaccuracies and is subject to change without notice. Modifications and additions may also be made to the products described in this document at any time.

Statement of Proper Use

The Twister is designed to be used in a laboratory environment. The Twister is integrated through hardware and software with an external microplate-processing device, such as a reader, washer, or dispenser. The Twister automates the processing of microplates by the external device. The Twister software is designed to run under Windows 95 and Windows NT4.0.

WARNING



Use this product only in the manner described in this manual.

When used other than as specified, the safety protections may be impaired.

DANGER



Risk of electric shock!

TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT REMOVE COVER. NO USER SERVICEABLE PARTS INSIDE. REFER TO QUALIFIED SERVICE PERSONNEL.

Contact Us

Bio-Rad Technical Services Department
Open Monday–Friday, 8:00 a.m. to 4:00 p.m., Pacific Standard Time.

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E-mail: LSG.TechServ.US@Bio-Rad.com (U.S.)
LSG.TechServ.Intl@Bio-Rad.com (International)

FCC

This device complies with Part 15 of the FCC (United States Federal Communications Commission) Rules. Operation is subject to the following two conditions:

This device may not cause harmful interference, and

This device must accept any interference received, including interference that may cause undesired operation.

NOTE



Changes or modifications to this equipment not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Table of Symbols

These symbols are intended to draw your attention to particularly important information and alert you to the presence of hazards as indicated. Some of these symbols may not appear in the manual or on the product:

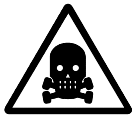
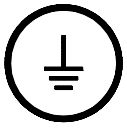
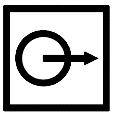
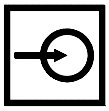
DANGER 	An imminently hazardous situation, which, if not avoided, will result in death or serious injury.
WARNING 	A potentially hazardous situation, which, if not avoided, could result in death or serious injury.
NOTE 	A cautionary statement; operating tip, or maintenance suggestion, which may result in instrument damage if not followed.
	Hazardous voltage, risk of shock injury.
	Risk of body parts, hair, jewelry or clothing getting caught in a moving part.
	Risk of puncture injury.
	Risk of eye injury, wear safety glasses.
	Risk of fire.
	Risk of poison.
	Risk of explosion.

Table of Symbols

These symbols are intended to draw your attention to particularly important information and alert you to the presence of hazards as indicated. Some of these symbols may not appear in the manual or on the product:

	Hazardous fumes.
	Hot surface, risk of burns.
	Ground symbol.
	CE compliance mark.
	Output.
	Input.
	Signifies that the unit has passed safety tests for grounding, high voltage spikes and voltage leakage.
☞	Helpful hints, additional information.

Equipment Labels

Equipment labels are color coded as follows:

Yellow: **Caution, risk of danger**

Red: **Stop**

Blue: **Mandatory action**

Green: **Safe condition or information**

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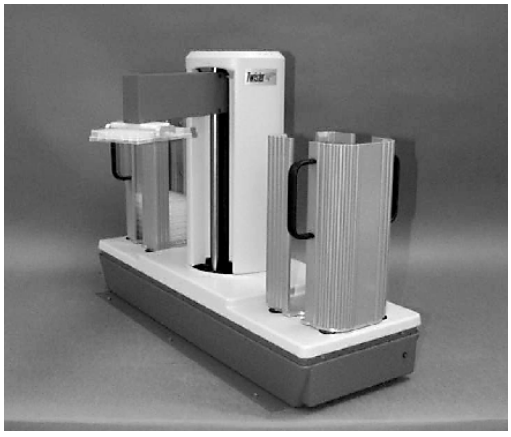
1. Introduction

Overview

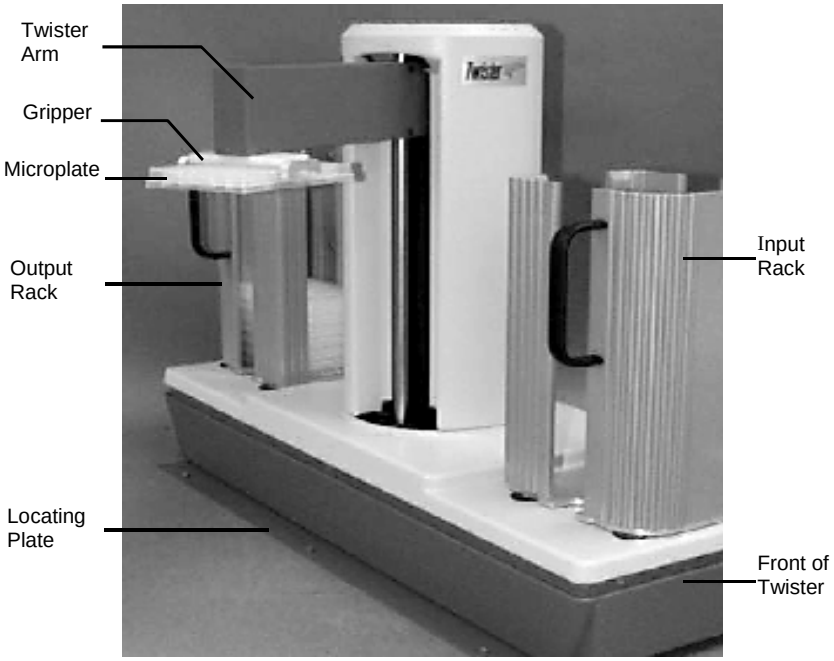
The Twister Universal Microplate Handler is a flexible and upgradeable robotic microplate loading system. The basic Twister unit is capable of sequentially loading up to 20, 96-well or 384-well microplates into such microplate instruments as readers, washers, and dispensers. The dual docking station design of the Twister allows for the addition of a variety of accessories and off-the-shelf, single-function instruments to provide additional capacity and handling options. The compact size and intuitive software make Twister a welcome addition to any laboratory performing repetitive tasks using microplates.

The Twister microplate handler works in conjunction with a microplate instrument (reader, washer, dispenser, etc.) and a personal computer. The Twister moves sample microplates from a Twister input rack to the external microplate device, then the Twister software initiates the external device's cycle. When the device's cycle is complete, the Twister retrieves the plate and places it into an output rack. This process is repeated for up to 20 microplates (expandable to 80) in a single run. The Twister can be set to restack the plates into the input rack(s) for easy removal, if desired. Operation is fast, with a plate transfer from the input rack to the microplate device and subsequently to the output rack requiring only 28 seconds. Restacking plates (moving them from the output rack back to the input rack) takes only 17 seconds per plate.

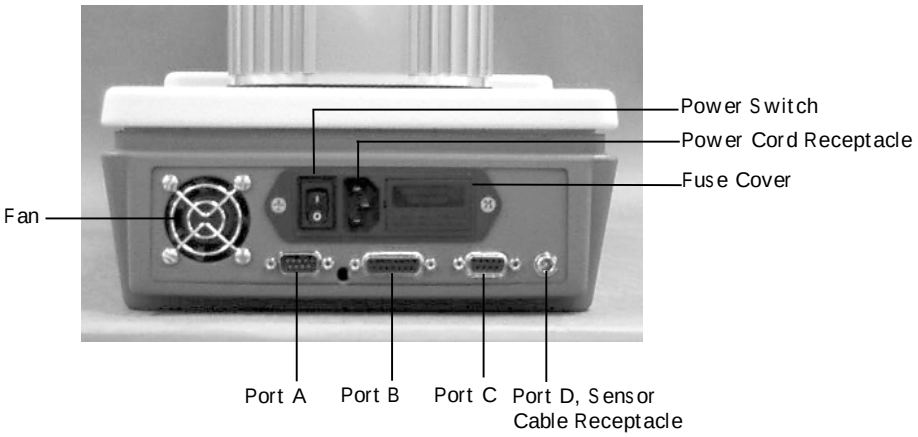
Standard 96-well, 384-well, and 1536-well microplates can be handled by the Twister, with the microplates in either a landscape or portrait configuration. (Note: Bio-Rad's Twister ships in **landscape** orientation, for compatibility with the Ultramark.) To prevent sample contamination or evaporation, microplates with lids can be used. The Twister removes the lid prior to processing the plate, then replaces the lid after processing. Alternatively, a lid or an additional empty microplate can be used as a "topper" on the stack to prevent contamination or evaporation of the top microplate. Twister removes the topper prior to processing the stack then replaces the topper on the stack.



Twister—Front View



Twister—Rear Panel



Standard Components of the Twister

The standard components of the Twister are:

The Robotic Arm, which rotates horizontally and moves up and down, with grippers that open and close around a microplate or lid;

Removable aluminum Input and Output Racks, which store up to 20 microplates (without lids) and one “topper,” or up to 15 plates with lids;

The Twister Locating Plate, which interlocks with the locating plates for the microplate reader and/or other peripheral devices;

The Lid Storage Platform, where microplate lids and microplates used as “toppers” are temporarily stored during operation;

The communications cable that connects the Twister to a personal computer;

The power cord; and

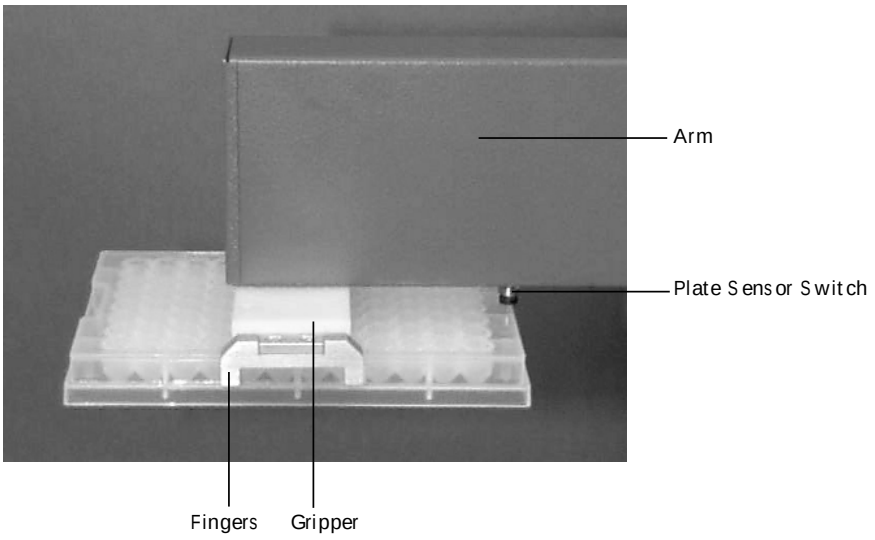
The Twister software.

The Robotic Mechanism

The robotic mechanism consists of two vertical posts, a rotary hub, and a horizontal arm with a microplate gripper. The rotary hub rotates horizontally by means of a stepper motor making about 3,800 steps per complete revolution, allowing precise orientation. A mechanical stop prevents continuous rotation, and the Rotary Sector Sensor determines the correct position above each of the 8 possible rack or device positions. One complete rotation (330°) can be made in less than five seconds.

The horizontal arm moves up and down the vertical posts by means of a second stepper motor with a vertical resolution of 0.003 in. (0.008 cm) per motor step. An optical sensor determines the “home” position (at the topmost extent of the arm) for the vertical motion of the arm, and a mechanical stop is located just above the “home” position. The vertical system, when lifting a nominally loaded plate, can travel from bottom to top in 3 seconds and from top to bottom in less than 3 seconds, including acceleration and deceleration.

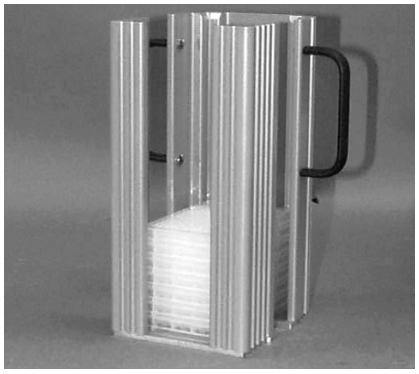
The gripper consists of two aluminum “fingers”. Polyurethane pads are attached to the fingers, assuring a secure grip on the sides of the microplate. The “plate sensor switch” is a mechanical sensor located under the gripper section that indicates when the arm has contacted a microplate. The Plate Sensor Switch is activated by the elevated and centered extreme inner edge (the “lip”) of a plate, as the arm descends. This inner edge is available on all but one commonly used line of microplates. Microplates without this inner edge or "lip" cannot currently be used with Twister.



Twister Arm

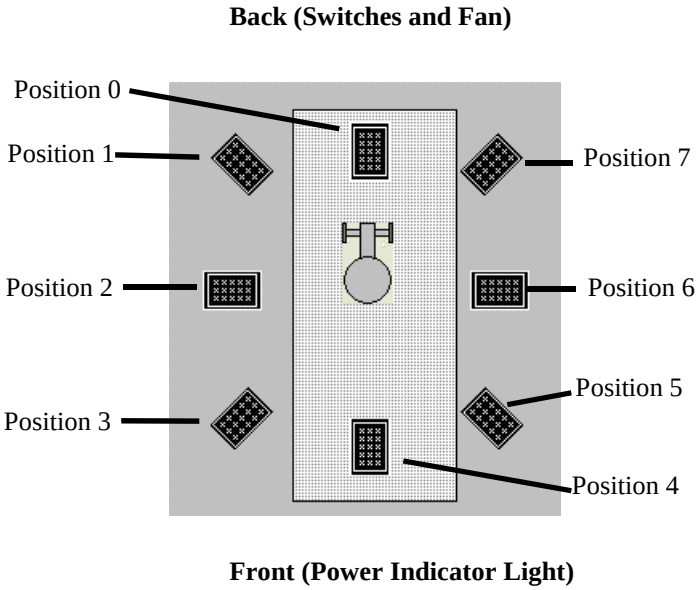
Input and Output Racks

Two removable aluminum racks form the standard input and output areas of the Twister. Each rack has two handles to facilitate removal and transport of the filled racks. Before processing begins, prepared microplates are placed by hand into a rack, the rack is placed in the input area (position 4 on the diagram below), and an empty rack is placed in the output area (position 0). During operation, the Twister lifts a plate from the top position of the Input Rack, places it in the open drawer of the microplate device, and initiates the device cycle. After the cycle is complete, the Twister moves the plate to the Output Rack. An Expanded Capacity Kit is available to expand the Twister's capacity to five racks (four input and one output).



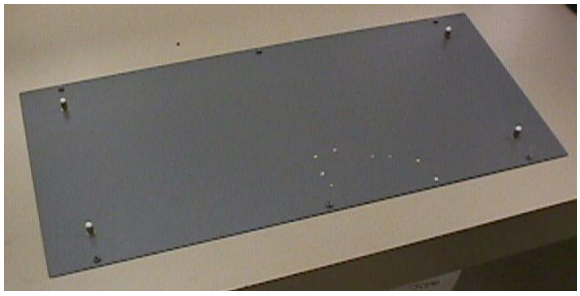
Input and output storage racks

Rack Positions



Locating Plates

Two locating plates are required for use with the Twister. One is placed beneath the Twister; the other fits beneath the microplate reader. These locating plates are designed to overlap and connect, ensuring that the microplate reader maintains the correct position in relation to the Twister. The Twister Locating Plate is included with the Twister. The Ultramark Locating Plate is included with the Twister/Ultramark Interface Kit.



Twister Locating Plate

Lid Storage Platform

The Lid Storage Platform attaches to the Twister and provides a space for storing lids or a microplate used as a “topper” (an empty microplate placed on top of the stack of plates which prevents contamination of the top plate). By designating the use of a topper or lids in the software, the Twister will process the plates properly.

The Barcode Reader (optional) also attaches to this platform.



Lid Storage Platform

Using the Twister with Lids:
The Twister removes the lid from the top microplate, places it on the Lid Storage Platform, retrieves the first plate, and places it in the microplate instrument drawer. After the plate processing is complete, Twister places the microplate in the output rack,

retrieves the lid from the Lid Storage Platform, and places it on the top microplate in the output rack.

Using the Twister with a Topper:
The Twister removes the topper from the input rack, places it on the Lid Storage Platform, then processes the rest of the plates in the input rack in the standard manner. After all the microplates have been processed, Twister retrieves the topper from the Lid Storage Platform and places it on the top microplate in the output rack.

Communications Cable

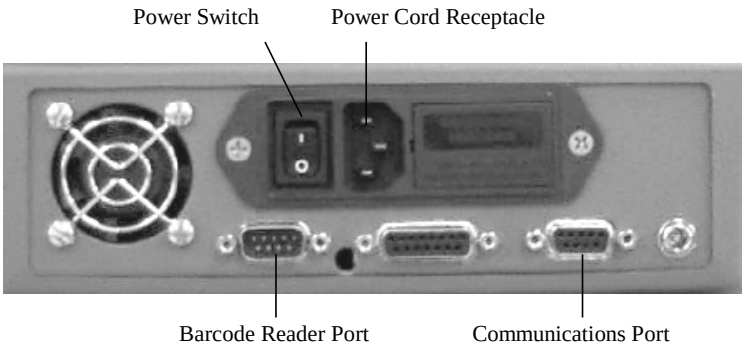
The communications cable is connected from the serial port on the rear panel of the Twister to the chosen serial communications port on the computer. One fully dedicated serial communications port on the computer is required to connect to the Twister (in addition to the port required for communication with the microplate device). The serial port can be any COM port from 1 through 4.

Power Cord

The power cord plugs into the back of the Twister. Input line power of either 100–120V or 200–240V, 50 or 60 Hz, is automatically sensed by the power supply; the fuse assembly located inside the Power Entry Port cover reverses position to allow either one or two fuses to be used, for either 120V or 240V operation.

Power Switch

The Power switch is a rocker switch on the back of the Twister and is labeled 1/0 (1 is the ON position, 0 is the OFF position). When switched ON (1), the green power light on the front of the Twister is illuminated.



Rear panel view, showing communications ports, cable, power cord, and power switch

Optional Components

The following optional components are available for the Twister:

Twister/Ultramark Interface Kit – Enables the Twister to work in conjunction with Bio-Rad's Ultramark to process microplates.

Extended Capacity Kit – Expands the capacity of the Twister to process up to 80 microplates in each session.

Barcode Reader Kit – Enables the Twister to identify individual microplates by means of barcode strips on the microplate

Installation Overview

Before proceeding with installation, review the Twister requirements, unpacking instructions, and parts list in the next chapter.

The following chapters provide detailed instructions on the steps outlined below.

1. Assemble the Twister

Seat the Twister on the Twister Locating Plate

Connect the Power Cord and Communications Cable

Install the Lid Storage Platform (optional)

Install the Input and Output Racks

2. Set Up the Software

Install the Twister Software

Configure the COM Port

Start the Twister Software

Set the Location of the Lid Storage Platform (optional)

3. Calibrate the Twister

Teach the Input and Output Rack Offsets

Teach the Lid Storage Platform Offsets (optional)

4. Complete an Exercise Run

5. Install the Accessories (Optional)

Install the Barcode Reader according to the instructions in the *Twister Barcode Reader Interface Guide* (optional)

Install the Extended Capacity according to the instructions in the *Twister Extended Capacity Installation Guide* (optional)

6. Install the Ultramark

Connect the Twister with the Ultramark, according to the instructions in the *Twister/Ultramark Interface Guide*, included with the Twister/Ultramark Interface Kit.

7. Complete the Final Exercise Run

2. Preinstallation

Computer Requirements

The following hardware and operating system software are required to ensure proper operation of the Twister software:

IBM compatible personal computer with a Pentium processor

Windows 95 or Windows NT 4.0 Operating System

16 MB RAM (32 MB RAM recommended)

10 MB free hard disk space

3.5 inch 1.44 MB HD (high-density) floppy disk drive

SVGA display (1024 x 768 using Hi-Color 64K recommended)

2 buffered (16550 AF) serial ports

Bus mouse

Tool Requirements

Long Phillips head screwdriver

Small flat-blade screwdriver

Small Phillips head screwdriver

Optional: To convert to portrait orientation:

13/64 or 7/32 inch open-end wrench

$7/16^{th}$ inch open-end wrench or small adjustable wrench

Space Requirements

The Twister should be assembled in its permanent position on a sturdy lab bench with at least three electrical outlets nearby.

NOTE



The bench top must be flat and sturdy enough to support the weight of the computer, the Twister, the microplate reader, and any accessories without sagging. An uneven surface will result in the misalignment of the Twister.

Space Requirements, Continued

It is easier to assemble the Twister and align it with the microplate reader or washer if you unplug and remove the reader or washer from the laboratory bench first (take note of the location of any cables connected to the device).

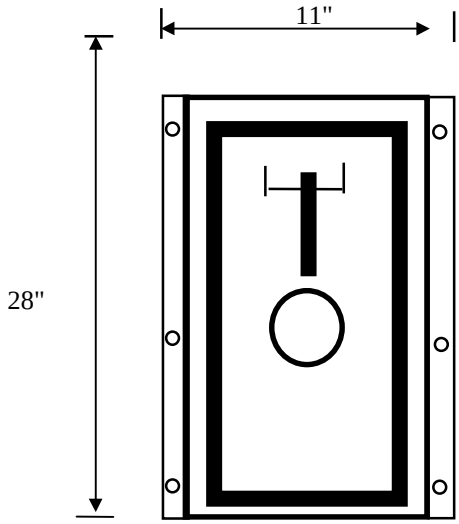
For Standard Capacity, you need an area approximately:

11 in. (28 cm.) wide,

28 in. (72 cm.) deep, and

19 in. (49 cm.) high.

In addition, you must provide space next to the Twister for the computer, microplate reader, and Extended Capacity base (optional). See the device *Interface Guide* for precise measurements.



Front of Twister

Layout and measurements of the Twister (Top View)

Unpacking the Twister

WARNING



The Twister weighs approximately 32 pounds (14.53 kg) and should be lifted with care. Take the proper precautions to avoid injury.

Step	Action
1	Carefully inspect the shipping carton for damage.
2	Remove all components from the box and verify that all parts are in the carton. (See the Parts List on the next page.) If any parts are missing, contact Bio-Rad. Refer to *Contact Us* at the front of this manual for more information.
3	Retain the carton and packing materials. If the unit should need to be returned for repair, you must use the original packing materials and carton for shipping. If the carton has been damaged in transit, it is particularly important to retain it for inspection by the carrier in case there has been damage to the instrument.

Parts List

The shipping carton should contain the following items:

Twister Universal Microplate Handler

2 removable 20-capacity racks

Lid Storage Platform and mounting hardware

Twister Locating Plate

Power cord

Communications cable [6 ft, (1.8 m) 9-pin to 9-pin]

13/64 inch open end wrench

Spare fuses

Twister User Guide (this document)

4 Twister software diskettes

Warranty Card

If you are missing any of these items, please contact Bio-Rad.

Change the Fuse Configuration to 220/240V, If Necessary

The Twister is factory-set for 120V operation using a single 1.5 Amp fuse. To convert the unit from the single 1.5 Amp fuse configuration to the dual 0.8 Amp fuse configuration used for 220/240V operation, refer to the diagrams and instructions below. Otherwise, proceed to "Seat the Twister on the Twister Locating Plate."

DANGER



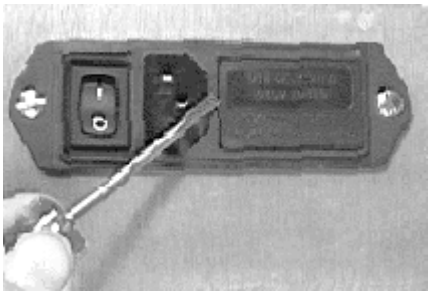
Electrical shock hazard.

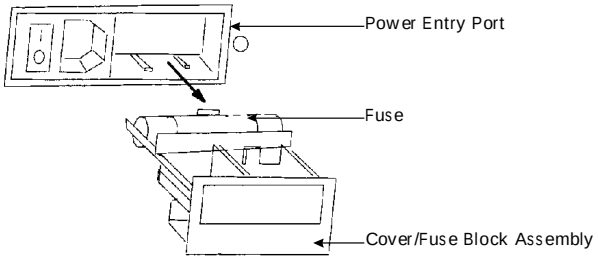
Disconnect the power supply before changing the fuses.

For continued fire protection and correct functioning, replace fuses only with fuses of the same type and rating.

Tools: Small, flat-blade screwdriver
Small, Phillips head screwdriver

Step	Action
1	Ensure the Twister's power switch is in the OFF position and the power cord is unplugged.
2	Using a small flat-blade screwdriver, gently pry the cover/fuse block assembly away from the power entry port housing and remove.



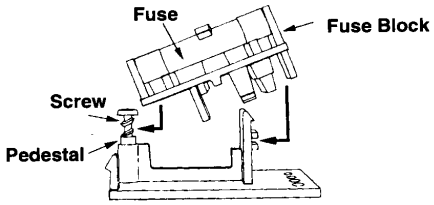


Prying open the cover/fuse block assembly on the Twister

Change the Fuse Configuration, If Necessary, Continued

Step	Action

3 Loosen the Phillips head screw on the pedestal by two turns. Remove the fuse block by sliding it up and away from the screw and pedestal, as shown in the figure below.

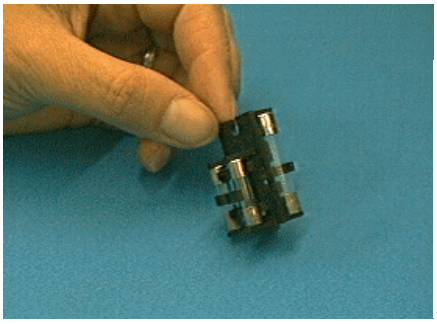


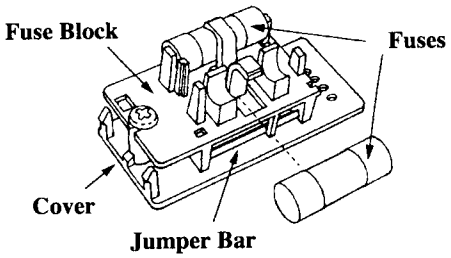
Remove the fuse block from the screw and pedestal

4 Invert the fuse block so the two 0.8 Amp fuses are on top.

5 Confirm that the fuses are seated securely in the fuse block

6 Slide the fuse block back into position and tighten the screw. Make sure the two active 0.8 Amp fuses face out.





7 Slide the cover/fuse block assembly back into the power entry port housing. Snap the cover/fuse block assembly securely into place.

3. Installation

Installation Warnings

WARNING



Make sure the Twister power is OFF before beginning these procedures.

Use only the tools listed in this manual to perform the steps described in the instructions.

Never perform any operation on the instrument in an environment where potentially damaging liquids or gases are present.

Installation Notes

NOTE



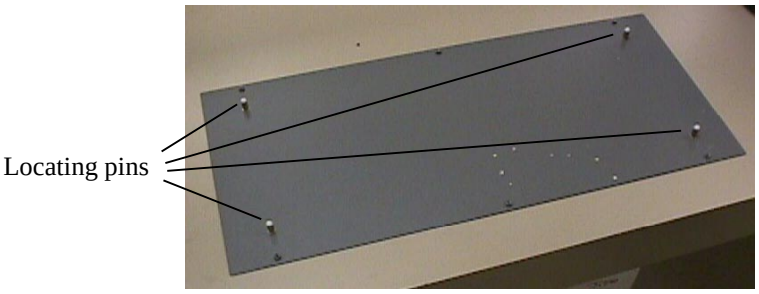
Do not loosen or tighten any screws or touch parts other than those specifically designated in the instructions. Doing so may cause misalignment and could void the instrument warranty.

Never force any component to fit.

Place the Twister on the Twister Locating Plate

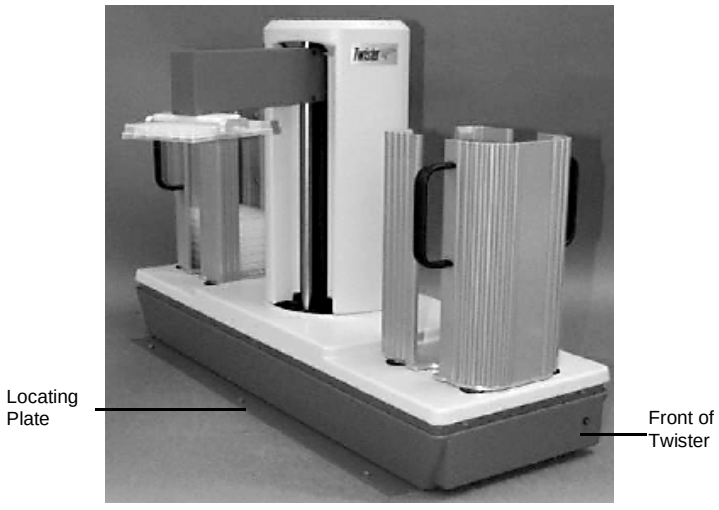
In this step, you will place the Twister on the Twister Locating Plate.

Step	Action
1	Remove any packing materials from around the Twister and the Twister Locating Plate.
2	Place the Locating Plate on the bench with either short edge facing the front of the bench. The four white-tipped locating pins on the plate are designed to fit into the four holes on the underside of the Twister.



WARNING **The Twister weighs approximately 32 pounds (14.53 kg) and should be lifted with care. Take the proper precautions to avoid injury.**

3	Lift the Twister and carefully place it onto the locating pins on the Twister Locating Plate. The end of the Twister with the green power light should face forward and the end with the communications and power ports should face to the rear.



☞ The properly seated Twister should rest flat and secure on the locating plate.

Connect the Power Cord and Communications Cable

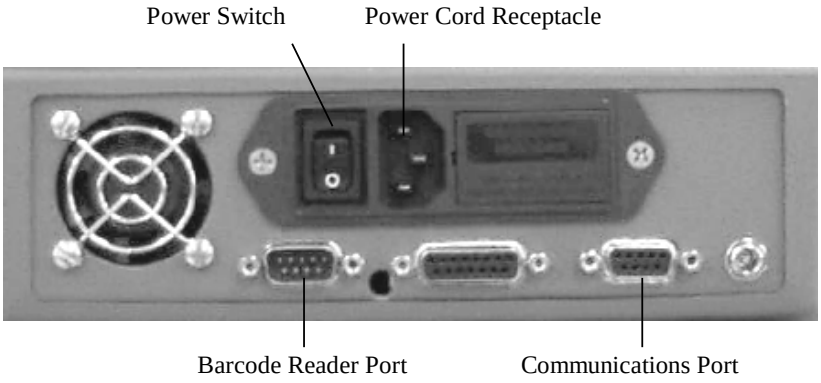
WARNING

Verify the Twister Power switch is OFF and the computer's power cord is unplugged from the power source before proceeding.

Step	Action

1 Locate the 9-pin to 9-pin, 6-ft (1.8 m) communications cable included with the Twister.

2 Insert the 9-pin male end of the communications cable into the 9-pin female COM port (C) on the rear panel of the Twister.



Rear panel of the Twister, showing communications port, power cord receptacle, and power switch

3 Connect the female end of the cable into an open serial port on the computer. (The Twister software will automatically detect which COM Port the Twister is connected to.)

☞ If the computer has a 25-pin serial port, a 9-pin male to 25-pin female cable or cable adapter must be used.

4 Locate the power cord for the Twister and connect it to the receptacle on the rear panel of the Twister.

5 Plug the Twister power cord into a grounded 100-240 volt AC power outlet. (If using 220/240V AC power, be sure the Twister's fuse configuration has been changed per the instructions in the previous section of this manual.)

6 Plug the computer's AC power cord into the receptacle on the rear panel of the computer and into an appropriate power source.

NOTE

Verify all communications cables and power cords are securely plugged into the Twister and the computer.

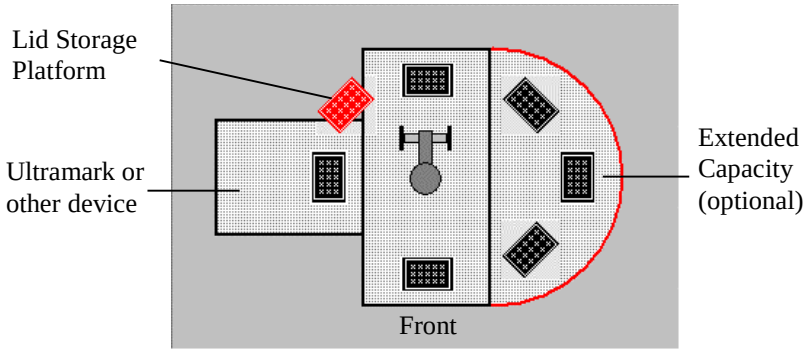
Install the Lid Storage Platform

The Lid Storage Platform provides temporary storage for lids or toppers and is used to attach the Barcode Reader accessory to the Twister. If you do not use lids or toppers and are not installing the Barcode Reader, it is not necessary to install the Lid Storage Platform. To install the platform, follow the instructions below.

Tools: Long Phillips head screwdriver

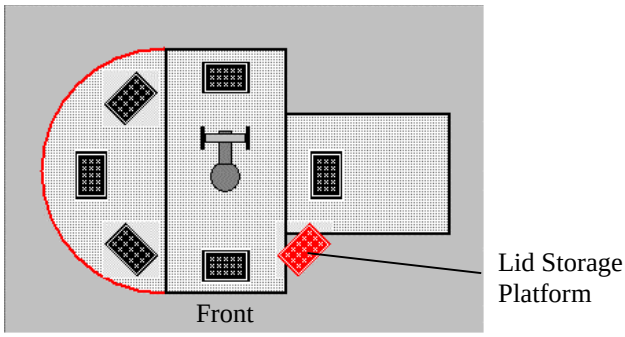
NOTE **Before proceeding, decide on the configuration of your Twister, Ultramark or other device, and Extended Capacity racks (if any). The configuration you select will determine where you put the Lid Storage Platform.**

The **most efficient** configuration is with the Ultramark (or other device) and the Lid Storage Platform on the **left side** of the Twister. (See figure below.) This is the preferred configuration. If you have purchased the Extended Capacity Kit, the Extended Capacity would then be located on the right side of the Twister.



Preferred Configuration

If this configuration is unacceptable, you can locate the Ultramark or other device on the right side of the Twister, with the Lid Storage Platform on the lower right side.



Optional Configuration

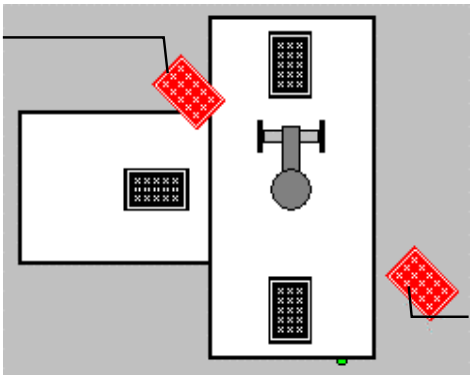
Install the Lid Storage Platform, Continued

Step	Action

1 Locate the Lid Storage Platform and the three Lid Storage Platform screws. Remove the packing material from around the Lid Storage Platform.

2 Select the location of the Lid Storage Platform. Position 1 is preferred, Position 5 is optional (see discussion above).

Position 1, Upper Left (Preferred)



Position 5, Lower Right (Optional)

NOTE **If you have purchased the Extended Capacity Kit, the Ultramark and the Lid Storage Platform must be located on the same side of the Twister (opposite the Extended Capacity).**

3 Position the Lid Storage Platform so the screw holes in the platform are aligned with the holes in the Twister base, and the platform is facing up, as shown in the following picture.



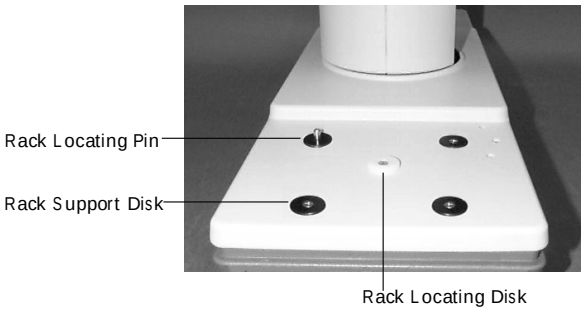
Lid Storage Platform

4 Insert the three screws through the Lid Storage Platform, into the holes in the Twister and tighten by inserting the Phillips head screwdriver through the holes in the top of the Lid Storage Platform down to the screw heads.

☞ The Lid Storage Platform should be in landscape orientation (shipping default) for compatibility with the Ultramark.

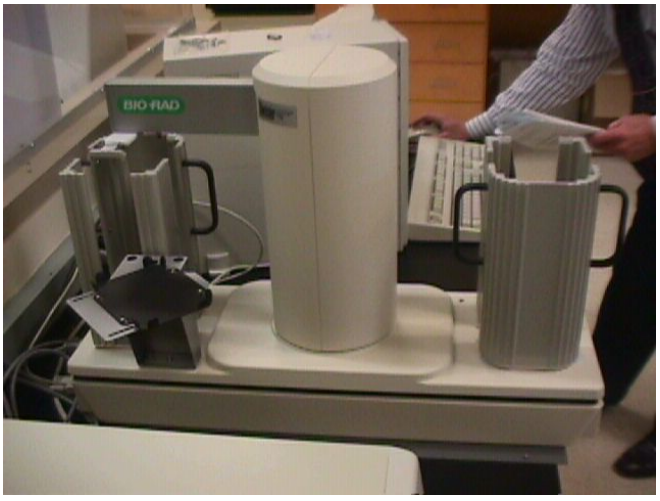
Install the Input and Output Racks

In this step, you will install the input and output racks. Note that the two racks are identical except for their positions on the Twister.



Input Rack Locating Pin and Locating Disk (Front View)

Step	Action
1	Locate the two holes for the Rack Locating Pin on the bottom of each rack.
2	Place one rack on the white Rack Locating Disk on the Input (front) end of the Twister (see figure above). The Rack Locating Pin should fit into one of the holes on the bottom of the rack. The rack should be squarely aligned with the Twister in landscape orientation (i.e., with the long edge of the rack closest to the center of the Twister). The channel for the Twister arm should face the center of the Twister.
3	Place the other rack on the other end of the Twister in the same manner.



Input and Output Rack Placement

Install the Twister Software

In this step, you will install the new Twister software. If a previous version of Twister software is installed on your computer, you must first uninstall the old software, as described below.

Step	Action
1	Switch ON the computer. Start Windows, if it is not already running.
2	Click the Windows Start button, select Settings from the Start menu, then click on Control Panel to open the Control Panel folder.
3	Double-click the Add/Remove Programs icon to display the Add/Remove Programs dialog box.
4	If a previous version of Twister software is installed on your computer, first uninstall it before installing Twister V.2. Select the old Twister software name from the list in the dialog box, then click on the Add/Remove button. After the uninstall is complete, proceed to the following step.
5	Click the Install button under the Install/Uninstall tab.
6	Insert disk #1 of the Twister software into the computer's 3.5" disk drive, then click the Next button.
7	If the program `a:\setup.exe` (or `b:\setup.exe` if the 3.5-inch drive is drive B) is not found, click the Browse button and find the file manually.
8	Click the Finish button to begin installing the Twister software.
9	Follow the prompts to complete the software installation. Bio-Rad recommends using the default directory (`C:\PROGRAM FILES\BIO-RAD\BIO-RAD TWISTER PLATE HANDLER`).

Configure the COM Port

If you choose to set up the Twister using either COM3 or COM4 from the computer, and the COM port settings are not assigned yet, try the following settings:

COM Port #	Base IO Port Address	IRQ Line
COM3	Port 03E8	5
COM4	Port 02E8	2

Verify the serial port hardware card is set up to use the indicated IRQ lines and use the Windows Control Panel to set the port address and IRQ assignments. The settings above are generic settings, and may not work on all systems. See the serial communications hardware manual and the Windows documentation for help with these assignments.

Start the Twister Software

In this step, you will start the Twister software to verify that software installation was successful and to set the COM Port used to communicate with the Twister.

WARNING

When the Twister is switched ON, the Twister arm moves to the vertical and horizontal home positions. Ensure that you are out of the way of the arm before switching ON the Twister.

Step	Action
1	Switch ON the Twister and the computer (if the computer is not already on).
2	Click on the Windows Start button, select Programs, select Bio-Rad Twister Plate Handler, then select Twister. The Twister software will start.
3	As it is starting, the Twister software will check all COM Ports and attempt to communicate with the Twister. ☞ If a connection cannot be made, make sure the Twister is plugged in and turned on (the green power light on the front of the Twister should be lit). Check your cable connections and review Configure the COM Port, above. Contact Bio-Rad for further assistance.
4	After the Twister software establishes communication with the Twister, the Twister Main Menu will be displayed.

For optimum display of the Twister software interface, the display settings on the computer should be at least High Color (16 bit), 1024 x 786 pixels, and Small Fonts.



Different settings will not affect operation of the Twister, but will alter the display of the user interface. See Windows documentation for instructions on changing display settings.

4. Calibrate the Twister

In this chapter, you will learn how to "train" the Twister in the location of the Input and Output racks and Lid Storage Platform.

Offsets identify the rotary and vertical arm positions of the Input and Output racks, Lid Storage Platform, and microplate reader. The positions of the Input and Output racks are factory-set, but may need to be adjusted slightly. The offsets for the Lid Storage Platform, as well as the microplate reader and any Extended Capacity racks, are **not** set at the factory and must be set before running the Twister.

WARNING

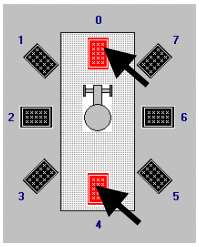
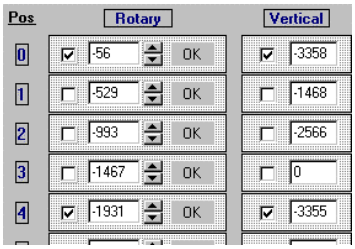


Always keep body parts, hair, jewelry, and clothing away from the Twister while it is operating. The Twister arm may move unexpectedly.

Keep all objects out of the path of the Twister arm. If the Twister arm encounters an object in its path, the Twister will lose the proper orientation.

Teach the Input and Output Rack Positions

The positions of the standard Input and Output racks are set at the factory, but may require slight adjustment.

Step	Action
1	Start the Twister software if it is not already running.
2	On the Twister Main Menu, click the Positional Training button to display the Positional Training window. 
3	In the Plate Description list box, select the Defaults plate type.
4	In the Position Diagram, click the microplates at position 4 (Input rack) and at position 0 (Output rack). They will appear highlighted in red.  In the Rotary and Vertical columns, the checkboxes for position 0 and position 4 will appear checked. 

Teach the Input and Output Rack Positions, Continued

Step	Action

5 Click the Begin Training button.

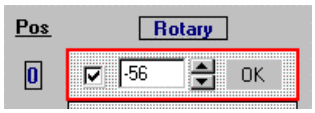


The Twister arm will move to the Home position (position 0) above the Output rack, and an alert box will appear instructing you to place one microplate or lid in each position being taught.

6 Place one microplate in the Input rack and one in the Output rack.

☞ Pick the microplate type that you will be using in most of your experiments. Use the same brand and model of microplates in each rack.

7 Click the OK button in the alert box to dismiss it. The Twister arm will move to position 0, and the **Rotary offset** textbox for position 0 will be outlined in red.



NOTE **It is recommended that two people working together perform the following steps. One should observe the position of the arm, while the other makes adjustments to the position.**

8 Click on the arrow buttons next to the Rotary offset textbox to adjust the rotational position of the Twister arm. Click the up arrow to move the arm clockwise, and the down arrow to move the arm counter-clockwise. Click the arrows until the arm is centered over the rack.

☞ The arm should be centered to within one click of the arrows. The tolerances are very close.

9 When the arm is centered, click the small OK button next to the arrows (shown in the figure in Step 7).

10 The Twister arm will move down until the Plate Sensor Switch is activated by the lip of the microplate. This automatically records the **Vertical offset** of the microplate.

☞ **Very Important!** The grippers of the fingers should not touch the sides of the rack as the arm moves down. The fingers should also be an equal distance from the sides of the plate. If these conditions are not met, you must go back to Step 5 after you have trained the next position.

Teach the Input and Output Rack Positions, Continued

Step	Action
11	When the Vertical offset is recorded, the arm moves up to vertical home, and over to position 4.
12	Repeat Steps 8–10 for the rack in position 4 The Twister arm will find and record the vertical offset for position 4, then return to the vertical and rotary Home position.
13	**Very Important!** At this point, if one or both of the rack positions have not been properly trained (e.g., the arm has not dropped smoothly or was not properly centered on the plate), go back to Step 5 and repeat the training.
14	When you have properly trained these positions, click the Save Plate Data button to save the offsets for the Default plate type. Click on the Main Menu button to return to the Main Menu.
15	Finally, remove the microplates from the Twister.

Set the Location of the Lid Storage Platform

If the Lid Storage Platform is installed, the following steps will set the Clear position—the position where the Twister arm stops after a run—over the the platform (position 1 or 5, depending on where the platform is installed).

Step	Action
1	Click the Configure Layout button on the Twister Main Menu to display the Configure Layout window.
2	If the Lid Storage Platform is installed, click the down arrow next to the Lid Storage/Barcode Position list box and select the location where the Lid Storage Platform is located (None, Upper Left, or Lower Right).
3	Click the Save button at the bottom of the window to save the configuration. The Twister Main Menu is displayed.

Teach the Lid Storage Platform Position

If the Lid Storage Platform has been installed, the following steps will teach the position offsets. Otherwise, skip this procedure and click the Main Menu button to return to the Twister Main Menu. The Lid Storage Platform must be installed in either position 1 or position 5, as described in Chapter 3, Installation.

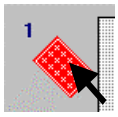
Step	Action

1 On the Twister Main Menu, click the Positional Training button to display the Positional Training window.



2 In the Plate Description textbox in the Positional Training window, select the Default plate type.

3 In the Position Diagram, click the microplate at Position 1 or 5, depending on where the Lid Storage Platform is located.



In the Rotary and Vertical columns, the checkboxes for position 1 or position 5 will appear checked.



4 Click the Begin Training button.



The Twister arm moves to the Home position, then a dialog box is displayed instructing you to place one microplate or lid in each position being taught.

5 Place one lid (if using lids or using a single lid as a topper) **OR** one microplate (if using an empty microplate as a topper) on the Lid Storage Platform.

6 Click the OK button in the dialog box. The Twister arm will move to position 1 or 5, and the **Rotary offset** textbox for the position will be outlined in red.

Teach the Lid Storage Platform Position, Continued

Step	Action

NOTE **It is recommended that two people working together perform the following steps. One should observe the position of the arm, while the other makes adjustments to the position.**

7 Click on the arrow buttons next to the Rotary offset textbox to adjust the rotational position of the Twister arm. Click the up arrow to move the arm clockwise, and the down arrow to move the arm counter-clockwise. Click the arrows until the arm is centered over the platform.

☞ The arm should be centered to within one click of the arrows. The tolerances are very close.

8 When the arm is centered, click the small OK button next to the arrows (shown in the figure in Step 2).

9 The Twister arm will move down until the Plate Sensor Switch is activated by the lip of the lid or microplate. This automatically records the **Vertical offset**.

☞ **Very Important!** The grippers of the fingers should be an equal distance from the sides of the plate. If this condition is not met, you must repeat this procedure.

10 The arm will move up and over to the rotary home position.

☞ If necessary, repeat the above steps until the gripper is centered on the lid or microplate and the gripper fingers are an equal distance from the sides of the lid or plate.

11 Click the Save Plate Data button to save the offsets to the Default plate type. Then click the Main Menu button to return to the Twister Main Menu.

☞ All checkboxes must be CLEARED before the Positional Training window will close.

12 Remove the topper plate or lid from the Twister before continuing.

NOTE **You must exit the Twister software and then restart it to download your new positional settings to the Twister.**

Perform an Exercise Run

After the positions of the Input and Output racks and the Lid Storage Platform have been calibrated, performing an exercise run is recommended to verify that the offsets are correct.

Step	Action
1	From the Twister Main Menu, click the Exercise (Demo) button.  The Exercise window is displayed.
2	If you have installed the Lid Storage Platform, select either ALL Plates Have Lids or Topper Lid ONLY as the Lid Configuration option. Otherwise, select No Lids.
3	Click the desired Restacking Parameter.
4	Select Continuous Operation to start the run again after the microplates are restacked. (This option is not available if the Don't Restack option is selected.)
5	Load clean, empty microplates into the Input rack in position 4.
6	Click the Start Run button to start the run. 
7	Verify that the Twister grips the microplates and places them in the racks correctly.

NOTE **If the microplates graze the sides of either rack or are not placed correctly in the racks, go back to the previous procedures (Teach the Input and Output Rack Positions, Teach the Lid Storage Platform Position).**

8	To stop the run while Continuous Operation is selected, click the Quit Exercising button 
9	Finally, remove all the plates from the Output rack.

5. Install the Ultramark and Accessories

The Twister is now configured to run as a stand-alone instrument. You are now ready to install the Ultramark as well as any accessories you have purchased.

Install Twister Accessories

If you have purchased accessories such as the the **Barcode Reader** and/or the **Extended Capacity Kit**, install these before installing the Ultramark.

NOTE **It is preferable to install the Barcode Reader before installing the Extended Capacity, if you are installing both.**

Follow the instructions in the appropriate accessory installation manual included with the accessory kit.

Install the Ultramark

First install any accessories you have purchased before installing the Ultramark. To install the Ultramark, follow the instructions in the **Twister/Ultramark Interface Guide**, included in the Twister/Ultramark Interface Kit. To install a device other than the Ultramark, see below.

Install an External Device Other Than the Ultramark

If you have an external device other than the Ultramark to be connected to the Twister, follow the installation instructions in that device's interface guide.

6. Operating the Twister with the Ultramark

After the Twister has been set up and calibrated, and the Ultramark has been connected with the Twister and exercised following the instructions in the *Twister/Ultramark Interface Guide*, you are ready to operate the Twister and the Ultramark. Bio-Rad's Twister and Ultramark are both operated through Bio-Rad's Microplate Manager software. Microplate Manager is included with the Ultramark and should be installed when you install the Ultramark.

See the *Microplate Manager User Guide* for complete instructions on installing and using Microplate Manager in conjuction with the Ultramark and the Twister. A summary of the Twister interface in Microplate Manager is provided below.

Loading Microplates into the Twister

Step	Action
1	Press the Power Switch on the back of the Twister to the ON position. The green power indicator light on the front of the Twister is illuminated, indicating the Twister is ON.

WARNING When the Twister is switched ON, the Twister arm moves to the vertical and horizontal home positions. Ensure you are out of the way of the arm before switching ON the Twister.

2	Switch ON the computer and the Ultramark, if they are not on already.
3	Remove the Input rack (position 4) and any Extended Capacity racks from the Twister for loading with microplates.

WARNING BIOHAZARD Wear gloves during any procedure that could involve contact with hazardous materials or fluids.

Ensure that the bottom of each microplate is dry. Fluid on the bottom of a microplate may present a contamination hazard.

Use proper laboratory practices when handling any hazardous materials.

Loading Microplates into the Twister, Continued

4 Load your prepared microplates into the one of the racks. The microplates must be loaded into the rack by hand.

☞ Well A1 on the microplates should always be on the **outside edge** of the rack for proper insertion into the Ultramark. (To determine the outside edge in landscape mode, face the rack with the curved edge on the left. The outside edge is the edge closest to you.)

NOTE **Ensure that all microplates in each run are the same brand and model. If there are different microplates in a run, the Twister will not operate properly and could drop or spill microplates.**

5 Carefully lift the rack by both handles and set the rack in position 4. Make sure that Well A1 in each of the plates is on the **outside edge** of the rack.

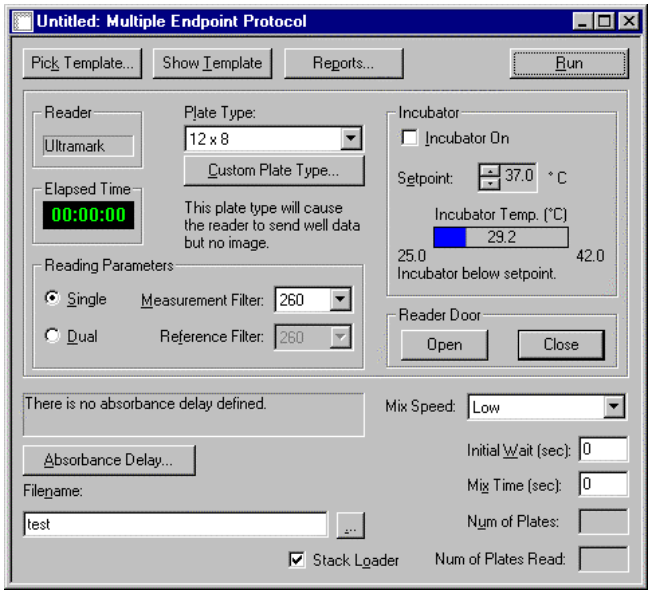
6 If you are using the Twister Extended Capacity option, repeat steps 4 and 5 for each of the Extended Capacity racks.

7 Make sure an empty rack is in position 0 on the Twister.

8 Now you are ready to run your plates, as described in the *Microplate Manager User Guide.*

Controlling the Twister Through Microplate Manager

The Twister is operated through the Multiple Endpoint Protocol window in Bio-Rad's Microplate Manager software. See the *Microplate Manager User Guide* for more information on accessing the Twister software through this window.



If you are connected to the Twister and have installed the Twister software, the *Stack Loader* checkbox will appear checked when you first open the Multiple Plate Protocol window. (If the Twister software is not installed, this checkbox will be unavailable.)

With the checkbox checked, when you click on the *Run* button in the protocol window, the *Plate Handler Options* dialog box will open.



Select the appropriate plate type from the pull-down menu under *Plate Type* in the *Plate Handler Options* dialog box (if you are using a plate type other than default, see the following chapter).

The *Restacking Option* buttons allow you to specify whether and how you will restack your plates. *Restack at End of Rack* will restack the plates after each rack is emptied. *Restack at End of Batch* will wait to restack the plates until all the plates in all the racks have been read.

If you have installed the Lid Storage Platform on the Twister, you can select the appropriate option in the *Lid Configuration* field.

If the Twister Extended Capacity platform has been installed, you can select the *Use Extended Capacity* checkbox. If you do not want to use the Extended Capacity, deselect this checkbox.

If a Barcode Reader is installed with your Twister, the *Scan Barcode* checkbox will appear unchecked. If you do want to scan barcodes, select this checkbox. Each scanned barcode will be stored in the plate file generated by Microplate Manager and printed on all the reports. (It will not be visible in the reports displayed on the screen.) If a scanned plate has no barcode, the Barcode Reader will return a blank string.

From this dialog box you can enter the Twister Main Menu by clicking on the *Twister Configuration/Training* button.

Click on OK to accept the settings and begin running the Twister and Ultramark.

Running Microplates with the Twister

Run your microplates as described in the *Microplate Manager User Guide*.

NOTE **Once a run is started:**



Do not add or remove plates from either the input or output racks.

Do not interfere with the movement of the Ultramark plate drawer or the Twister arm.

WARNING **If the Twister stops with a microplate in the gripper, do not turn the Twister power off without holding the microplate or the Twister will drop the microplate.**



WARNING **Always keep body parts, hair, jewelry, and clothing away from the Twister while it is operating. The Twister arm may move unexpectedly.**





Keep all objects out of the path of the Twister arm. If the Twister arm encounters an object in its path, the Twister will lose the proper orientation.

7. New Plate Types

If you will be using more than one plate type in your runs, or if your Default plate type does not match the type of plate you are using, follow the instructions below to create a new plate type for the Twister.

☞ Note that you only need to create a new plate type if the height of the new plate differs from that of the Default plate type. **The rotary position does not change for different plate types—only the vertical position.**

NOTE **Do not create a new plate type until have trained all the positions for your Default plate type, including the position of the microplate reader or other device, Input and Output racks, Lid Storage Platform, and Extended Capacity racks (if any). See the previous chapters for details.**

Creating a New Plate Type

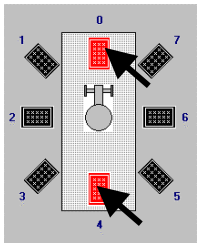
Step	Action
1	In the Twister Main Menu, click the Positional Training button to display the Positional Training window. 
2	Select the "Default" plate type to recall your previous settings, then overwrite the word "Default" with your new plate type name in the Plate Description textbox. Select an appropriately descriptive name for the new type (e.g., "1536-well plate" for a 1536-well microplate).

Creating a New Plate Type, Continued

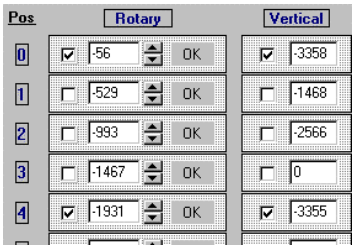
Step	Action

3 In the Position Diagram, click on all the positions you want to train for the new plate type. These may include the main Input and Output racks, the Ultramark plate carrier, the Lid Storage Platform (if using plates for toppers), and the Extended Capacity racks, depending on your configuration. Remember that all these positions should already be trained for the Default plate type.

The positions you select will appear highlighted in red (see the example in the figure below).



In the Rotary and Vertical columns, the checkboxes for the positions will appear selected.



4 Click the Begin Training button.

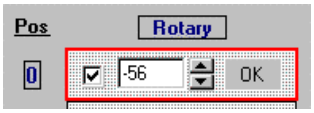


The Twister arm will move to the Home position (position 0) above the Output rack, and an alert box will instruct you to place one microplate in each position being taught.

☞ If you are training for the Ultramark plate carrier, make sure the plate carrier is fully extended before training. After placing a microplate in the carrier, press Open/Close on the Ultramark twice to ensure the carrier is fully extended.

Creating a New Plate Type, Continued

Step	Action
5	Click the OK button in the alert box to dismiss it. The Twister arm will move to the first position you selected, and the **Rotary offset** textbox for that position will be outlined in red.



6	Since the rotary position for the Default plate type has already been trained, you do not need to change this setting for the new plate type. Click the small OK button next to the Rotary Offset textbox.
7	The Twister arm will move down until the Plate Sensor Switch is activated by the lip of the microplate. This automatically records the **Vertical offset** of the new plate type.

☞ **Very Important!** The grippers of the fingers should not touch the sides of the rack as the arm moves down. The fingers should also be an equal distance from the sides of the plate. If these conditions are not met, you must go back to the original training for this position and retrain it.

8	When the Vertical offset is recorded, the Twister arm will move up and over to the next position.
9	Repeat Steps 6–8 for the remaining positions to be trained.
10	When all the positions have been trained for the new plate type, the Twister arm will return to the Home position.
11	Click the Save Plate Data button to save the offsets for the plate type. (Saving the new plate data DOES NOT make the plate the current Twister default.)



12	If you are using the Ultramark, you will select your new plate type from within Microplate Manager when performing a plate run using the Twister. See the *Microplate Manager User Guide* for details. If you are using an external device other than the Ultramark, see the following chapter for instructions on choosing the new plate type.

Change the Twister Default Plate Type

If you are using the Ultramark, you can select the plate type for each Twister run through Microplate Manager. If the plate type you select is not the Twister default, you will have to reselect it every time you start Microplate Manager.

If you want to change the default plate type selection for the Twister, perform the following steps:

Step	Action
1	From the Twister Main Menu, select Positional Training.
2	In the Positional Training window, select the Plate Type in the Plate Description textbox.
3	If the selected plate type is the Current default, the "Plate is Current Default" textbox displays "Yes". If the selected plate type is not the current default, the "Plate is Current Default" textbox displays "No".
4	Click the update Twister button.  ☞ The offsets for the selected plate type are stored in the Twister firmware and are used for every run until the default plate type is changed. ☞ The "Plate is Current Default" textbox displays "Yes".

8. Using the Twister with an External Device

This chapter describes Twister operating procedures with a microplate device other than the Ultramark. For instructions on operating the Twister with the Ultramark, see previous chapters. For specific, detailed instructions for a particular device, see the Twister/device interface guide included in the device interface kit.

Teach the External Device Position

Following are general instructions for devices without obstructions above the device drawer. If the microplate has an obstruction above the device drawer, see the specific device interface guide for instructions.

Step	Action
1	From the Twister Main Menu, click the Positional Training button to display the Positional Training window.
2	Select the desired plate type in the Plate Type textbox.
3	Click the device position (2 or 6) on the Position Diagram to select the offsets to be taught.
4	Click the Begin Training button.
5	Put one microplate in the device drawer.
6	Click the OK button in the dialog box to begin training the position. ☞ The Twister arm moves to the device position and the rotary position textbox for the position is outlined in red.
7	Click the OK button next to the rotary position textbox. ☞ This position should not have to be adjusted if the instrument positions were adjusted properly in the previous procedure. ☞ The Twister finds and sets the vertical offset for the position and then returns to the home position.

Teach the External Device Position, Continued

Step	Action
8	Click the Save Plate Data button to save the settings to the plate type displayed in the Plate Type textbox.
	☞ Saving the plate data does not make change the current default. Click the Update Twister button to update the firmware and make the current plate type the default.

Choose the Actions for the External Device

Before running a batch of microplates using the Twister, you must choose the sequence of actions for the external device. External device operations are not defined using Twister software, they are chosen through an OLE server application, which integrates the Twister software with the device software. Depending on the options available in the device software, it may be possible to choose only standard operations or you may be able to create custom sequences and save them using the device software. Once a sequence of actions has been saved, Twister can execute that sequence on all microplates handled in one run. See the manual accompanying your microplate device software for more information regarding the types of actions that can be saved.

It is important to ensure that custom sequences created using the microplate device software work correctly and contain all necessary parameter options prior to automating them using Twister.

If the device does not have an associated software application, choose and test a standard sequence of actions.

If the device has an associated software application, follow the procedure below to choose the actions of the device.

Step	Action
1	Open the microplate device software.
2	Decide on a standard sequence of actions or create a custom sequence to process all microplates in the run. ☞ See the manual accompanying the device software for information regarding choosing, creating and saving actions.
3	Thoroughly test the sequence to verify correct operation.
4	Close the device software.

Operating the Twister with the External Device

WARNING



When the Twister is switched ON, the Twister arm moves to the vertical and horizontal home positions. Ensure you are out of the way of the arm before switching ON the Twister.

Step	Action
1	Press the Power Switch on the back of the Twister to the ON (1) position. The green power indicator light on the front of the Twister is illuminated, indicating the Twister is ON.
2	Switch ON the computer and the external device.

Load the Microplates

The microplates must be loaded into the input racks by hand. The position of well A1 depends on the microplate device being used. Further details on positioning the microplates can be found in "Loading the Microplates" in the device *Interface Guide*. Below are general instructions.

Step	Action
1	Ensure that all microplates in each run are the same brand and model. If there are different microplates in a run, the Twister will not operate properly and could drop or spill microplates.

WARNING



BIOHAZARD Wear gloves during any procedure that could involve contact with hazardous materials or fluids.

Ensure that the bottom of each microplate is dry. Fluid on the bottom of a microplate may present a contamination hazard.

Use proper laboratory practices when handling any hazardous materials.

2	Load the desired number of microplates into a storage rack by hand. Be sure to stack the microplates so that well A1 on each microplate is in the appropriate location for the device you are using. See "Loading the Microplates" in the device *Interface Guide* for details on the location of well A1 for the specific device.
3	Carefully lift the rack by both handles and set the rack in position 4.
4	If using the Twister Extended Capacity option, repeat steps 2 and 3 for each of the Extended Capacity racks.
5	Place an empty rack in position 0.

Start the Twister Software

Step	Action
1	Open the Twister Software program by double-clicking the Twister icon on the Windows desktop **OR** Select the Twister V2.0 program group from the Windows Start button, then click on Twister V2.0. ☞ The Twister software starts and the Twister Main Menu is displayed.

Start the Device Software

Step	Action
1	Click the Device Interfaces button on the Twister Main Menu to open the Device Interfaces window.
2	In the Loaded Device list box, click on the name of the device that the Twister has been configured to use.
3	Click the Launch button at the bottom of the Device Interfaces window. The main window for the selected device is displayed.

Run the Microplates

After choosing or creating the desired sequence of actions for the microplate device and loading the microplates into the Twister racks, follow the procedure below to run the batch of microplates.

Step	Action
1	From the main window, click the Run button to configure the run.
2	Choose the desired options in each screen, and then click the Next button to move to the next screen. Click the Previous button to go back and change information.

WARNING



Always keep body parts, hair, jewelry, and clothing away from the Twister while it is operating. The Twister arm may move unexpectedly.

Keep all objects out of the path of the Twister arm. If the Twister arm encounters an object in it's path, the Twister will lose the proper orientation.

Run the Microplates, Continued

Step	Action
3	Choose the Run button on the Run Configuration Complete screen to begin running the batch of microplates. The Twister processes all of the microplates in the batch, closes the external device software (if it was open), and then beeps to indicate that the run has finished. ☞ **DO NOT** attempt to control the device software while the Twister is running.
4	When the run is complete, the Device Interface Main window is displayed. Exit the Twister software by clicking the Exit buttons on each window or click the Run button to choose the options for another run.

Stop a Run

Stopping a run in progress is **NOT** recommended because the run can not be restarted after it has been stopped. If it should become necessary, you can stop a run in the following manner:

Step	Action
1	Click one of the three Stop buttons in the Running screen. Now! At End of Current Plate At End of Current Rack
2	The Twister stops at the selected time, the Washer Interface software closes, and the Twister Main Menu is displayed.

WARNING



If the Twister stops with a microplate in the gripper, do not turn the Twister power off without holding the microplate or the Twister will drop the microplate.

3 Before beginning the next run, re-initialize the Twister by switching the power off, then on.

WARNING



When the Twister is switched ON, the Twister arm moves to the vertical and rotary home positions. Ensure you are out of the way of the arm before switching ON the Twister.

9. Twister Software Functions

The Twister software runs on an IBM-compatible personal computer running Microsoft Windows (NT 4.0 or 95), and integrates with the microplate device software through an OLE server, providing a consistent interface with the external device.

Microplate Devices without Associated Software Programs

If the Twister is being used with a microplate device without any associated software, the Twister software is able to interface with the device and control it directly. For example, some microplate washers operate from a keypad located directly on the washer. If the Twister is being used with this type of washer, you can choose a preset cycle or create a custom cycle to be used to wash all the microplates in the run (if the washer has these options). After configuring the Twister software for the cycle and starting the run, Twister software controls the operation of the Twister and the external device until all plates have been processed. Specific information regarding the operation of a particular device can be found in the operator's manual accompanying the device.

Twister Software Conventions

Twister software employs standard IBM-PC and Microsoft Windows conventions for using windows, menus, dialog boxes, and mouse. This manual assumes you are familiar with the basic operation of the computer and with Windows software. Some general instructions are given here, but if you need additional assistance regarding the basic use of the computer, please review its accompanying documentation.

Twister Main Menu

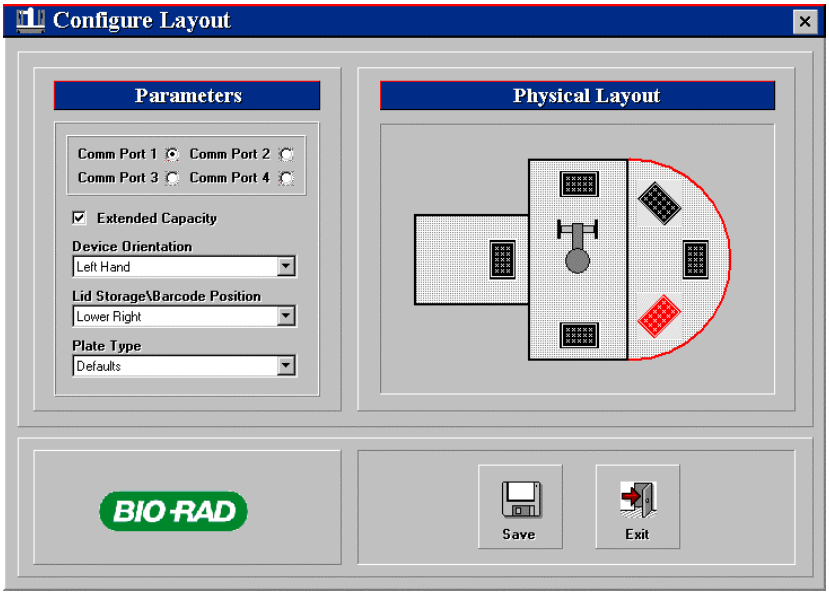
The Twister Main Menu is the first window displayed when the Twister software is launched. The buttons on the screen provide access to windows for configuring the Twister software, teaching the Twister, running external devices, getting help, and exiting the software.



Button	Function
Device Interfaces	Displays the Device Interfaces window to run the device software.
Configure Layout	Displays the Configure Layout window to configure the physical layout of the Twister.
Positional Training	Displays the Positional Training window to teach the Twister to the 8 available microplate positions.
Manual Control	Displays the Manual Control window to move the Twister manually.
Exercise (Demo)	Displays the Exercise window to run the Twister exercise program.
On-line Help	Opens the Twister Help File.
Quit Application	Closes the Twister software.

Configure Layout Window

The Configure Layout window sets the COM port for the Twister software to communicate with the Twister and sets the physical layout of the Twister. The settings should not have to be changed unless the Twister is connected to a different COM port on the computer, or new options or a new device are installed.



COM port

The COM port the Twister software uses to communicate with the Twister.

Extended Capacity checkbox

Check when the Extended Capacity option is installed. If the box is not checked, the Twister will not recognize any extended capacity input racks.

Device Orientation

The layout of the device in relation to the Twister. Left Hand indicates the device is on the left side of the Twister, Right Hand indicates the device is on the right side of the Twister.

Lid Storage/Barcode Reader Location

The location of the Lid Storage Platform (and the Barcode Reader, if both are installed).

☞ If both the Lid Storage Platform and the Barcode Reader are installed, they must be installed in the same location.

Plate Type

The current default plate type. This plate type will be used in each run.

Configure Layout Window, Continued

Physical Layout Diagram

A graphical representation of the choices made in the Parameters section. The Physical Layout diagram changes to match the choices made in the Parameters section.

Button	Function
Save	Saves the Twister configuration, closes the Configure Layout window, and displays the Twister Main Menu.
Exit	Closes the Configure Layout window and displays the Twister Main Menu. The Exit button does not save any changes. Click the Save button to save changes.

Positional Training Window

The Positional Training window sets the rotary and vertical offsets for the eight microplate positions available to the Twister. Access this window by clicking the Positional Training button on the Twister Main Menu.

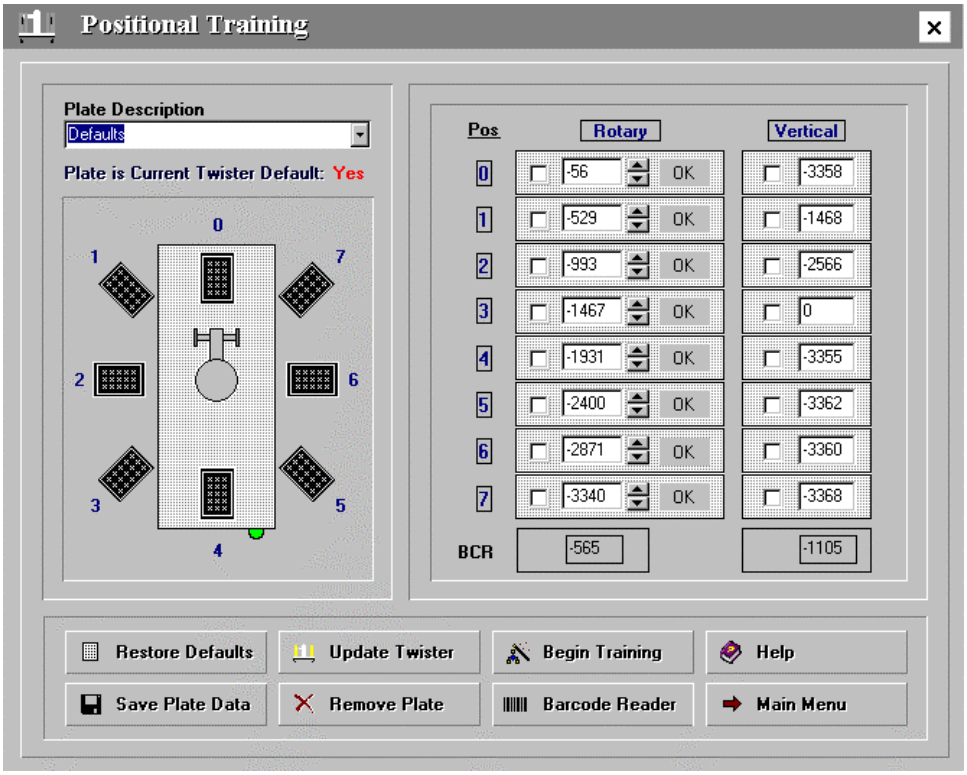


Plate Description Textbox

The name of the plate type being modified. Overwrite this name with a new name to create the new type. Selecting a plate type name displays the associated rotary and vertical settings.

Plate is Current Twister Default

Displays "Yes" if the plate type displayed in the Plate Description textbox is the Current Twister Default. Displays "No" if the plate type is not the Current Twister Default. The offsets for the Current Twister Default plate type are used in the run.

Position Diagram

A graphical representation of the eight possible microplate positions. The positions being taught are displayed in red. Click on the microplate position to select or deselect the Rotary and Vertical checkboxes for the position.

Positional Training Window, Continued

Position Checkboxes

Each of the checked offsets will be taught when the Begin Training button is clicked. (BCR = Barcode Reader)

Button	Function
Restore Defaults	Displays the offsets stored in the “Defaults” Plate Type.
Save Plate Data	Saves the offsets to the plate type shown in the Plate Description textbox. If the plate type is the current default, the offsets are saved to the Twister firmware, and will be used in the next run.
Update Twister	Saves the current offsets to the Twister firmware and makes the plate type displayed in the Plate Description textbox the Current Default. The Current Twister Default plate type will be used in the run.
Remove Plate	Deletes the plate type shown in the Plate Description textbox.
Begin Training	Begins the Twister training routine. The Twister will teach only the offsets which are checked.
Barcode Reader	Opens the Train Barcode Position window to teach the barcode reader position to the Twister.
Help	Displays the Twister Help file.
Main Menu	Closes the Positional Training window and displays the Twister Main Menu.

☞ All checkboxes must be CLEARED before the Positional Training window will close.

Manual Control Window

The Manual Control window allows the user to move the Twister arm and operate the gripper manually. The external device can not be controlled through this screen. Access this window by clicking the Manual Control button on the Twister Main Menu.

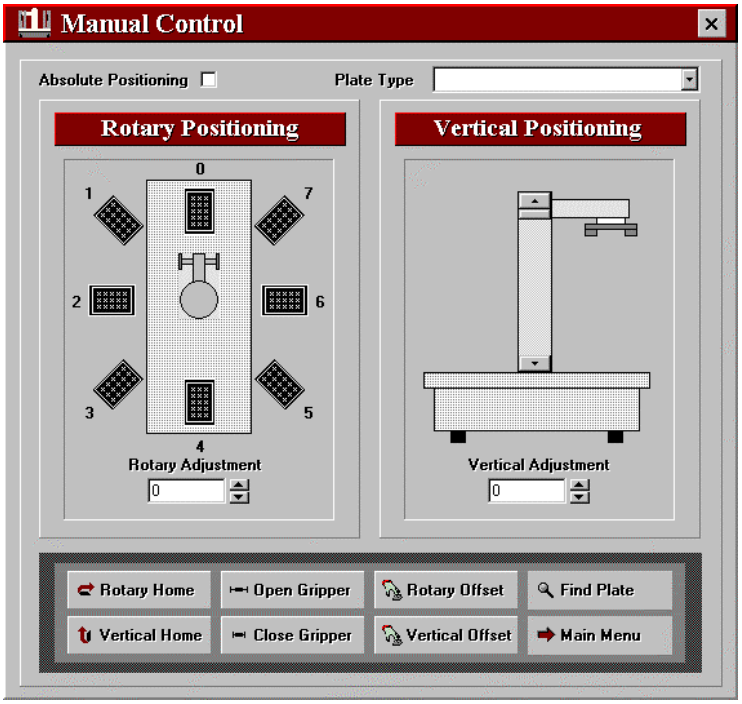


Plate Type

Displays the name of the Plate Type that will be used in the exercise run.

Absolute Positioning checkbox

When Absolute Positioning is checked (contains an "X"), the Twister arm does not move to vertical home before moving in the rotary direction.

Plate Type listbox

Displays the Plate Type being used to position the Twister arm.

Rotary Positioning Diagram

Represents the physical layout of the Twister positions. Click on any of the eight microplate positions to move the Twister arm to that position. The Rotary Optical Sensor verifies that the arm is over a valid microplate position. If the arm is too far away from the center of a microplate position, the arm returns to the Rotary Home position.

Manual Control Window, Continued

Vertical Positioning Diagram

Graphically represents the current height of the Twister arm. Click the up or down scroll arrows or drag the scroll bar to move the Twister arm up or down.

☞ The Twister does NOT check for obstacles before moving the arm. Ensure that the arm's path is not obstructed.

Rotary Adjustment Textbox

Shows the distance from the Rotary Home position in steps. Click the up or down arrows to move the arm one step at a time in either direction. The up arrow moves the Twister arm one step in the clockwise direction, the down arrow moves the Twister arm one step in the counter-clockwise direction. Rotary Home position is at 0 (zero) steps.

Vertical Adjustment Textbox

Represents the distance from Vertical Home in steps. Click the up or down arrows to move the arm up or down one step at a time. Vertical Home position is at 0 (zero) steps.

Button	Function
Rotary Home	Moves the Twister arm to the Rotary Home position.
Vertical Home	Moves the Twister arm to the Vertical Home position.
Open Gripper	Opens the gripper. If a microplate is in the grippers, make sure to hold the microplate before clicking the Open button.
Close Gripper	Closes the gripper.
Rotary Offset	Saves the current rotary position to the plate type shown in the Plate Type textbox as the rotary offset for the active position.
Vertical Offset	Saves the current vertical position to the plate type shown in the Plate Type textbox as the vertical offset for the active position.
Find Plate	Moves the Twister arm down until the lip of a microplate activates the Plate Sensor Switch.
Exit	Closes the Twister Calibration window and displays the Configure Twister window. The Exit button does not save any changes made to the Twister Calibration. Click the appropriate Rotary or Vertical Offset button to save changes.

Exercise Window

The Exercise window sets the options for the Exercise program and runs the program to check the operation of the arm and the grippers. Access this window by clicking the Exercise button on the Twister Main Menu.

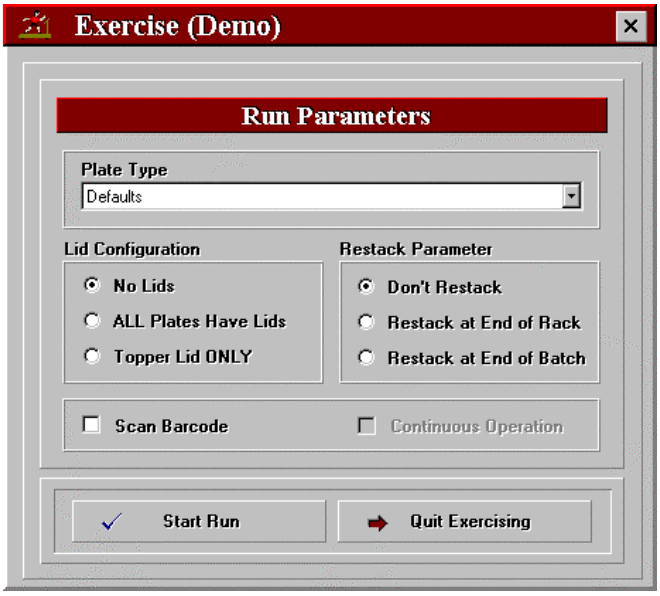


Plate Type textbox

Displays the plate type that will be used in the exercise run.

Lid Configuration

Choose whether or not the microplates for the exercise run have lids or a topper.

Restack Parameter

Choose whether or not to restack the microplates. The microplates can be restacked after each rack is empty or after the entire batch of microplates has been processed.

Scan Barcode

Scans the barcode on each microplate in the exercise run. This option is not available unless the Barcode Reader Interface Kit is installed.

Continuous Operation checkbox

Check the box to begin the exercise run again after the microplates are restacked. This checkbox is available only if Restack at End of Rack or Restack at End of Batch is selected.

Exercise Window, Continued

Button	Function
Start Run	Starts the exercise run using the parameters specified in the Exercise window.
Quit Exercising	Stops the exercise run and closes the Exercise window. If the Twister arm is in motion when the Quit Exercising button is clicked, the arm moves to the next valid position before stopping.

Standard Exercise Run -

In a standard exercise run, the Twister:

1. Picks up the top microplate in the Input rack.
2. Moves to the device position and lowers the microplate to 7 in. (18 cm.) above the lab bench.
3. Pauses, then moves up to vertical home.
4. Moves to the Output Rack.
5. Places the microplate in the Output Rack.
6. Repeats the steps above until the Input rack is empty.

Exercise Run with Lids -

In an exercise run where all the microplates have lids, the Twister:

1. Picks up the lid of the top microplate in the Input Rack.
2. Moves to the Lid Storage Platform position and places the lid on the platform.
3. Moves back to the Input Rack and picks up the top microplate in the Input Rack.
4. Moves to the device position and lowers the microplate to 7 in. (18 cm.) above the lab bench.
5. Pauses, then moves up to vertical home.
6. Moves to the Output Rack and places the microplate in the Output Rack.
7. Moves to the Lid Storage Platform position, retrieves the lid, and places it on the microplate in the Output Rack.
8. Repeats the steps above until the Input rack is empty.

Exercise Window, Continued

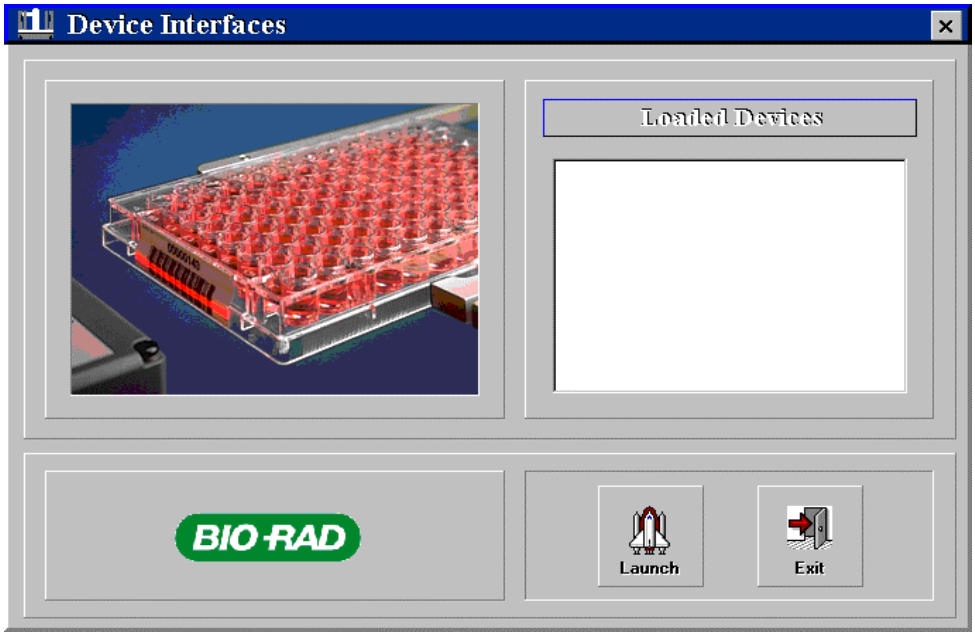
Exercise Run with One Lid or a Topper -

In an exercise run where only the top microplate has a lid or topper, the Twister:

1. Picks up the lid or topper from the top microplate in the Input Rack.
2. Moves to the Lid Storage Platform position and places the lid on the platform.
3. Moves back to the Input Rack and picks up the top microplate in the Input Rack.
4. Moves to the device position and lowers the microplate to 7 in. (18 cm.) above the lab bench.
5. Pauses, then moves up to vertical home.
6. Moves to the Output Rack and places the microplate in the Output Rack.
7. Repeats the steps above until the Input rack is empty.
8. Moves to the Lid Storage Platform position, retrieves the lid, and places it on the top microplate in the Output Rack.

Device Interfaces Window

The Device Interfaces window is used to select the Device Interface program to use for a run. Access this window by clicking the Device Interfaces button on the Twister Main Menu.



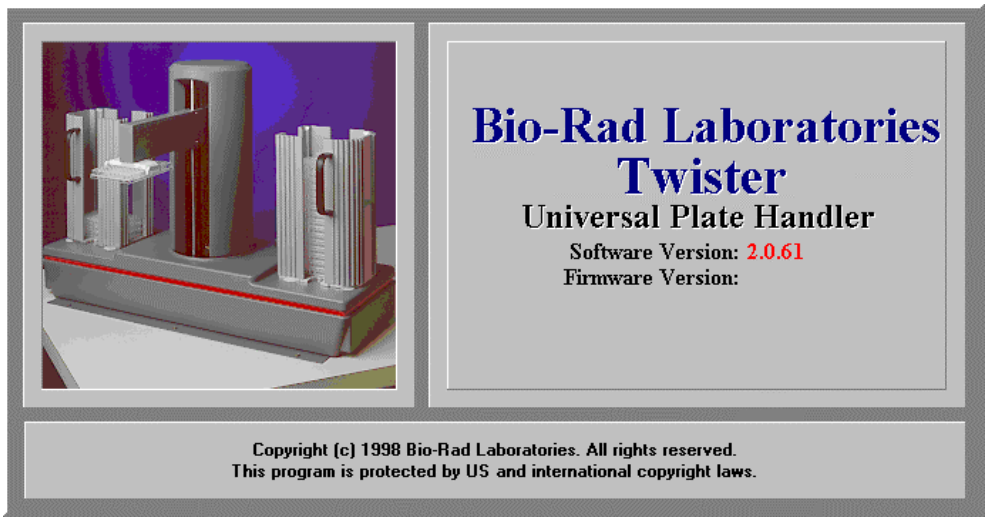
Loaded Devices List

Displays the names of the device software that have been loaded and are available for the Twister to use.

Button	Function
Launch	Launches the device software to configure and start a run. See the device *Interface Guide* included with the Interface Kit for information on configuring and starting a run.
Exit	Closes the External Devices window and displays the Twister Main Menu.

Twister Splash Screen

The Twister splash screen is displayed as the Twister software is starting. The splash screen displays the current software version. When communication is established with the Twister, the firmware version is displayed. The Twister Main Menu is displayed after the Twister initializes.



10. Converting to Portrait Orientation

Bio-Rad's Twister is shipped in landscape orientation for compatibility with the Ultramark. Follow the instructions in this chapter if you want to convert the Twister to portrait orientation (e.g., if you are using an external device other than the Ultramark).

To convert the Twister from landscape to **portrait** orientation, you will:

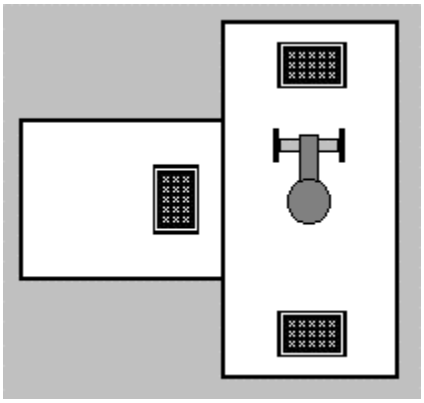
Change the Input Rack Orientation

Change the Output Rack Orientation

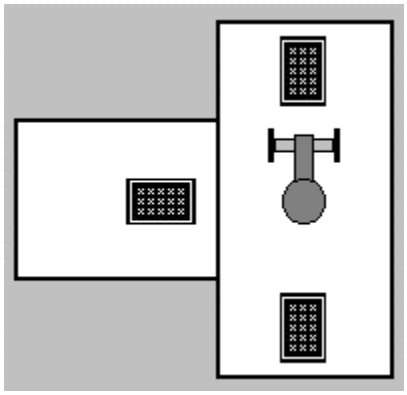
Change the Fingers on the Twister

Adjust the Plate Sensor Switch

Tools: Phillips head screwdriver
small Phillips head screwdriver
13/64th-inch open-end wrench
7/16th-inch open-end wrench



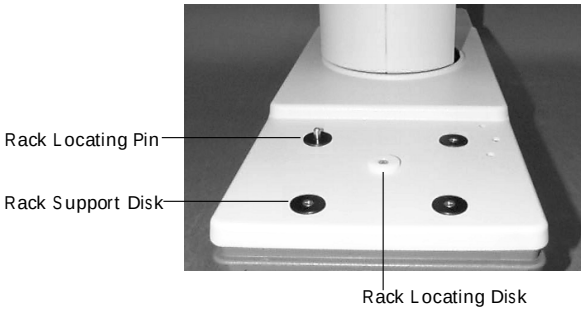
Landscape Orientation



Portrait Orientation

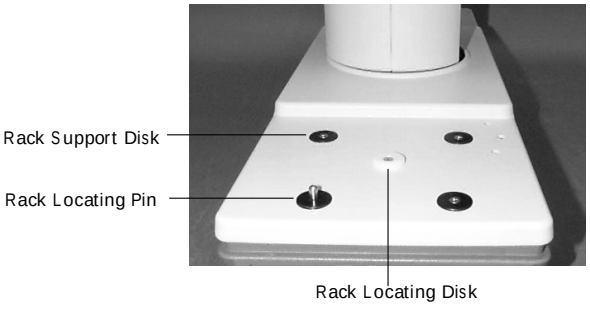
Change the Rack Orientation to Portrait

The Input Rack location is at the front of the Twister (position 4). The four white Rack Support Disks at the corners, the white Rack Locating Disk in the center, and the Rack Locating Pin are used to locate the rack in the proper position.



Input Rack - Landscape Orientation (Front View)

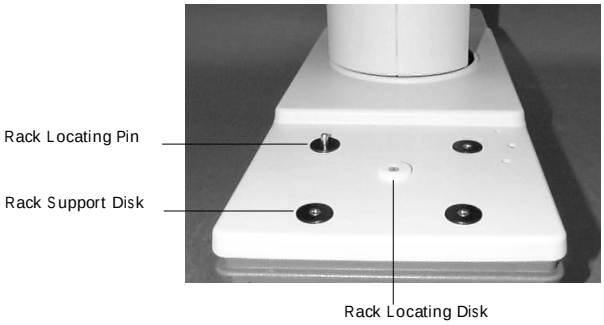
Step	Action
1	Using the 13/64-inch open end wrench, remove the Rack Locating Pin from the rear left position.
2	Remove the white disk from the rear left position, turn the disk over so the countersink is facing up, and replace the disk in the hole.
3	Using a Phillips head screwdriver, remove the screw from the center of the Rack Support Disk in the front left position.
4	Remove the white disk from the front left position, turn the disk over so the countersink is facing down, and replace the disk in the hole.
5	Screw the Rack Locating Pin into the front left position by hand, and then tighten using the 13/64-inch open-end wrench.
6	Insert the screw into the hole in the rear left disk then tighten the screw.



Input Rack - Portrait Orientation (Front View)

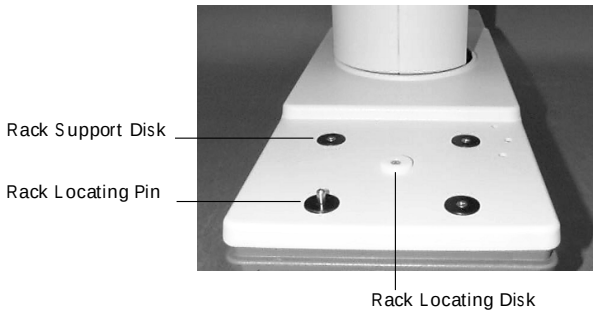
Change the Rack Orientation to Portrait, continued

The Output Rack location is at the rear of the Twister (position 0).



Output Rack - Landscape Orientation (Rear View)

Step	Action
1	Using the 13/64-inch open end wrench, remove the Rack Locating Pin from the front right position.
2	Remove the white disk from the front right position, turn the disk over so the countersink is facing up, and replace the disk in the hole.
3	Using a Phillips head screwdriver, remove the screw from the center of the Rack Support Disk in the rear right position.
4	Remove the white disk from the rear right position, turn the disk over so the countersink is facing down, and replace the disk in the hole.
5	Screw the Rack Locating Pin into the rear right position by hand, and then tighten using the 13/64-inch open-end wrench.
6	Insert the screw into the hole in the front right disk and tighten.



Output Rack - Portrait Orientation (Rear View)

Change the Fingers on the Twister

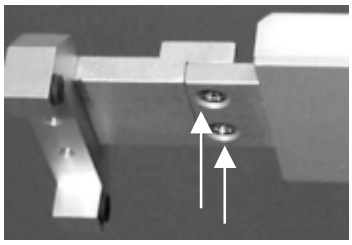
The Twister comes equipped with standard **landscape** finger extensions installed on the gripper. If the device uses microplates in the **portrait** orientation, the fingers on the Twister must be changed to the shorter portrait fingers. To change the fingers on the Twister:

Tools: small Phillips head screwdriver

Step	Action

1 Remove the 2 small Phillips head screws from the bottom of the gripper using the small Phillips head screwdriver, and remove the landscape finger extensions.

☞ Move the Twister arm into any position where it is easy to access the screws.



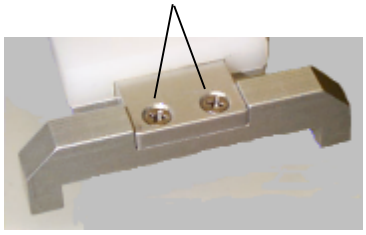
Screws

Removing the Landscape Fingers

2 Install the portrait fingers with the fingers pointing down.

3 Insert the two screws into the ***top*** of the gripper for both sets of fingers. (As shown in the figure below.)

Screws



Installing the Portrait Fingers on the Twister

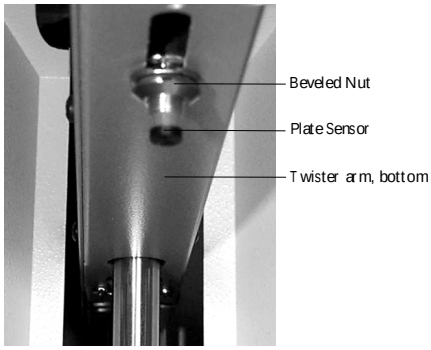
4 Tighten all screws firmly.

Adjust the Plate Sensor Switch

The Plate Sensor Switch signals the Twister when the arm has contacted a microplate. The sensor is set to detect microplates in the **landscape** orientation. If the external device processes the microplates in the **portrait** orientation, the sensor must be adjusted so that it contacts the lip of the microplate. If the sensor is not in the proper position, the Twister will not operate correctly.

Tools: $7/16^{th}$-inch open-end wrench **or** small adjustable wrench

Step	Action
1	Locate the beveled nut on the Plate Sensor Switch located on the underside of the Twister arm. (See the figure below.)



2	Align the wrench with the 2 flat areas on the beveled nut and loosen the nut slightly to allow the sensor to move in the slot.
3	Slide the sensor **away from** the gripper as far as it will go.
4	Tighten the beveled nut to secure the plate sensor.
5	Place a microplate in the portrait-oriented input or output rack of the Twister, and manually move the Twister arm so it contacts the microplate.
6	Verify that the plate sensor contacts the lip of the microplate. Readjust if necessary.

11. Specifications

NOTE **Technical specifications are subject to change without notice.**

General Instrument

Plate Capacity	**Standard:** Up to 20 plates without lids or up to 15 plates with lids **Extended:** Up to 80 plates without lids or up to 60 plates with lids
Microplates Supported	96-well, 384-well, and 1536-well microplates, including lids
Handling Format	Landscape or portrait configuration
Plate Storage Areas	2 removable racks (expandable to 5) plus lid storage platform
Housing Materials	Kydex-T Plastic covering aluminum internal support plates
Gripper Materials	White acetyl housing; aluminum fingers; polyurethane grip pads
Locating Plate Materials	Sheet steel
Arm Mechanism	Ball bearing axis with stainless steel pivot shaft; mechanical stops to prevent continuous rotation (330° maximum)
Spill Control	Interior components protected from accidental spillage by spill shield rim located beneath rotating arm base
Ventilation/Cooling	12 volt fan located in the Twister base

Robotic Arm

Rotary Travel	330 °
Horizontal Reach	10 inch overall reach, 5.5 inches beyond boundary of base
Vertical Reach	Maximum 14.4 inches from table, minimum 4 inches from table, total 10.4 inch vertical travel distance

Physical Performance

Rotary stepper motor	400 steps per motor revolutions; 0.016 in. (0.41 cm.) resolution per motor step at 10.0 in. (25.4 cm.) radius; <5 seconds per full rotation (330°)
Vertical Stepper Motor	400 steps per motor revolutions; 0.003 in. (0.008 cm.) vertical resolution per motor step; approximately 3 seconds per complete vertical motion (one direction)
Home Position	Optical sensors for rotary and vertical arm home (zero) positions
Plate Sensor	Mechanical pushbutton sensor

Environmental

Operating Temperature	59° to 104°F (15° to 40°C)
Operating Humidity	0 to 85%, non-condensing
Storage Temperature	-4° to 149°F (-20° to 65°C)

Physical

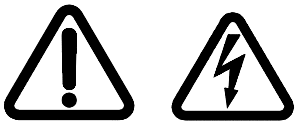
Size (H x W x D)	19 in. (48.26 cm) x 9.1 in. (23.1 cm) x 27 in. (68.6 cm)
Weight	32 lbs. (14.53 kg)

Electrical

Power Input	120V/240V, 50/60 Hz (autosensing), 45 watts maximum
Power Consumption	Approximately 45V AC
Line Voltage	90-250 V AC, autoranging
Line Frequency	50/60 Hz
Fuses	For 120-volt operation: One 1.5-A, 0.25 in. x 1.25 in. (0.64 cm. x 3.2 cm.) For 240V operation: Two 0.8-A, 0.2 in. x 0.08 in. (5.2-mm x 20-mm).
Grounding	Through the power cord
Computer Interface	RS-232 serial (double shielding required)

12. Maintenance

WARNING



Qualified personnel can safely perform all maintenance procedures described in this manual. Maintenance not covered in this manual should be performed only by a Bio-Rad representative.

Switch OFF the power and disconnect the power cord from the power supply before performing any maintenance procedure that requires removal of any panel or cover, or disassembly of any interior instrument component.

Removal of protective covers marked with the High Voltage warning symbol shown at left can result in a safety hazard.

Clean the Twister

WARNING



BIOHAZARD Wear gloves during any cleaning procedure that could involve contact with hazardous materials or fluids.

Periodically, you should clean the outside surfaces of the Twister using a cloth or sponge dampened with water, alcohol, glass cleaner, or a mild soap solution diluted with water. If using glass cleaner or mild soap, wipe with a damp cloth or sponge after cleaning to remove any residue. Do not use abrasive cleaners. Do not spray cleaner onto the instrument. Clean the finger pads of the gripper and the lid storage platform pad with alcohol or other residue-free solvent.

Should fluids spill on the base of the Twister, the fluid is directed away from the rotating base by means of a fluid barrier located beneath it. Wipe up any spills immediately. Clean only the exterior of the unit. Never remove any instrument panels to clean the inside of the instrument. Do not allow excess water or other fluids to drip inside the instrument.

Change the Fuse(s)

Fuses burn out occasionally and must be replaced. If the power indicator light on the front of the unit does not light after switching ON the Twister, first check to see whether the power cord is securely seated in a functioning power outlet and in the Twister power cord receptacle at the rear of the Twister. If the power failed while the Twister was on, check that the power cord is not loose or disconnected and that power to the outlet is functioning properly. If these checks fail to remedy the loss of power, follow the steps listed below to replace the fuses.

Spare fuses are shipped with Twister. If you no longer have spare fuses, you may obtain new ones from Bio-Rad. The Twister uses the following fuses:

U.S.: 1.5 amp, 0.25 x 1.25 inch Fast Acting	P/N 37645
Metric: 0.8-amp, 5.2 x 20 mm Fast Acting	P/N 39838

WARNING



Make sure the power to the Twister is OFF and that the power cord is unplugged from the instrument or the power source before proceeding with the following instructions.

Step	Action
1	Switch OFF power to the Twister and remove the power cord from the power outlet or from the Twister power cord receptacle.
2	Using a small, flat-blade screwdriver, gently pry the cover/fuse block assembly away from its housing and remove it to access the fuses.
3	On the fuse block, loosen the Phillips-head screw two turns and remove the fuse block by sliding it up and away from the screw and pedestal.
4	Remove the blown fuse—either the two 0.8-amp fuses or the single 1.5-amp fuse—and replace with fuses of the same rating.
5	Making sure that the active fuses face out, slide the fuse block back into position and tighten the screw.
6	Slide the cover/fuse block assembly back into the housing and snap into place on the rear panel of the Twister.
7	Reconnect the power cord to the Twister and to the wall outlet and then reconnect the other cables previously disconnected.

Change the Fuse(s), Continued

WARNING  **When the Twister is switched ON, the Twister arm moves to the vertical and horizontal home positions. Ensure that you are out of the way of the arm before switching ON the Twister.**

8 Verify correct fuse replacement by switching ON the Twister power - the Twister should initialize immediately.

Move the Twister

If you need to relocate the Twister, perform the following steps:

Step	Action
1	Remove any microplates from the Input and Output racks and from the Lid Storage Platform.
2	Switch OFF the power and unplug the power cord from the power outlet and from the receptacle on the rear panel of the instrument. Disconnect the communications cable from the rear panel of the instrument.
3	Prepare a space to accommodate the Twister during the move (an empty area on the lab bench or a sturdy cart).

WARNING  **The Twister weighs approximately 32 pounds (14.53 kg) and should be lifted with care. Take the proper precautions to avoid injury.**

4 Lift the Twister straight up and off the locating pins of the Twister Locating Plate and set it carefully on the bench or cart. Depending on the distance that you are moving the instrument, you may wish to repackage the Twister in its original shipping carton.

5 Disconnect the locating plate screws and remove the Twister Locating Plate, setting it aside with the Twister.

6 To reinstall the Twister, follow the instructions in *Installation* to assemble and re-calibrate the Twister.

Long-Term Shutdown

If you will not be using the Twister for an extended period of time, clean the external surfaces of the instrument, unplug the Twister from the main power source, and cover it with a plastic or cloth cover.

13. Troubleshooting

This chapter describes problems and error messages that you may encounter during the operation of the Twister, followed by their most likely causes and possible solutions. Also included are performance checks used to verify proper operation of the Twister. Routine maintenance procedures are described in Chapter 5. For problems with the Twister that are not listed here, see *Contact Us* at the front of this manual.

Performance Checks

The following procedures verify the proper operation of the mechanical components of the Twister.

Verify Robotic Arm Operation

Step	Action
1	From the Twister Main Menu, click the Manual Control button to display the Manual Control window.
2	Click on any of the microplate positions to rotate the arm to that position.
3	If the arm does not move correctly, try resetting the offsets for the position.
4	Use the Vertical Adjustment scroll bar or arrow buttons to move the arm vertically.
5	If the arm does not move correctly using the vertical or horizontal positioning arrows, contact Bio-Rad. See *Contact Us* at the front of this manual for more information.

Verify Gripper Operation

Step	Action
1	From the Twister Main Menu, click the Manual Control button to display the Manual Control window.
2	Click the Open Gripper button on the right side of the window to open the gripper.
3	Click the Close Gripper button on the right side of the window to close the gripper.
4	If the grippers do not open or close correctly, contact Bio-Rad. See *Contact Us* at the front of this manual for more information.

Error Messages

Error messages inform the user of serious problems requiring immediate attention and stop the run in progress. If an error occurs during operation, the Twister stops and an error message is displayed on the computer screen. Error messages are listed below in alphabetical order, along with the probable cause and possible solutions.

Error	Possible Cause	Possible Solution
Illegal Command. The Twister is shutting down	The Twister has contacted an object in its path.	Keep all objects out of the Twister arm's path. Reset the Twister by switching the power off then on.
	A Rotary Offset is not over a valid position.	Reset the Rotary offset for the position.
The attempt to connect to the Twister has failed.	The Twister is switched off or unplugged.	Plug in and switch on the Twister before opening the Twister software.
	The COM port is not configured properly.	See the computer documentation for more information.

Troubleshooting the Twister

This section contains some of the problems that have been encountered with the Twister, and the solutions for these problems. If you are still having problems after following the instructions for the problem, contact Bio-Rad for support. See *Contact Us* at the front of this manual for contact information.

Problem:

The Twister does not turn on or initialize properly when switched on.

Possible Cause:	Solution:
Power cord not firmly attached.	Verify Power cord is securely seated in receptacles.
Bad fuse.	Replace Fuse(s)
Fuse configuration not correct.	See Change the Fuse Configuration

Problem:

The Twister makes a grinding noise at the bottom of a rack or at the device drawer.

Possible Cause:	Solution:
The Plate Sensor Switch on the bottom of the arm is not being depressed by the lip of the microplate.	Place ONE microplate in the rack when teaching the rack positions. Ensure the lip of the microplate depress the Plate Sensor Switch when the gripper is against the microplate. ☞ If the lip of the microplate is notched, the microplate must be placed such that the notch is **not** under the Plate Sensor Switch. If the microplate does not have a lip, the microplates can **not** be used with the Twister.
Wrong Default Plate Type selected	In the Positional Training window, select or create the correct plate type, then click the Update Twister button.
Plates were added or removed during the run	Do not add or remove plates from the racks currently being processed.

Troubleshooting the Twister, Continued

Problem:

The Twister arm tries to move horizontally while it is inside the rack.

Possible Cause:	Solution:
In the Calibrate Twister window, Absolute Positioning may be on.	Turn Absolute Positioning off (clear the checkbox), or click the Vertical Home button before moving the Twister arm in the rotary direction.
During a run, the Twister may have lost the proper orientation due to contact with a foreign object in the Twister arm's path.	Reset the Twister by switching the power off then on. It may also be necessary to restart the Twister software.

Problem:

The Twister returns to the home position immediately after attempting to go to a rotary position.

Possible Cause:	Solution:
The offset for the position is not over a valid microplate position.	In the Calibrate Twister window, click on the microplate position. Does the arm go to that position, then return immediately to the home position? **Yes** - The offset is not over a valid microplate position. Reset the offset for the position. **No** - Contact Bio-Rad for assistance. See *Contact Us* at the front of this manual for more information.

Microplate Location Problems

If the Twister loses the precise location of one or more of the positions (main Input/Output racks, microplate device, Lid Storage Platform, Extended Capacity racks), plates may rub on the racks or become misaligned at one of the other rotary positions. This may occur if the Twister and its accessories are jarred or moved slightly.

If you need to recalibrate the positions of the main Input and Output racks or Lid Storage Platform, refer to the instructions in Chapter 4, Calibrate the Twister.

If you need to recalibrate or adjust the positions of the Ultramark or other external device, Barcode Reader, or Extended Capacity racks, refer to the appropriate interface guide for each of those accessories.

See the following chart for possible solutions to orientation or location problems.

Problem	Possible Solution
The Twister is not seating the plates in the device drawer correctly.	See *Twister/Ultramark Interface Guide* See interface guide for any other external device
The plates are rubbing on the main input or output racks and/or the Extended Capacity racks.	See Chapter 4, Calibrate the Twister, and/or the *Twister Extended Capacity Installation Guide*
The Twister is not lowering the plates all the way down before releasing them.	See Chapter 4, Calibrate the Twister

If none of these remedies solves the problem, contact Bio-Rad. See *Contact Us* at the front of this manual for more information.

Power Outage

If a power outage occurs during operation of the Twister, the grippers will open and the plate will drop. If you routinely operate the Twister overnight or with valuable samples, consider using a 900-watt (or greater) uninterruptable power supply (UPS) to provide a back up power source for the Twister, the external device, and the computer.

Technical Support

If you have any problems using the Twister microplate handler, please contact Bio-Rad Technical Services Department (open Monday–Friday, 8:00 a.m. to 4:00 p.m., Pacific Standard Time).

Phone:	(800) 424-6723, option 2, option 3
	(510) 741-6576
Fax:	(510) 741-5802
E-mail:	LSG.TechServ.US@Bio-Rad.com (U.S.)
	LSG.TechServ.Intl@Bio-Rad.com (International)

14. Glossary

Device Interface Software that allows the Twister software to control the external device (microplate reader, washer, or dispenser), and allows the user to select options for and control the run.

Exercise program The Twister Exercise program moves the Twister through a pre-determined series of movements to check the operation of the arm and grippers.

Extended Capacity The Twister with the Extended Capacity Kit has a capacity of up to 80 microplates without lids, or up to 60 microplates with lids. Toppers can be used on the microplates without lids. This configuration uses 5 racks (4 Input Racks and one Output Rack).

External Device A microplate reader, washer, or dispenser other than the Ultramark that is attached to the Twister using the locating plates and is integrated with the Twister software through the device software.

Rotary Home The Twister arm's furthest position of travel in a clockwise direction.

Input Rack The microplates are taken out of this rack for processing.

Landscape Orientation The long edge of the microplate is closest to the center of the Twister when the plate is in one of the racks or in the device.

Lid A flat cover placed on top of a microplate to prevent evaporation and/or contamination of the samples in the plate. Twister can process plates with a lid on each plate or with a lid only on the top plate in the stack.

☞ When using a lid only on the top plate, the lower plates in the stack are protected by the plate above them.

Output Rack The microplates are placed in this rack after processing.

Portrait Orientation The short edge of the microplate is closest to the center of the Twister when the plate is in one of the racks or in the device.

Standard Capacity The standard capacity of the Twister is up to 20 microplates without lids, or up to 15 plates with lids. A topper can be used on the stack of 20 microplates. This configuration uses 2 storage racks (one Input Rack and one Output Rack).

Storage Rack An aluminum rack used to store microplates, also called Input or Output Racks, depending on where they are located.

Topper A lid or an empty microplate placed on the top of a stack of microplates to prevent evaporation and/or contamination of the samples in the top plate.

☞ When using a topper on the stack of microplates, the lower plates in the stack are protected by the plate above them.

Vertical Home The Twister arm's highest vertical position.

BIO-RAD

Declaration of Conformity

Bio-Rad Laboratories, Inc., 1000 Alfred Nobel Drive, Hercules, California, 94547, U.S.A., declares that the product

Twister (Catalog No. 170-9597)

to which this declaration relates, is in conformity to the following standards or normative documents

EN55011, EN50082-1, EN 61010-1

following the provisions of the Low Voltage, EMC, Affixing CE marking Directive.

The product is imported into the EU by Bio-Rad Laboratories Ltd., Bio-Rad House, Maylands Avenue, Hemel Hempstead (London area), Hertfordshire HP2 7TD England.

March 23, 1999

date of issue

Norman Schwartz
Vice President

DC1709597 Rev A

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