

# Bio-Stack™

## Operator's Manual





# **Bio-Stack™ Microplate Stacker**

## **Operator's Manual**

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## Document Conventions

This manual uses the following typographic conventions:

Example	Description
	This icon calls attention to important <b>safety</b> notes.
<b>Warning!</b>	A <b>Warning</b> indicates the potential for bodily harm and tells you how to avoid the problem.
<b>Caution</b>	A <b>Caution</b> indicates potential damage to the instrument and tells you how to avoid the problem.
DEFINE	Text in <code>COURIER</code> font represents menu options as they appear on the display of the $\mu$ Fill™ Microplate Dispenser or ELx405™ Microplate Washer during operation with the Bio-Stack™.
<b>Note:</b>	<b>Bold</b> text is primarily used for emphasis.
	This icon calls attention to important information.

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### About This Manual

The intent of this Operator's Manual is to instruct the new user how to set up and operate BioTek's Bio-Stack. To help you read and understand this manual, certain document conventions have been used.

Major topic headings start a new page (such as **Document Conventions**, above) to give you a visual and style clue that a new major subject is being introduced. One or more subheadings may appear below each major heading.

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## Revision History

Revision	Date	Changes
A	11/02	First Release.
B	05/03	<ul style="list-style-type: none"><li>• Added a Caution concerning the Waste Monitor Sensor Connector on the ELx405™, in the Cautions section of the Preface.</li><li>• Updated TAC information in the Preface and Chapter 1, and Customer Service and European contact information, Safety Symbols, and Warranty in the Preface.</li><li>• Updated Package Contents, Chapter 1, and Repackaging the Instrument, Chapter 2.</li><li>• Clarified the compatibility of the ELx405 with the Bio-Stack™ by specifying the Washer's Auto Plate and Select models only in the Preface, Chapters 1 through 5, and Appendices C, D, and E.</li><li>• Removed steps 10 and 11 regarding the aerosol cover in "ELx405 Aligning Plate Instructions," Appendix C.</li><li>• Updated Appendix E with additional error code probable causes and new tables E-3, E-4, and E-5 for Bio-Stack motor numbers, sensor numbers, and interfacing instrument numbers referenced in Table E-2.</li></ul>
C	10/03	<ul style="list-style-type: none"><li>• Updated the Intended Use statement to distinguish between the European Union and all other jurisdictions.</li></ul>
D	06/04	<ul style="list-style-type: none"><li>• Re-formatted the manual in the new template and according to the format designated in TP01, Structure for Operator Manuals/User Guides.</li><li>• Added references throughout manual about compatibility of the Bio-Stack™ with the ELx405™ HT and ELx405™ Select CW Microplate Washers.</li><li>• Added new sections throughout manual about compatibility, installation, operation, alignment, etc., of the Precision™ XS Microplate Sample Processor and Precision™ Microplate Pipetting System with the Bio-Stack, controlled by Precision Power™ Software.</li><li>• Revised the Technical Support section and added new sections on Depot Service Contracts and Applications Support. Enhanced Introduction, Installation, Operation, and Maintenance chapters of the manual.</li></ul>

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## Revision History, *Cont'd*

Revision	Date	Changes
E	06/05	<ul style="list-style-type: none"> <li>Added text to all sections of the manual about the Bio-Stack™ enhancements: new barcode scanner and USB port. Added new Appendix B, Barcode Scanner.</li> <li>Restructured manual: moved instructions from previous Appendix B, Serial Cable Connections and Appendix C, Mounting the Aligning Plates and Posts into Chapter 3, Installation.</li> <li>Applied current product name configuration for ELx405™ standard model: changed "Auto" to "ELx405."</li> <li>Simplified/clarified IQ and OQ sections in Chapter 5, Qualification Tests.</li> <li>Enhanced Chapter 7, Troubleshooting and Error Codes with KC4™ error codes for Bio-Stack operation with readers, and Bio-Stack barcode scanner error codes.</li> </ul>
F	05/06	<ul style="list-style-type: none"> <li>Added Gen5™ references and instructions wherever KC4 references or instructions were present.</li> <li>Updated safety information and removed Warranty, Registration Card, and Registration Online sections in Preface.</li> <li>Added laser beam warning to the Preface and to Appendix B, Bio-Stack Barcode Scanner.</li> </ul>
G	07/06	<ul style="list-style-type: none"> <li>Added references to the Synergy™ 2 throughout the manual, and artwork and instructions for installation/alignment of the reader with the Bio-Stack™.</li> </ul>
H	12/06	<ul style="list-style-type: none"> <li>Added references to the NanoQuot™ Microplate Dispenser throughout the manual, instructions/artwork for installation, operation, and qualification of the NanoQuot (Chapters 3, 4, &amp; 5), and troubleshooting/error codes information for the NanoQuot (Chapter 7).</li> <li>Added the Bio-Stack Barcode Scanner Test as an optional IQ and OQ test (for the readers and Precision instruments) in Chapter 5, and added instructions for performing the Scanner Test in Appendix B.</li> </ul>

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## Revision History, *Cont'd*

Revision	Date	Changes
I	06/07	<ul style="list-style-type: none"><li>• Added references to the Synergy™ 4 throughout the manual.</li><li>• Updated Chapter 7, Troubleshooting and Error Codes, with several new error codes.</li><li>• Incorporated manual update revision H1 as Appendix C, Reconfiguration of the Bio-Stack.</li><li>• Added Appendix D, Required Software Versions.</li></ul>
J	08/07	<ul style="list-style-type: none"><li>• Added references to the Liquid Handling Control™ (LHC) Software throughout the manual, and instructions for installation/operation of the software for PC control of the Bio-Stack and ELx405.</li></ul>
K	10/07	<ul style="list-style-type: none"><li>• Added references to BioTek's new MicroFlo™ Select Microplate Dispenser throughout the manual. Added instructions for installation/operation of the MicroFlo with the Bio-Stack, via instrument control (using the MicroFlo keypad) and PC control (using the LHC Software).</li></ul>

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## Intended Use Statement

- The Bio-Stack™ Microplate Stacker is an automated microplate stacking system that is designed to systematically transfer a stack of microplates to BioTek laboratory products wherever washing, dispensing, pipetting, or reading of multiple microplates is performed.
- The Bio-Stack can be computer-controlled
  - via BioTek's Bio-Stack™ PC Control Software, when used with BioTek's PowerWave™ /PowerWave™ XS Microplate Spectrophotometers or Synergy™ HT/Synergy™ 2/Synergy™ 4 Multi-Detection Microplate Readers,
  - via BioTek's Precision Power™ Software when used with BioTek's Precision™ XS Microplate Sample Processor or Precision™ Microplate Pipetting System, or
  - via BioTek's Liquid Handling Control™ (LHC) Software, when used with BioTek's ELx405™ Microplate Washer or MicroFlo™ Select Microplate Dispenser.
- The Bio-Stack can be instrument-controlled by BioTek's µFill™, NanoQuot™, and MicroFlo Select Microplate Dispensers, and by the ELx405.
- **In the European Union:** This product may only be used for Research and Development and other nonclinical uses.
- **In all other jurisdictions:** This product may be used for Research and Development and *in vitro* Diagnostic Use.

❖ **ELx405 Washer:** The Bio-Stack with the ELx405 may be either computer controlled using the LHC Software, or instrument controlled using the keypad on the ELx405.

All ELx405 models except the Magna support the Bio-Stack.

❖ **MicroFlo Select Dispenser:** The Bio-Stack with the MicroFlo Select may be either computer controlled using the LHC Software, or instrument controlled using the keypad on the MicroFlo Select.

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## Quality Control

It is considered good laboratory practice to run laboratory samples according to instructions and specific recommendations included in the assay package insert for the test to be conducted. Failure to conduct Quality Control checks could result in erroneous test data.

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## Repackaging and Shipping



If you need to ship the instrument to BioTek for service or repair, contact BioTek for a **Return Materials Authorization (RMA)** number, and be sure to use the original packing. Other forms of commercially available packing are not recommended and can void the warranty. If the original packing materials have been damaged or lost, contact BioTek for replacement packing.

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## Warnings



Operate the instrument on a flat surface and away from excessive humidity.

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## Hazards and Precautions

### Hazards



**Warning! Power Rating.** The power supply for the Bio-Stack™ must be connected to a power receptacle that provides voltage and current within the specified rating for the system. Use of an incompatible power receptacle may produce electrical shock and fire hazards.

**Warning! Internal Voltage.** Always turn off the power switch and unplug the power supply before cleaning the outer surface of the instrument.

**Warning! Liquids.** Avoid spilling liquids on the Bio-Stack; fluid seepage into internal components creates a potential shock hazard. Wipe up all spills immediately. Do not operate the instrument if internal components have been exposed to fluid.

**Warning! Potential Biohazards.** Some assays or specimens may pose a biohazard. Adequate safety precautions should be taken as outlined in the assay's package insert. Always wear safety glasses and appropriate protective equipment, such as chemically resistant rubber gloves and apron.

**Warning! Unspecified Use.** Failure to operate this equipment according to the guidelines and safeguards specified in this manual could result in a hazardous condition.

**Warning! Pinch Hazard.** Some areas of the Bio-Stack can present pinch hazards when the unit is operating. These areas are marked with the symbol shown in the Safety Symbols section of this Preface. Keep hands/fingers clear of these areas when the unit is operating.

**Warning! Laser Beam (Barcode Scanner).** Serious eye injury may occur if you stare directly into the laser beam of the Bio-Stack's barcode scanner during operation of the scanner. This hazard is noted by the warning label attached to the scanner's cover and shown in the **Safety Symbols** section of this **Preface**. Do not look directly into the laser beam during operation of the scanner.

## Precautions



**Caution: Service.** The Bio-Stack™ should be serviced by BioTek authorized service personnel. Only qualified technical personnel should perform troubleshooting and service procedures on internal components.

**Caution: Environmental Conditions.** Do not expose the instrument to temperature extremes. For proper operation, ambient temperatures should remain between 15° to 35°C (59° to 95°F). Performance may be adversely affected if temperatures fluctuate above or below this range.

**Caution: Power Supply.** Only use the correct line voltage when operating the Bio-Stack.

**Caution: Shipping Panel, Shipping Block, and Carrier Shipping Screw.** The shipping panel, shipping block, and carrier screw must be removed prior to operating the Bio-Stack, and reinstalled before repackaging the instrument for shipment. See **Chapter 3, Installation**, for instructions.

**Caution: Aligning Posts.** When installing the Bio-Stack's four aligning posts, use caution not to cross thread these parts.

**Finger-tighten only!** See **Chapter 3, Installation**.

**Caution: Bio-Stack Barcode Scanner Mirror.** Be very careful not to scratch or damage the mirror when unpacking or installing the barcode scanner!

**Caution: Warranty.** Failure to follow preventive maintenance protocols may void the warranty. See **Chapter 6, Preventive Maintenance**.

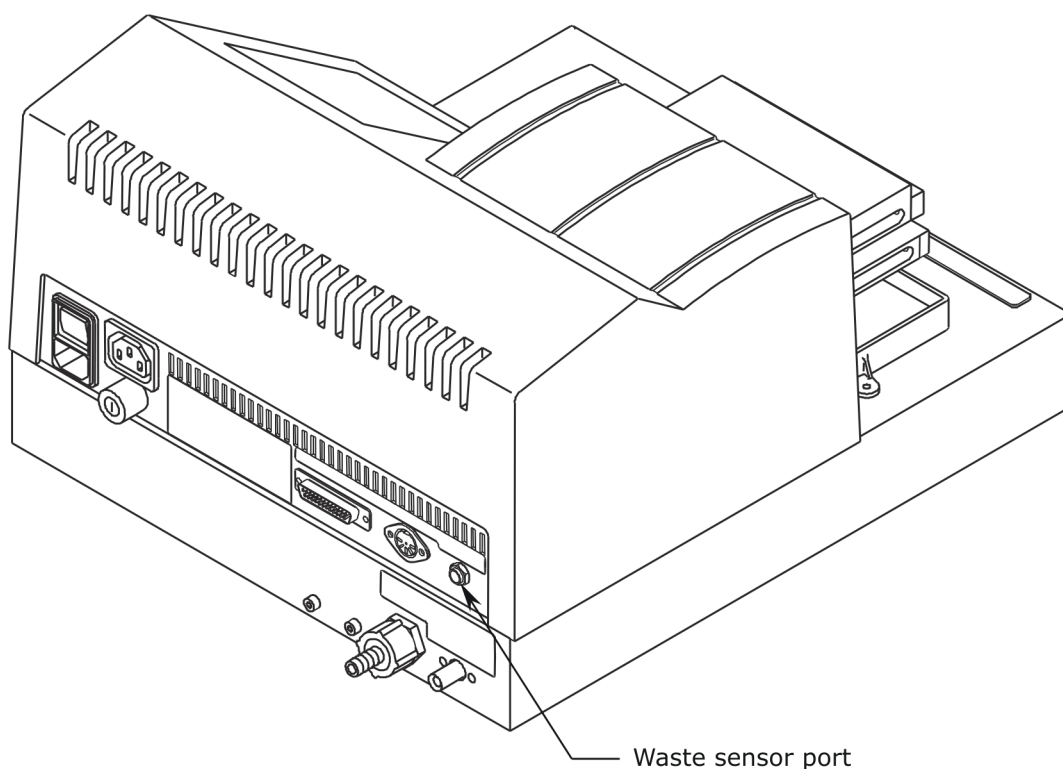
**Caution: Disposal.** This instrument contains printed circuit boards and wiring with lead solder. Dispose of the instrument according to Directive 2002/96/EC, "on waste electrical and electronic equipment (WEEE)."



**Caution: Waste Sensor Port.** (For all customers who have purchased the Bio-Stack™ Microplate Stacker for use with the ELx405™ Microplate Washer.) Although the port on the back of all ELx405 Washers for the waste sensor is the same type as the 24-VDC power connector on the back of the Bio-Stack, if an external 24-VDC power supply is plugged into this waste sensor port, **it will permanently damage components** on the PCB inside the ELx405.



**Important! DO NOT** plug the external 24-VDC power supply that came with your Bio-Stack into the waste sensor port on the ELx405!





**Based on the testing described below and information contained herein, this instrument bears the CE mark.**

## **EC Directive 73/23/EEC Low Voltage (Safety)**

The system has been type tested by an independent testing laboratory and was found to meet the requirements of EC Directive 73/23/EEC for Low Voltage. Verification of compliance was conducted to the limits and methods of the following:

### ***EN 61010-1 (2001) 2<sup>nd</sup> Edition***

“Safety requirement for electrical equipment for measurement, control and laboratory use. Part 1, General requirements.”

## **EMC EC Directive 89/336/EEC Electromagnetic Compatibility**

### ***Emissions - CLASS A***

The system has been type tested by an independent, accredited testing laboratory and found to meet the requirements of EN 61326-1:2002 for Radiated Emissions and Line Conducted Emissions. Verification of compliance was conducted to the limits and methods of the following:

CISPR 16-1:1993, CISPR 16-2:1999, and EN 55022

### ***Immunity***

The system has been type tested by an independent, accredited testing laboratory and found to meet the requirements of EN 61326-1:2002 for Immunity. Verification of compliance was conducted to the limits and methods of the following:

EN 61000-4-2:1998 Electrostatic Discharge

EN 61000-4-3:1998 Radiated EM Fields

EN 61000-4-4:1995 Electrical Fast Transient/Burst

EN 61000-4-5: 1995 Surge Immunity

EN 61000-4-6:1996 Conducted Disturbances

EN 61000-4-11:1994 Voltage Dips, Short Interruptions and Variations

## **Directive 2002/96/EC Waste Electrical and Electronic Equipment**

### ***Disposal Notice***

This instrument contains printed circuit boards and wiring with lead solder. Dispose of the instrument according to Directive 2002/96/EC, “on waste electrical and electronic equipment (WEEE).”

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## Electromagnetic Interference and Susceptibility

### USA FCC CLASS A

**Warning:** Changes or modifications to this unit not expressly approved by the manufacturer could **void the user's authority** to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules.

These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. Like all similar equipment, this equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause interference, in which case the user will be required to correct the interference at his own expense.

### Canadian Department of Communications Class A

This digital apparatus does not exceed Class A limits for radio emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le present appareil numerique n'emet pas du bruits radioelectriques depassant les limites applicables aux appareils numerique de la Class A prescrites dans le Reglement sur le brouillage radioelectrique edicte par le ministere des Communications du Canada.

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## User Safety

This device has been type tested by an independent laboratory and found to meet the requirements of the following:

### North America

- **Underwriters Laboratories UL 61010A-1:2002**  
“Electrical Equipment for Laboratory Use; Part 1: General Requirements.”
- **Canadian Standards Association CAN/CSA C22.2 No. 1010.1-1992**  
“Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use, Part 1: General Requirements.”

### International

- **EN 61010-1**  
“Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use, Part 1: General Requirements.”

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## Safety Symbols

Some of these symbols may appear on the instruments.

**Alternating current**

Courant alternatif  
Wechselstrom  
Corriente alterna  
Corrente alternata

**Direct current**

Courant continu  
Gleichstrom  
Corriente continua  
Corrente continua

**Both direct and alternating current**

Courant continu et courant alternatif  
Gleich - und Wechselstrom  
Corriente continua y corriente alterna  
Corrente continua e corrente alternata

**Earth ground terminal**

Borne de terre  
Erde (Betriebserde)  
Borne de tierra  
Terra (di funzionamento)

**Protective conductor terminal**

Borne de terre de protection  
Schutzleiteranschluss  
Borne de tierra de protección  
Terra di protezione

**On (Supply)**

Marche (alimentation)  
Ein (Verbindung mit dem Netz)  
Conectado  
Chiuso

**Off (Supply)**

Arrêt (alimentation)  
Aus (Trennung vom Netz)  
Desconectado  
Aperto (sconnessione dalla rete di alimentazione)



**Caution (refer to accompanying documents)**

Attention (voir documents d'accompagnement)

Achtung siehe Begleitpapiere

Atención (vease los documentos incluidos)

Attenzione, consultare la doc annessa



**Warning, risk of electric shock**

Attention, risque de choc électrique

Gefährliche elektrische Schlag

Precaución, riesgo de sacudida eléctrica

Attenzione, rischio di scossa elettrica



**Warning, risk of crushing or pinching**

Attention, risque d'écrasement et pincement

Warnen, Gefahr des Zerquetschens und Klemmen

Precaución, riesgo del machacamiento y sejeción

Attenzione, rischio di schiacciare ed intrappolarsi



**Warning, hot surface**

Attention, surface chaude

Warnen, heiße Oberfläche

Precaución, superficie caliente

Attenzione, superficie calda



**Laser radiation: Do not stare into beam**

Rayonnement laser: Ne pas regarder dans le faisceau

Laserstrahlung: Nicht in den strahl blicken

Radiación de láser: No mire fijamente al rayo

Radiazione di laser: Non stare nel fascio



**Consult instructions for use**

Consulter la notice d'emploi

Gebrauchsanweisung beachten

Consultar las instrucciones de uso

Consultare le istruzioni per uso



***In vitro* diagnostic medical device**

Dispositif médical de diagnostic *in vitro*

Medizinisches *In-Vitro*-Diagnostikum

Dispositivo médico de diagnóstico *in vitro*

Dispositivo medico diagnostico *in vitro*



**Separate collection for electrical and electronic equipment**

Les équipements électriques et électroniques font l'objet d'une collecte sélective

Getrennte Sammlung von Elektro- und Elektronikgeräten

Recogida selectiva de aparatos eléctricos y electrónicos

Raccolta separata delle apparecchiature elettriche ed elettroniche



Chapter 1

Introduction

This chapter introduces the Bio-Stack™ and describes its hardware and software features and technical specifications. Instructions on how to contact BioTek for **Product Support & Service** are included on page 19.

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## Introducing the Bio-Stack™

Compact, fast, and easy to use, the Bio-Stack Microplate Stacker can efficiently and repeatedly transfer a stack of microplates to a wide variety of BioTek instruments. The Bio-Stack's seamless operation and rugged construction guarantee walk-away automation wherever washing, dispensing, pipetting, and/or reading of multiple microplates is performed.

Features include:

- Two easily removable, interchangeable stacks (one input and one output)
- Optional automatic re-stacking of plates in original order
- Delivery or retrieval of a microplate in less than 8 seconds
- Flexibility to be PC-controlled or instrument-controlled
- Universal design for operation with BioTek's
  - PowerWave™ and PowerWave™ XS Microplate Spectrophotometers
  - Synergy™ HT/Synergy™ 2/Synergy™ 4 Multi-Detection Microplate Readers
  - Precision™ Microplate Pipetting System
  - Precision™ XS Microplate Sample Processor
  - μFill™, NanoQuot™, and MicroFlo™ Select Microplate Dispensers
  - ELx405™ Microplate Washer
- Cams actuated by stepper motors for quiet and reliable operation
- Onboard diagnostics
- Durable precision-ground aluminum base
- Sensors to ensure completion of each plate movement
- Gripper spring pre-loaded to maintain grip on plate in event of power loss
- Rack and pinion drive for synchronous movement
- Microplate addressed from below for reliable transport
- Linear mechanisms built around proven BioTek technology
- Extremely small footprint that saves bench space
- Accommodation of SBS compliant standard-height microplates as well as low-profile microplates
- Optional barcode scanner

❖ SBS = Society for Biomolecular Screening.



**Figure 1:** The Bio-Stack™ and PowerWave™, Synergy™ HT, ELx405™, and μFill™

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## PC Control of the Bio-Stack™

### Bio-Stack with the PowerWave™ or Synergy™ Readers

In this configuration, BioTek's **Bio-Stack™ PC Control Software** and **Gen5™** or **KC4™ Software** are installed on a host computer equipped with at least two communication ports.

The Bio-Stack PC Control Software uses

- one serial port to control the PowerWave/PowerWave XS or Synergy HT/Synergy 2/Synergy 4 (with the help of Gen5 or KC4 running in the background), and
- another communication port (serial or USB) to control the Bio-Stack.

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❖ In the configuration described above, the Bio-Stack PC Control Software uses **Gen5 only** to control the **Synergy 2/Synergy 4** readers. KC4 software does not support the Synergy 2/Synergy 4.

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❖ **For operation of the reader with the Bio-Stack:** All Gen5 software versions may be used with the Bio-Stack; however, you will need versions of the Bio-Stack PC Control Software and Bio-Stack basecode software that are appropriate for Gen5. For example, the Synergy 4 reader uses Gen5 version 1.04.x, which requires a Bio-Stack PC Control Software version of at least 2.00.7 and a Bio-Stack basecode version of at least 1.27.1 for all plate types.

If you are using KC4 software, you will need KC4 v. 3.3, Rev. 9 or greater.

❖ **For operation of the Bio-Stack barcode scanner:** Contact BioTek to determine if your Bio-Stack supports the barcode scanner.

All Gen5 software versions support the scanner.

If you are using KC4 software, you will need KC4 v. 3.4, Rev. 16 for the scanner. If you wish to have Bio-Stack scanned barcodes appear in KC4 plate description dialogs, you will need KC4 v. 3.4, Rev. 22.

❖ Refer to **Appendix D, Required Software Versions**, for more information on required software versions for the Bio-Stack and readers, or contact BioTek Instruments.

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❖ Some Synergy HT readers may also need to be upgraded with a Bio-Stack compatible carrier. See **Upgrade Information** on page 14 for more information.

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## Bio-Stack™ with the Precision™/XS

In this configuration, BioTek's **Bio-Stack™ PC Control Software** and **Precision Power™ Software** are installed on a host computer equipped with at least two communication ports.

Precision Power software uses

- one serial port to control all functions of the Precision™ Microplate Pipetting System/Precision™ XS, and
- another communication port (serial or USB) and a component of the Bio-Stack PC Control Software to control all functionality of the Bio-Stack.

❖ **For operation of the Precision with the Bio-Stack**, you will need Precision Power Software v. 2 or greater.

Precision XS instruments do not need to be upgraded for operation with the Bio-Stack, however, some Precision Microplate Pipetting Systems may need an upgrade. Refer to **Upgrade Information** on page 14 for more information.

❖ **For operation of the Bio-Stack barcode scanner:** Contact BioTek to determine if your Bio-Stack supports the barcode scanner. You will also need Precision Power Software, v. 2.xx or greater if you will be using the scanner during operation of the Bio-Stack with the Precision.

❖ Refer to **Appendix D, Required Software Versions**, for more information on required software versions for the Bio-Stack and Precision instruments, or contact BioTek Instruments.

❖ Precision instruments that are Bio-Stack compatible may also be operated with **two Bio-Stacks**. In this configuration, you will need a computer equipped with three communication ports.

## Bio-Stack™ with the ELx405™

- ❖ The Bio-Stack with the ELx405 may be either computer controlled using the Liquid Handling Control (LHC) Software, or instrument controlled using the keypad on the ELx405. (See ***Instrument Control of the Bio-Stack™*** on page 8.)

In this configuration, BioTek's **Liquid Handling Control™ (LHC) Software**, **ELx405™ Interface Software**, and **Bio-Stack™ PC Control Software** are installed on a host computer equipped with at least two communication ports (one serial port and a second serial or USB port).

LHC Software uses

- one serial port and the **ELx405 Interface Software** to control all functions of the ELx405, and
- another communication port (serial or USB) and a component of the **Bio-Stack PC Control Software** to control all functionality of the Bio-Stack.

- ❖ **For operation of the ELx405 with the Bio-Stack using the LHC Software**, you will need any version of the LHC Software and the following *minimum* software versions: v. 2.00.4 of the ELx405 Interface Software, v. 2.02.1 of the ELx405 basecode software (PN 7100227), v. 2.00.10 of the Bio-Stack PC Control Software, and v. 1.24.1 of the Bio-Stack basecode software.

Refer to ***Appendix D, Required Software Versions***, or contact BioTek Instruments for more information on required software versions for the Bio-Stack and ELx405 using LHC.

- ❖ Some ELx405 washers may need to be upgraded to support the Bio-Stack. For example, if the ELx405 is not equipped with the robot compatible microplate carrier, you will need to upgrade the washer. Refer to ***Upgrade Information*** on page 14, or contact BioTek for more information.
- ❖ The ELx405 does not support the **Bio-Stack barcode scanner**, and the **Magna** model of the ELx405 washer is not compatible with the Bio-Stack.

- ❖ The LHC Software also allows you to operate **two Bio-Stacks** simultaneously with **two ELx405 washers**. In this configuration, you will need a computer equipped with at least four communication ports and two washers that are Bio-Stack and LHC compatible.

## Bio-Stack™ with the MicroFlo™ Select

- ❖ The Bio-Stack with the MicroFlo Select Microplate Dispenser may be either computer controlled using the Liquid Handling Control (LHC) Software, or instrument controlled using the keypad on the MicroFlo Select. (See ***Instrument Control of the Bio-Stack™*** on page 8.)

In this configuration, BioTek's **Liquid Handling Control™ (LHC) Software**, **MicroFlo™ Select Interface Software**, and **Bio-Stack™ PC Control Software** are installed on a host computer equipped with at least two communication ports (one serial port and a second serial or USB port).

LHC Software uses

- one communication port (serial or USB) and the **MicroFlo Select Interface Software** to control all functions of the MicroFlo Select, and
- another communication port (serial or USB) and a component of the **Bio-Stack PC Control Software** to control all functionality of the Bio-Stack.

- ❖ **For operation of the MicroFlo Select with the Bio-Stack using the LHC Software**, you will need any version of the LHC Software and the following *minimum* software versions: v. 1.01.0 of the MicroFlo Select Interface Software, v. 1.04.0 of the MicroFlo Select basecode software, v. 2.00.10 of the Bio-Stack PC Control Software, and v.1.24.1 (96-/384-well plates) or v.1.25.1 (1536-well plates) of the Bio-Stack basecode software.
- ❖ The MicroFlo Select does not support the **Bio-Stack barcode scanner**.
- ❖ Refer to ***Appendix D, Required Software Versions***, or contact BioTek Instruments for more information on required software versions for the Bio-Stack and MicroFlo Select using LHC.

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## Instrument Control of the Bio-Stack™

### Bio-Stack with the µFill™, NanoQuot™, ELx405™, or MicroFlo™ Select

In this configuration, the Bio-Stack is controlled serially by the µFill, NanoQuot, or MicroFlo Select Dispenser, or by the ELx405 Washer. A serial cable must be used; the µFill, NanoQuot, and ELx405 do not currently support the USB cable. A serial cable must also be used for instrument control of the Bio-Stack by the MicroFlo. The MicroFlo only supports USB cable connection to a host computer during PC control of the Dispenser.

- ❖ Some µFill and ELx405 instruments may need to be upgraded to be Bio-Stack compatible. Refer to **Upgrade Information** on page 14 for more information. **Note:** The Magna model of the ELx405 washer is not compatible with the Bio-Stack.
- ❖ The NanoQuot does not need to be upgraded to be Bio-Stack compatible, however, you will need a Bio-Stack basecode software version of at least 1.24.1 for 96-/384-well standard height plates and 1.25.1 for 1536-well plates.
- ❖ The MicroFlo Select does not need to be upgraded to be Bio-Stack compatible, however, you will need a Bio-Stack basecode software version of at least 1.24.1 for 96-/384-well standard height plates and 1.25.1 for 1536-well plates.
- ❖ During installation of the Bio-Stack with the NanoQuot, the Bio-Stack must be *temporarily* connected to a host computer that has version 2.00.4 or greater of the Bio-Stack™ PC Control Software installed. The PC Software is used to align the Bio-Stack's claw/gripper with the Dispenser's plate carrier, and to obtain software versions for the Bio-Stack.
- ❖ Refer to **Appendix D, Required Software Versions**, for more information on required software versions for the Bio-Stack and µFill, NanoQuot, and ELx405, or contact BioTek Instruments.
- ❖ The µFill, NanoQuot, ELx405, and MicroFlo Select do not support the **Bio-Stack barcode scanner**.



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## Hardware Features

- Microprocessor-driven device with adequate memory for performing all functions
- Two removable, interchangeable upright stacks (one input and one output) that can accommodate a variety of microplate types, including 96-, 384-, and 1536-well plates
- A carrier to transfer plates one at a time from the input stack (holds incoming plates) and to the output stack (holds processed plates)
- A claw/gripper mechanism for securely lowering plates to, and lifting them from, the plate carrier and the interfacing instrument
- Two stack lifters to lift and lower the stack of plates within the input and output stacks
- Two stack locks to secure the stacks during operation of the instrument
- Two dogs in each stack to hold a set of plates within the stack and to lower a single plate down to the carrier
- Compatible with 100 to 240 V~  $\pm 10\%$  @ 50-60 Hz; an external 24-VDC power supply is supplied
- (Optional) barcode scanner

## Software Features

Functionality of the Bio-Stack™ is controlled by the **Bio-Stack's basecode software**, as well as by **serial messages** transmitted either from the

- Bio-Stack™ PC Control Software, Precision Power™ Software, or LHC™ Software during PC control of the Bio-Stack, or from the
- basecode software of the µFill™, NanoQuot™, or MicroFlo™ Select, or the ELx405™ Washer, during instrument control of the Bio-Stack.
- **The Bio-Stack PC Control Software** is an efficient design that works with BioTek's **Gen5™** or **KC4™ Software** to send serial commands for the transfer of plates to and from the Bio-Stack and the PowerWave™/XS or Synergy™ HT/Synergy™ 2/Synergy™ 4 Readers.
  - The operator may initially run Gen5 or KC4 as a stand-alone application to create Gen5 protocols and experiments or KC4 protocols, and later to review plate results or manually export the results. During actual processing of the plates, the Bio-Stack PC Control Software automatically runs Gen5 or KC4 in the "background" to send serial commands to the reader, while sending its own set of serial commands to the Bio-Stack to control plate transfers.
 

❖ Gen5 experiments may also be created from within the Bio-Stack PC Control Software. **Note:** Gen5 software must be used with the Synergy 2/Synergy 4 readers (KC4 does not support the Synergy 2/Synergy 4).
- **Precision Power Software** controls all functions of the Precision™/XS, and uses a component of the Bio-Stack PC Control Software to control all functionality of the Bio-Stack.
  - For high-throughput fluid-transfer programs, up to **two Bio-Stacks** may be used with the Precision instruments.
- **Liquid Handling Control (LHC) Software** uses
  - the **ELx405 Interface Software** to control all functions of the ELx405, and a component of the **Bio-Stack PC Control Software** to control all functionality of the Bio-Stack; or
  - the **MicroFlo™ Select Interface Software** to control all functions of the MicroFlo Select, and a component of the **Bio-Stack PC Control Software** to control all functionality of the Bio-Stack.
- The **basecode software** on the µFill and **ELx405** (ELx405, Select, HT, and Select CW models) has been modified so their normal operating displays now accommodate instructing the operator to place plates on the Bio-Stack, and identifying how many plates have been processed. The **basecode software** on the **NanoQuot** and **MicroFlo Select** includes a **Bio-Stack** mode for running and re-stacking plates, and homing the Bio-Stack.

- **Additional software features** include:
  - A utility for aligning the Bio-Stack-to-instrument interface height ( $\mu$ Fill™, MicroFlo™ Select, and ELx405™) (**Note:** The NanoQuot™ requires the Bio-Stack™ PC Control Software for this.)
  - The ability to home both instruments
  - The ability to continue processing a stack of plates, following the aborting/failure of one plate ( $\mu$ Fill and ELx405)
  - The ability to pause processing to add more plates to the input stack or to remove some from the output stack ( $\mu$ Fill and ELx405).

---

## Package Contents

- Bio-Stack™ Microplate Stacker
- Two microplate stacks (PN 7310008)
- 24 VDC power supply, 48 watts minimum (PN 61062)
- Plate Stacking Pedestal (PN 7312083)
- Grease kit (PN 7110017)
- Unpacking (PN 7311003) and packing (PN 7311002) instructions
- Operator's Manual (PN 7311000) on CD (PN 7311033)
- Set of shipping materials (PN 7313002 for Bio-Stack; PN 7313001 for stacks)
- Shipping document (PN 94075) that includes a Warranty Statement and Certificate of Compliance and Calibration
- Declaration of Conformity (PN 7311001)

❖ Part numbers are subject to change over time. Please contact BioTek Customer Care if you have any questions.

## Optional Accessories

- Spare set of two microplate stacks (PN 7310008S)
- Instrument Qualification package (PN 7310530)
- Bio-Stack™ Service Manual (PN 7311018)
- Barcode scanner and installation kit (PN 7310017) for scanner-compatible Bio-Stack units

❖ The Bio-Stack barcode scanner is compatible only with Bio-Stack instruments that include the necessary hardware and basecode software version. Contact BioTek to determine if your Bio-Stack supports the barcode scanner.

Interfacing instruments that support the scanner include the PowerWave™/XS and Synergy™ HT with Gen5™ Software (all versions) or KC4™ Software (v. 3.4, Rev. 16), Synergy™ 2 with Gen5 v. 1.01.x, Synergy™ 4 with Gen5 v. 1.04.x, and Precision™/XS instruments with Precision Power™ (v. 2.xx). The µFill™, ELx405™, NanoQuot™, and MicroFlo™ Select **do not** support the Bio-Stack barcode scanner.

- Bio-Stack alignment kits (PN's listed in the chart on the following page) for the interfacing instruments, that may consist of the following:
  - **2 aligning plates** (1 for the Bio-Stack (PN 7312052), and 1 for the interfacing instrument), to prevent the instrument from sliding around and becoming misaligned with the Bio-Stack
  - **2 aligning caps** for elevating the interfacing instrument to the correct height and for positioning in the alignment plate (not necessary for the µFill or NanoQuot)
  - **4 aligning posts** ("feet") for elevating the Bio-Stack to the correct height and for positioning in the alignment plate
  - **Other hardware:** Left and right roller extensions (PN's 7110544 and 7110556) to extend the supply platform on the Precision instruments
  - **Bio-Stack PC Control Software** (PN 7310204) (not included for the µFill)
  - **2 RS-232 serial cables:** 9-pin to 9-pin (PN 75034 or 75110), 9-pin to 25-pin (PN 75053 or 75111), and/or 25-pin to 25-pin (PN 75106)
  - **1 USB cable** (PN 75108) and **driver software** (PN 7090204) (not included for the µFill or NanoQuot)

❖ Some instruments may need to be **upgraded** before their alignment kit hardware and software can be installed. Refer to the **Upgrade Information** section on page 14 or contact BioTek.

## Bio-Stack™ Alignment Kits for Interfacing Instruments

This Alignment Kit	Contains the following:						
	2 Plates	2 Caps	4 Posts* ("feet")	Other Hardware	PC Control Software	2 Serial Cables	USB Cable/ Software
<b>7310011</b> PowerWave™ and PowerWave™ XS	7312047; 7312052	7312075	7310523 (66 mm)	N/A	7310204	75034 75053	75108/ 7090204
<b>7310009</b> Synergy™ HT	7312048; 7312052	7312073	7310523 (66 mm)	N/A	7310204	75034 75053	75108/ 7090204
<b>7310019</b> Synergy™ 2 and Synergy 4	7132153 7312052	7312073	7130559 (73 mm)	N/A	7310204	75034 75053	75108/ 7090204
<b>7110004</b> Precision™ XS and Precision™ Microplate Pipetting System	7112139; 7112140	7312074	7110542 (33 mm)	7110544; 7110556	7310204	75034 75053	75108/ 7090204
<b>7310012</b> μFill™	7312049; 7312052	N/A	7310524 (14 mm)	N/A	N/A	75106 75111	N/A
<b>7310010</b> ELx405™ (Excludes Magna)	7312050; 7312052	7312074	7310524 (14 mm)	N/A	7310204	75106 75111	75108/ 7090204
<b>7150001</b> NanoQuot™	7152000; 7312052	N/A	7310524 (14 mm)	N/A	7310204	75110 75111	N/A
<b>7310020</b> MicroFlo™ Select	7172125 7312052	7170527 (4 caps instead of 2)	7310524 (14 mm)	N/A	7310204	75110 75111	75108/ 7090204
* The lengths listed for the posts include the rubber bits, but do not include the threaded portions.							

- ❖ Part numbers are subject to change over time. Please contact BioTek Customer Care if you have any questions.
- ❖ **ELx405 and MicroFlo Select Alignment Kits:** PN's 7310204 and 75108/7090204 are for users who have purchased the Liquid Handling Control (LHC) Software for **computer control** of the Bio-Stack with the ELx405 or MicroFlo Select.

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## Upgrade Information

### Upgrade Kits

Upgrade kits are available for customers with existing BioTek instruments that may be interfaced with the Bio-Stack™. Please refer to the chart in **Figure 2** on the next page or contact BioTek's Technical Assistance Center (tac@biotek.com) to determine whether your instrument must be upgraded to be compatible with the Bio-Stack.

The following upgrade kits are available:

- **Synergy™ HT Multi-Detection Microplate Reader (PN 7310007)**

- Bio-Stack compatible microplate carrier

❖ The Synergy HT must be returned to BioTek TAC for installation of the Bio-Stack compatible carrier.

- **µFill™ Microplate Dispenser (PN 7310015)**

- Disk with latest µFill basecode software (PN 7140200)
- CD with BioTek's Download Utility (PN 8300200) and disk with µFill ActiveX (PN 7140202); both used for downloading the latest µFill basecode software

- **ELx405™ Microplate Washer (PN 7310006)**

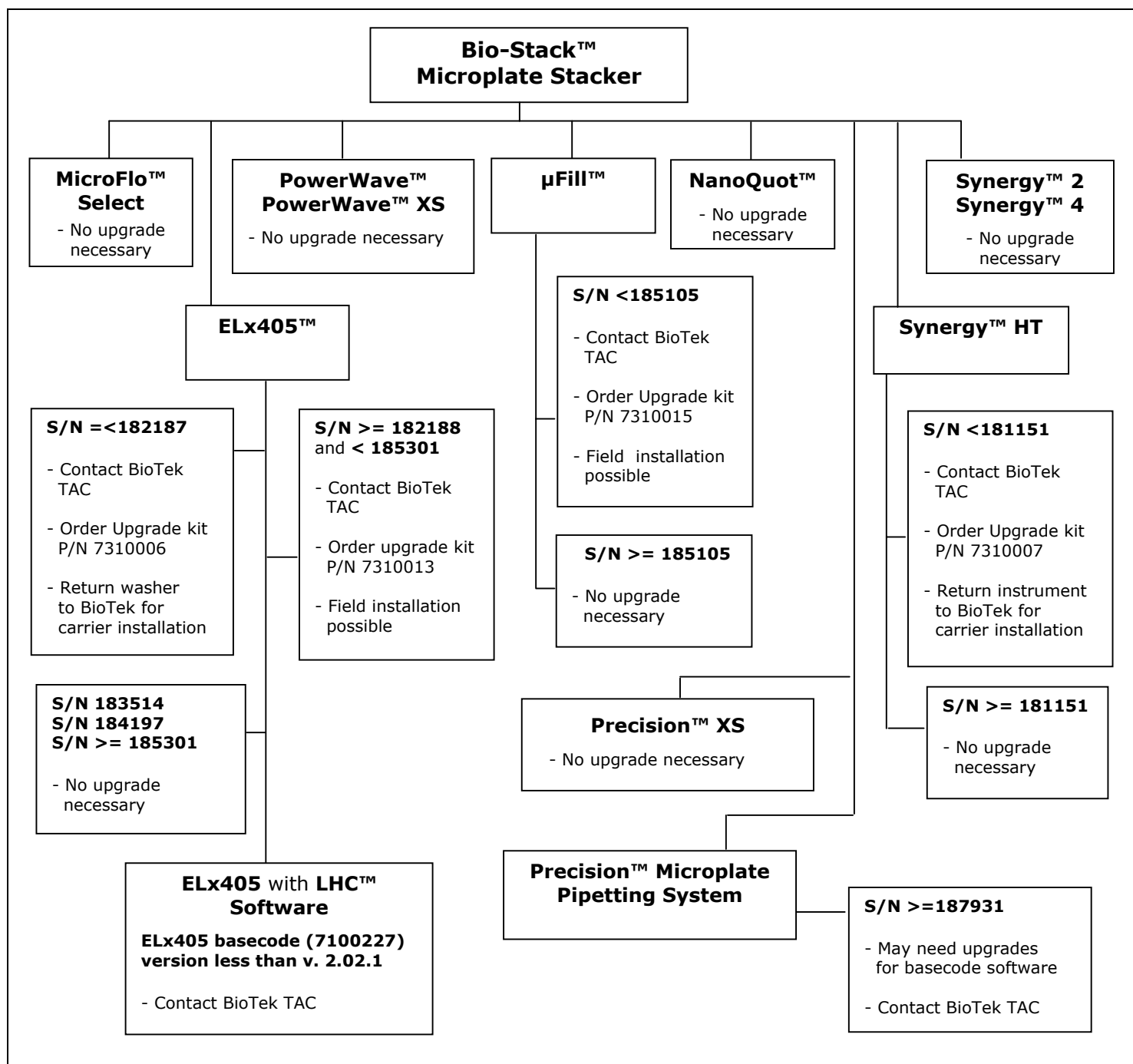
- Bio-Stack compatible microplate carrier
- Disk with latest ELx405 basecode software (PN 7100227)
- CD with BioTek's Download Utility (PN 8300200) for downloading the basecode software

❖ The ELx405 must be returned to BioTek TAC for installation of the Bio-Stack compatible carrier.

- **ELx405 Microplate Washer Software Upgrade Only (PN 7310013)**

- Disk with latest ELx405 basecode software (PN 7100227)
- CD with BioTek's Download Utility (PN 8300200) for downloading the basecode software

❖ The Magna models of the ELx405 are not Bio-Stack compatible.



**Figure 2:** Criteria Chart for Upgrading Bio-Stack Interfacing Instruments

❖ The following Precision Microplate Pipetting Systems **are not Bio-Stack compatible** and **cannot be upgraded**:

- Instruments with serial numbers < 187931
- All 12-Channel models
- Universal 8-/12-Channel models in 12-channel mode

## Specifications

### Bio-Stack™

Electrical	
<b>External Power Supply:</b>	Compatible with 100 to 240 V~ ± 10% @ 50-60 Hz
<b>Power Consumption:</b>	40 watts maximum
Physical	
<b>Display:</b>	None
<b>Dimensions:</b>	<p>Length: 18.5" (46.9 cm)      Width: 7" (17.8 cm)</p> <p>Height when aligned with the following instruments:</p> <p><b>PowerWave™, PowerWave™ XS, Synergy™ HT, Synergy™ 2*, Synergy™ 4*</b></p> <p>25" (63.5 cm) with stacks and long aligning posts 16" (40.6 cm) without stacks</p> <p>* The Bio-Stack is taller with the Synergy 2/Synergy 4 than with the other readers: .28" (.71 cm) higher with/without the stacks.</p> <p><b>Precision™ XS, Precision™ Microplate Pipetting System</b></p> <p>24" (61.1 cm) with stacks and medium aligning posts 15" (37.0 cm) without stacks</p> <p><b>µFill™, ELx405™, NanoQuot™, MicroFlo™ Select</b></p> <p>23" (58.4 cm) with stacks and short aligning posts 14" (35.6 cm) without stacks</p>
<b>Weight:</b>	24 lbs (10.9 kg)
Environmental	
<b>Operating Temperature:</b>	15°C to 35°C (59°F to 95°F)
<b>Humidity:</b>	Maximum relative humidity of 80% at temperatures up to 31°C (87.8°F) decreasing linearly to 50% relative humidity at 40°C (104°F)



## Microplates

<b>Dimensions:</b>	<p>Society for Biomolecular Screening (SBS) compliant standard-height 96- and 384-well microplates</p> <p>Other laboratory microplates, which conform to the following standardized dimensions:</p> <p>Width: 3.365" (85.48 mm) <math>\pm</math> 0.020" (0.5 mm)</p> <p>Length: 5.030" (127.76 mm) <math>\pm</math> 0.020" (0.5 mm)</p> <p>Height: 0.565" (14.35 mm) <math>\pm</math> 0.030" (0.76 mm)</p> <p><b>Shorter profile plates:</b> 1536-well and low volume 384-well microplates are shorter than standard-height plates, and <b>can</b> be processed in the Bio-Stack™. These plates have a minimum height of 0.400" (10.16 mm).</p> <p>The maximum rim height for plates with an overall height that is less than 0.450" (11.43 mm) is 0.100" (2.54 mm).</p> <p>To run plates shorter than 0.565" (14.35 mm), you will need Bio-Stack basecode software version 1.25.1 or greater installed in the Bio-Stack. Some half-height plates may require Bio-Stack basecode version 1.27.1 or greater, as well as reconfiguration of the Bio-Stack. See <b>Appendix C, Reconfiguration of the Bio-Stack</b> and <b>Appendix D, Required Software Versions</b>.</p>
<b>Standards:</b>	<p>With the exception of 1536-well and low volume 384-well microplates, BioTek recommends that you use microplates that comply with the following American National Standards Institute (ANSI)/Society for Biomolecular Screening (SBS) dimensional standards:</p> <p>ANSI/SBS 1-2004 "for Microplates – Footprint Dimensions"</p> <p>ANSI/SBS 2-2004 "for Microplates – Height Dimensions"</p> <p>ANSI/SBS 3-2004 "for Microplates – Bottom Outside Flange Dimensions"</p> <p>ANSI/SBS 4-2004 "for Microplates – Well Positions"</p> <p><b>Note:</b> Microplates that do not meet these requirements may cause functional problems. Plastic "flash" (burrs and extra plastic) on the edges of plates, and strip plates that are not as rigid or flat, may also cause problems.</p>

## PC Software

For PC control of the Bio-Stack™, you will need a computer equipped with **at least two communication ports**. If you are operating *two* Bio-Stack's with a Precision™ instrument, you will need a PC with **three com ports**. If you are operating *two* Bio-Stack's with *two* ELx405 washers, controlled by the LHC™ Software, you will need a PC with **four com ports**.

### Bio-Stack™ PC Control Software

(v. 1.02.8 with KC4)  
(v. 2.00.x with Gen5)  
(v. 2.00.4 or greater for the NanoQuot™; you do not need to install KC4 or Gen5 for the NanoQuot)  
(v. 2.00.7 or greater for the Synergy™ 4)  
(v. 2.00.10 or greater for the LHC Software)

Intel Pentium processor / 266 MHz (or compatible)  
Microsoft® Windows™ 2000, XP, or Vista operating system  
64 MB of RAM (minimum), 128 MB recommended  
60 MB of available hard drive space  
CD ROM drive  
Color monitor, 800x600 resolution with 256 colors minimum (1024x768 resolution with 32-bit color recommended)  
Keyboard, mouse, and serial or USB ports

### Gen5™ Software

(Any version for the PowerWave™/XS or Synergy™ HT)  
(v. 1.01.x or greater for the Synergy™ 2)  
(v. 1.04.x or greater for the Synergy 4)

Refer to the **Gen5 Getting Started Guide** or Help system for system requirements.

### KC4™ Data Analysis Software

(v. 3.3, Rev. 9 or greater)  
(v. 3.4, Rev. 16 or greater for Bio-Stack™ barcode scanner)

Refer to the **KC4 User's Guide** for system requirements.

### Precision Power™ Software

(v. 2 or greater)  
(v. 2.xx or greater for Bio-Stack barcode scanner)

Refer to the **Precision Power User's Guide** for system requirements.

### Liquid Handling Control™ (LHC) Software

(Any version of the LHC and v. 2.00.4 of the ELx405 Interface Software for the ELx405 or v.1.01.0 of the MicroFlo™ Select Interface Software for the MicroFlo)

Refer to the **Liquid Handling Control Software Installation Guide** for system requirements.

Refer to **Appendix D** for more information on required software versions.

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## Product Support & Service

All of BioTek's products are backed by a superior support staff. If your instrument ever fails to function perfectly, if you have questions about how to use or maintain it, or if you need to send the instrument to BioTek for service or repair, please contact our Technical Assistance Center (TAC).

### Contacting the Technical Assistance Center

Our Technical Assistance Center is open from 8:30 AM to 5:30 PM (EST), Monday through Friday, excluding standard U.S. holidays. You can send a fax or an e-mail any time.

**Phone:** 800-242-4685 (in the U.S.) or 802-655-4740 (outside the U.S.)

**Fax:** 802-655-3399

**E-Mail:** [tac@biotek.com](mailto:tac@biotek.com)

Please be prepared to provide the following information:

- Your name and company information
- A daytime phone or fax number, and/or an e-mail address
- The product name, model, and serial number
- The software part number and basecode versions for the Bio-Stack™ and interfacing instrument, and, if applicable, the software versions for the Bio-Stack™ PC Control Software Installation CD, StackerContainer.exe, and BTIAutoStackerActiveX.
- For troubleshooting assistance or instruments needing repair: the specific steps that produce your problem, and any error codes displayed (see also **Chapter 7, Troubleshooting and Error Codes**).

### Returning Instruments for Service/Repair

If you need to return an instrument to BioTek for service or repair, please contact the TAC for a Return Materials Authorization (RMA) number *before* shipping the instrument. Repackage the instrument properly (see **Chapter 3, Installation**), write the RMA number on the shipping box, and ship to this address:

**BioTek Instruments, Inc.**  
Technical Assistance Center  
100 Tigan Street  
Highland Park  
Winooski, Vermont 05404 USA



**Chapter 2**

**Instrument Description**

This chapter describes the important external components of the Bio-Stack™.

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## Review the Major Components of the Bio-Stack™

Before you install the Bio-Stack according to the instructions in **Chapter 3**, please take a few minutes to become familiar with the Bio-Stack components described in this chapter.

❖ Refer to **Figure 3** on the next page for an illustration of the Bio-Stack components.

The Bio-Stack's major external components consist of the **microplate stacks** ("input stack" and "output stack"), **carrier**, **claw/gripper**, **stack lifters**, **stack locks**, **stack dogs**, and **LED**.

There is no onboard display or keypad, because the Bio-Stack is either

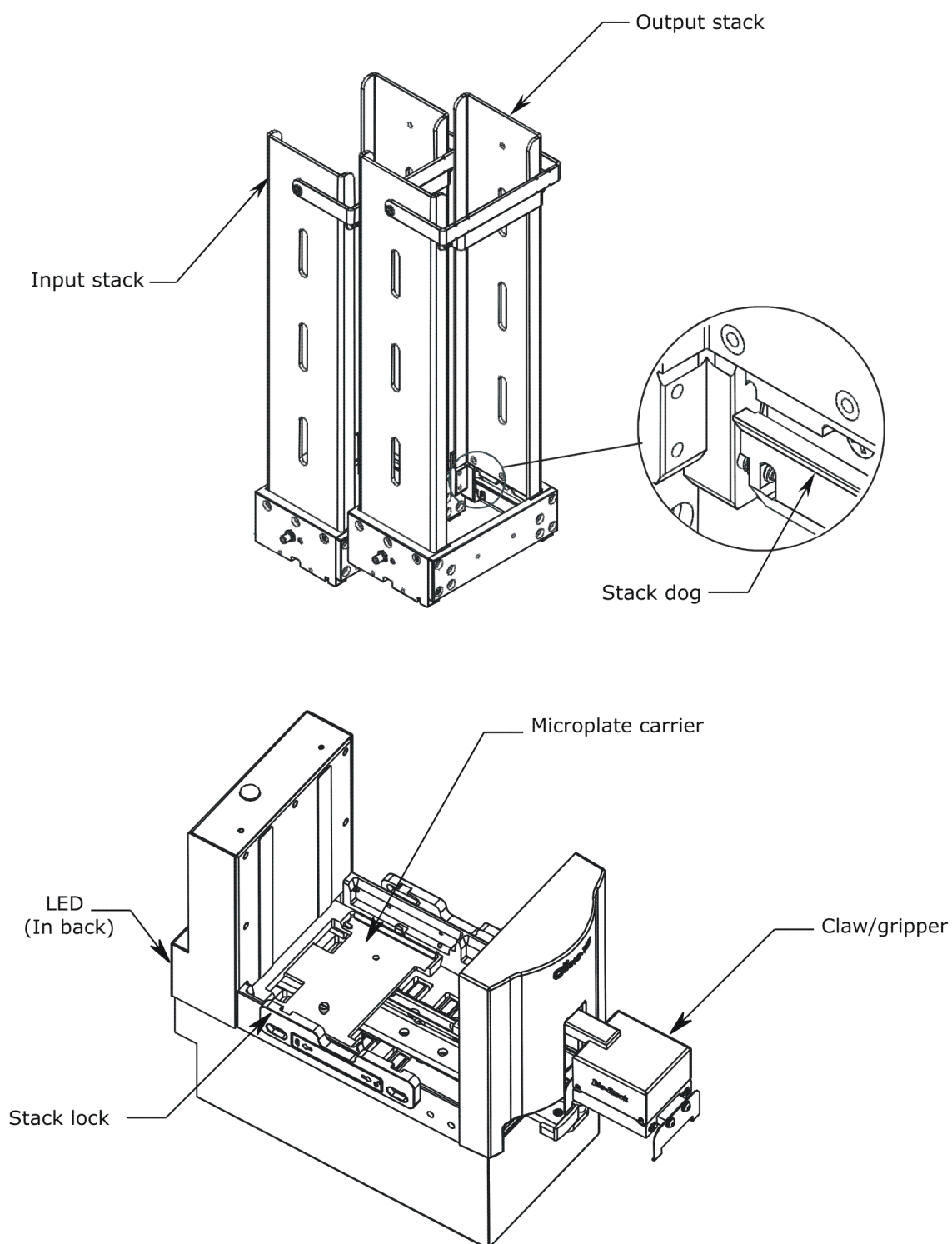
- **computer-controlled**
  - via the Bio-Stack™ PC Control Software (when used with the PowerWave™/PowerWave™ XS or Synergy™ HT/Synergy™ 2/Synergy™ 4 Readers), or
  - via Precision Power™ Software, (when used with the Precision™ Microplate Pipetting System/Precision™ XS instruments), or
  - via Liquid Handling Control™ (LHC) Software (when used with the ELx405™ Washer or MicroFlo™ Select Dispenser).
- **instrument-controlled** by the µFill™, NanoQuot™, or MicroFlo Select Dispenser, or ELx405 Washer.

❖ **ELx405 Washer:** The Bio-Stack with the ELx405 may be either computer controlled using the LHC Software, or instrument controlled using the keypad on the ELx405. **Note:** The Magna model of the ELx405 does not support the Bio-Stack.

❖ **MicroFlo Select Dispenser:** The Bio-Stack with the MicroFlo Select may be either computer controlled using the LHC Software, or instrument controlled using the keypad on the dispenser.

### Stacks

The two microplate stacks are for storing plates to be processed (input stack) and for storing plates after they have been processed (output stack). The stacks are mechanically identical and interchangeable, and can hold up to 30 standard-height plates and at least 40 of the shorter profile plates.



**Figure 3:** External Components of the Bio-Stack™

## Carrier

The carrier transfers one plate at a time from the input stack to the extended carrier position, and then back to the output stack. The carrier can also transfer a plate from the output stack to the input stack, if the **optional re-stacking feature** is requested.

## Claw/Gripper

The claw/gripper

- lifts the plate off the carrier at the extended carrier position and places it on the instrument, and
- lifts the plate off the instrument and places it back on the carrier.

The gripper has a sensor that indicates when the grip arms are at their closest position. The sensor is triggered when there is no plate within the gripper arms.

The two sides of the gripper are spring-loaded so that if the power goes off, the gripper still holds the plate.

## Stack Lifters

The two stack lifters lift and lower the stack of plates contained within the input and output stacks.

## Stack Locks

The two stack locks (one on the left side, one on the right side of the Bio-Stack™) prevent the stacks from accidentally getting knocked over during operation of the instrument. A **magnetic latch** holds the locks in place.

## Stack Dogs

There are two dogs per stack to hold a set of plates within the stack, and to aid the stack lifters in the process of lowering a plate down to the carrier.

## LED

A green LED on the back of the Bio-Stack indicates the current state of the instrument. The light will turn on when the power-up and homing sequence begins (System Self-Test), and will remain constant if the instrument is functioning properly. A flashing light indicates an error that requires user intervention. (Refer to **Chapter 7, Troubleshooting and Error Codes**.) Any other state indicates either loss of power or, possibly, a defective LED.



## Optional Barcode Scanner

The Bio-Stack™ barcode scanner may be installed by the operator

- on either the left side or right side of the Bio-Stack for operation with the Synergy™ HT/Synergy™ 2/Synergy™ 4 and Precision™/XS, or
- on the left side only for operation with the PowerWave™/XS

The scanner automatically scans barcode labels on plates at the Bio-Stack's extended carrier position during plate transfers between the Bio-Stack and interfacing instrument.

Barcode values returned from the scanner may be displayed in the Bio-Stack™ PC Control Software if the operator selects the option to display barcode information. The barcode value is then passed into Gen5™ or KC4™ Software for storage in the Gen5 experiment or KC4 output file, and optionally, as part of the output filename (KC4 only).

Barcode scanner options are also available in Precision Power™ Software through the Supply Command and To-Do List features.

❖ The µFill™, NanoQuot™, ELx405™, and MicroFlo™ Select do not support the Bio-Stack barcode scanner.



## Chapter 3

# Installation

This chapter includes instructions for unpacking and setting up the Bio-Stack™ Microplate Stacker, installing the Bio-Stack with the interfacing instrument, and repackaging the Bio-Stack for shipment.

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## Before You Begin the Installation

- ❖ For your convenience, an **Installation Checklist** is provided in **Chapter 5, Instrument Qualification**. The Checklist is a one-page form that you can use to check off each of the installation tasks you will be performing in this chapter.
- ❖ If you have purchased the Bio-Stack's optional **barcode scanner**, install the Bio-Stack™ with the interfacing instrument first, *before* you install the scanner.
- ❖ You will need a **flat-blade screwdriver**, **7/64" hex wrench**, and **9/64" hex wrench** to perform some of the Installation tasks.

### Tips for Easier Installation

It may be easier to install the Bio-Stack with the instruments listed below, if you remove the following components from these instruments *before* installation. After you have completed installation and alignment of the Bio-Stack with the instrument, re-install the components that you removed.

- **Synergy™ HT/Synergy™ 2/Synergy™ 4 with injectors:** If equipped with injectors, and the dispense module is in use, disconnect the cable and tubing from the back of the reader and set the module aside.
- **Precision™/Precision™ XS:** Remove any supplies from the platform. If installed, remove the optional aerosol cabinet; the cabinet is not designed to be used in a robotic environment. Disconnect the tubing and remove the manifold and manifold priming trough.
- **ELx405™:** Remove the microplate carrier. Disconnect the tubing, vacuum pump cable, and waste sensor cable from the back of the washer.

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## Unpack and Inspect the Bio-Stack™



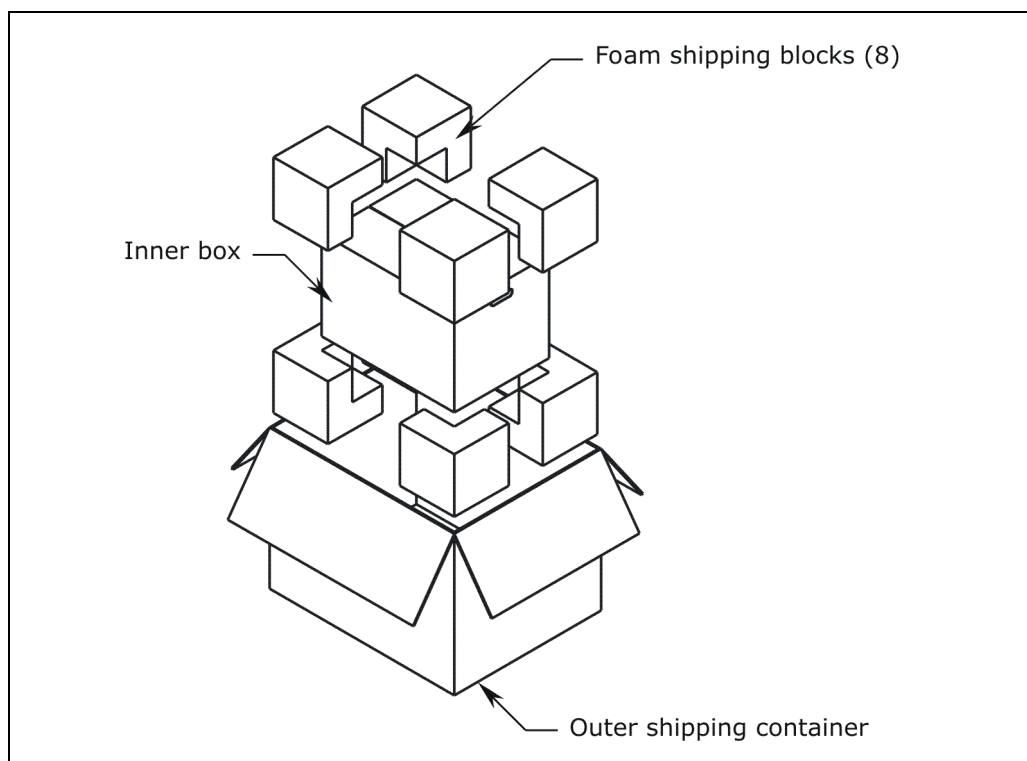
**Save all packaging materials!** If you need to ship the instrument to BioTek for repair or replacement, you must use the original packaging. Using other forms of commercially available packaging is not recommended and can **void the warranty**.

If the shipping box has been damaged, inspect the instrument for visible dents and scratches as you unpack it. If the instrument is damaged, notify the carrier and your BioTek sales representative. Keep the shipping cartons and the packing material for the carrier's inspection. BioTek will arrange for the repair or replacement of your instrument immediately.

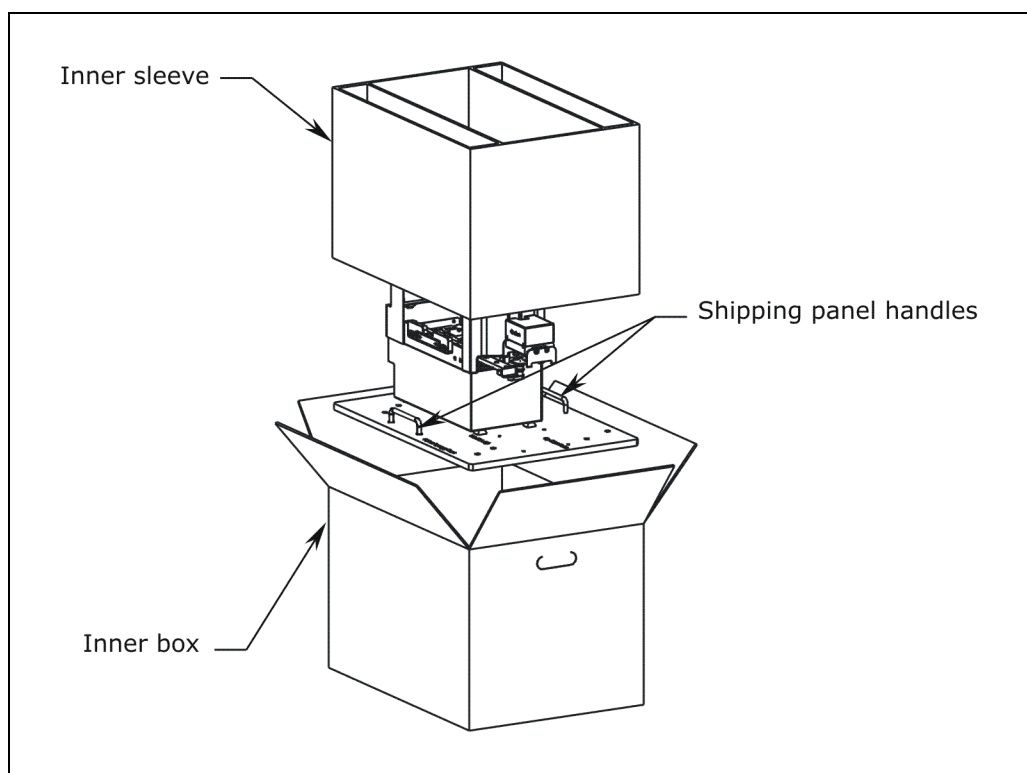
See **Repackaging and Shipping** at the end of this chapter for complete shipping instructions.

Perform these steps to unpack and inspect the instrument:

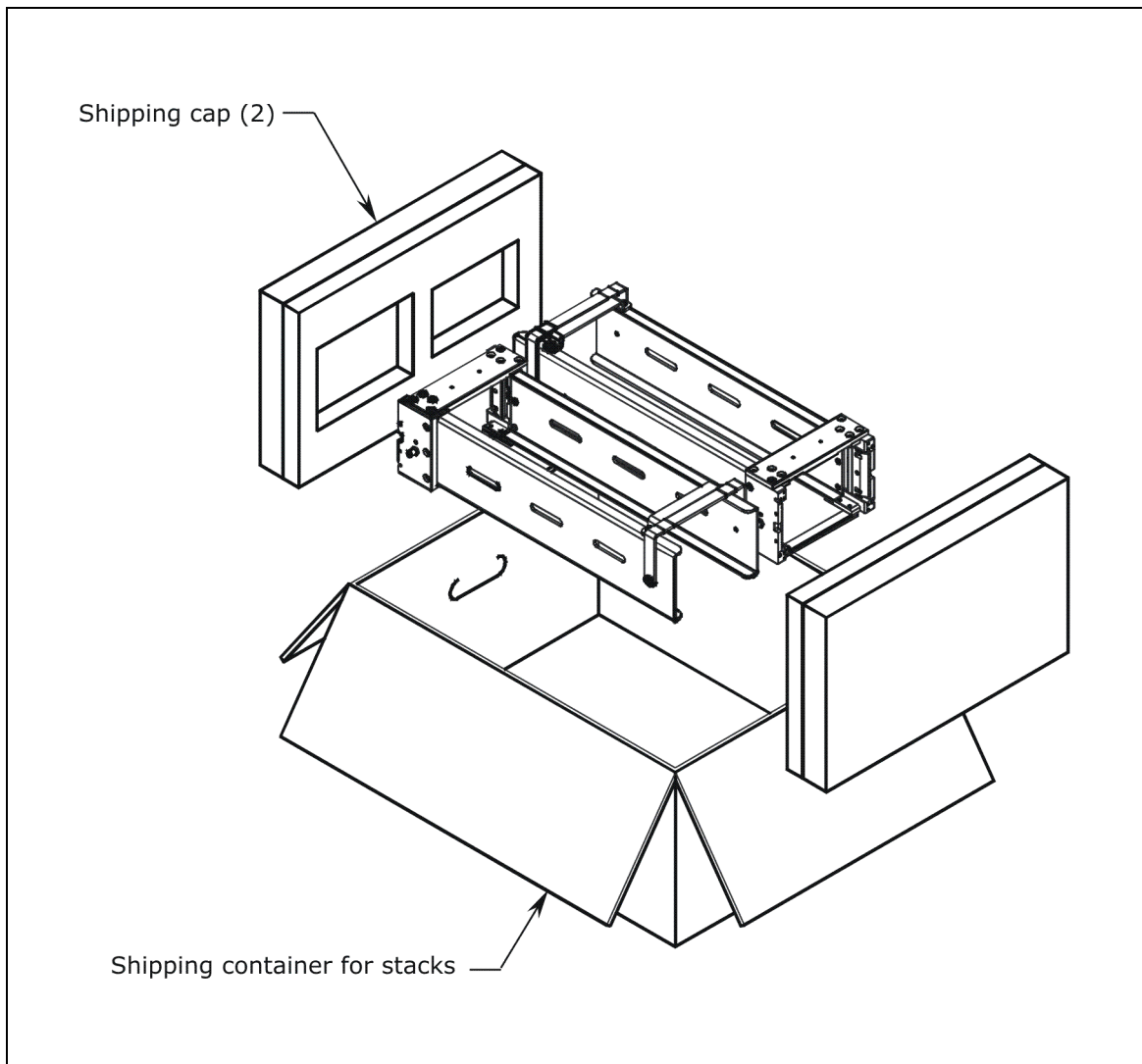
1. Open the outer shipping container and remove the top foam shipping blocks from the inner box (see **Figure 4** on the following page).
2. Lift the inner box out of the bottom foam shipping blocks and outer shipping container, and place the box on a level surface.
3. Remove all accessories from the inner sleeve, and then remove the inner sleeve (see **Figure 5** on the following page).
4. Carefully pull the Bio-Stack™ out of the inner box by lifting on the handles of the shipping panel. Place the instrument on a level surface.
5. Place all packing materials back into the shipping container for reuse if the instrument needs to be shipped again.
6. Unpack the two microplate stacks, which are shipped in a smaller, separate container. Save this container with the other packaging materials for the Bio-Stack and its accessories (see **Figure 6** on page 31).



**Figure 4:** Opening the Outer Shipping Container



**Figure 5:** Removing the Bio-Stack™ from the Inner Box



**Figure 6:** Unpacking the Microplate Stacks

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## Check the Components

### Required Components

Confirm that all required components are included. If any are missing or damaged, contact your BioTek sales representative.

❖ **Chapter 1, Introduction**, contains BioTek part numbers for the components listed below.

- Two microplate stacks
- Power supply
- Plate stacking pedestal
- Grease kit
- Unpacking and packing instructions
- Bio-Stack™ Operator's Manual (on CD after January 2007)
- Declaration of Conformity, Warranty Statement, and Certificate of Compliance and Calibration
- Bio-Stack Alignment Kit for one of the following instruments:
  - PowerWave™/PowerWave™ XS Reader
  - Synergy™ HT Reader
  - Synergy™ 2/Synergy™ 4 Reader
  - Precision™ Microplate Pipetting System/Precision™ XS
  - µFill™ Dispenser
  - ELx405™ Washer
  - NanoQuot™ Dispenser
  - MicroFlo™ Select Dispenser

❖ Refer to **Appendix B, Bio-Stack Barcode Scanner**, for a complete list of the components contained in the Bio-Stack's **optional barcode scanner** installation kit.

### Optional Components

Confirm that all purchased optional components are included (they should be documented on the packing list). If any are missing or damaged, contact your BioTek sales representative.



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## Set Up the Bio-Stack™

### Select an Appropriate Location

For optimal operation, install the Bio-Stack on a clean, level surface in an area where ambient temperatures between 15°C (59°F) and 35°C (95°F) can be maintained.

Conditions to avoid are:

- **Excessive humidity:** Condensation directly on the sensitive electronic circuits can cause the instrument to fail internal self-checks. The Bio-Stack requires a maximum relative humidity of 80% at temperatures up to 31°C (87.8°F), decreasing linearly to 50% relative humidity at 40°C (104°F).
- **Dust:** Efficient microplate transporting may be affected by extraneous particles (such as dust) on the carrier's linear ways. A clean work area is necessary to ensure smooth plate transporting.

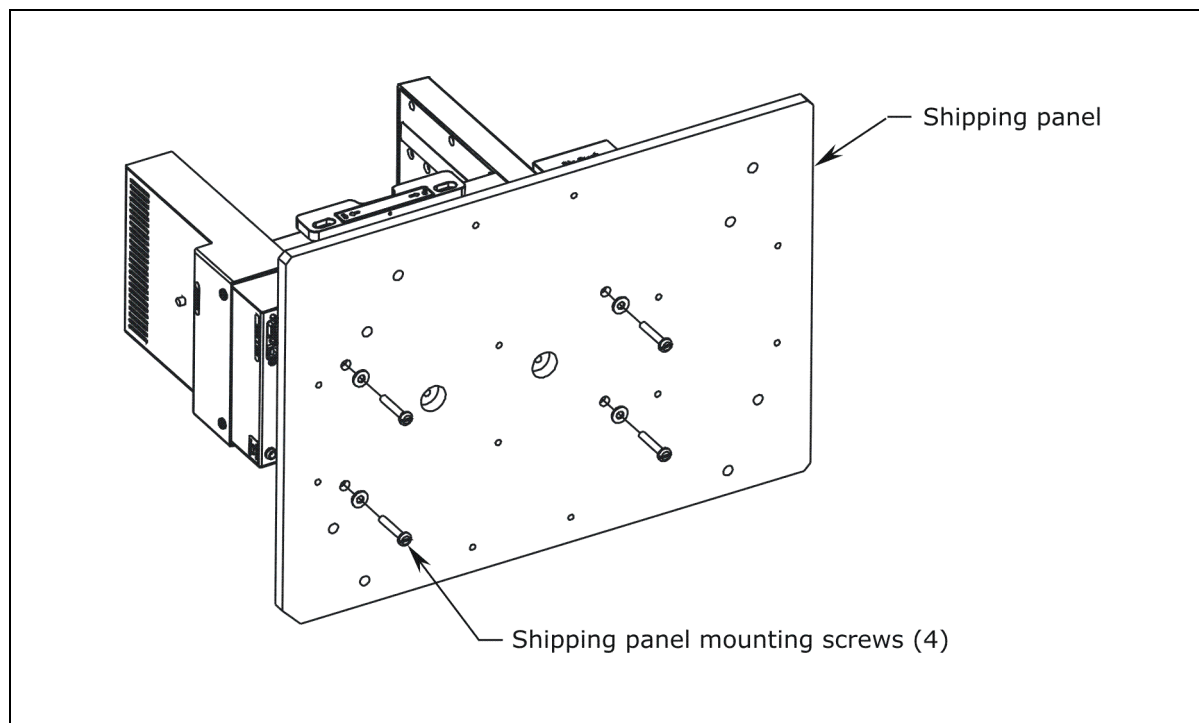
### Remove the Shipping Hardware



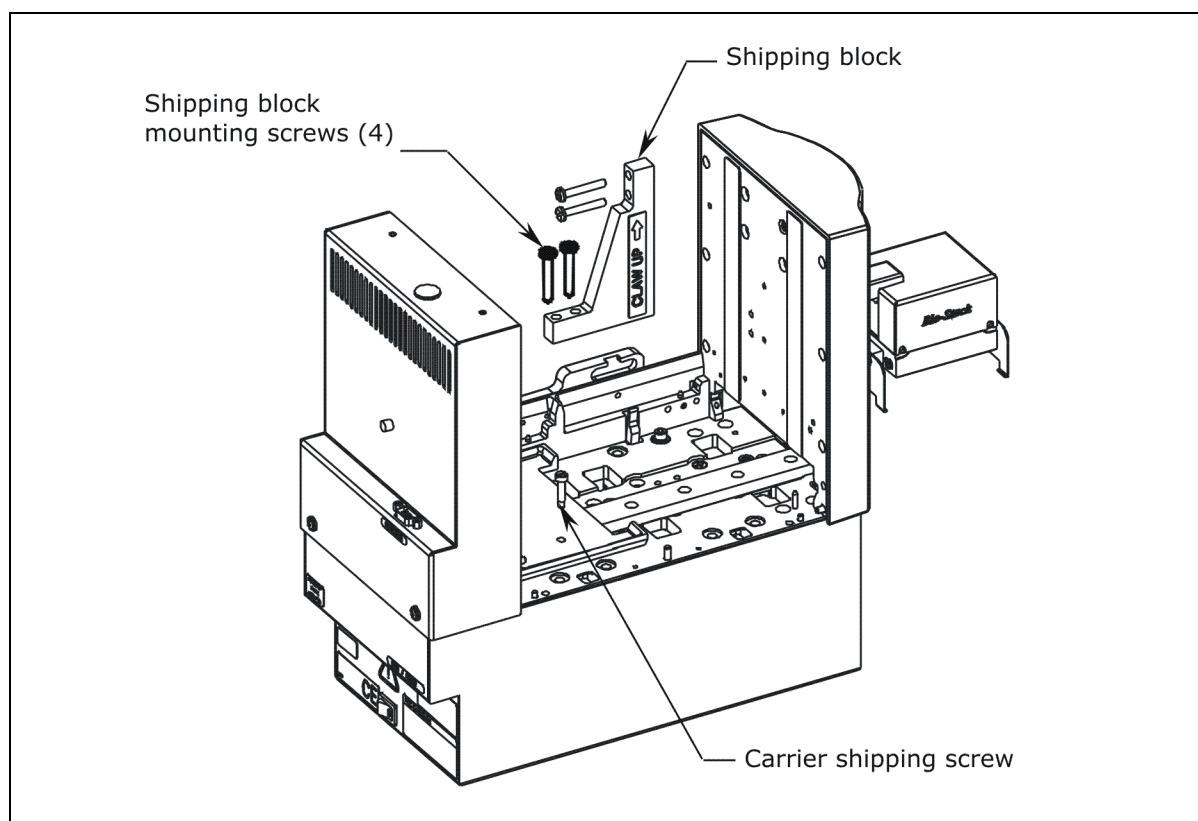
The Bio-Stack is shipped with a **shipping panel, shipping block, and carrier shipping screw** that must be removed before the instrument can be used. **Do not throw these components away!** Save them in case the instrument needs to be repackaged for shipment.

Perform these steps to remove the shipping hardware:

1. Carefully set the instrument on its side with the bottom of the shipping panel facing you and hanging over the edge of a flat surface (see **Figure 7** on the following page).
2. Using a screwdriver, remove the four shipping panel mounting screws. Remove the shipping panel and set it aside.
3. Carefully lift the Bio-Stack and set it upright.
4. Locate the shipping block and carrier shipping screw inside the Bio-Stack (see **Figure 8** on the following page).
5. Remove the four shipping block mounting screws and the shipping block.
6. Remove the carrier shipping screw.
7. Keep all screws together, and store them with the shipping panel, shipping block, and all other packaging materials in the shipping container.



**Figure 7:** Removing the Shipping Panel



**Figure 8:** Removing the Shipping Block and Carrier Shipping Screw

## Connect the Power Supply



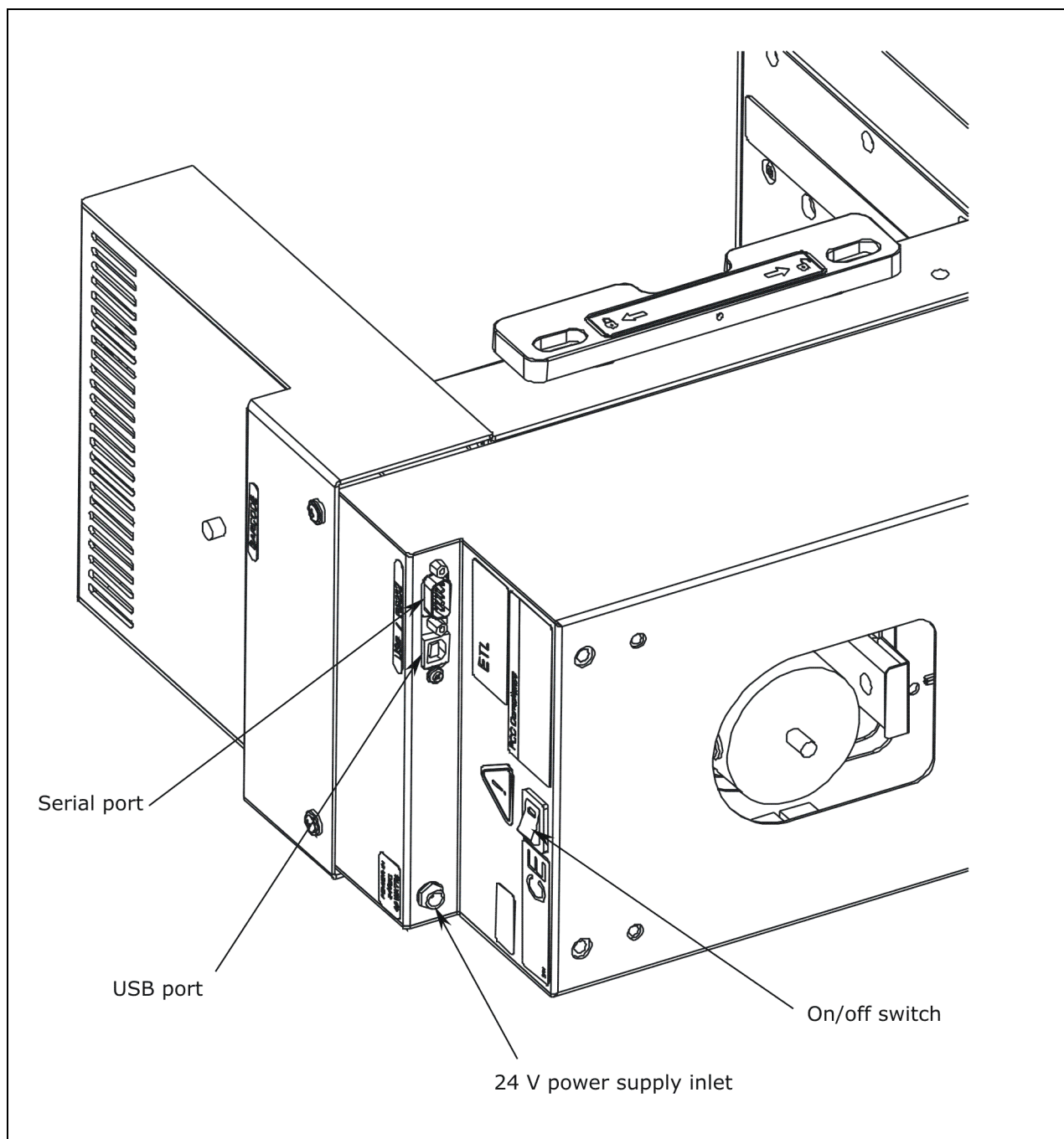
**Warning! Power Rating.** The Bio-Stack's power supply must be connected to a power receptacle that provides voltage and current within the specified rating for the system. Use of an incompatible power receptacle may produce electrical shock and fire hazards.

**Warning! Electrical Grounding.** Never use a two-prong plug adapter to connect primary power to the Bio-Stack™. Use of a two-prong adapter disconnects the utility ground, creating a severe shock hazard. Always connect the power supply cord directly to a three-prong receptacle with a functional ground.

Perform these steps to connect the power supply to the Bio-Stack:

1. Connect the power cord to the external 24-volt power supply.
2. Locate the power inlet on the rear of the Bio-Stack, above the power on/off switch (see **Figure 9** on the next page). Plug the rounded end of the power supply's line cord into the power inlet. Be sure to tighten the knurled nut.
3. Plug the 3-prong end of the power cord into an appropriate power receptacle.

❖ Do **not** turn on the Bio-Stack! Aligning posts ("feet") need to be attached to the Bio-Stack before power-up. You will perform this step during installation of the Bio-Stack with the interfacing instrument.



**Figure 9:** Location of the Power Supply Inlet and Serial/USB Ports on the Bio-Stack™

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## Where To Go From Here

### Installation of the Bio-Stack™ with the Interfacing Instrument

Before the Bio-Stack can operate with the interfacing instrument, the two instruments must be **mechanically aligned** with each other, **serial or USB cables** need to be attached, and instruments that are computer-controlled require **installation of software** on the PC. Refer to the following sections in this chapter for instructions:

- ***Install the Bio-Stack with the PowerWave™/XS or Synergy™ HT/Synergy™ 2/Synergy™ 4***, page 39
- ***Install the Bio-Stack with the Precision™/XS***, page 65
- ***Install the Bio-Stack with the µFill™ or ELx405™***, page 85
- ***Install the Bio-Stack with the NanoQuot™***, page 111
- ***Install the Bio-Stack with the MicroFlo™ Select***, page 129

### Installation of the Bio-Stack Barcode Scanner

Install the Bio-Stack with the interfacing instrument *first*, then refer to **Appendix B, Bio-Stack Barcode Scanner** for instructions on installing the barcode scanner. It will be easier to install the Bio-Stack if the barcode scanner is not attached.



## Install the Bio-Stack™ with the PowerWave™ or Synergy™ Readers

### Lay Out the Alignment Hardware

You will need the alignment hardware from the Bio-Stack Alignment Kits for the PowerWave/PowerWave XS (**PN 7310011**), illustrated below, or the Synergy HT (**PN 7310009**) or Synergy 2/Synergy 4 (**PN 7310019**), illustrated on the following pages.

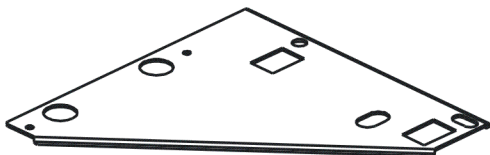
#### ***PowerWave/XS Alignment Kit 7310011***



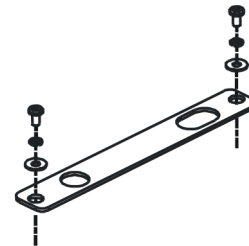
**Four aligning posts** (PN 7310523) for elevating the Bio-Stack to the correct height and for seating in the aligning plate.



**Two aligning caps** (PN 7312075) for elevating the PowerWave/XS to the correct height and for seating in the aligning plate.



**PowerWave/XS aligning plate** (PN 7312047) for preventing the instrument from sliding around and being misaligned with the Bio-Stack.



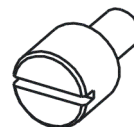
**Bio-Stack aligning plate** (PN 7312052) for attachment to the PowerWave/XS aligning plate.

Includes two each of mounting hardware: pan head screws (PN 12028), lock washers (PN 16017), and flat washers (PN 16068).

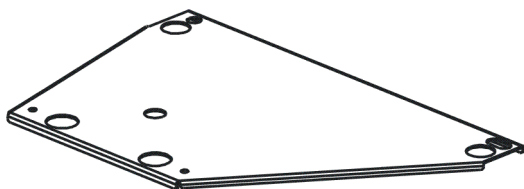
## **Synergy™ HT Alignment Kit 7310009**



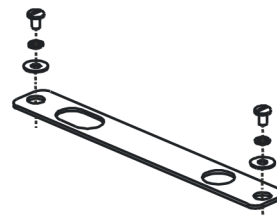
**Four aligning posts** (PN 7310523) for elevating the Bio-Stack™ to the correct height and for seating in the aligning plate.



**Two aligning caps** (PN 7312073) for elevating the Synergy HT to the correct height and for seating in the aligning plate.



**Synergy HT aligning plate** (PN 7312048) for preventing the instrument from sliding around and being misaligned with the Bio-Stack.



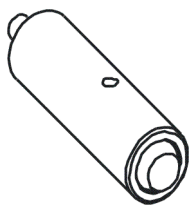
**Bio-Stack aligning plate** (PN 7312052) for attachment to the Synergy HT aligning plate.

Includes two each of mounting hardware: pan head screws (PN 12028), lock washers (PN 16017), and flat washers (PN 16068).

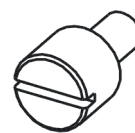
❖ Synergy HT readers **with serial numbers < 181151** may need to be factory upgraded with a Bio-Stack compatible carrier. Please contact your BioTek sales representative for details.



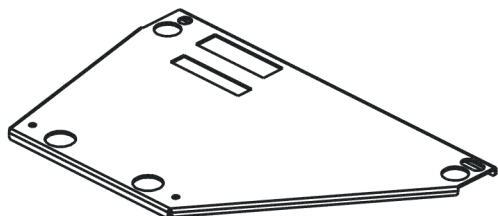
### **Synergy™ 2/Synergy™ 4 Alignment Kit 7310019**



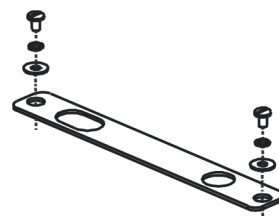
**Four aligning posts** (PN 7130559) for elevating the Bio-Stack™ to the correct height and for seating in the aligning plate.



**Two aligning caps** (PN 7312073) for elevating the Synergy 2/Synergy 4 to the correct height and for seating in the aligning plate.



**Synergy 2/Synergy 4 aligning plate** (PN 7132153) for preventing the instrument from sliding around and being misaligned with the Bio-Stack.



**Bio-Stack aligning plate** (PN 7312052) for attachment to the Synergy 2 or Synergy 4 aligning plate.

Includes two each of mounting hardware: pan head screws (PN 12028), lock washers (PN 16017), and flat washers (PN 16068).

## Attach the Aligning Posts and Caps



**Important!** When attaching the four aligning posts (“feet”) to the Bio-Stack™, do not over-tighten the posts!  
**Finger-tighten only!**

To avoid scratches to the Bio-Stack or to the reader, place a towel down before laying the instrument on its side or back.



**Important!** The Synergy™ 2/Synergy™ 4 are very heavy instruments; use extra care when laying one of these readers on its side or when returning it to the upright position.

Perform these steps to attach the aligning posts to the Bio-Stack and the aligning caps to the reader:

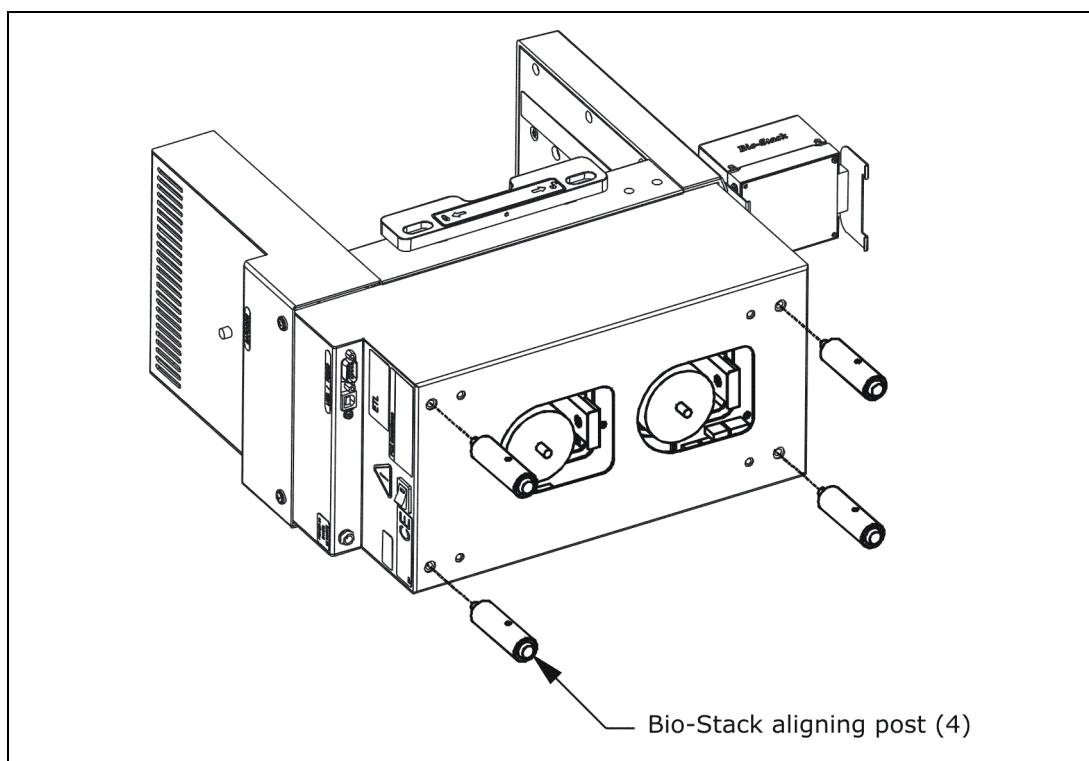
1. Carefully lay the Bio-Stack on its side so the bottom is facing you (see **Figure 10** on the following page).
2. Screw in all four aligning posts as shown.
3. Return the Bio-Stack to the upright position.
4. If the reader is on, turn it off and disconnect the power supply.
5. Attach the aligning caps:

### **PowerWave™/XS:**

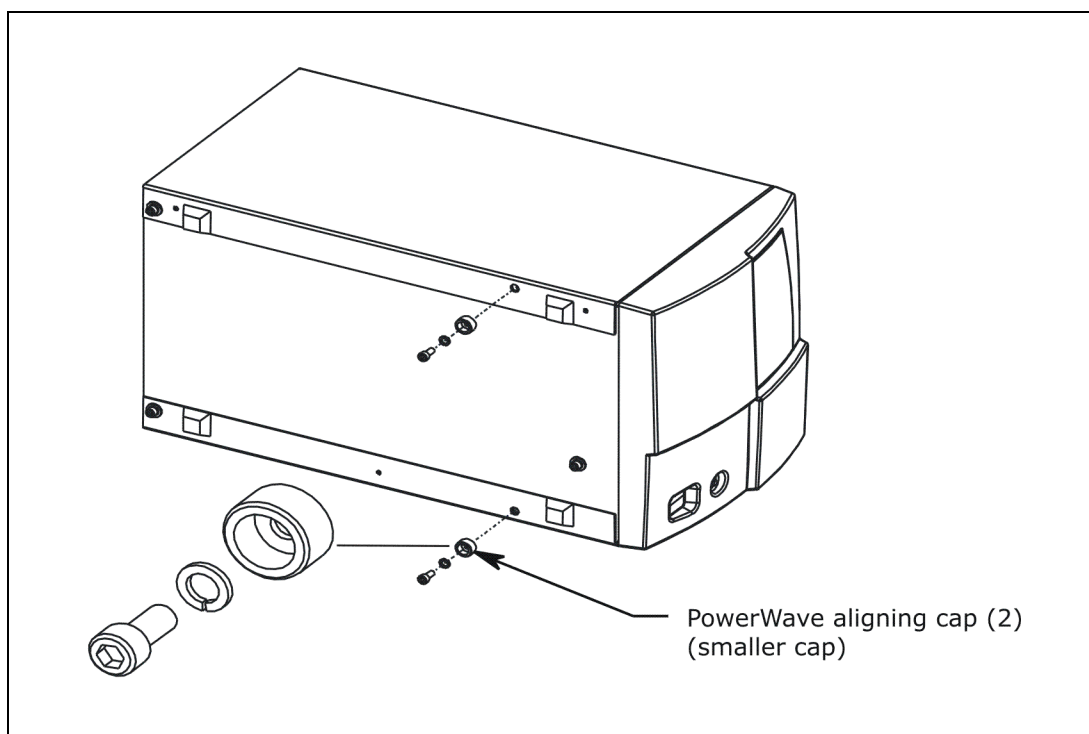
- Carefully lay the reader on its side so the bottom is facing you.
- Using a 9/64” hex wrench, remove the mounting hardware on the reader and replace the flat washers with the aligning caps as shown in **Figure 11** on the following page.
- Reinstall the hardware that was removed (except the flat washers).

### **Synergy™ HT/Synergy™ 2/Synergy™ 4:**

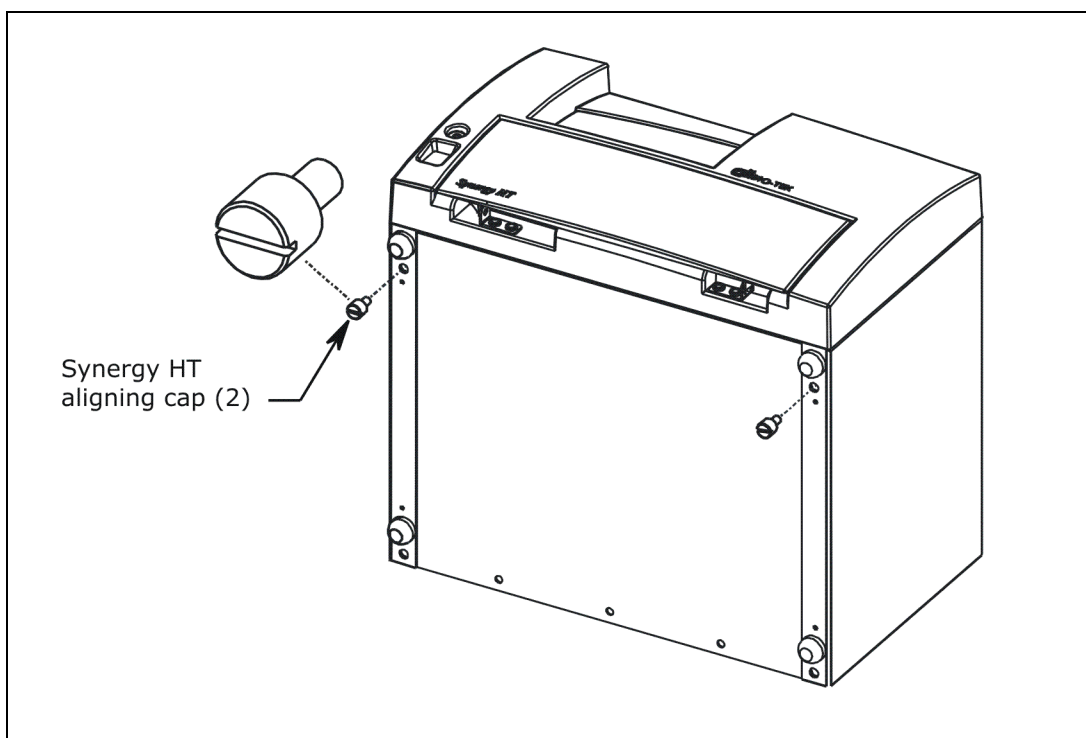
- Carefully lay the reader on its back (Synergy HT) or on its side (Synergy 2/Synergy 4) so the bottom is facing you.
  - Screw in the two aligning caps as shown in **Figure 12** (Synergy HT) or **Figure 13** (Synergy 2/Synergy 4) on page 44.
6. Return the reader to the upright position.



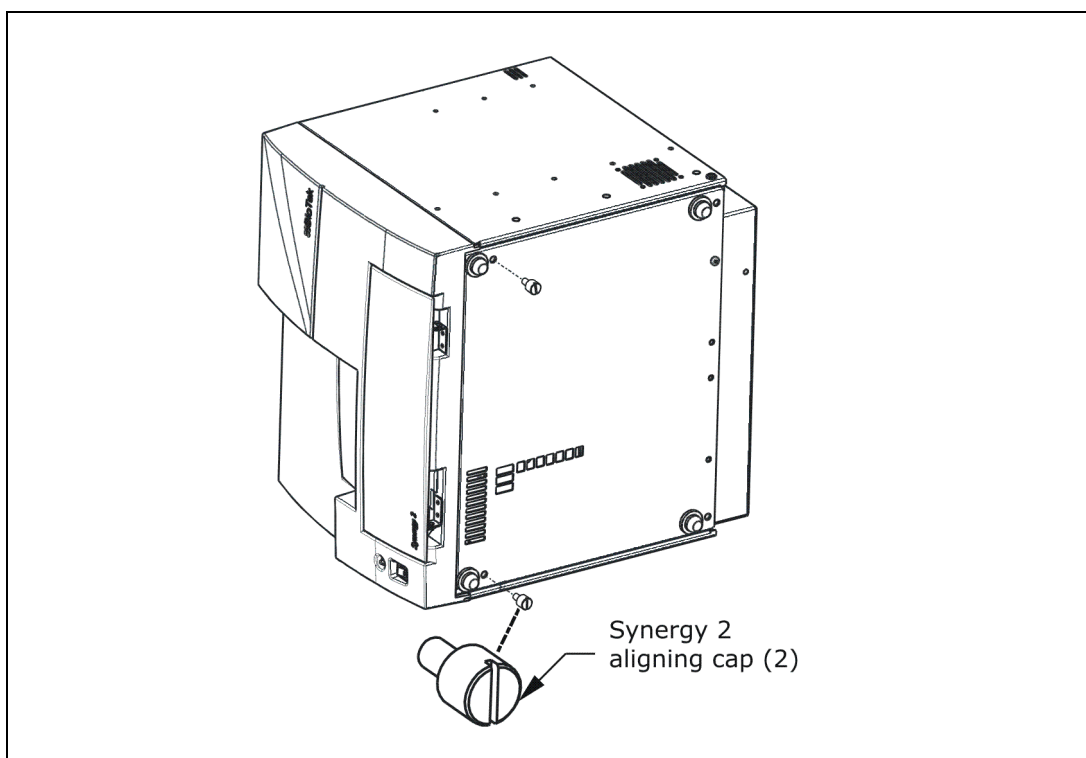
**Figure 10:** Attaching the Aligning Posts to the Bio-Stack™



**Figure 11:** Attaching the Aligning Caps to the PowerWave™/XS Reader



**Figure 12:** Attaching the Aligning Caps to the Synergy™ HT Reader



**Figure 13:** Attaching the Aligning Caps to the Synergy™ 2/Synergy™ 4 Reader  
(The Synergy 2 is shown.)

## Seat the Instruments in the Aligning Plates



**Important!** The Synergy™ 2/Synergy™ 4 are very heavy instruments; use extra care when lifting or moving one of these readers. The following instructions require *two people* when seating the Synergy 2/Synergy 4 in the aligning plate, to ensure that the reader's aligning caps/legs are properly positioned in the slots provided on the plate.

Perform these steps to seat the Bio-Stack™ and reader in the aligning plates:

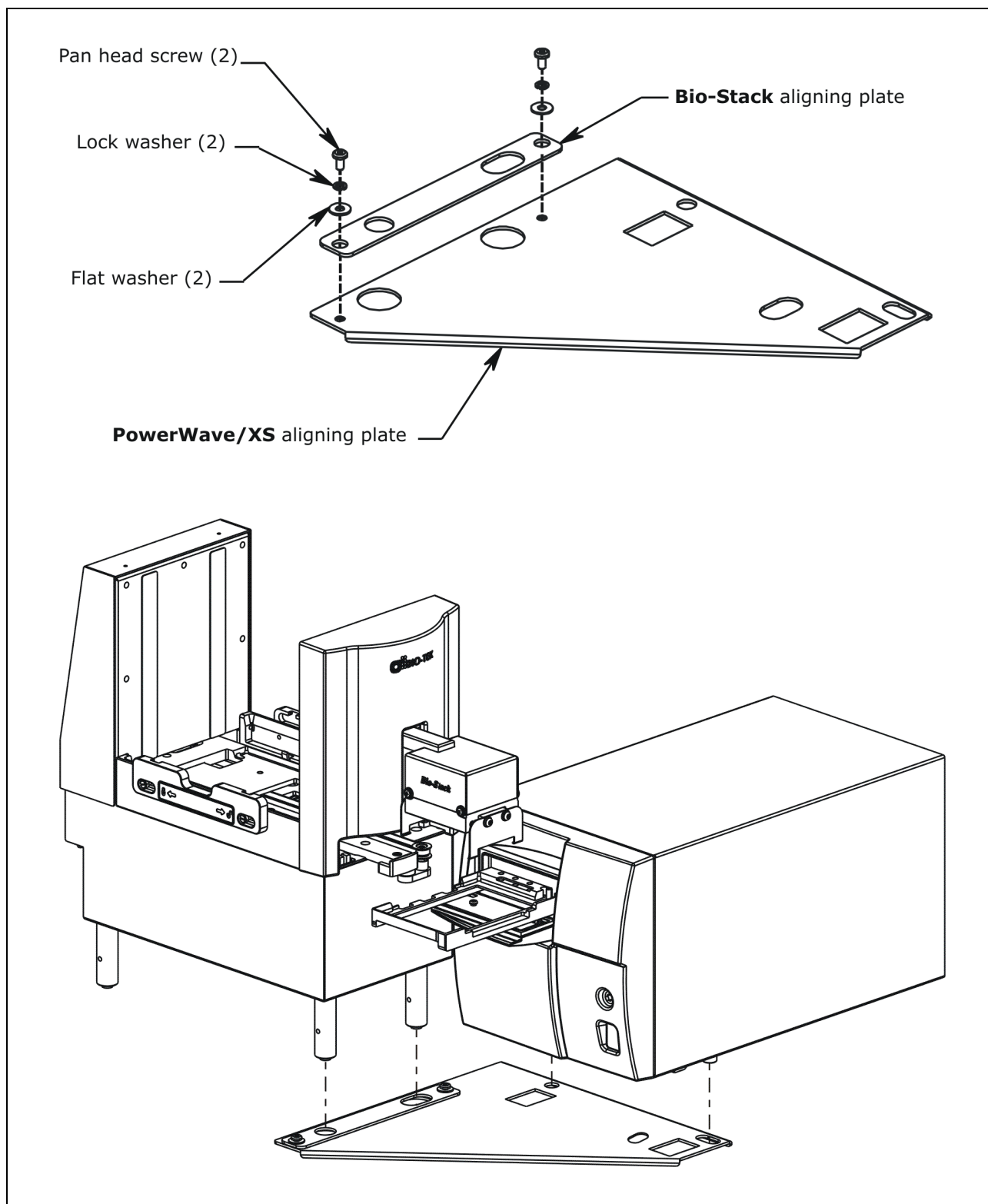
1. Place the reader's aligning plate on a level surface.
2. Loosely attach the Bio-Stack aligning plate to the reader's aligning plate by screwing in the pan head screw, lock washer, and flat washer only halfway. See **Figures 14** through **16** on the following pages.
3. Seat the reader in its aligning plate:

**PowerWave™/XS and Synergy™ HT:**

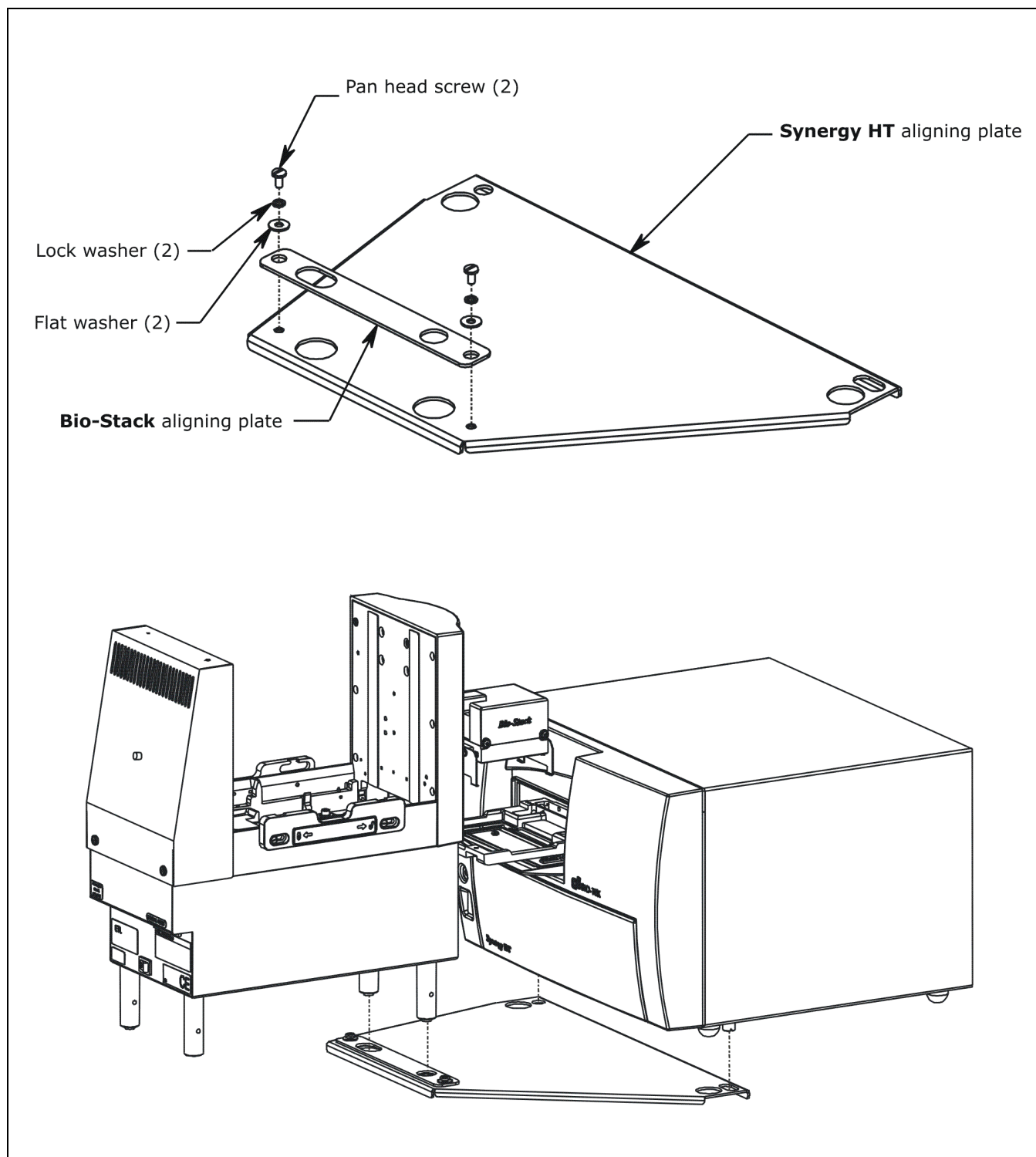
- Slide the reader's two front aligning caps and two front legs into the slots provided on the reader's plate (**Figure 14** and **Figure 15**).

**Synergy 2/Synergy 4 (two people are required):**

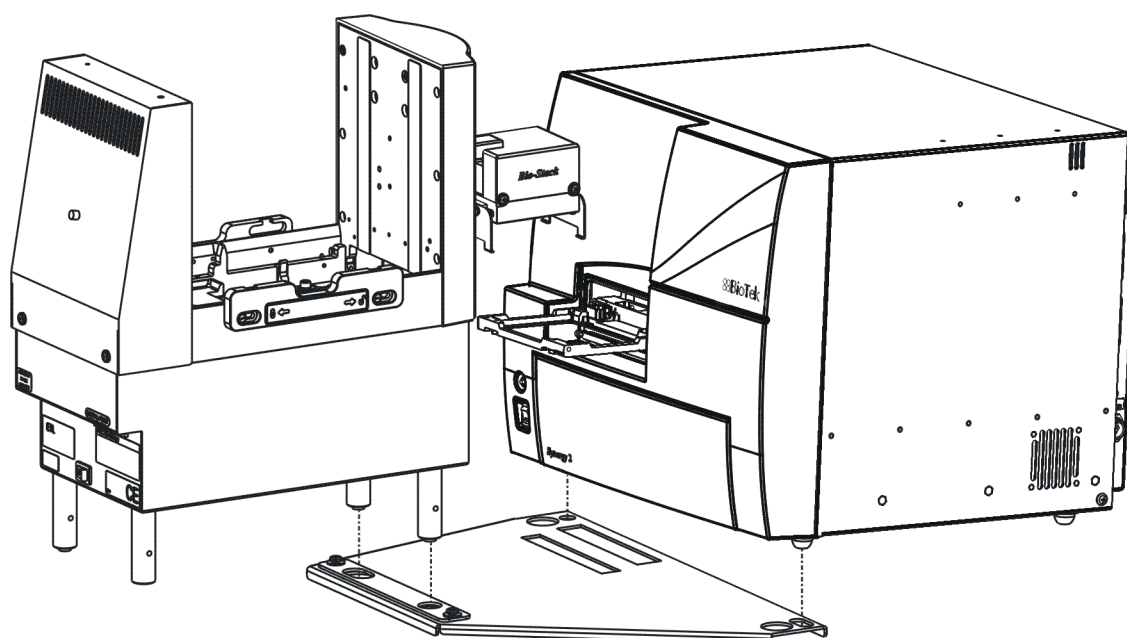
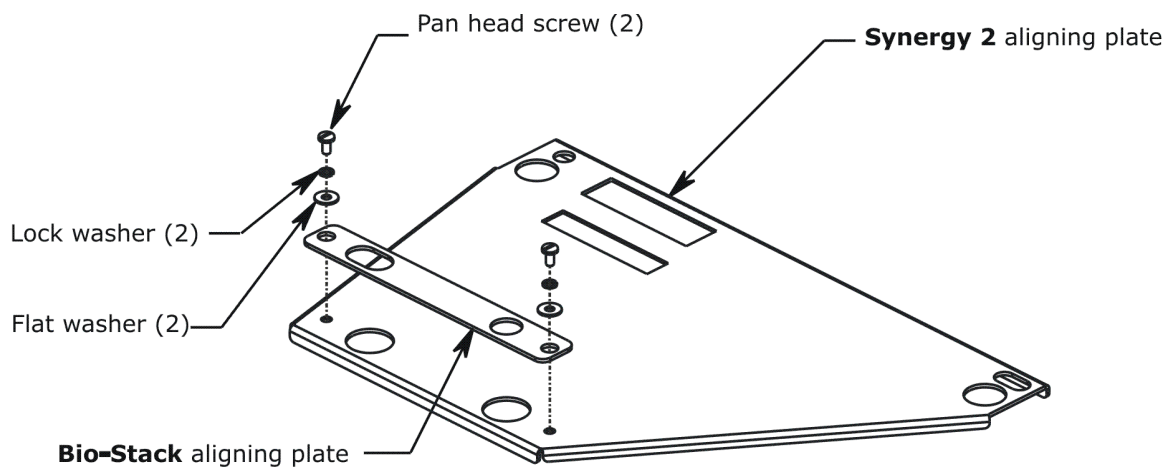
- Lift the front of the reader slightly while another person slides the reader's aligning plate in place under the reader, so the slots on the plate are lined up with the reader's aligning caps and legs.
  - Carefully lower the reader's aligning caps/legs into the slots (**Figure 16**).
4. Slide the Bio-Stack's two front aligning posts into the slots provided on the Bio-Stack's plate.
  5. Move both instruments back and forth in their slots until you are satisfied that they are positioned correctly next to each other (approximately). Ensure that all posts and caps are properly seated (not resting on top of the plates), and that the instruments are level.



**Figure 14:** Seating the Bio-Stack™ and PowerWave™/XS in the Aligning Plates



**Figure 15:** Seating the Bio-Stack™ and Synergy™ HT in the Aligning Plates



**Figure 16:** Seating the Bio-Stack™ and Synergy™ 2/Synergy™ 4 in the Aligning Plates  
(The Synergy 2 is shown.)



## Turn on the Bio-Stack™ and Run a Self-Test



**Warning!** Keep your hands away from the claw/gripper and carrier while the Bio-Stack is being powered up. The carrier and claw/gripper move quickly during the homing sequence.



The Bio-Stack **must** pass the Self-Test for installation with the PowerWave™/XS or Synergy™ HT/Synergy™ 2/Synergy™ 4.

❖ The Bio-Stack does not need to be connected to a host computer for this test.

Locate the Bio-Stack's power switch and turn on the instrument (see **Figure 9** on page 36 for the location of the switch). The Bio-Stack will home all axes (claw/gripper, carrier, input and output stack lifts) and then perform a system Self-Test.

- **If the Self-Test passes**, the green light will turn on and remain on.
- **If the Self-Test fails**, the green light will flash. If this happens, turn off the Bio-Stack and check for any obstructions. Ensure that all of the shipping hardware has been removed. If you cannot resolve the problem, contact BioTek's Technical Assistance Center for guidance.

Leave the Bio-Stack powered up for the next section, ***Align the Bio-Stack with the Reader.***

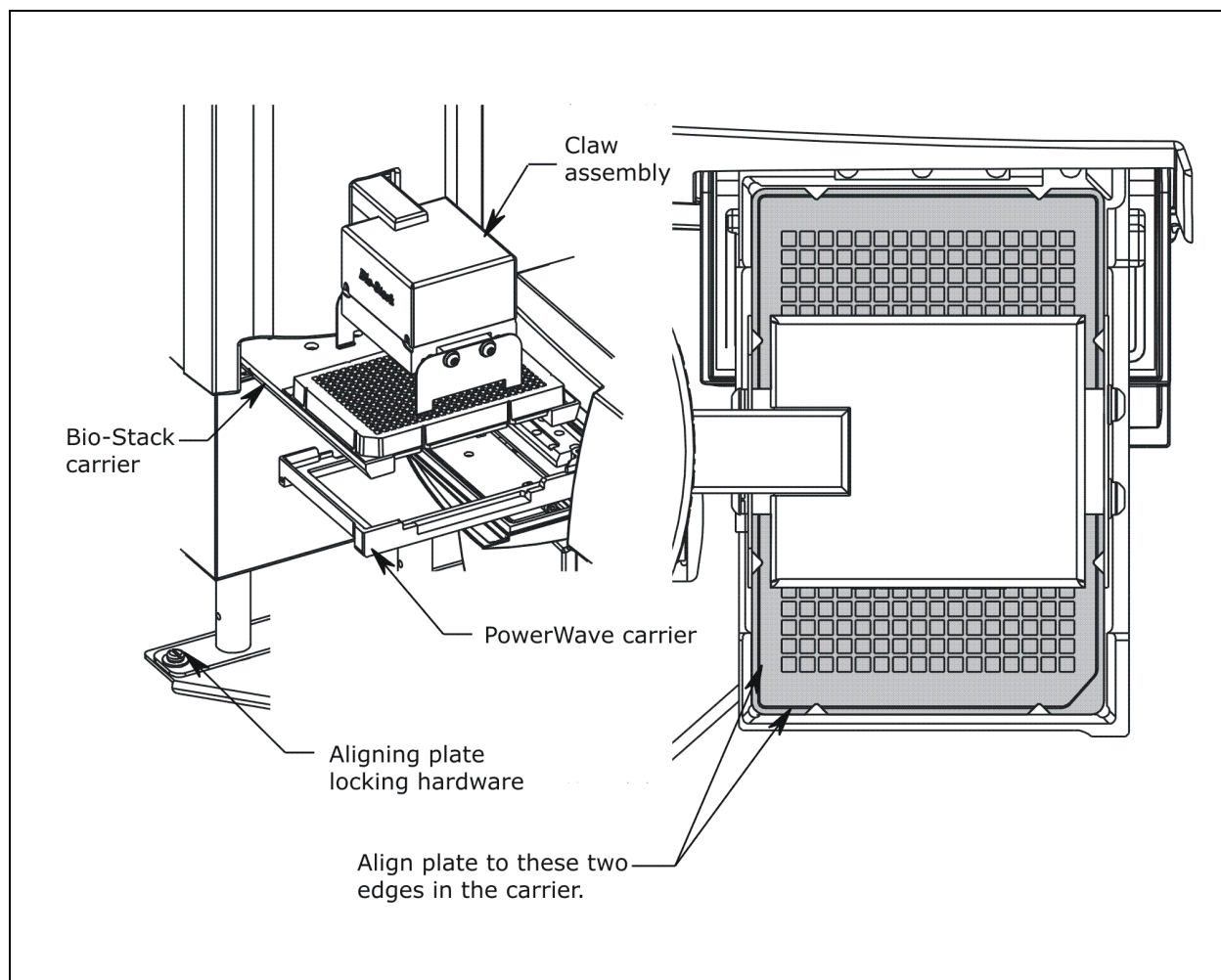
## Align the Bio-Stack™ with the Reader

Perform these steps to align the Bio-Stack™ with the PowerWave™/XS or Synergy™ HT/Synergy™ 2/Synergy™ 4 reader:

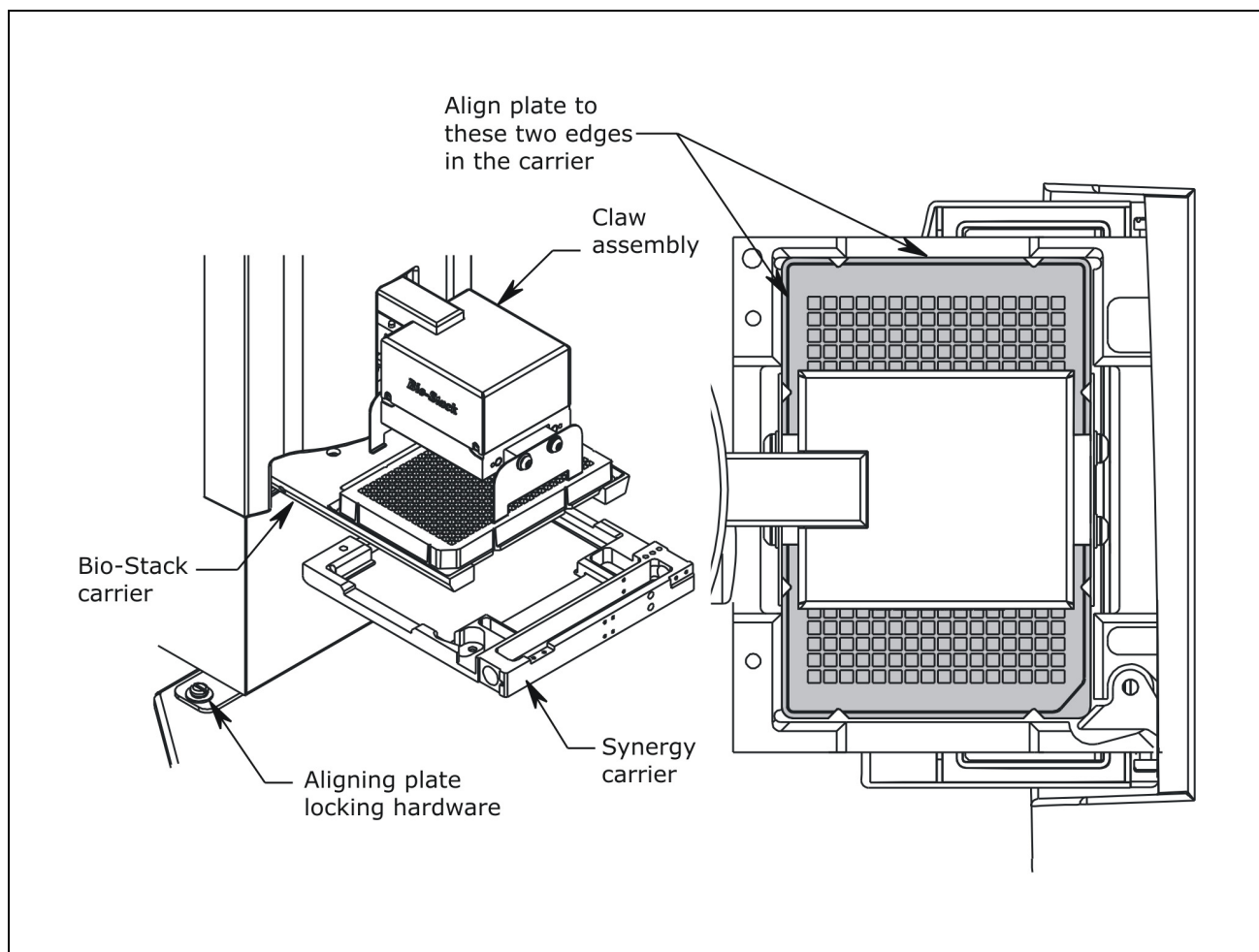
1. Ensure that the Bio-Stack has been homed according to the instructions in the previous section.
2. **PowerWave/XS:** Reconnect the power supply to the reader.  
**Synergy HT/Synergy 2/Synergy 4:** Reconnect the power supply and serial or USB cable to the reader.
3. Turn on the reader. The carrier should be in the “out” position. Leave the reader powered up.
4. Turn the Bio-Stack off.
5. Manually pull the Bio-Stack carrier all the way out and position it below the claw assembly. Refer to **Figure 17** or **Figure 18** on pages 51 and 52.

❖ **PowerWave/XS:** The Bio-Stack’s carrier should not touch the front of the reader.

6. Place a microplate on the Bio-Stack carrier.
7. Manually lower the claw assembly down to the microplate and pick up the microplate (manually open the gripper to get around the plate and close it to pick up the plate). Raise the claw assembly carefully to ensure that the microplate does not change positions in the claw.
8. Slide the Bio-Stack carrier out of the way.
9. Lower the claw assembly until the microplate is just above the carrier of the reader.
10. Manually adjust the Bio-Stack on the tabletop so the microplate can be lowered onto the carrier of the reader. The microplate carrier should be positioned as if it was just homed by the reader. If the reader’s carrier or microplate has been moved, home the instruments, remove the microplate from the Bio-Stack claw, then repeat steps 4 through 10.
11. When you are satisfied with the microplate positioning relative to the carrier of the reader (look carefully at the top-down drawing in **Figure 17** for the PowerWave/XS or **Figure 18** for the Synergy HT/Synergy 2/Synergy 4, to see how the plate should fit in the carrier), finger-tighten the aligning plate locking hardware in both places.
12. Repeat all of the steps a couple times to ensure that the microplate does not change position and that it rides smoothly in and out of the carriers.



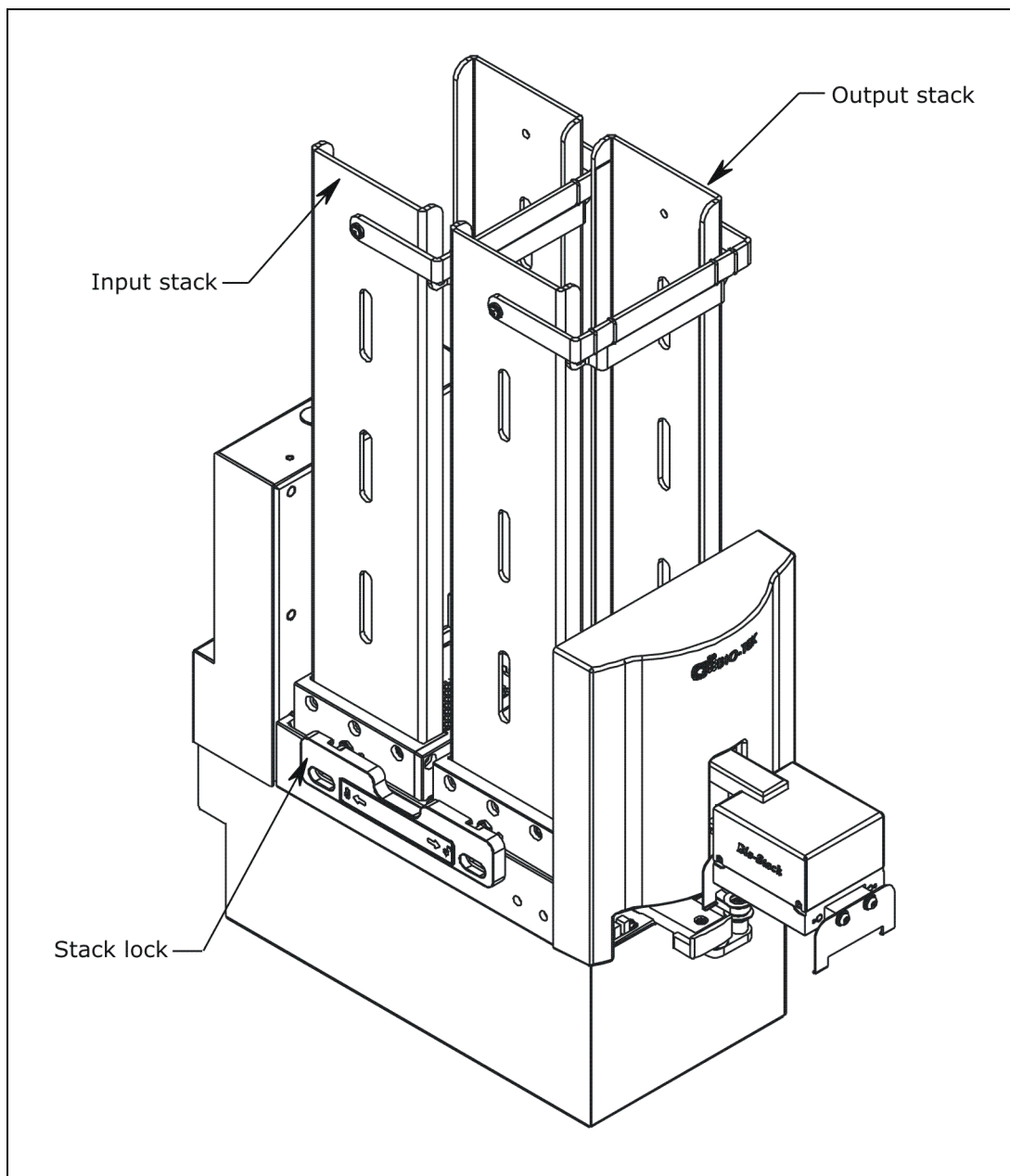
**Figure 17:** Aligning the Bio-Stack™ with the PowerWave™/XS Reader



**Figure 18:** Aligning the Bio-Stack™ with the Synergy™ HT/Synergy™ 2/Synergy™ 4 Reader

## Install the Plate Stacks

Locate the stack locks on the side of the Bio-Stack™. Make sure the locks are both in the “unlocked” position. Install the stacks as shown in **Figure 19** below and then close the stack locks.



**Figure 19:** Installing the Plate Stacks

## Connect the Host Computer to the Bio-Stack™ and Reader



The host computer must be equipped with at least **two serial ports** or **one serial port and one USB port**.

- ❖ The **Bio-Stack™ Alignment Kits** for the PowerWave™/XS, Synergy™ HT, and Synergy™ 2/Synergy™ 4 include two serial cables (a 9-pin to 9-pin female/male cable and 9-pin to 25-pin female/female cable), a USB cable, and USB Virtual COM Driver Software CD.

The **shipping accessories** for the PowerWave/XS include a 9-pin to 25-pin female/female serial cable.

The **shipping accessories** for the Synergy HT/Synergy 2/Synergy 4 include a 9-pin to 9-pin female/male serial cable, USB cable, and USB Virtual COM Driver Software CD.

Perform these steps to connect the host computer to both the Bio-Stack and the interfacing reader (refer to **Figure 9** on page 36 for an illustration of the serial and USB ports):

1. If the Bio-Stack is on, turn it off.
2. Place the computer in a location adjacent to the Bio-Stack and the reader.
3. Connect the computer to the Bio-Stack, using the supplied serial cable **or** USB cable:

### Connect the serial cable:

- Using the *appropriate* serial cable, attach one end of the cable to a serial port on the computer.
- Attach the other end of the cable to the serial port on the rear of the Bio-Stack.
- Tighten the securing screws on both ends of the cable.

### Connect the USB cable and install the USB driver:

- Attach one end of the supplied USB cable to a USB port on the computer. Attach the other end of the cable to the USB port on the rear of the Bio-Stack.
- Turn the computer on.

- Place the USB Virtual COM Driver Software CD in the computer's CD ROM drive.
- Using Microsoft® Explorer or other file management software, find the installation guide appropriate for your computer's operating system (e.g., WXPInstall.pdf).
- Follow the directions provided within the document to install the driver software.

❖ In the instructions on the following pages you will need to know which COM number is associated with the USB port on your computer. (You'll select this number in the Gen5™ or KC4™ Software and Bio-Stack™ PC Control Software port selection dialogs.) The COM port can be customized to use any number port that is not currently defined by the System. For customization instructions, consult the **ComPortGuide.doc** or **ComPortGuide.pdf** file on the USB driver CD.

4. Turn the computer off.
5. Attach the reader to the computer using the *appropriate* serial cable or the USB cable (Synergy™ HT/Synergy™ 2/Synergy™ 4 only).
6. If the serial cable was used, tighten the securing screws on both ends of the cable.

## Install Gen5™ Software and Test Communication with the Reader



All Gen5 software versions support the Bio-Stack™, however, you will need versions of the Bio-Stack™ PC Control Software and the Bio-Stack basecode software that are appropriate for the Gen5 version you are using with your reader. See **Appendix D, Required Software Versions**.

Perform these steps to install the **Gen5** software, and then test communication with the interfacing reader:

1. Follow the instructions provided in Gen5's Getting Started Guide or Help system for installing and registering Gen5.
  - If you purchased the Diagnostics Utility and Test Plate Package (PN 7770042), install the Diagnostics Utility.
2. Turn on the reader and allow the system Self-Test to complete.
3. Launch Gen5. Login if prompted to do so (Gen5 Secure); the default password is **admin**.
4. At the Welcome screen, select **System Menu**.
5. At Gen5's main screen, select **System > Reader Configuration** to open the 'Reader Configuration' dialog.
6. Click the **Add** button to open the 'Reader Settings' dialog.
  - Gen5 and Gen5 Secure: Up to two readers may be added in Gen5.
7. Use the drop-down list in **Reader Type** to select the correct reader.
8. Enter the reader's **Com Port**.
9. Select a **Baud Rate** (**9600** is recommended for most BioTek readers).
10. Click **Test Comm.** to establish communication. If any informational messages appear, read them carefully and follow the instructions provided by Gen5.
  - If you receive "The Reader is communicating!" message, click **OK** and then **OK** again to save the settings.
  - If you receive an error message, check the serial cable connections or refer to the Troubleshooting section of the Help system for assistance.
11. Click **Close** at the Reader Configuration dialog to return to the main menu.

❖ Gen5 Secure: An 'Audit Trail' dialog will appear after closing Reader Configuration. Enter any comments, if desired, then click **Close**. Note also that when Gen5 Secure is used in the Bio-Stack operating environment, Audit Trail events are identified by the user "OLE User."



## Install KC4™ Software and Test Communication with the Reader



You will need KC4 software **v. 3.3, Rev. 9 or greater** for operation of the reader with the Bio-Stack™. If you do not have this software, please contact your BioTek sales representative for more information.

For operation of the Bio-Stack's optional barcode scanner, you will need KC4 **v. 3.4, Rev. 16 or greater**. (You will need **v. 3.4, Rev. 22** if you wish to have Bio-Stack scanned barcodes appear in KC4 plate description dialogs.)

See **Appendix D, Required Software Versions**.

Perform these steps to install the **KC4** software, and then test communication with the interfacing reader:

1. Follow the instructions provided in the KC4 User's Guide for installing and registering the software.
2. Turn on the reader and allow the system Self-Test to complete.
3. Launch KC4. Login if prompted to do so.
4. From KC4's main menu, select **System > Readers** to open the 'Reader Selection' dialog.
5. Carefully review the list of **Available Readers**. Click once to highlight the correct reader model.

❖ BioTek's Synergy™ 2/Synergy™ 4 readers are not included in the list of Available Readers; KC4 does not support the Synergy 2 or Synergy 4.

6. Click **Port** and select the reader's **COM port#**.
7. Click **Setup** and set the **Transmission Speed** (Baud Rate), **Data Bits**, **Parity**, and **Stop Bits** to **9600, 8, No**, and **2**.
8. Click **OK, OK** to return to the Reader Selection dialog.
9. Click **Current Reader** to establish communication. If any informational messages appear, read them carefully and follow the instructions provided by KC4.
  - If asked, "Do you want to update the software wavelength table?" click **Yes**.
  - If a "No reader response" message appears, you may have selected the wrong COM port in step 6.
10. Click **Close** to return to KC4's main screen.

## Run the Checksum Test for the Reader

Perform these steps to run the Checksum Test and record the software versions for Gen5™ or KC4™ Software and for the reader:

❖ For your convenience, **Software Data Sheets** are provided in **Chapter 5, Instrument Qualification**, for recording the software versions for Gen5 or KC4 and for the PowerWave™/XS or Synergy™ HT/Synergy™ 2/Synergy™ 4.

### Gen5:

1. At Gen5's main screen, select **Help > About Gen5**.
2. Record Gen5's Installation Version, Build Version, Reader Control Version, and Diagnostics Version (if the Diagnostics Utility was installed). Record the serial number listed on the Gen5 software package.
3. Return to the main menu and select **System > Reader Control**, then click the appropriate reader to open the 'Reader Control' dialog.
4. At the Reader Control dialog, select the **Information** tab to display the reader's basecode software information. If software version information is displayed and no errors occurred, the Checksum Test completed successfully.
5. Record the reader's basecode part number, version number, and checksum. Record the serial number listed on the reader.

### KC4:

1. At KC4's main screen, select **About > About KC4**.
2. Record KC4's version and revision numbers. Record the serial number listed on the KC4 software package.
3. Click **OK** to return to the main screen, then select **System > Reader Control**. If software version information is displayed and no errors occurred, the Checksum Test completed successfully.
4. Record the reader's basecode part number, version number, and checksum. Record the serial number listed on the reader.

## Install Bio-Stack™ PC Control Software and Test Communication with the Bio-Stack™



**Warning!** Keep your hands away from the claw/gripper and carrier while the Bio-Stack is being powered up. The carrier and claw/gripper move quickly during the homing sequence.

❖ A CD containing the **Bio-Stack PC Control Software** and an installation guide are included in the Bio-Stack Alignment Kits for the readers.

Perform these steps to install the Bio-Stack PC Control Software on the computer, and then test communication with the Bio-Stack:

1. Turn the computer and the Bio-Stack on. Allow the Bio-Stack to complete its Self-Test.
2. Follow the instructions provided in the **Bio-Stack PC Control Software Installation Guide** to install the software on the computer.
3. Launch the Bio-Stack PC Control Software.
4. From the software main screen, select **Gen5™** or **KC4™**, as appropriate, for the **Reader Control Software**.
5. Click the **Configure Instruments** button.
6. When the 'Instrument Configuration' dialog appears, select the appropriate **COM Port** for the **Bio-Stack Configuration** and then click **Test Communications**.
  - If the test is **not** successful, ensure that the cable is properly connected and you have correctly identified the COM port number.
  - (Optional) If you installed Gen5, you may also test communication with the reader in the Instrument Configuration dialog. Select the appropriate **Instrument**, **COM Port**, and **BAUD Rate (9600 is recommended)** for the **Instrument Configuration**, then click **Test Communications**.
7. If the test is successful, return to the main screen.

## Run the Checksum Test for the Bio-Stack™

Perform these steps to run the Checksum Test for the Bio-Stack and record the software versions for the Bio-Stack™ PC Control Software and for the Bio-Stack:

❖ For your convenience, **Software Data Sheets** are provided in **Chapter 5, Instrument Qualification**, for recording the Bio-Stack software versions.

1. From the top menu bar in the Bio-Stack PC Control Software, select **Help > About Bio-Stack**.
2. The 'About Bio-Stack Software' dialog will open. Record the Bio-Stack PC Software Versions for the Installation CD, StackerContainer.exe, and BTIAutoStackerActiveX. Record the serial number listed on the Bio-Stack PC Control Software package.
3. Click **Get On-board values now**. If software version information is displayed and no errors occurred, the Checksum Test completed successfully.
4. Record the Bio-Stack onboard software versions for the basecode software, interface definition, and checksum. Record the serial number listed on the Bio-Stack.

❖ When you have Gen5™ or KC4™ software installed on your PC, the Bio-Stack PC Control Software retrieves and displays the Gen5 or KC4 software versions in the 'About Bio-Stack Software' dialog.

## Align the Claw/Gripper with the Reader's Plate Carrier

The Bio-Stack's claw/gripper mechanism must now be aligned vertically with the reader's plate carrier. The Bio-Stack™ PC Control Software has an **Instrument Alignment Utility** for this task.

Perform these steps to run the Instrument Alignment Utility:

1. Launch the Bio-Stack PC Control Software.
2. From the main screen, click the **Configure Instruments** button.
3. When the 'Instrument Configuration' dialog appears, select the appropriate **Instrument** (reader).

❖ **KC4™**: Select "PowerWave" for any PowerWave™ model, and "Synergy" for any Synergy™ model (excludes the Synergy 2/ Synergy 4 readers).

4. Click the **Instrument Alignment Utility** button.
5. Use the **Re-Alignment Control** buttons to position the Bio-Stack's claw/gripper mechanism to the desired height relative to the reader's plate carrier. To aid in this activity, place a microplate on the reader's carrier. Lower the claw/gripper so that the gripper's "fingers" rest approximately 50-60 thousandths of an inch (1.3-1.5 mm) below the plate bottom or carrier surface (see **Figure 20** on the following page).

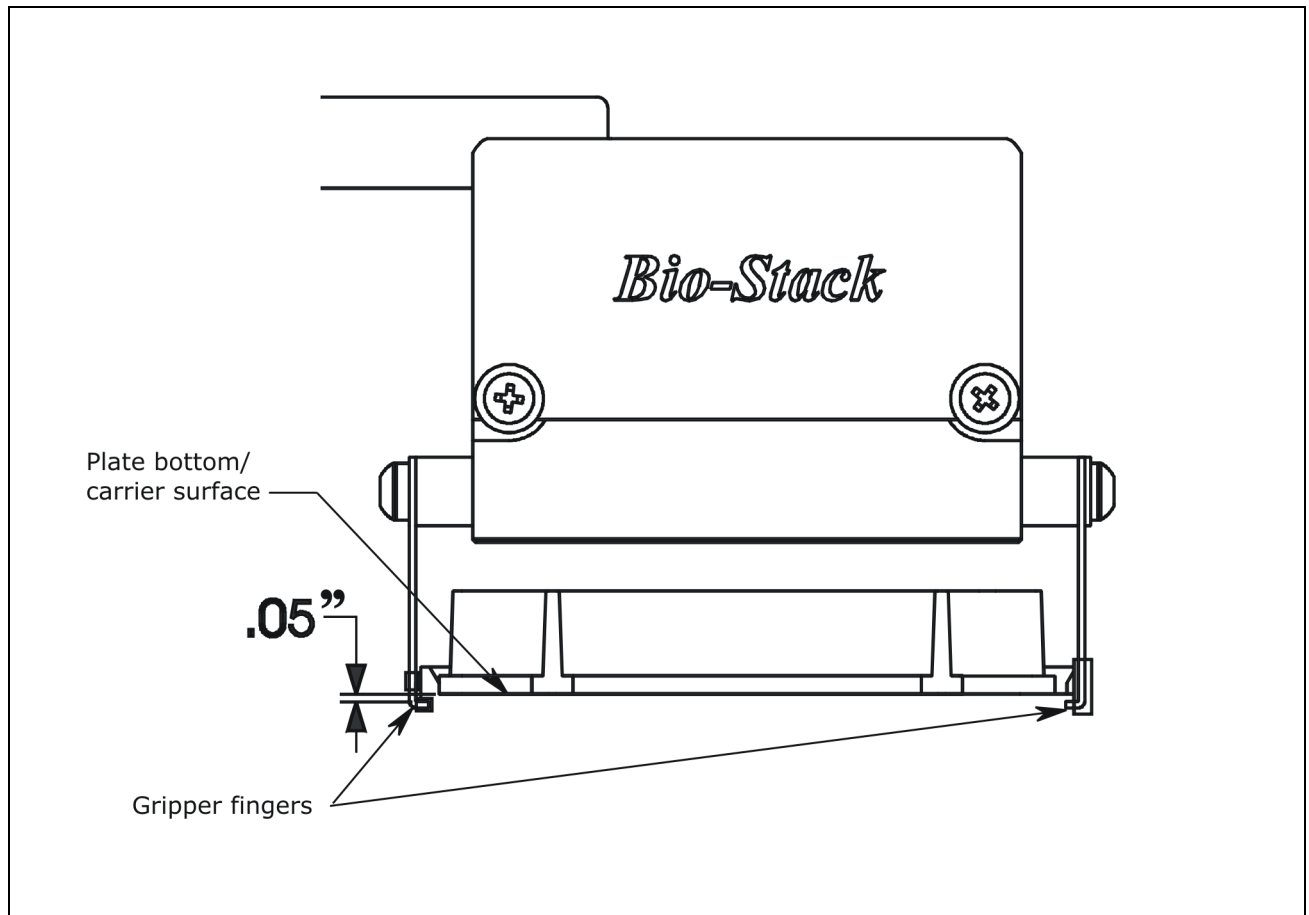
❖ If the Bio-Stack and reader are located on an uneven surface, the gripper's fingers should rest below the lowest point of the plate bottom, to ensure proper plate delivery.

- Begin with the **Down** radio button selected. To avoid collision of the gripper with the reader's carrier, click the **20 Step** button first, to see how far that goes, before clicking the **400 Step** button. Use the **400/20/1 Step** buttons to *gradually* lower the claw/gripper mechanism to the desired height.

If you go down too far, click the **Up** radio button and step up a bit.

❖ If the alignment is interrupted, and you receive an error code such as **2500**, the Bio-Stack™ will have to be homed to resolve the error. Click the **Home the Bio-Stack** button (in the **Instrument Alignment Utility** dialog) to home all axes on the Bio-Stack, then repeat step 5 above.

6. When you are satisfied with the position, click the **Save Position** button.
7. Remove the plate from the carrier.



**Figure 20:** Position of the Bio-Stack's Gripper Fingers Below the Plate Bottom (on the Reader's Plate Carrier)

## Verify the Alignment

Perform the following test to verify alignment of the Bio-Stack™ with the reader:

1. Place a dry microplate in the Bio-Stack's input stack.
2. If you have not already done so, launch the Bio-Stack™ PC Control Software.
3. Click **Configure Instruments** to open the 'Instrument Configuration' dialog, then select the appropriate **Instrument** (reader).
4. Click **Instrument Alignment Utility**, then click the **Verify** button.
5. Watch closely to confirm the following behavior (the claw/gripper will pause periodically; this is the expected behavior):
  - The Bio-Stack will transfer the plate from the input stack to the Bio-Stack plate carrier, and then eject the plate carrier.
  - The claw/gripper will pick up the plate, lower it toward the reader's plate carrier, and then *smoothly* place the plate on the carrier.

❖ If the plate drops onto the carrier, the claw interface position has been set too high. Repeat the steps in the previous section: ***Align the Claw/Gripper with the Reader's Plate Carrier.***

- The claw/gripper will come up a short distance. The gripper will then power-down, allowing its spring mechanism to tighten the gripper "fingers."

❖ If the gripper fingers catch on the top of the microplate, the claw interface position is set too low. An error code will appear in the software. Repeat the steps in ***Align the Claw/Gripper with the Reader's Plate Carrier.***

- If the gripper fingers did not catch on the plate, the "Verify plate placement" message will appear. Click **OK** to continue.
  - The claw/gripper will lower, pick up the plate, place the plate on the Bio-Stack's carrier, and then store the plate in the output stack.
6. If the alignment verification completed successfully and you have determined that the gripper fingers are positioned correctly, the Bio-Stack is now ready for operation with the reader.
    - If the gripper fingers are not positioned correctly, perform the steps in ***Align the Claw/Gripper with the Reader's Plate Carrier*** again, and then re-run the Verify Test.

❖ The Verify Test must pass before the Bio-Stack can be used to transfer microplates.

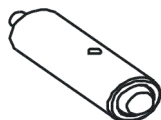




## Install the Bio-Stack™ with the Precision™/XS

### Lay Out the Alignment Hardware

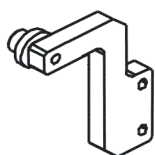
You will need the alignment hardware from the Bio-Stack Alignment Kit for the Precision/XS (**PN 7110004**) illustrated below:



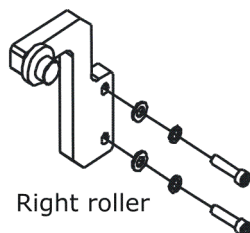
**Four aligning posts** (PN 7110542) for elevating the Bio-Stack to the correct height and for seating in the aligning plate. (You will need *two* sets of 7110542 if you will be using 2 Bio-Stack's.)



**Two aligning caps** (PN 7312074) for elevating the Precision/XS to the correct height and for seating in the aligning plate.



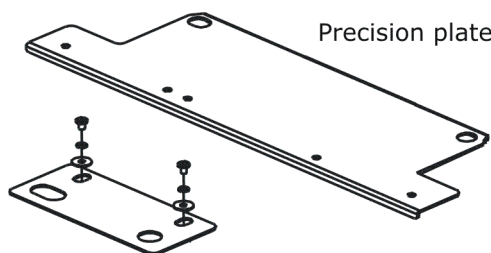
Left roller



Right roller

**Left and right roller extensions** (PN's 7110544 and 7110556) for extending the Precision supply platform forward for alignment with the Bio-Stack.

Four each of mounting hardware: lock washer (PN 16003), screw (PN 19055), and flat washer (PN 17003).



Bio-Stack plate

**Precision aligning plate** (PN 7112139) for preventing the instrument from sliding around and being misaligned with the Bio-Stack.

**Bio-Stack aligning plate** (PN 7112140) for attachment to the Precision aligning plate. Includes two each of mounting hardware: pan head screws (PN 12028), lock washers (PN 16017), and flat washers (PN 16068). (You will need *two* sets of 7112140 if you will be using 2 Bio-Stack's.)

- ❖ If you are using two Bio-Stack's with the Precision, you will need **two** sets of the Bio-Stack's alignment hardware (PN's **7110542** and **7112140**).
- ❖ Some Precision Microplate Pipetting Systems with **serial numbers ≥ 187931** may need to be upgraded; contact BioTek for details. The following Precision Microplate Pipetting Systems **cannot be upgraded or are not Bio-Stack compatible**: instruments with serial numbers < 187931, all 12-Channel models, and Universal 8-/12-Channel models in 12-Channel mode.

## Attach the Aligning Posts and Caps



**Important!** When attaching the four aligning posts (“feet”) to the Bio-Stack™, do not over-tighten the posts! **Finger-tighten only!**

To avoid scratches to the Bio-Stack or to the Precision™, place a towel down before laying the instrument on its side or back.

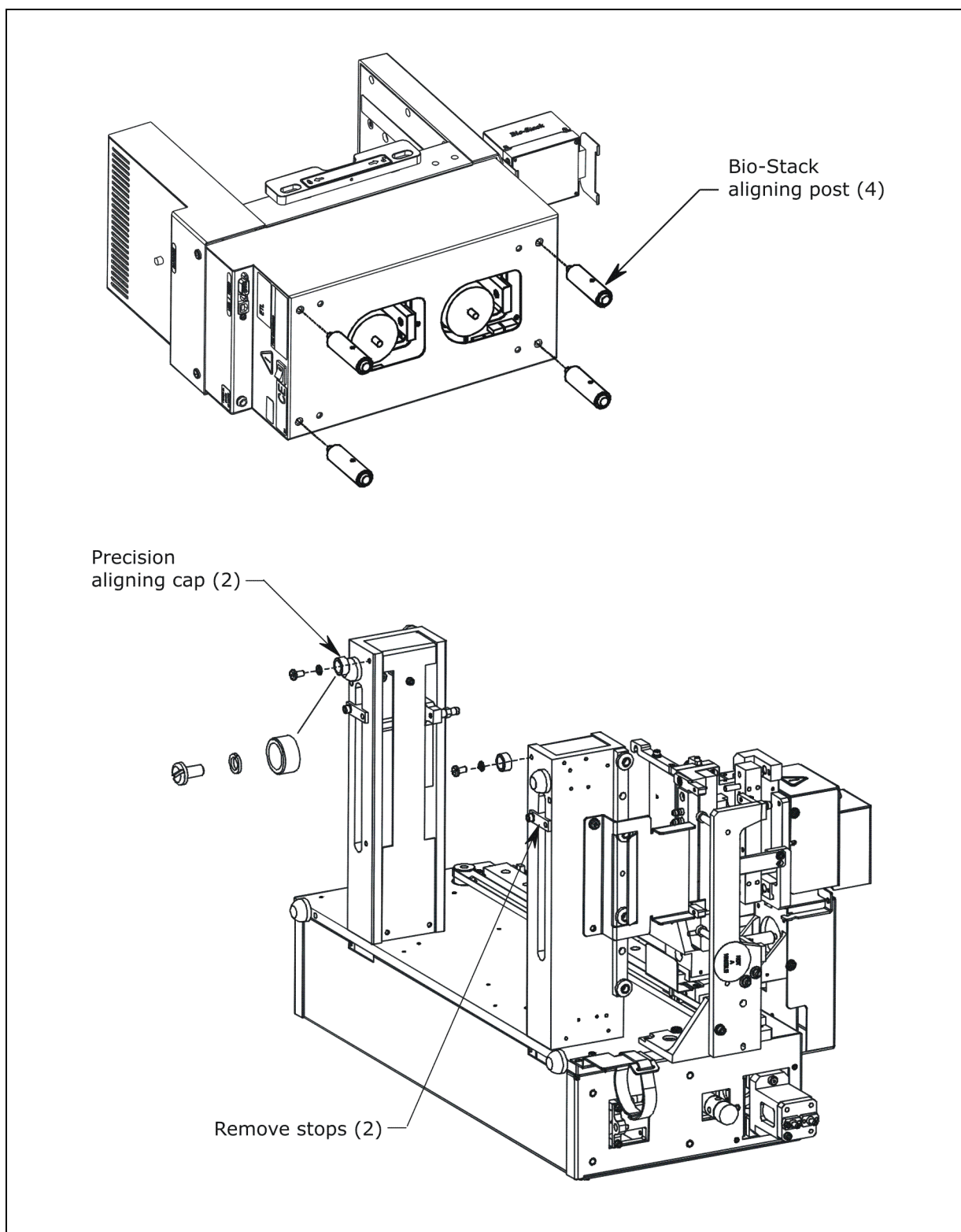
Refer to **Figure 21** on the next page for the following instructions. Perform these steps to attach the aligning posts to the Bio-Stack and the aligning caps to the Precision.

1. Carefully lay the Bio-Stack on its side, so the bottom of the instrument is facing you.
2. Screw in all four aligning posts as shown. Return the Bio-Stack to the upright position.
3. If you are using two Bio-Stacks with a Precision instrument, repeat steps 1 through 2 for the second Bio-Stack.
4. Turn off the Precision instrument and disconnect it from the power supply cord and serial or USB cable.
5. Carefully lay the Precision on its back so that the bottom surfaces of the left and right supports are facing you.
6. Using a 9/64” hex wrench, remove the stop from the bottom of one support first. Install the aligning cap, using a flat blade screwdriver.
7. Repeat Step 6 for the other support on the Precision. Return the Precision to the upright position.

## Attach the Roller Extensions to the Supply Platform

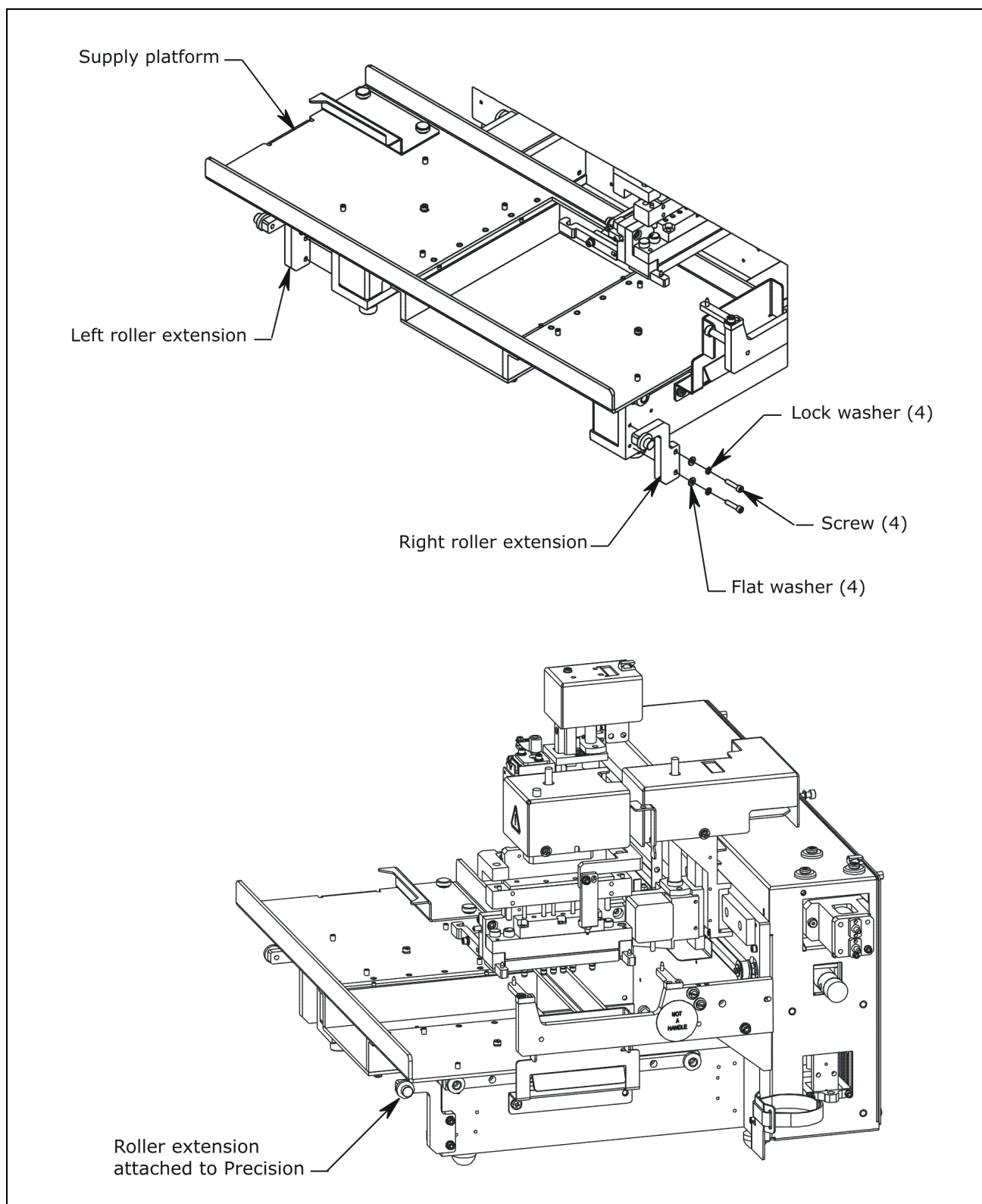
Refer to **Figure 22** on page 68 for the following instructions. Perform these steps to attach the left and right roller extensions to the Precision supply platform:

1. If you haven’t already done so, install the supply platform (refer to the Installation chapter in the Precision Operator’s Manual).
2. Using a 7/64” hex wrench, loosely attach the left roller extension to the left support by screwing in the screw, lock washer and flat washer only halfway.
3. Slide the extension up until it touches the bottom of the supply platform without raising the platform.
4. Tighten the mounting hardware of the extension.
5. Repeat steps 2 through 4, using the right roller extension, mounting hardware, and the right support.



**Figure 21:** Removing the Stops and Attaching the Aligning Posts (Bio-Stack™) and Caps (Precision™/XS)

❖ The Precision™ XS is illustrated in **Figure 21**.



**Figure 22:** Attaching the Roller Extensions to the Precision™/XS

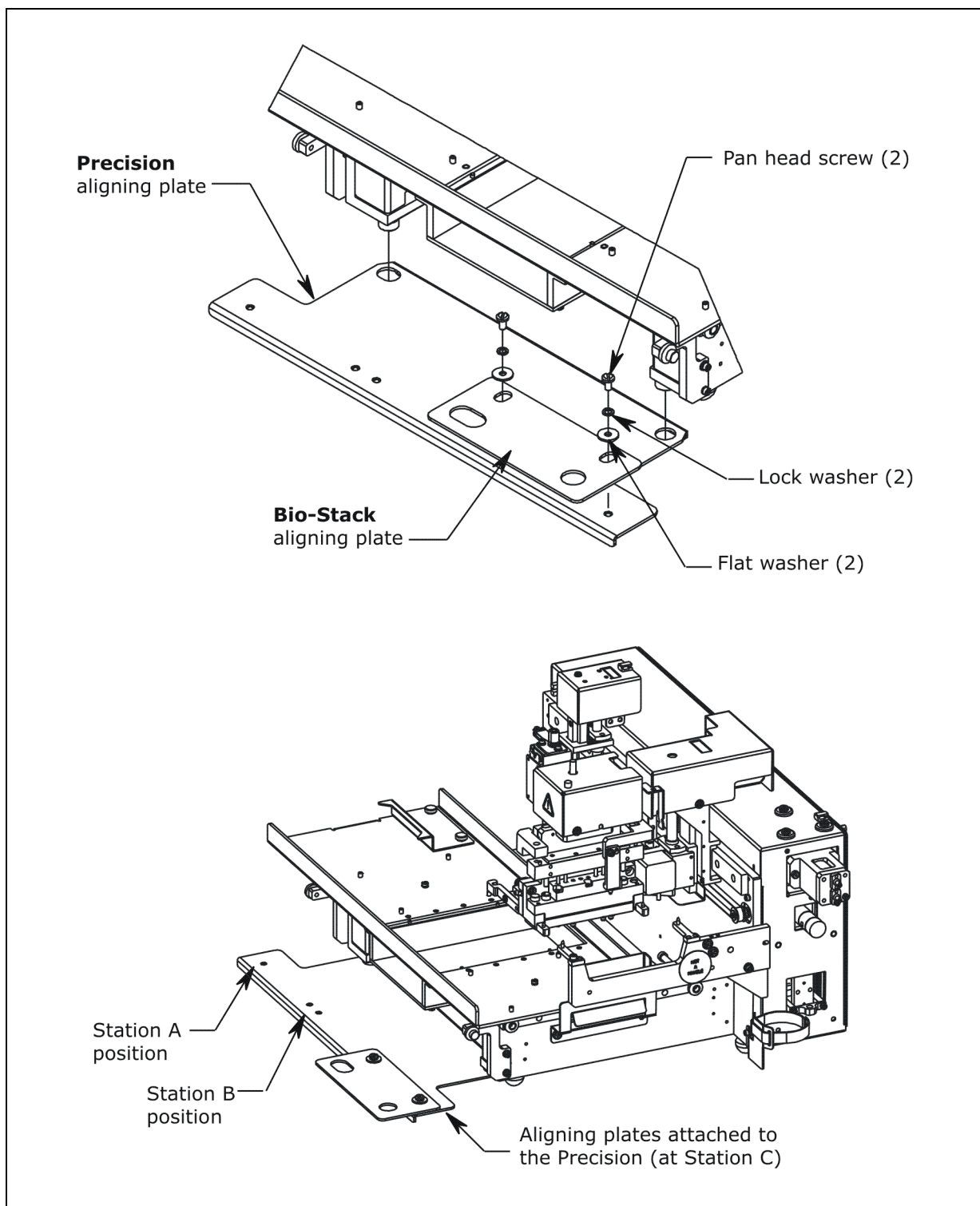
❖ The Precision™ XS is illustrated in **Figure 22**.

## Seat the Instruments in the Aligning Plates

- ❖ The Precision's aligning plate contains slots for aligning the Bio-Stack™ with any one of the supply stations A, B, or C, located on the front row of the supply platform. **Figure 24** on page 71 illustrates the Bio-Stack aligned with station C.
- ❖ If you are using two Bio-Stacks with a Precision™ instrument, align one Bio-Stack with supply station A, and the other Bio-Stack with supply station C, in order to allow adequate spacing between the two Bio-Stacks. You will need *two* sets of part numbers **7110542** (Bio-Stack aligning posts) and **7112140** (Bio-Stack aligning plate), and *three* communication ports on the host PC.

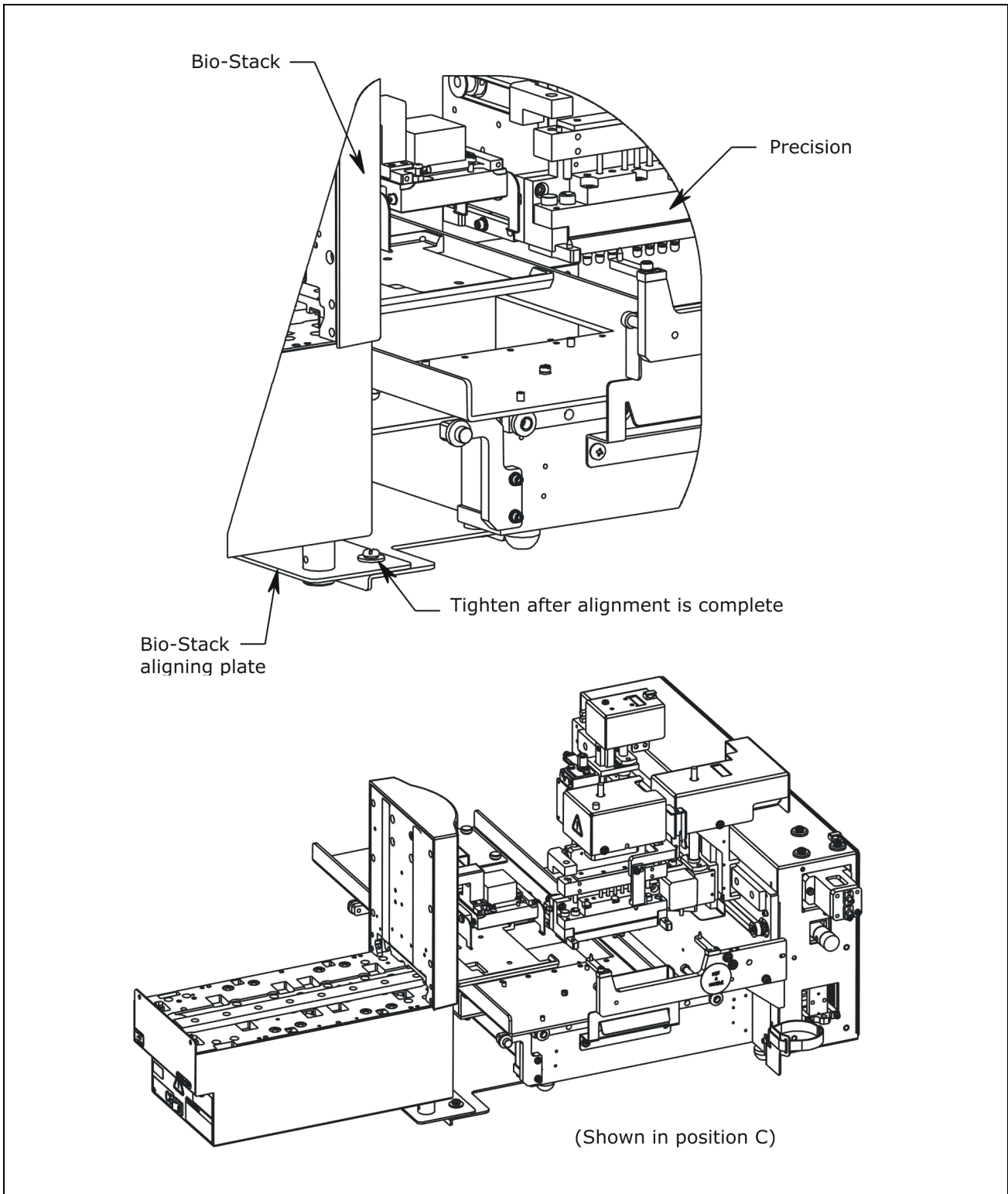
Refer to **Figure 23** and **Figure 24** on pages 70 and 71 for the following instructions. Perform these steps to seat the Precision and Bio-Stack in the aligning plates:

1. With the Precision still in the upright position, slide the Precision's two front aligning caps into the slots provided on the Precision aligning plate (**Figure 23**).
2. Loosely attach the Bio-Stack aligning plate to the Precision aligning plate in front of the supply station (A, B, or C) that the Bio-Stack will be aligned with, by screwing in the pan head screw, lock washer, and flat washer only half-way.
3. Slide the Bio-Stack's two front aligning posts into the slots provided on the Bio-Stack aligning plate (**Figure 24**).
4. Move both instruments back and forth in their slots until you are satisfied that they are positioned correctly next to each other (approximately). Ensure that all posts and caps are properly seated (not resting on top of the plates), and that the instruments are level.



**Figure 23:** Attaching the Aligning Plates (Precision™/XS)

❖ The Precision™ XS is illustrated in **Figure 23**.



**Figure 24:** Seating the Bio-Stack™ and Precision™/XS in the Aligning Plates

❖ The Precision™ XS is illustrated in **Figure 24**.

## Turn on the Bio-Stack and Run a Self-Test



**Warning!** Keep your hands away from the claw/gripper and carrier while the Bio-Stack™ is being powered up. The carrier and claw/gripper move quickly during the homing sequence.



The Bio-Stack **must** pass the Self-Test for installation with the Precision/XS.

❖ The Bio-Stack does not need to be connected to a host computer for this test.

Locate the Bio-Stack's power switch and turn on the instrument (see **Figure 9** on page 36 for the location of the switch). The Bio-Stack will home all axes (claw/gripper, carrier, input and output stack lifts) and then perform a system Self-Test.

- **If the Self-Test passes**, the green light will turn on and remain on.
- **If the Self-Test fails**, the green light will flash. If this happens, turn off the Bio-Stack and check for any obstructions. Ensure that all of the shipping hardware has been removed. If you cannot resolve the problem, contact BioTek's Technical Assistance Center for guidance.

## Connect the Host Computer to the Bio-Stack™ and Precision™/XS



The host computer must be equipped with at least **two serial ports** or **one serial port and one USB port**.

❖ The **Bio-Stack Alignment Kits** for the Precision™/XS include two serial cables (9-pin to 9-pin female/male cable and 9-pin to 25-pin female/female cable), a USB cable, and USB driver software CD.

The **shipping accessories** for the Precision/XS include a 9-pin to 25-pin female/female serial cable.

Perform these steps to connect the host computer to both the Bio-Stack and the interfacing Precision instrument (refer to **Figure 9** on page 36 for an illustration of the serial and USB ports):

1. If the Bio-Stack is on, turn it off.
2. Place the computer in a location adjacent to the Bio-Stack and the Precision.



3. Connect the computer to the Bio-Stack™, using a serial cable **or** USB cable:

**Connect the serial cable:**

- Using the *appropriate* serial cable, attach one end of the cable to a serial port on the computer.
- Attach the other end of the cable to the serial port on the rear of the Bio-Stack.
- Tighten the securing screws on both ends of the cable.

**Connect the USB cable and install the USB driver:**

- Attach one end of the supplied USB cable to a USB port on the computer. Attach the other end of the cable to the USB port on the rear of the Bio-Stack.
- Turn the computer on.
- Place the USB Virtual COM Driver Software CD in the computer's CD ROM drive.
- Using Microsoft® Explorer or other file management software, find the installation guide appropriate for your computer's operating system (e.g., WXPInstall.pdf).
- Follow the directions provided within the document to install the driver software.

❖ In the instructions on the following pages you will need to know which COM number is associated with the USB port on your computer. (You'll select this number in the Precision Power™ Software port selection dialog.) The COM port can be customized to use any number port that is not currently defined by the System. For customization instructions, consult the **ComPortGuide.doc** or **ComPortGuide.pdf** file on the USB driver CD.

4. Turn the computer off.
5. Attach the Precision™ to the computer using the *appropriate* serial cable.
6. Tighten the securing screws on both ends of the cable.

## Install the Bio-Stack™ PC Control Software



**Warning!** Keep your hands away from the claw/gripper and carrier while the Bio-Stack™ is being powered up. The carrier and claw/gripper move quickly during the homing sequence.

- ❖ A CD containing the **Bio-Stack PC Control Software** and an installation guide are included in the Bio-Stack Alignment Kit (PN 7110004) for the Precision™.
- ❖ Since Precision Power™ Software controls the Bio-Stack via a component of the Bio-Stack PC Control Software, it is not necessary to test communication between the Bio-Stack and the Bio-Stack PC Control Software. There is a step to test communication between the Bio-Stack and Precision Power in **Configure Precision Power for Bio-Stack Operation and Test Communication** on page 76.

Perform these steps to install the Bio-Stack PC Control Software on the computer:

1. Turn the computer and the Bio-Stack on.
2. Follow the instructions in the **Bio-Stack PC Control Software Installation Guide** for installation of the software.
3. Launch the Bio-Stack PC Control Software.

## Run the Checksum Test for the Bio-Stack

Perform these steps to run the Checksum Test and record the software versions for the Bio-Stack PC Control Software and for the Bio-Stack:

- ❖ For your convenience, **Software Data Sheets** are provided in **Chapter 5, Instrument Qualification**, for recording the Bio-Stack software versions.

1. From the top menu bar in the Bio-Stack PC Control Software, select **Help > About Bio-Stack**.
2. The 'About Bio-Stack Software' dialog will open. Record the Bio-Stack PC Software Versions for the Installation CD, StackerContainer.exe, and BTIAutoStackerActiveX. Record the serial number listed on the Bio-Stack PC Control Software package.
3. Click **Get On-board values now**. If software version information is displayed and no errors occurred, the Checksum Test completed successfully.
4. Record the Bio-Stack onboard software versions for the basecode software, interface definition, and checksum. Record the Bio-Stack's serial number.

## Install Precision Power™ Software and Test Communication



A CD containing **Precision Power Software, v. 2 or greater** is included in the package contents with the Precision™ XS.

If you are operating with the Precision™ Microplate Pipetting System, please contact BioTek for more information.

Perform these steps to install **Precision Power** software on the computer, and then test communication with the Precision instrument:

1. Follow the instructions provided in the Precision Power User's Guide to install and register the software.
2. Turn on the Precision instrument.

❖ The Precision Microplate Pipetting System will perform a system self-test upon startup, however, this feature has been disabled in the Precision XS as a precaution to avoid shattering any breakable supplies that may be present on the platform during power-up.

3. Launch Precision Power.
  - If you **haven't** registered the software, the first time you launch Precision Power and each time you run it before it is registered (i.e., running in Demo mode), the **Program Registration** screen opens. Click **Demo** to run Precision Power in trial mode.
  - If you **have** already registered the software, an introductory screen will appear. After a few moments (or if you press any key or click the mouse on the image), Precision Power's main screen will appear.
4. At the main screen, select **Instrument > Precision Series Configuration** to open the 'Precision Series Instrument Configuration dialog'.
5. If the COM port that is highlighted is not the correct port, click the **Modify** button. At the 'Modify Instrument' dialog, select the correct **Com Port**, then click **OK**.
6. At the Precision Series Instrument Configuration dialog, click **Test Comm.**
  - If the test fails, ensure that the cable is properly connected and you have correctly identified the COM port number.
7. If the test is successful, return to Precision Power's main screen.

You must now configure Precision Power for operation with the Bio-Stack™ before you can test communication with the Bio-Stack. (See the next topic.)

## Configure Precision Power™ for Bio-Stack™ Operation and Test Communication

Perform these steps to configure Precision Power for Bio-Stack operation, and then test communication with the Bio-Stack:

1. For the Precision™ Microplate Pipetting System only:

Prepare the Precision for operation with the Bio-Stack:

- Select **Instrument > Precision Series Configuration > Settings**. Precision Power will attempt to communicate with the instrument. (If an error is displayed, click **OK** to get to the dialog.)
- Under **For Non-Precision XS Models**, select **Operating adjacent to Bio-Stack** to prepare the instrument to function with the Bio-Stack. This prevents the Precision from performing its normal homing routine (Self-Test) at startup – avoiding any hardware collisions with the Bio-Stack.
- Click **Exit** and then **OK** to return to Precision Power's main screen.

2. For the Precision Microplate Pipetting System and Precision™ XS:

Add a Bio-Stack to Precision Power's Instrument Configuration:

- Select **Instrument > Bio-Stack Configuration > Add**. Enter a unique **Name** for the Bio-Stack, using up to 16 alphanumeric characters.
- Use the up/down arrow keys to select a **Com Port**, or enter the desired number directly in the field.
- Select the supply **Station** where the Bio-Stack will interface with the Precision instrument.
- Click **OK** to save the settings and return to the Configuration dialog.
- At the Configuration dialog, click **Test Comm**. If the test is a success, Precision Power and the Bio-Stack are communicating properly. If the test fails, an error code will be provided for troubleshooting.
- Return to Precision Power's main screen.

## Run the Checksum Test for the Precision™/XS

Perform these steps to run the Checksum Test and record the software versions for Precision Power™ Software and for the Precision™/XS:

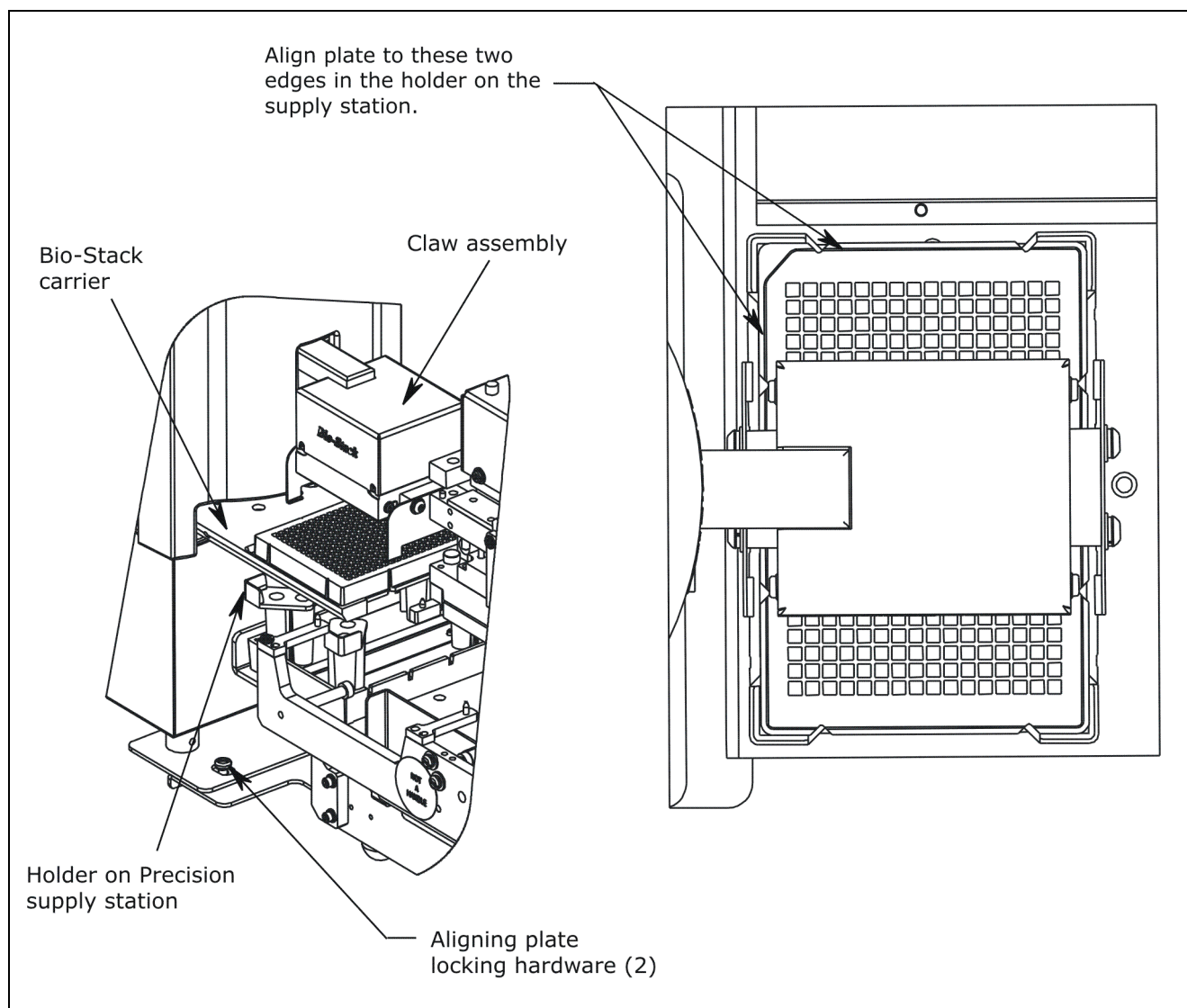
❖ For your convenience, **Software Data Sheets** are provided in **Chapter 5, Instrument Qualification**, for recording the software versions for Precision Power and the Precision instruments.

1. At Precision Power's main screen, select **Help > About Precision Power**.
2. Record the Precision Power software versions for the Installation CD, PrecisionPower#.exe, and BTIAutoDispenserActiveX. Click **OK** to return to the main screen. Record the serial number listed on the Precision Power Software package.
3. Select **Instrument > Precision Series Configuration > Test Comm**, then select **ActiveX/Instrument Versions > Instrument Version**. If software version information is displayed and no errors occurred, the Checksum Test completed successfully.
4. Record the Precision instrument's basecode part number, Function Version, and Structure Version. Record the serial number listed on the Precision instrument.

## Align the Bio-Stack™ with the Precision™/XS

Refer to **Figure 25** on the next page for the following instructions (the Precision™ XS is illustrated). Perform these steps to align the Bio-Stack with the desired supply station on the Precision:

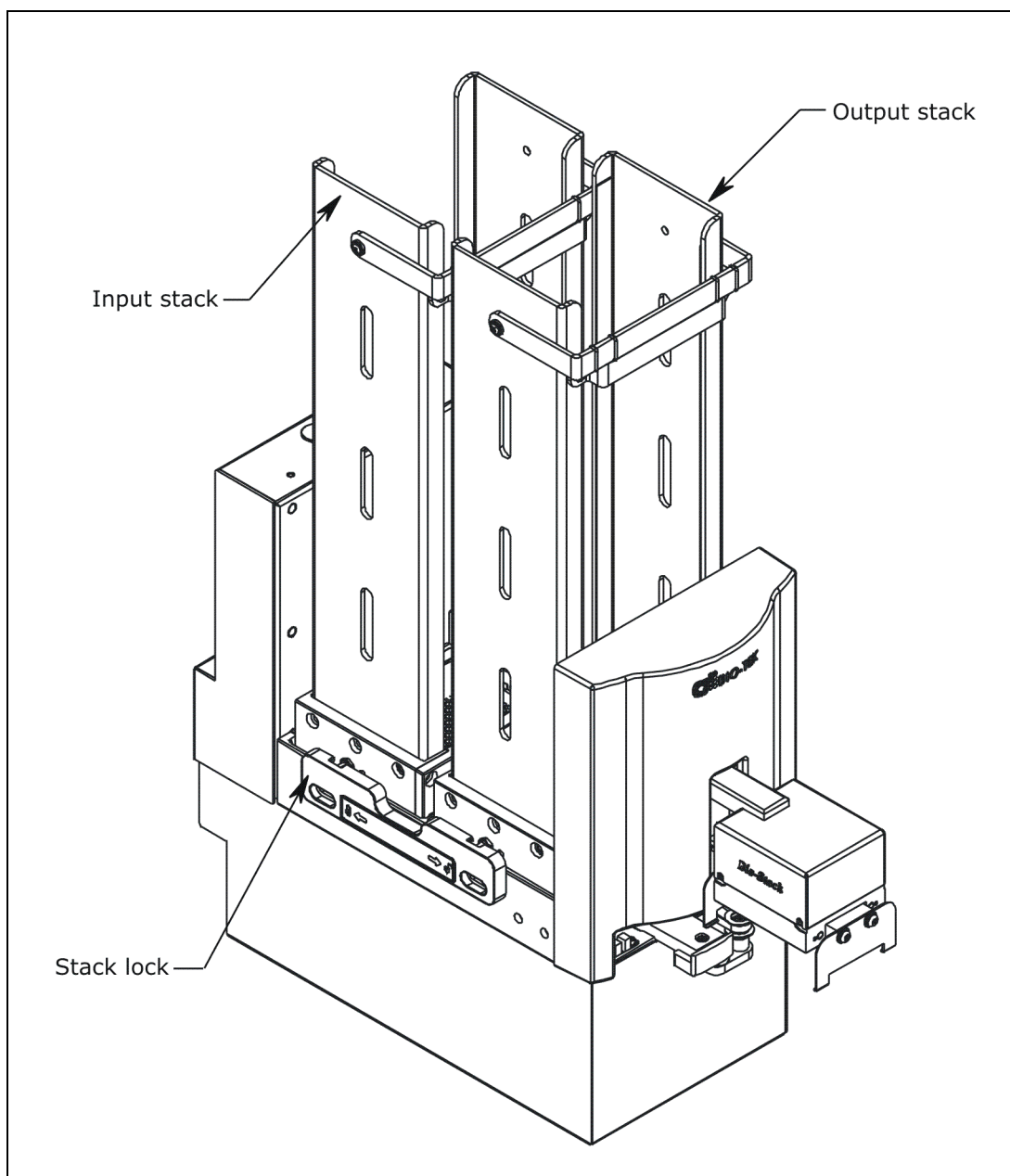
1. Reconnect the power supply and turn on the Bio-Stack. The carrier will home and the claw assembly will move up.
2. To home all components on the Precision, select **Instrument > Precision Series Configuration > Utilities > Home All Axis**.
3. After all axes have been homed, keep the 'Utilities' dialog open and prepare the supply platform for alignment with the Bio-Stack by clicking **Position Platform for Bio-Stack**. The platform will move forward. Click **Exit**, then **OK** to return to the main screen.
4. Leave the Precision powered up, however, turn the Bio-Stack off.
5. Manually pull the Bio-Stack carrier all the way out and position it below the claw assembly.
6. Place a microplate on the Bio-Stack carrier, and a microplate holder on the supply station that the Bio-Stack is aligned with.
7. Manually lower the claw assembly down to the microplate and pick up the microplate (open the gripper to get around the plate and close it to pick up the plate). Raise the claw assembly carefully to ensure that the microplate does not change positions in the claw.
8. Slide the Bio-Stack carrier out of the way.
9. Lower the claw assembly until the microplate is just above the microplate holder on the supply station of the Precision.
10. Manually adjust the Bio-Stack on the tabletop so the microplate can be lowered onto the microplate holder on the supply station. If the supply platform has been repositioned or the microplate has been moved, home the instruments, remove the microplate from the Bio-Stack claw, then repeat steps 3 through 10.
11. When you are satisfied with the microplate positioning relative to the supply station (refer to the top-down drawing in **Figure 25** to see how the plate should fit into the holder on the supply station), finger-tighten the aligning plate locking hardware in both places.
12. Repeat all of the steps a couple of times to ensure that the microplate does not change positions and that it rides smoothly in and out of the holder on the supply station.
13. If you are using two Bio-Stacks with a Precision instrument, power down the first Bio-Stack. Power up the second Bio-Stack to home the instrument, and repeat steps 4 through 12 for the second Bio-Stack.



**Figure 25:** Aligning the Bio-Stack™ with the Precision™ Instruments

## Install the Plate Stacks

Locate the stack locks on the side of the Bio-Stack™. Make sure the locks are both in the “unlocked” position. Install the stacks as shown in **Figure 26** below and then close the stack locks.



**Figure 26:** Installing the Plate Stacks



## Align the Claw/Gripper with the Precision's Supply Station

The Bio-Stack's claw/gripper mechanism must now be aligned vertically with the Precision™ supply station. Precision Power™ Software has an **Instrument Alignment Utility** for this task.

Perform these steps to run the Instrument Alignment Utility:

1. At Precision Power's main screen, select **Instrument > Bio-Stack Configuration**.
2. Click **Utilities**.
3. Click **Alignment Utility**.
4. To configure the alignment of the Bio-Stack™ to the Precision, begin with the **Home the Bio-Stack** function.
5. After all axes have been homed on the Bio-Stack, place a microplate in the microplate holder on the Precision's supply station. Then use the **Re-alignment Control** buttons to position the Bio-Stack's claw/gripper so that the gripper "fingers" rest approximately 50-60 thousandths of an inch (1.3-1.5 mm) below the plate bottom: click **Begin**. The gripper's jaws open. (See **Figure 27** on the next page.)

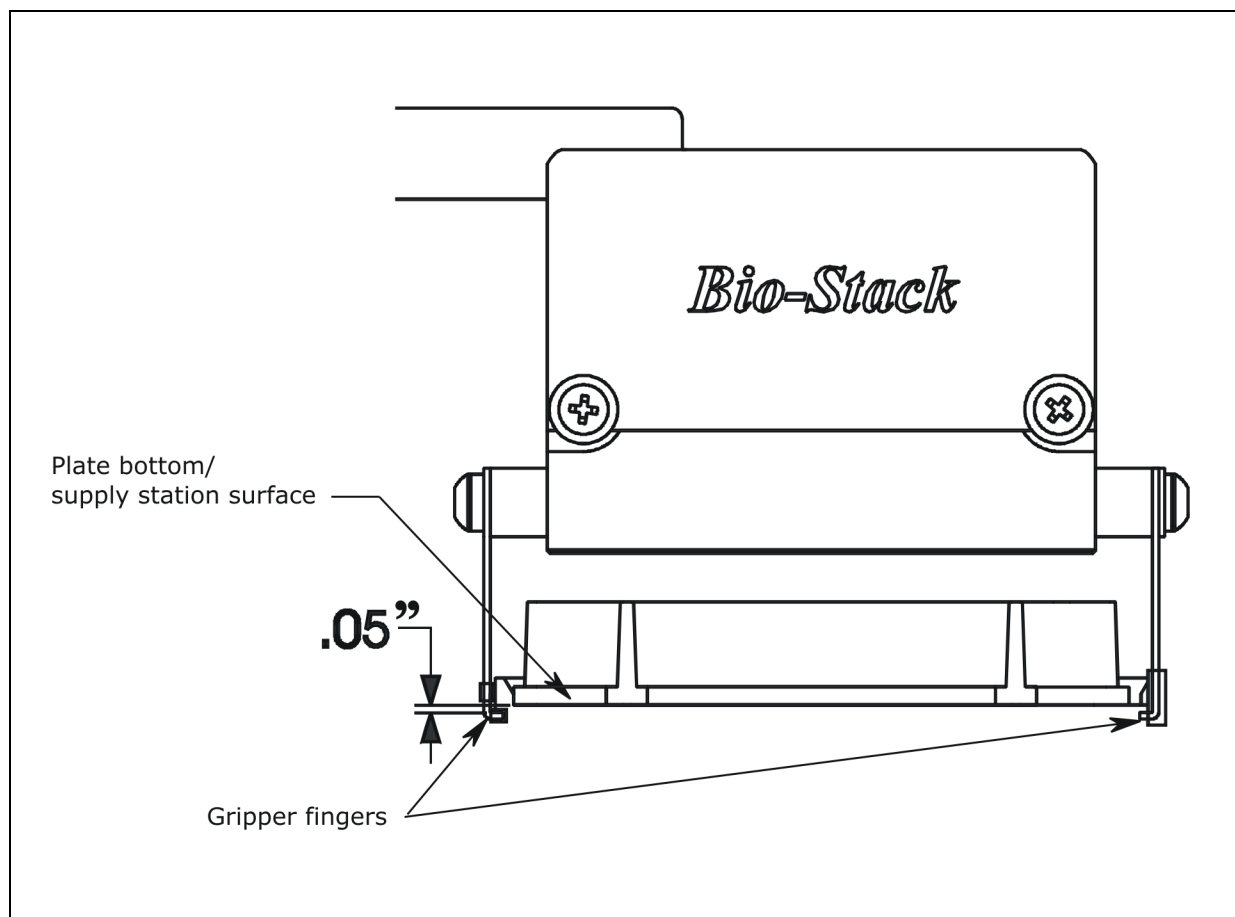
❖ If the Bio-Stack and Precision instrument are located on an uneven surface, the gripper's fingers should rest below the lowest point of the plate bottom, to ensure proper plate delivery.

- Begin with the **Down** radio button selected. To avoid collision of the gripper with the Precision supply station, click the **20 Step** button first, to see how far that goes, before clicking the **400 Step** button. Use the **400/20/1 Step** buttons to *gradually* lower the claw/gripper to the desired height.

If you have moved the gripper too far below the plate bottom, click the **Up** radio button and step up a bit.

❖ If the alignment is interrupted, and you receive an error code such as **2500**, the Bio-Stack will have to be homed to resolve the error. Click the **Home the Bio-Stack** button (in the **Instrument Alignment Utility**) to home all axes on the Bio-Stack, then repeat step 5 above.

6. When you're satisfied with the positioning of the gripper, click **Save Position**.
7. Remove the microplate from the station.



**Figure 27:** Position of the Bio-Stack's Gripper Fingers Below the Plate Bottom (on the Precision™ Supply Station)

## Verify the Alignment

Perform the following test to verify alignment of the Bio-Stack™ with the Precision™:

1. Place a dry microplate in the Bio-Stack's input stack.
2. In Precision Power™, select **Instrument > Bio-Stack Configuration**.
3. Click **Utilities > Alignment Utility**.
4. At the 'Bio-Stack Instrument Alignment Utility' dialog, click the **Verify** button.
5. Watch closely to confirm the following behavior (the claw/gripper will pause periodically; this is the expected behavior):
  - The Bio-Stack will transfer the plate from the input stack to the Bio-Stack plate carrier, and then eject the plate carrier.
  - The claw/gripper will pick up the plate, lower it toward the supply station, and then *smoothly* place the plate on the station.
 

❖ If the plate drops onto the station, the claw interface position has been set too high. Repeat the steps in the previous section ***Align the Claw/Gripper with the Precision's Supply Station***.
  - The claw/gripper will come up a short distance. The gripper will then power-down, allowing its spring mechanism to tighten the gripper "fingers."
 

❖ If the gripper fingers catch on the top of the microplate, the claw interface position has been set too low. An error code will appear in the software. Repeat the steps in the previous section ***Align the Claw/Gripper with the Precision's Supply Station***.
  - If the gripper fingers did not catch the plate, Precision Power issues a "Verify the placement" message and delays the Bio-Stack's movement to give you time to observe the action. Click **OK** to continue.
  - The claw/gripper will lower, pick up the plate, place the plate on the Bio-Stack's plate carrier, and then store the plate in the output stack.
  - If the gripper fingers are not positioned correctly, repeat the steps in ***Align the Claw/Gripper with the Precision's Supply Station*** and then re-run the Verify Test.
6. Click **OK, Exit**, then **OK**. Close Precision Power Software.
 

❖ The Verify Test must pass before the Bio-Stack can be used to transfer microplates.



## Install the Bio-Stack™ with the µFill™ or ELx405™

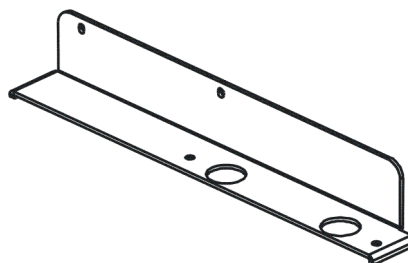
### Lay Out the Alignment Hardware

You will need the alignment hardware from the Bio-Stack Alignment Kits for the µFill (**PN 7310012**), illustrated below, or for the ELx405 (**PN 7310010**), illustrated on the following page.

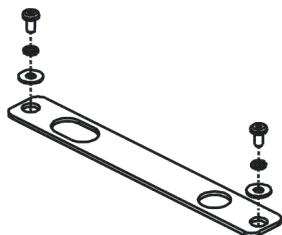
#### µFill Alignment Kit 7310012



**Four aligning posts** (PN 7310524) for elevating the Bio-Stack to the correct height and for seating in the aligning plate.



**µFill aligning plate** (PN 7312049) for preventing the instrument from sliding around and being misaligned with the Bio-Stack.



**Bio-Stack aligning plate** (PN 7312052) for attachment to the µFill aligning plate. Includes two each of mounting hardware: pan head screws (PN 12028), lock washers (PN 16017), and flat washers (PN 16068).

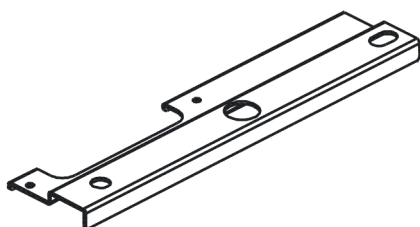
- ❖ µFill Dispensers **with serial numbers ≥ 185105** have been installed with the latest basecode software for Bio-Stack compatibility. Dispensers with serial numbers < 185105 may need the µFill Upgrade Kit (PN 7310015), which contains the latest µFill basecode software for Bio-Stack compatibility. Contact BioTek for details.

**ELx405™ Alignment Kit 7310010**

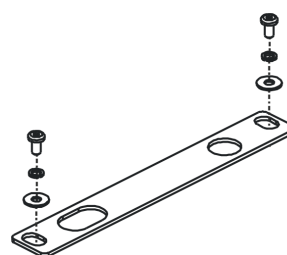
**Four aligning posts**  
(PN 7310524) for elevating the Bio-Stack™ to the correct height and for seating in the aligning plate.



**Two aligning caps** (PN 7312074) for elevating the ELx405 to the correct height and for seating in the aligning plate.



**ELx405 aligning plate**  
(PN 7312050) for preventing the instrument from sliding around and being misaligned with the Bio-Stack.



**Bio-Stack aligning plate** (PN 7312052) for attachment to the ELx405 aligning plate.  
Includes two each of mounting hardware: pan head screws (PN 12028), lock washers (PN 16017), and flat washers (PN 16068).

- ❖ ELx405 washers with serial numbers **183514, 184197**, or with serial numbers **≥ 185301** have been installed with the latest ELx405 basecode software for Bio-Stack compatibility.
- ❖ Washers with serial numbers **≥ 182188** and **< 185301** may need the **software Upgrade Kit (PN 7310013)**, which contains the latest ELx405 basecode software. Contact BioTek.
- ❖ Washers with serial numbers **≤ 182187** may need to be factory upgraded with **Upgrade Kit PN 7310006**, which includes a Bio-Stack compatible carrier and the latest ELx405 basecode software. Contact BioTek.
- ❖ The Magna model of the washer is not Bio-Stack compatible.
- ❖ **PC Control** of the Bio-Stack and ELx405 using the **Liquid Handling Control™ (LHC) Software**: Some washers may need their basecode software upgraded to be compatible with the LHC Software. Contact BioTek for more information.

## Attach the Aligning Posts and Caps



**Important!** When attaching the four aligning posts (“feet”) to the Bio-Stack™, do not over-tighten the posts!  
**Finger-tighten only!**

To avoid scratches to the Bio-Stack or to the ELx405™, place a towel down before laying the instrument on its side.

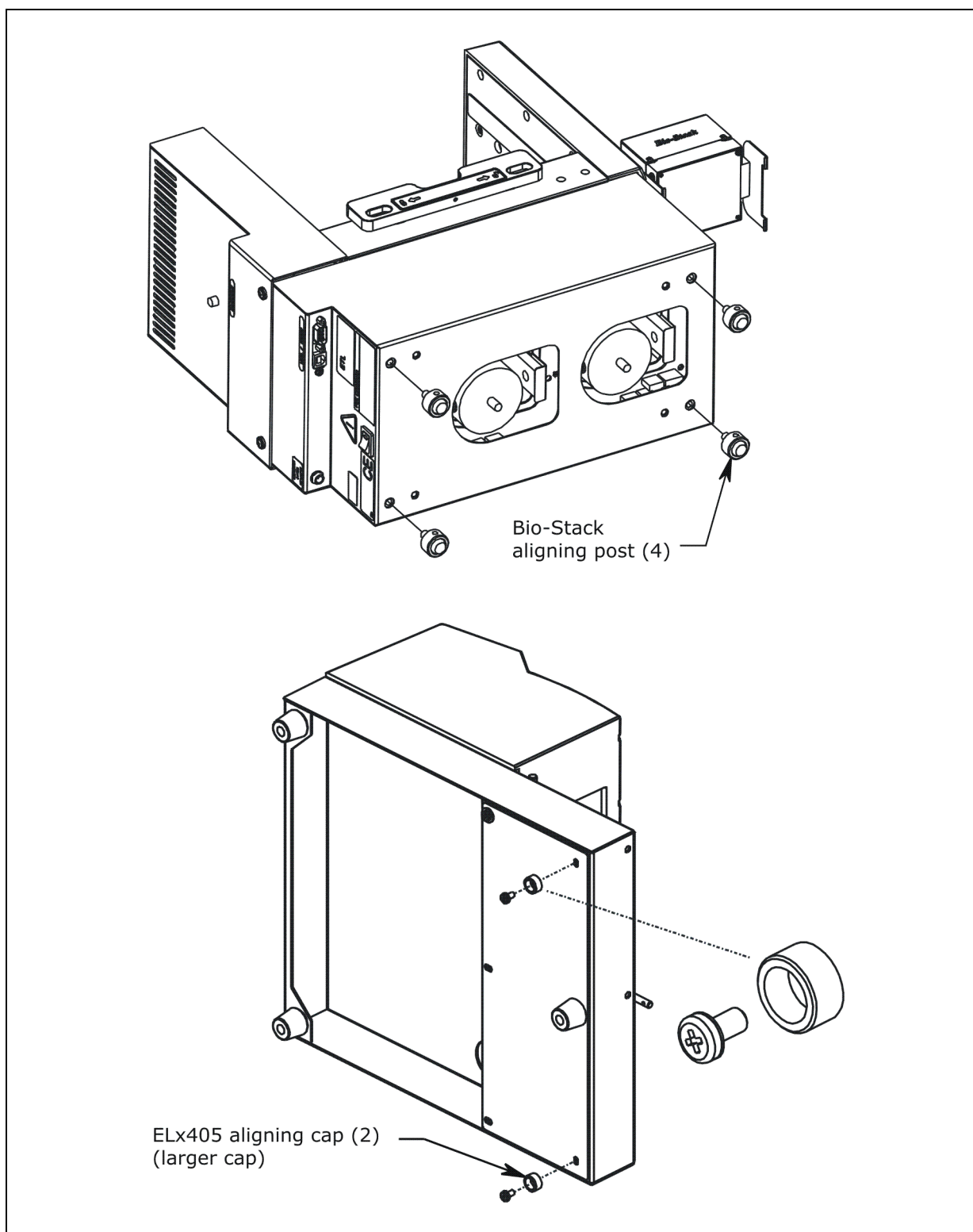
Perform these steps to attach the aligning posts to the Bio-Stack and the aligning caps to the ELx405 (refer to **Figure 28** on the following page):

❖ The **µFill** is already at the correct height for operation with the Bio-Stack, and does not need aligning caps attached to it.

1. Carefully lay the Bio-Stack on its side so the bottom is facing you.
2. Screw in all four aligning posts as shown.
3. Return the Bio-Stack to the upright position.
4. Turn off the µFill or ELx405. Disconnect the power supply cord from the µFill and the power cord from the ELx405.

**ELx405 only:**

- Carefully lay the washer on its side so the bottom is facing you.
- Remove the mounting hardware. Replace the flat washers with the aligning caps.
- Reinstall the hardware that was removed (except the flat washers).
- Return the washer to the upright position.



**Figure 28:** Attaching the Aligning Posts to the Bio-Stack™ and the Caps to the ELx405™



## Seat the Instruments in the Aligning Plates

Perform these steps to seat the Bio-Stack™ and the µFill™ or ELx405™ in the aligning plates:

1. Place the µFill or ELx405 aligning plate on a level surface.
2. Attach the Bio-Stack aligning plate as follows:

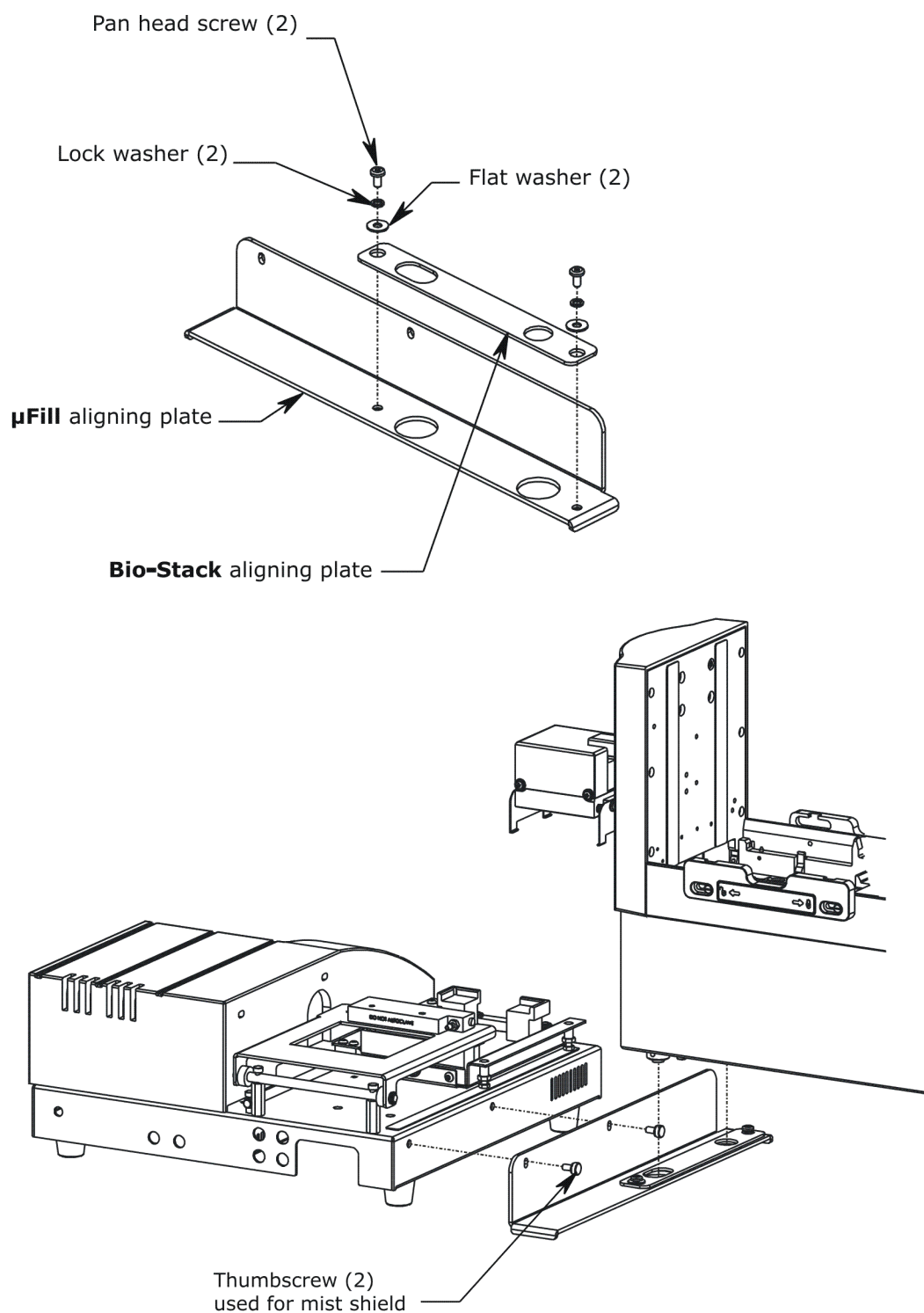
**µFill** (see **Figure 29** on the next page):

❖ **Note:** The mist shield is not illustrated in **Figure 29**.

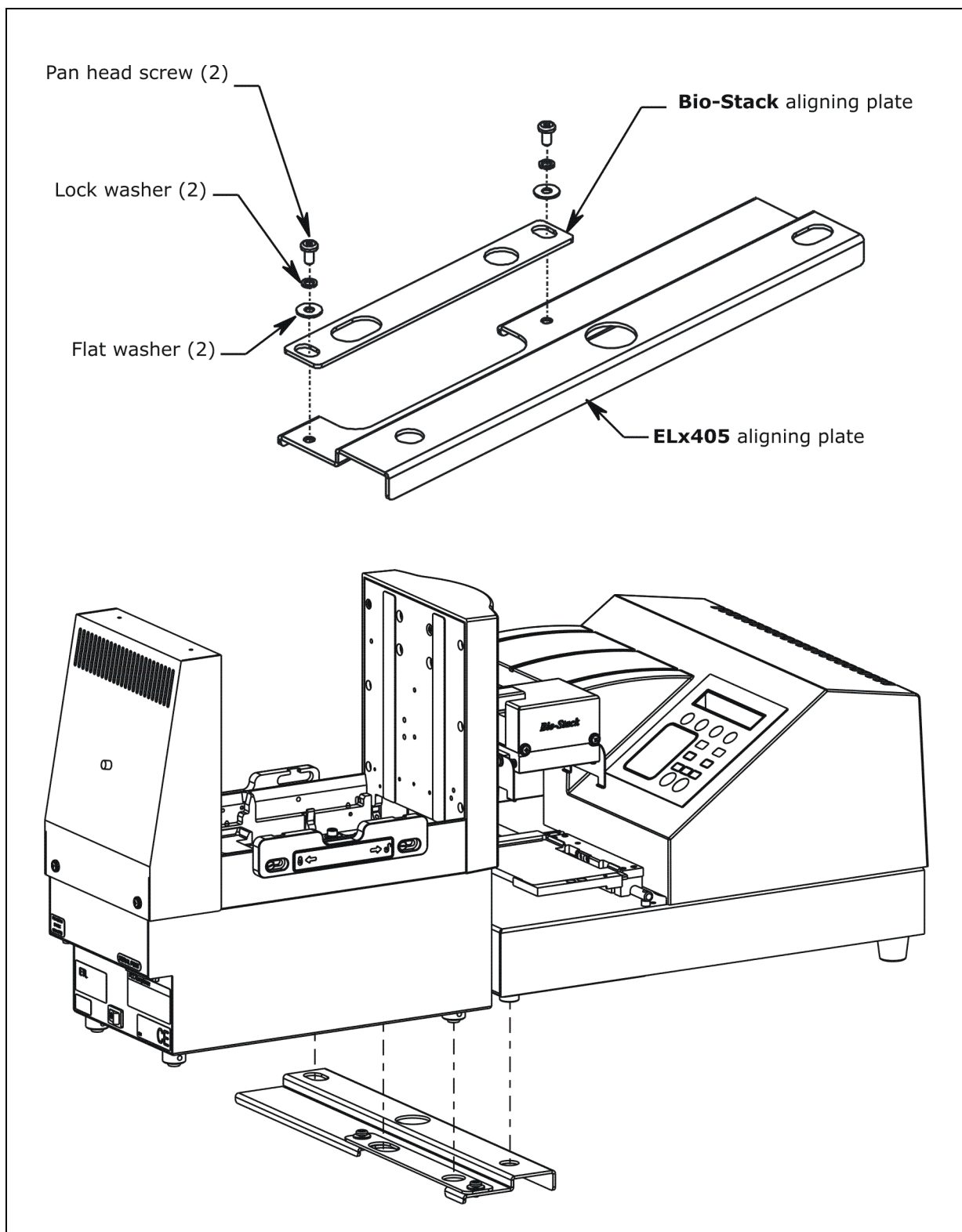
- Loosely attach the Bio-Stack aligning plate to the µFill aligning plate by screwing in the pan head screw, lock washer, and flat washer only halfway.
- Unscrew the two thumbscrews that attach the mist shield to the µFill.
- Holding the µFill's aligning plate against the mist shield, loosely screw in the two thumbscrews.

**ELx405** (see **Figure 30** on page 91):

- Loosely attach the Bio-Stack aligning plate to the ELx405 aligning plate by screwing in the pan head screw, lock washer, and flat washer only halfway.
  - Slide the ELx405's two front aligning caps into the slots provided on the ELx405 aligning plate.
3. Slide the Bio-Stack's two front aligning posts into the slots provided on the Bio-Stack's plate.
  4. Move both instruments back and forth in their slots until you are satisfied that they are positioned correctly next to each other (approximately). Ensure that the posts and caps (ELx405 only) are properly seated (not resting on top of the plates), and that the instruments are level.



**Figure 29:** Seating the Bio-Stack™ and µFill™ in the Aligning Plates



**Figure 30:** Seating the Bio-Stack™ and the ELx405™ in the Aligning Plates

## Turn on the Bio-Stack™ and Run a Self-Test



**Warning!** Keep your hands away from the claw/gripper and carrier while the Bio-Stack is being powered up. The carrier and claw/gripper move quickly during the homing sequence.



The Bio-Stack **must** pass the Self-Test for installation with the  $\mu$ Fill™ or ELx405™.

❖ The Bio-Stack does not need to be connected to a host computer for this test.

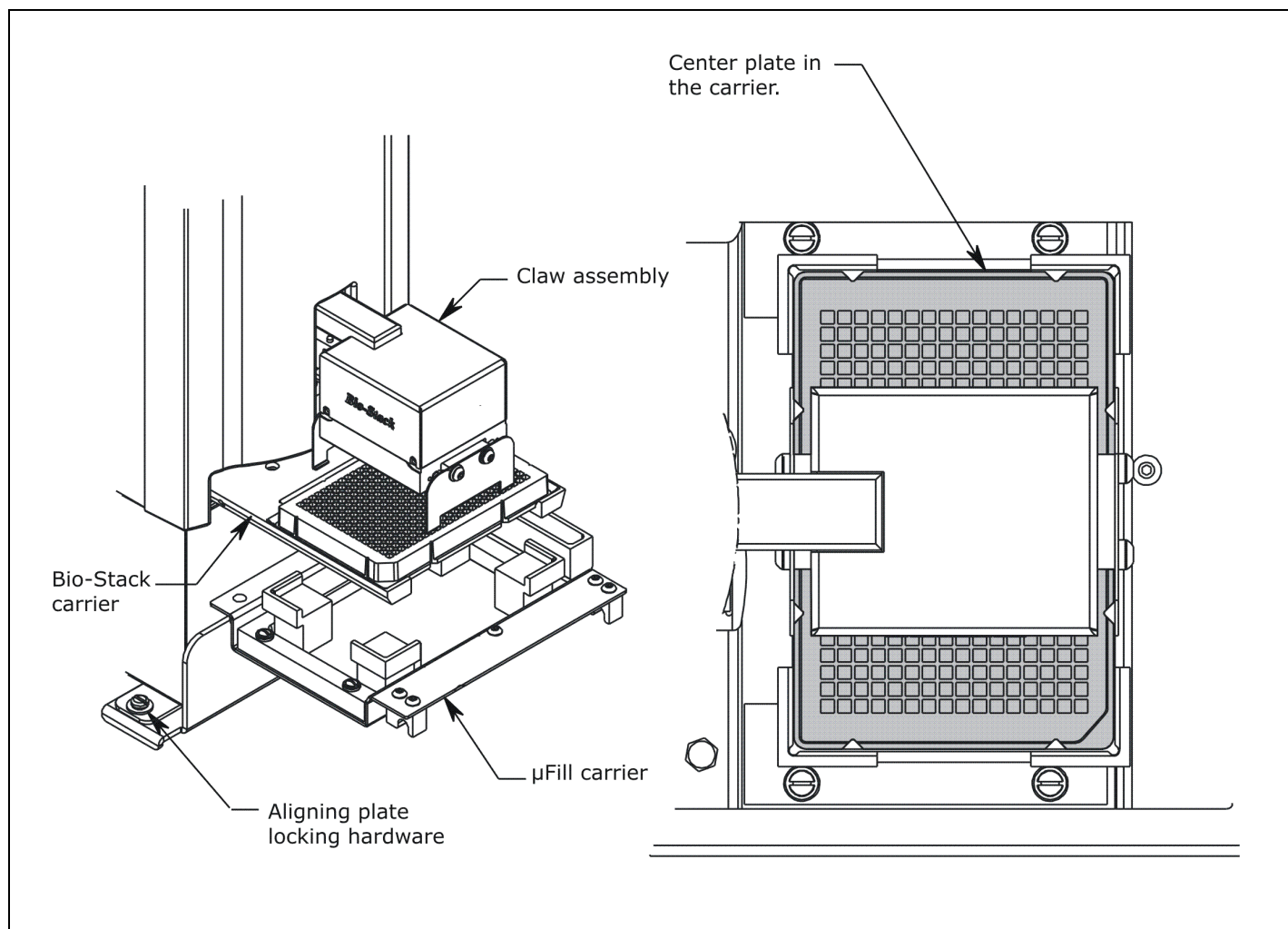
Locate the Bio-Stack's power switch and turn on the instrument (see **Figure 9** on page 36 for the location of the switch). The Bio-Stack will home all axes (claw/gripper, carrier, input and output stack lifts) and then perform a system Self-Test.

- **If the Self-Test passes**, the green light will turn on and remain on.
- **If the Self-Test fails**, the green light will flash. If this happens, turn off the Bio-Stack and check for any obstructions. Ensure that all of the shipping hardware has been removed. If you cannot resolve the problem, contact BioTek's Technical Assistance Center for guidance.

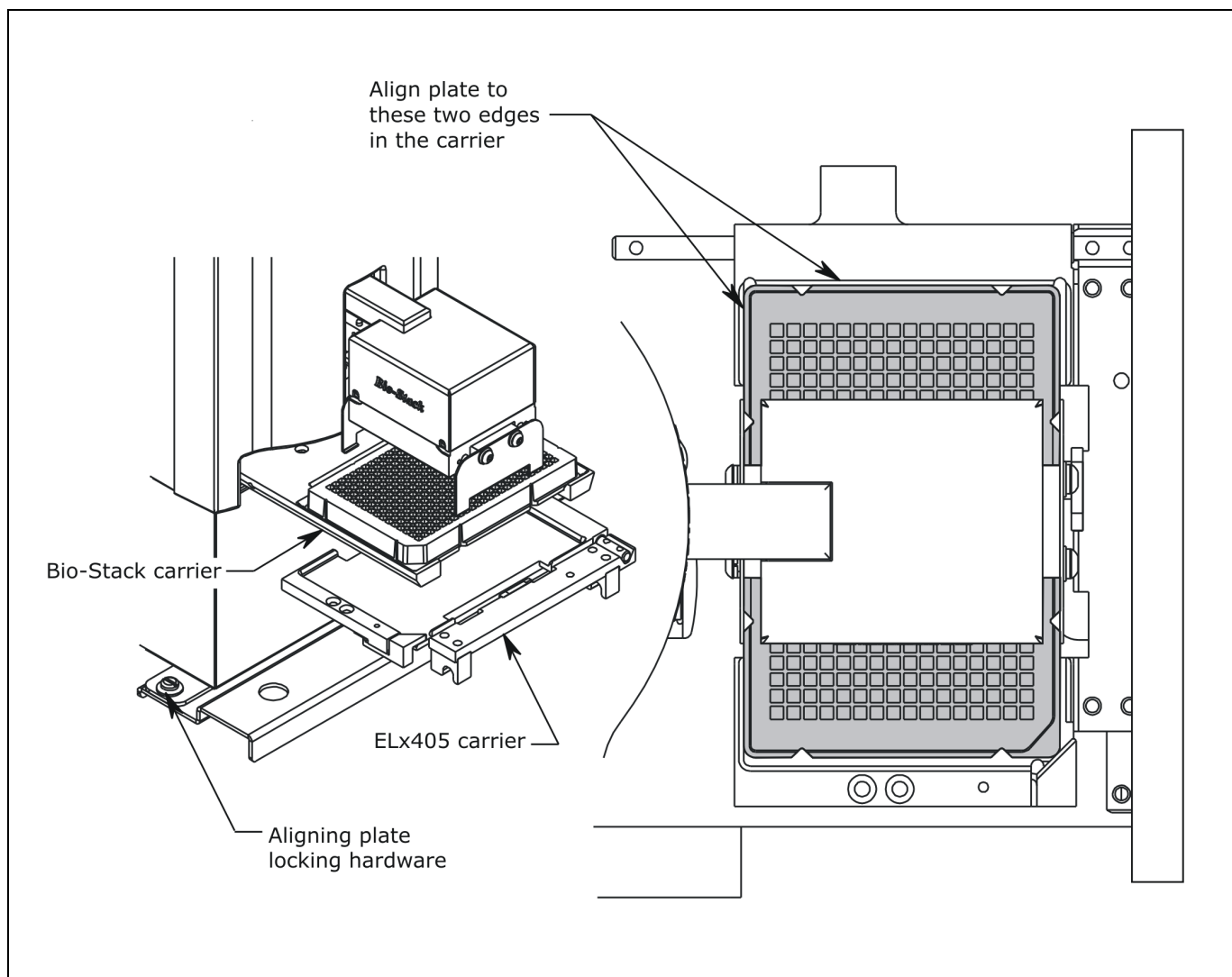
## Align the Bio-Stack™ with the µFill™ or ELx405™

Perform these steps to align the Bio-Stack with the µFill or ELx405:

1. Ensure that the Bio-Stack is powered up and homed. If the Bio-Stack is off, turn it on to home all axes.
2. Reconnect the power supply cord to the µFill or the power cord to the ELx405 and turn the instrument on. The carrier should be in the “out” position. Leave the µFill or ELx405 powered up.
3. Turn the Bio-Stack off.
4. Manually slide the Bio-Stack carrier all the way out and position it below the claw assembly. Refer to **Figure 31** or **Figure 32** on the following pages.
5. Place a microplate on the Bio-Stack carrier.
6. Manually lower the claw assembly down to the microplate and pick up the microplate (open the gripper to get around the plate and close it to pick up the plate). Raise the claw assembly carefully to ensure that the microplate does not change positions in the claw.
7. Slide the Bio-Stack carrier out of the way.
8. Lower the claw assembly until the microplate is just above the carrier of the µFill or ELx405.
9. Manually adjust the Bio-Stack on the tabletop so the microplate can be lowered into the carrier of the µFill or ELx405. The microplate carrier should be positioned as if it was just homed by the µFill or ELx405. If the µFill or ELx405's carrier or the microplate has been moved, home the instruments, remove the microplate from the Bio-Stack claw, then repeat steps 3 through 9.
10. When you are satisfied with the microplate positioning relative to the carrier of the µFill or ELx405 (look carefully at the top-down drawing in **Figure 31** on the next page for the µFill or **Figure 32** on page 95 for the ELx405, to see how the plate should fit in the carrier), finger-tighten the aligning plate locking hardware in both places.
11. Repeat all of the steps a couple of times to ensure that the microplate does not change positions and that it rides smoothly in and out of the carriers.



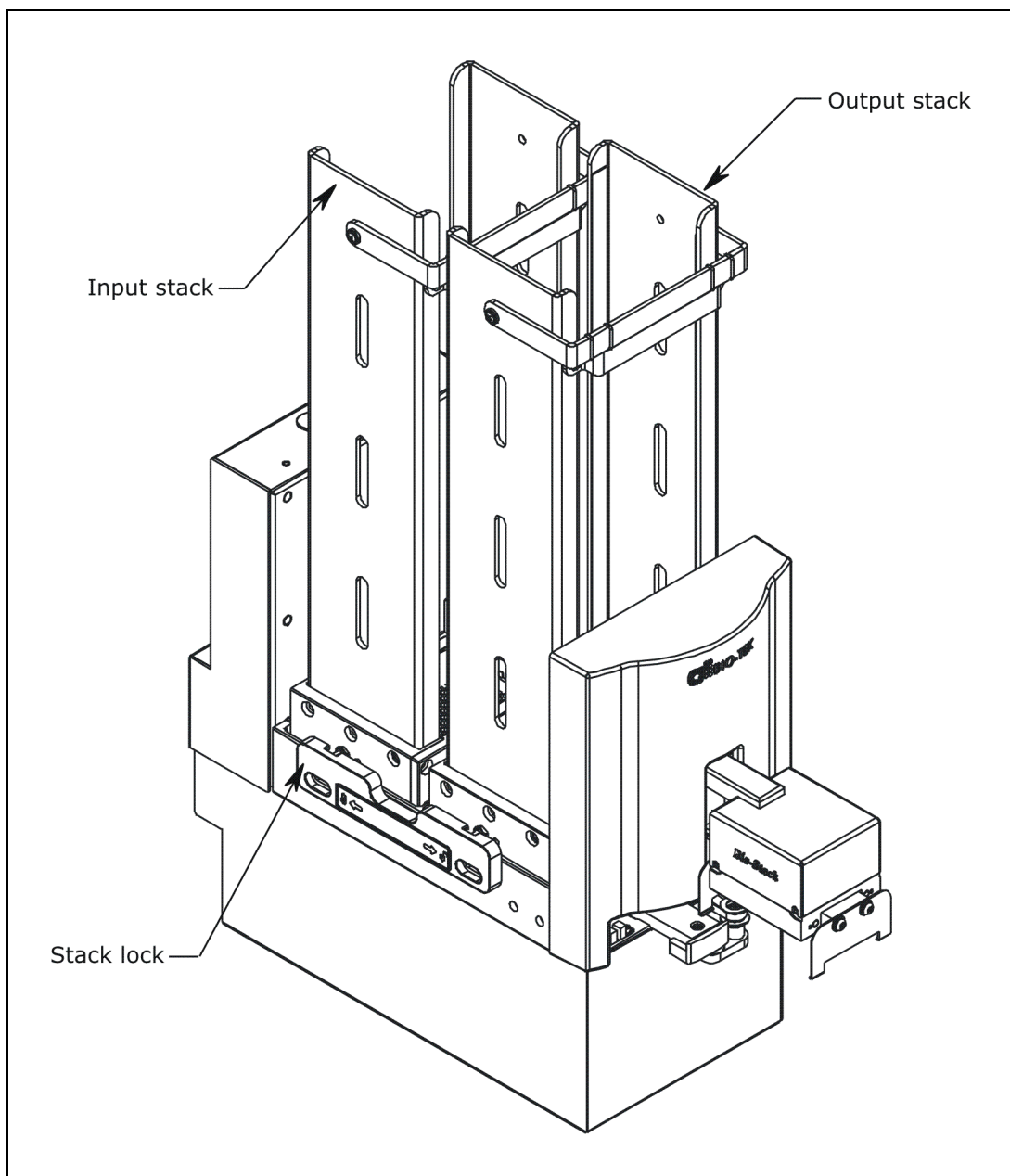
**Figure 31:** Aligning the Bio-Stack™ with the μFill™



**Figure 32:** Aligning the Bio-Stack™ with the ELx405™

## Install the Plate Stacks

Locate the stack locks on the side of the Bio-Stack™. Make sure the locks are both in the “unlocked” position. Install the stacks as shown in **Figure 33** below and then close the stack locks.



**Figure 33:** Installing the Plate Stacks



## Instrument Control of the Bio-Stack Using the Instrument Keypad (Pages 97 through 102)



For **instrument control** of the Bio-Stack and µFill or ELx405 using the µFill/ELx405 keypad:

- Perform the steps in the sections below and on pages 98 through 102.

For **PC control** of the Bio-Stack and ELx405 using the Liquid Handling Control (LHC) Software:

- Perform the steps in the sections on pages 103 through 110.

## Connect the Bio-Stack™ to the µFill™ or ELx405™

- ❖ The **Bio-Stack Alignment Kits** for the µFill and ELx405 include two serial cables: a 25-pin to 25-pin female/female cable and a 9-pin to 25-pin male/female cable. ELx405 Kits also include a USB cable and USB driver software CD. The USB cable may only be used for connection of the Bio-Stack to a host computer, for instance, if you will be using the Liquid Handling Control (LHC) Software to control the Bio-Stack and ELx405 washer.

Perform these steps to connect the serial cable between the Bio-Stack and the µFill or ELx405:

1. Make sure that the Bio-Stack and µFill or ELx405 are turned off.
2. Attach one end of the *appropriate* cable to the serial port on the rear of the Bio-Stack (refer to **Figure 9** on page 36 for an illustration of the serial port on the Bio-Stack).
3. Attach the other end of the cable to the serial port on the rear of the µFill or ELx405.
4. Tighten the securing screws on both ends of the cable.

## Run the Checksum Test for the $\mu$ Fill or ELx405

Perform these steps to run the Checksum Test and record the basecode software versions for the  $\mu$ Fill or ELx405, and the assay configuration software information for the ELx405:

❖ For your convenience, **Software Data Sheets** are provided in **Chapter 5, Instrument Qualification**, for recording the software versions for the  $\mu$ Fill or ELx405.

1. Turn on the  $\mu$ Fill or ELx405 and allow the self-test to complete.
2. From the instrument's keypad, select **UTIL > TESTS > CHKSUM**.
3. The first screen will display the  $\mu$ Fill or ELx405 basecode software part number, version number, and checksum. Record this information.

❖ If the  $\mu$ Fill or ELx405 displays an error code preceded by the letter "B", this means that the instrument is already configured to recognize the Bio-Stack (see **Configure the  $\mu$ Fill or ELx405 for the Bio-Stack** below) and it is trying unsuccessfully to communicate with the Bio-Stack. This is not a problem. Press the **Stop** key and continue with the procedure.

4. ELx405 only: After a few seconds, a second screen will display the assay configuration information. Record the ELx405 configuration software part number and version number.
5.  $\mu$ Fill only: After a few seconds, a second screen will display "Default Config Data." This information does not need to be recorded.
6. Record the serial number listed on the  $\mu$ Fill or ELx405.
7. Return to the  $\mu$ Fill or ELx405 main menu.

## Configure the $\mu$ Fill or ELx405 for the Bio-Stack™

Perform these steps to configure the  $\mu$ Fill™ or ELx405™ to recognize the Bio-Stack:

1.  **$\mu$ Fill:** From the main menu, select:  
**UTIL > SETUP > BIOSTACK > CONF > BIOSTACK**  
**ELx405:** From the main menu, select:  
**UTIL > SETUP > MORE > BIOSTACK > CONF > BIOSTACK**
2. When the selection sequence is complete, the **RE-STACK?** screen will appear.
3. Press the **Main Menu** key.

## Test Communication with the Bio-Stack™



**Warning!** Keep your hands away from the claw/gripper and carrier while the Bio-Stack is being powered up. The carrier and claw/gripper move quickly during the homing sequence.

Perform these steps to test communication between the Bio-Stack and the µFill™ or ELx405™ and (optionally) to record the software versions for the Bio-Stack:

❖ For your convenience, **Software Data Sheets** are provided in **Chapter 5, Instrument Qualification**, for recording the software versions for the Bio-Stack.

1. **Important:** Turn off the µFill or ELx405.
2. Turn on the Bio-Stack and allow its self-test to complete.
3. Turn on the µFill or ELx405 and allow its self-test to complete.
4. From the µFill or ELx405 main menu, select **UTIL > TESTS > CHKSUM**.
5. Examine the screens as they are displayed. The first two screens contain the basecode software information for the µFill or ELx405 (first screen) and “Default Config Data” for the µFill or assay configuration software information for the ELx405 (second screen). These screens appear regardless of configuration.

Two additional screens will appear, if the instrument is able to communicate with the Bio-Stack:

```
P L E A S E   W A I T . . .
```

```
B I O - S T A C K :   X . X X ,   X . X X
C O D E   C H E C K S U M :   ( X X X X )
```

6. If communication is successful, record the Bio-Stack basecode software version (the first X.XX), the interface definition version (the second X.XX), and the checksum. Record the serial number listed on the Bio-Stack.
7. If the µFill or ELx405 cannot communicate with the Bio-Stack, an error code will be displayed. Consult **Chapter 7, Troubleshooting and Error Codes** for guidance.

## Align the Claw/Gripper with the $\mu$ Fill or ELx405 Plate Carrier

The Bio-Stack's claw/gripper mechanism must now be aligned vertically with the microplate carrier on the  $\mu$ Fill or ELx405. The  $\mu$ Fill™ and ELx405™ have an on-board **Instrument Alignment Utility** for this task.

Perform these steps to align the Bio-Stack™ claw/gripper with the  $\mu$ Fill or ELx405 microplate carrier:

1.  **$\mu$ Fill:** From the main menu, select:  
**UTIL > SETUP > BIOSTACK > ALIGN > C-POS.**  
**ELx405:** From the main menu, select:  
**UTIL > SETUP > MORE > BIOSTACK > ALIGN > C-POS.**
2. The **FIND CLAW INTERFACE POS** menu will appear on the display with the following four selections:

-/+          +1          +20          +400

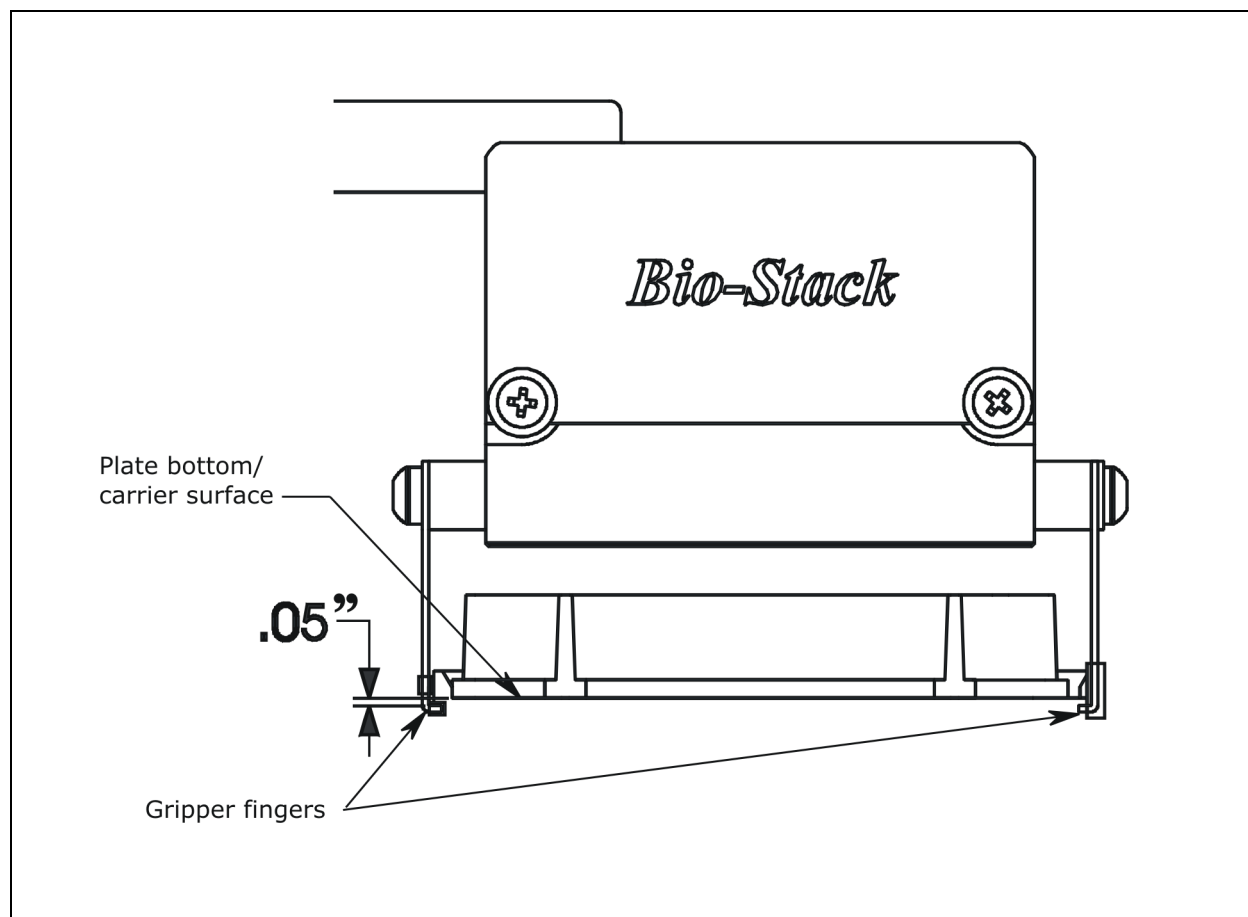
3. Use the four softkeys on the  $\mu$ Fill or ELx405 keypad to position the Bio-Stack's claw/gripper mechanism to the desired height relative to the plate carrier on the  $\mu$ Fill or ELx405. To help in this activity, place a microplate on the carrier of the  $\mu$ Fill or ELx405 (optional). Lower the mechanism so that the gripper's "fingers" rest approximately 50-60 thousandths of an inch (1.3-1.5 mm) below the plate bottom or carrier surface (see **Figure 34** on the next page).

❖ If the Bio-Stack and  $\mu$ Fill or ELx405 are located on an uneven surface, the gripper's fingers should rest below the lowest point of the plate bottom, to ensure proper plate delivery.

- To avoid collision of the gripper with the carrier on the  $\mu$ Fill or ELx405, press the **+20** key first, to see how far that goes, before pressing the **+400** key. Use the **1/20/400** softkeys to *gradually* lower the claw/gripper mechanism to the desired height.
- If you go too far, press the **-/+** softkey to step up a bit.

❖ If the alignment is interrupted, and you receive an error code such as **2500**, the Bio-Stack will have to be homed to resolve the error. To home the Bio-Stack, select **UTIL > SETUP > BIOSTACK > ALIGN > HOME > BIOSTACK**, then repeat steps 1 through 3 above.

4. When you are satisfied with the position, press the **PREVIOUS SCREEN** key to return to the Alignment screen and select **SAVE**.
5. At the **OK TO SAVE LOCATION?** screen, press **YES**, and then **ENTER**.
6. Remove the plate from the carrier on the  $\mu$ Fill or ELx405.



**Figure 34:** Position of the Bio-Stack's Gripper Fingers Below the Plate Bottom  
(on the µFill™ or ELx405™ Plate Carrier)

## Verify the Alignment

Perform the following test to verify alignment of the Bio-Stack™ with the µFill™ or ELx405™:

1. Ensure that both instruments are turned on.
2. Place a dry microplate in the Bio-Stack's input stack.
3. From the µFill or ELx405 main menu, select **UTIL > SETUP > MORE** (ELx405 only) **> BIOSTACK > VERIFY**. Press the **Enter** key.
4. Watch closely to confirm the following behavior (the claw/gripper will pause periodically; this is the expected behavior):
  - The Bio-Stack will transfer the plate from the input stack to the Bio-Stack plate carrier, and then eject the plate carrier.
  - The claw/gripper will pick up the plate, lower it toward the µFill's or ELx405's plate carrier, and then *smoothly* place the plate on the carrier.

❖ If the plate drops onto the carrier, the claw interface position is set too high. Repeat the instructions in ***Align the Claw/Gripper with the µFill or ELx405 Plate Carrier*** on page 100.

  - The claw/gripper will come up a short distance. The gripper will then power-down, allowing its spring mechanism to tighten the gripper "fingers."

❖ If the gripper fingers catch on the top of the microplate, the claw interface position is set too low. An error code will display on the µFill or ELx405. Repeat the instructions in ***Align the Claw/Gripper with the µFill or ELx405 Plate Carrier*** on page 100.

  - If the gripper fingers did not catch on the plate, the µFill or ELx405 will display **VERIFY PLATE PLACEMENT**. Press **Enter** to continue.
  - The claw/gripper will lower, pick up the plate, place the plate on the Bio-Stack's plate carrier, and then store the plate in the output stack.
  - The µFill or ELx405 will display **BIOSTACK UTILITIES**. From here you can select **VERIFY** to run the program again, or press **Main Menu**.
5. If the alignment verification completed successfully and you have determined that the gripper fingers are positioned correctly, return to the instrument's main menu.
  - If the gripper fingers are not positioned correctly, repeat the instructions in ***Align the Claw/Gripper with the Plate Carrier***, and then re-run the Verify Test.

❖ The Verify Test must pass before the Bio-Stack can be used to transfer microplates.

## PC Control of the Bio-Stack Using the LHC Software (Pages 103 through 110)



For computer control of the Bio-Stack™ and ELx405™ using the **Liquid Handling Control™ (LHC) Software**, you will need appropriate versions of the ELx405™ Interface Software, washer basecode software, Bio-Stack™ PC Control Software, and Bio-Stack basecode software.

**Note:** Any version of the LHC Software may be used to control the Bio-Stack and ELx405.

Refer to **Appendix D, Required Software Versions**, or contact BioTek for more information on required software versions.

During PC control of the Bio-Stack and ELx405, both instruments are controlled by BioTek's Liquid Handling Control (LHC) Software running on a host computer. The LHC Software uses the ELx405 Interface Software to control all functions of the ELx405, and uses a component of the Bio-Stack PC Control Software to control all functionality of the Bio-Stack.

❖ The **LHC Help system** contains a detailed description of the LHC Software, and how it interacts with the ELx405 Interface Software and Bio-Stack PC Control Software to control the instruments.

Perform the instructions below and on the following pages, for computer control of the Bio-Stack and ELx405 using the LHC Software.

### Prerequisites

- Verify that the host PC meets the minimum system requirements specified in the **Liquid Handling Control Software Installation Guide** and **Bio-Stack PC Control Software Installation Guide**.
- Verify Administrator privileges. BioTek software requires the user who is installing the software application to have Administrator privileges for the Windows® 2000/XP/Vista systems. If a user with restricted access attempts to install the application, errors may occur. Contact your organization's system administrator if you are uncertain about your privileges.

## Connect the Host Computer to the Bio-Stack™ and ELx405™



### For operation of one Bio-Stack with one ELx405 washer:

The host computer must be equipped with at least two communication (COM) ports.

### For operation of two Bio-Stacks with two ELx405 washers:

The host computer must be equipped with at least four COM ports.

- ❖ The **Bio-Stack Alignment Kit** for the ELx405 includes two RS-232 serial cables (25-pin to 25-pin female/female cable and 9-pin to 25-pin male/female cable). The kit also includes a USB cable, and USB driver software CD. The USB cable may be used instead of a serial cable for connection of the Bio-Stack to the host computer.
- ❖ The **shipping accessories** for the ELx405 include a 9-pin to 25-pin female/female serial cable.

Perform these steps to connect the host computer to both the Bio-Stack and the ELx405 washer (refer to **Figure 9** on page 36 for an illustration of the serial and USB ports):

1. If the Bio-Stack is on, turn it off.
2. Place the computer in a location adjacent to the Bio-Stack and the ELx405.
3. Connect the computer to the Bio-Stack™, using a serial cable **or** USB cable.

### Connect the serial cable:

- Using the *appropriate* serial cable, attach one end of the cable to a serial port on the computer.
- Attach the other end of the cable to the serial port on the rear of the Bio-Stack.
- Tighten the securing screws on both ends of the cable.

### Connect the USB cable and install the USB driver:

- Attach one end of the supplied USB cable to a USB port on the computer. Attach the other end of the cable to the USB port on the rear of the Bio-Stack.
- Turn the computer on.
- Place the USB Virtual COM Driver Software CD in the computer's CD ROM drive.



- Turn on the Bio-Stack. Instructions should appear on the screen for performing the installation.
- If necessary, using Microsoft® Explorer or other file management software, find the installation guide appropriate for your computer's operating system (e.g., WXPInstall.pdf). Follow the directions provided within the document to install the driver software.

❖ In the section **Test Communication** on page 106, you will need to know which COM number is associated with the USB port on your computer. You'll select this number in the Liquid Handling Control™ (LHC) Software port selection dialog for the Bio-Stack™. The COM port can be customized to use any number port that is not currently defined by the System. For customization instructions, consult the **ComPortGuide.doc** or **ComPortGuide.pdf** file on the USB driver CD.

4. Turn the computer off.
5. Attach the **ELx405™** to the computer using the *appropriate* serial cable.
6. Tighten the securing screws on both ends of the cable.

## Install the Liquid Handling Control (LHC) Software

- ❖ A CD containing the **Liquid Handling Control Software** and an installation guide are included in the LHC Software package (part number LHC405) for the ELx405. The package also includes a CD containing version 2.00.4 or greater of the **ELx405 Interface Software** and instructions for installing the software.
- ❖ ELx405 basecode software PN 7100227, version 2.02.1 or greater, is required for use of the LHC Software.

There is a certain sequence of events that *must* be followed to ensure that the Liquid Handling Control Software is properly installed and configured on the host PC. You will also need to install the ELx405 Interface Software on the PC, and, depending upon when you purchased your ELx405, you may need to download upgraded basecode software to the washer.

Please follow the instructions provided in the **Liquid Handling Control™ Software Installation Guide** to install and configure the Liquid Handling Control Software and any other necessary software components. Record the serial number listed on the software package.

## Install the Bio-Stack™ PC Control Software

- ❖ A CD containing version 2.00.10 or greater of the **Bio-Stack PC Control Software** and an installation guide are included in the Bio-Stack™ Alignment Kit for the ELx405™ (PN 7310010). Version 2.00.10 (or greater) is required for compatibility with the Liquid Handling Control™ Software.

There is a certain sequence of events that *must* be followed to ensure that the Bio-Stack PC Control Software is properly installed and configured on the host PC. Please follow the instructions provided in the **Bio-Stack PC Control Software Installation Guide** to install the software. Record the serial number listed on the software package.

## Test Communication

Perform these steps to test communication between the LHC Software and the instruments:

1. Turn the ELx405 and Bio-Stack on.
2. Launch the LHC Software.
3. **Test communication between the LHC Software and the ELx405:**
  - When the LHC main screen opens, click **Name** in the **Instrument** field. The 'ELx405 Communications' dialog will appear.

❖ If more than one instrument's interface software is found on your PC by the LHC Software, clicking **Name** will open the 'Installed Instruments' dialog. Select **ELx405** and click **OK**. The 'ELx405 Communications' dialog will then appear.

- Select the correct **COM Port** for the serial cable connection to the ELx405, and then click **Test Communications**.

If the test passes, click **OK**. The 'Instrument Settings Dialog' will then open.

❖ If the test fails, check the serial cable connections or try a different serial port.

- At the 'Instrument Settings Dialog,' select the correct washer **Model** (**Auto**, **Magna**, or **Select**) and **Manifold Type** (**96 well** or **192 well**) and then click **OK**.
4. **Test communication between the LHC Software and the Bio-Stack:**
    - Click the **Bio-Stack** box.

- Click **Port** to open the 'Bio-Stack Communications' dialog. Select the correct **COM Port** for the serial or USB connection to the Bio-Stack, and then click **Test Communications**.

If the test passes, click **OK**. If the test fails, check the serial/USB cable connections or try a different COM port.

## Run the Checksum Test for the ELx405

Perform these steps to run the Checksum Test and record the software versions for the Liquid Handling Control™ Software and for the ELx405:

❖ For your convenience, **Software Data Sheets** are provided in **Chapter 5, Instrument Qualification**, for recording the ELx405 software versions.

1. Make sure that the washer is powered on, and the cable connected from the PC to the washer.
2. At the LHC Software's main screen, select **Help > About Liquid Handling Control**.
3. The 'Help About' dialog will open. Record the Liquid Handling Control Build Version and Installation Version.
4. Click **Close** to return to the main screen.
5. Select **Tools > Instrument Utilities**. The 'ELx405 Washer Utilities' screen will open.
6. Click **Test Communications**. If software version information is displayed and no errors occurred, the Checksum Test completed successfully.
7. Record the ELx405 Interface Software Version, Interface Functional Version, Basecode SW Version, and Basecode SW Checksum. Record the washer's serial number (listed on the ELx405).
8. Close the LHC Software.

## Run the Checksum Test for the Bio-Stack

Perform these steps to run the Checksum Test and record the software versions for the Bio-Stack™ PC Control Software and for the Bio-Stack™:

❖ For your convenience, **Software Data Sheets** are provided in **Chapter 5, Instrument Qualification**, for recording the Bio-Stack software versions.

1. Make sure that the Bio-Stack is powered on, and the cable connected from the PC to the Bio-Stack.
2. Launch the Bio-Stack PC Control Software.
3. Click the **Configure Instruments** button.
4. Set the **COM Port** and click **Test Communications**. If the test fails, check the cable and/or try another Com port. Return to the main screen.
5. From the top menu bar in the Bio-Stack PC Control Software, select **Help > About Bio-Stack**. The 'About Bio-Stack Software' dialog will open.
6. Record the Bio-Stack PC Software Versions for the Installation CD, StackerContainer.exe, and BTIAutoStackerActiveX. Record the serial number listed on the Bio-Stack PC Control Software package.
7. Click **Get On-board values now**. If software version information is displayed and no errors occurred, the Checksum Test completed successfully.
8. Record the Bio-Stack onboard software versions for the basecode software, interface definition, and checksum. Record the Bio-Stack's serial number listed on the Bio-Stack.
9. Close the Bio-Stack PC Control Software.

## Align the Claw/Gripper with the ELx405™ Plate Carrier

The Bio-Stack's claw/gripper mechanism must now be aligned vertically with the microplate carrier on the ELx405. The Liquid Handling Control™ Software has an **Instrument Alignment Utility** for this task.

Perform these steps to align the Bio-Stack™ claw/gripper with the ELx405 microplate carrier:

1. Start the LHC Software and select **Tools > Bio-Stack Utilities**.
2. Click **Alignment Utility**.
3. From the 'Bio-Stack Instrument Alignment Utility,' use the drop-down arrow in the **Selected Instrument** field to select the **ELx405 Washer**.
4. To configure the alignment of the Bio-Stack to the ELx405, begin with the **Home the Bio-Stack** function.
5. After all axes have been homed on the Bio-Stack, place a microplate on the ELx405's plate carrier. Then use the **Re-alignment Control** buttons to position the Bio-Stack's claw/gripper so that the gripper "fingers" rest approximately 50-60 thousandths of an inch (1.3-1.5 mm) below the plate bottom or carrier surface: click **Begin**.

The gripper's fingers open. (See **Figure 34** on page 101.)

❖ If the Bio-Stack and ELx405 washer are located on an uneven surface, the gripper's fingers should rest below the lowest point of the plate bottom, to ensure proper plate delivery.

- Begin with the **Down** radio button selected. To avoid collision of the gripper with the carrier on the ELx405, click the **20 Steps** button first, to see how far that goes, before clicking the **400 Steps** button. Use the **400 Steps**, **20 Steps**, and **1 Step** buttons to gradually lower the claw/gripper to the desired height.
- If you have moved the gripper too far below the plate bottom, click the **Up** radio button and step up a bit.

❖ If the alignment is interrupted, and you receive an error code such as **2500**, the Bio-Stack will have to be homed to resolve the error. Click the **Home the Bio-Stack** button to home all axes on the Bio-Stack, then repeat step 5 above.

6. When you're satisfied with the positioning of the gripper, click **Save Position**.
7. Remove the microplate from the washer's carrier.

## Verify the Alignment

Perform the following test to verify alignment of the Bio-Stack™ with the ELx405™:

1. Place a dry microplate in the Bio-Stack's input stack.
2. At the Liquid Handling Control™ Software's main screen, select **Tools > Bio-Stack Utilities**.
3. Click **Alignment Utility**.
4. From the 'Bio-Stack Instrument Alignment Utility,' click the **Verify** button.
5. Watch closely to confirm the following behavior (the claw/gripper will pause periodically; this is the expected behavior):
  - The Bio-Stack will transfer the plate from the input stack to the Bio-Stack plate carrier, and then eject the plate carrier.
  - The claw/gripper will pick up the plate, lower it toward the ELx405's plate carrier, and then *smoothly* place the plate on the carrier.

❖ If the plate drops onto the carrier, the claw interface position is set too high. Repeat the steps in the preceding section, **Align the Claw/Gripper with the ELx405 Plate Carrier**.

- The claw/gripper will come up a short distance. The gripper will then power-down, allowing its spring mechanism to tighten the gripper "fingers."

❖ If the gripper fingers catch on the top of the microplate, the claw interface position is set too low. An error code will be displayed in the LHC Software. Repeat the steps in the preceding section.

- If the gripper fingers did not catch on the plate, the LHC Software issues a "Verify plate placement" message and delays the Bio-Stack's movement to give you time to observe the action. Click **OK** to continue.
  - The claw/gripper will lower, pick up the plate, place the plate on the Bio-Stack's plate carrier, and then store the plate in the output stack.
  - If the gripper fingers are not positioned correctly, repeat the steps in the preceding section and then re-run the Verify Test.
6. Click **OK**, then **Exit** to return to the main screen.

❖ The Verify Test must pass before the Bio-Stack can be used to transfer microplates.

---

## Install the Bio-Stack™ with the NanoQuot™

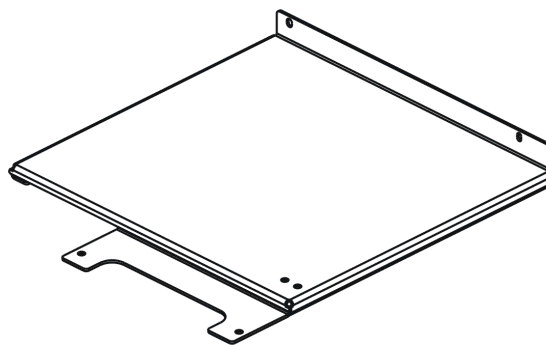
### Lay Out the Alignment Hardware

You will need the alignment hardware from the Bio-Stack Alignment Kit for the NanoQuot (PN 7150001), illustrated below.

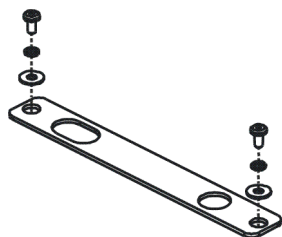
#### *NanoQuot Alignment Kit 7150001*



**Four aligning posts**  
(PN 7310524) for elevating the Bio-Stack to the correct height and for seating in the aligning plate.



**NanoQuot aligning plate**  
(PN 7152000) for preventing the instrument from sliding around and being misaligned with the Bio-Stack.



**Bio-Stack aligning plate** (PN 7312052)  
for attachment to the NanoQuot aligning plate.

Includes two each of mounting hardware: pan head screws (PN 12028), lock washers (PN 16017), and flat washers (PN 16068).

## Attach the Aligning Posts to the Bio-Stack™



**Important!** When attaching the four aligning posts (“feet”) to the Bio-Stack, do not over-tighten the posts!

**Finger-tighten only!**

To avoid scratches to the Bio-Stack, place a towel down before laying the instrument on its side.

Perform these steps to attach the aligning posts to the Bio-Stack (refer to **Figure 35** on the following page):

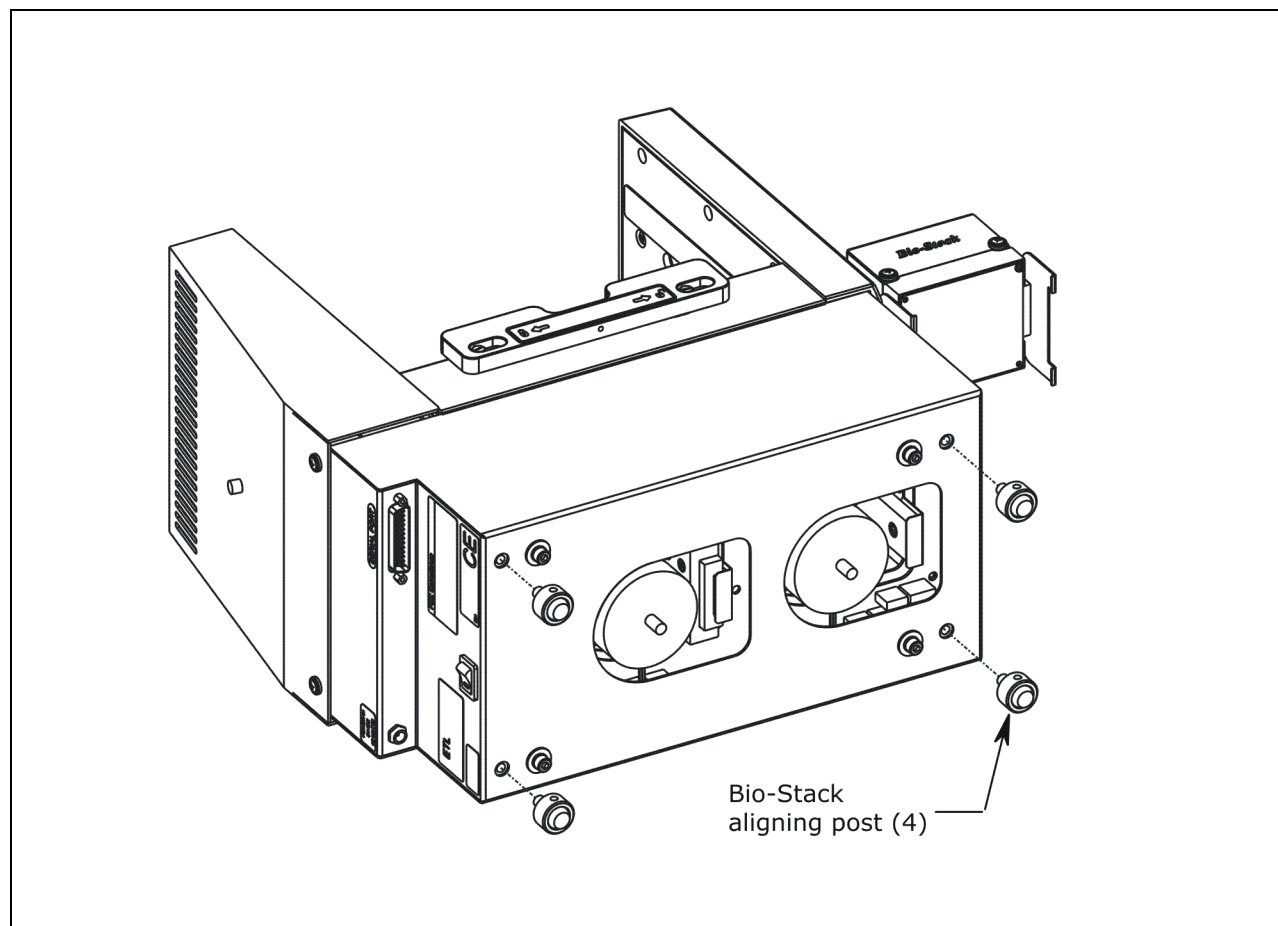
1. Carefully lay the Bio-Stack on its side so the bottom is facing you.
2. Screw in all four aligning posts, as shown.
3. Return the Bio-Stack to the upright position.
4. If the NanoQuot™ is on, turn it off and disconnect the power supply.

## Seat the Instruments in the Aligning Plates

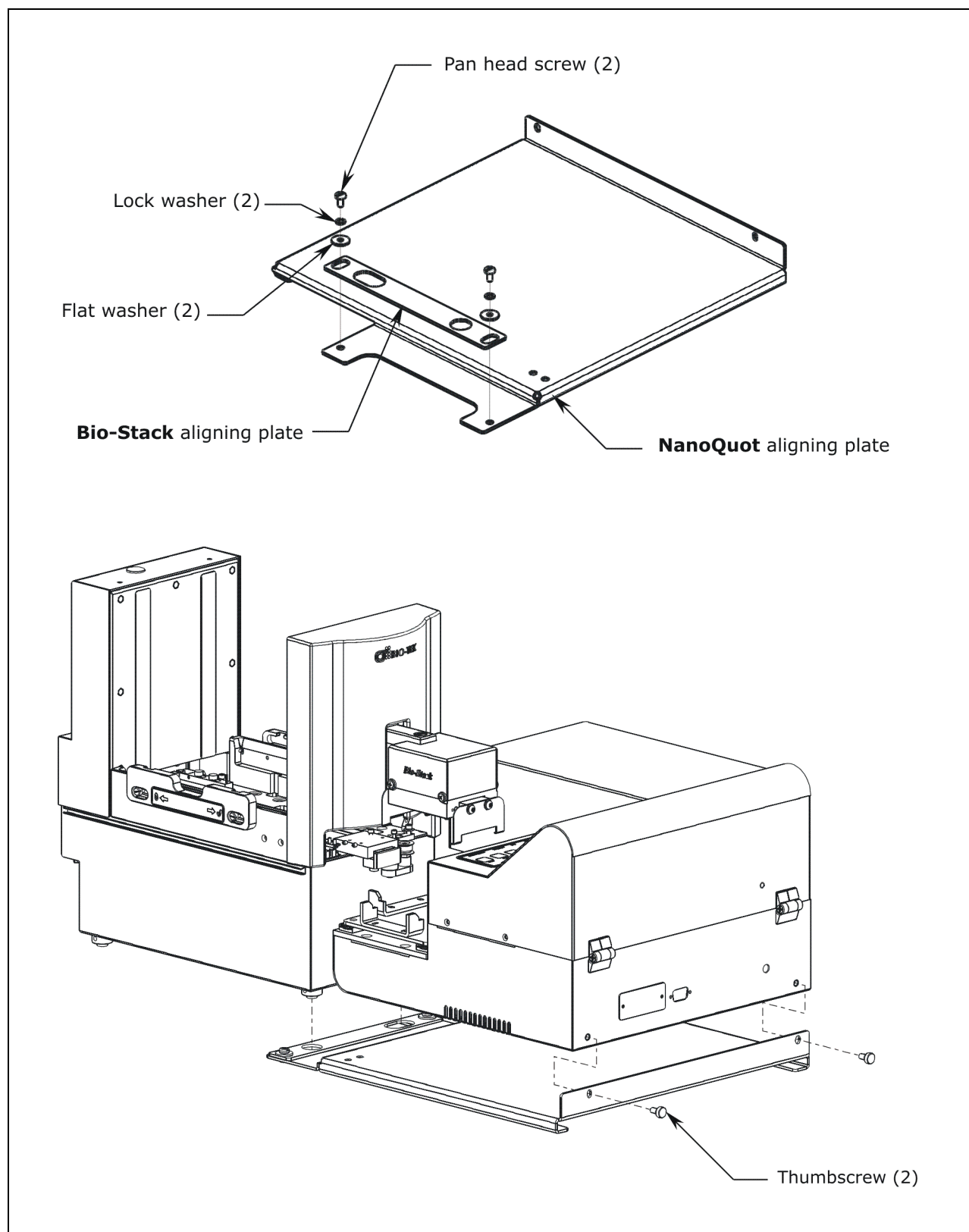
Perform these steps to seat the Bio-Stack and the NanoQuot in the aligning plates (refer to **Figure 36** on page 114):

1. Place the NanoQuot’s aligning plate on a level surface.
2. Loosely attach the Bio-Stack aligning plate to the NanoQuot aligning plate by screwing in the pan head screw, lock washer, and flat washer only halfway.
3. Slide the NanoQuot into its aligning plate until the two thumbscrew holes in the rear panel of the NanoQuot are aligned with the two holes in the back of the aligning plate. Screw in the thumbscrews halfway.
4. Slide the Bio-Stack’s two front aligning posts into the slots provided on the Bio-Stack’s plate.
5. Move both instruments back and forth until you are satisfied that they are positioned correctly next to each other (approximately). Ensure that the Bio-Stack’s posts are properly seated (not resting on top of the plates), and that the instruments are level.





**Figure 35:** Attaching the Aligning Posts to the Bio-Stack™



**Figure 36:** Seating the Bio-Stack™ and the NanoQuot™ in the Aligning Plates

## Turn on the Bio-Stack™ and Run a Self-Test



**Warning!** Keep your hands away from the claw/gripper and carrier while the Bio-Stack is being powered up. The carrier and claw/gripper move quickly during the homing sequence.



The Bio-Stack **must** pass the Self-Test for installation with the NanoQuot™.

❖ The Bio-Stack does not need to be connected to a host computer for this test.

Locate the Bio-Stack's power switch and turn on the instrument (see **Figure 9** on page 36 for the location of the switch). The Bio-Stack will home all axes (claw/gripper, carrier, input and output stack lifts) and then perform a system Self-Test.

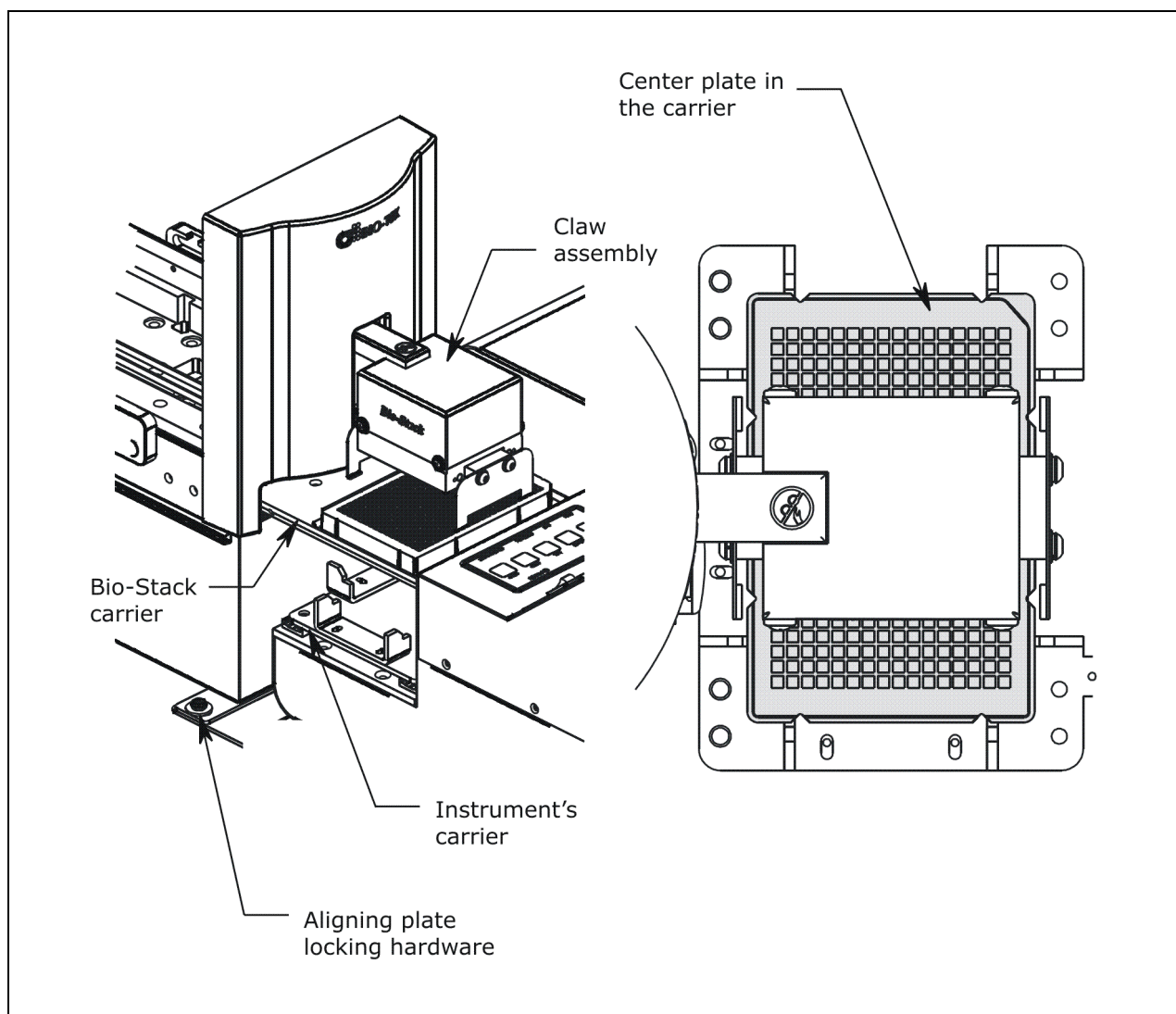
- **If the Self-Test passes**, the green light will turn on and remain on.
- **If the Self-Test fails**, the green light will flash. If this happens, turn off the Bio-Stack and check for any obstructions. Ensure that all of the shipping hardware has been removed. If you cannot resolve the problem, contact BioTek's Technical Assistance Center for guidance.

Leave the Bio-Stack powered up for the next section, ***Align the Bio-Stack™ with the NanoQuot.***

## Align the Bio-Stack™ with the NanoQuot™

Perform these steps to align the Bio-Stack with the NanoQuot:

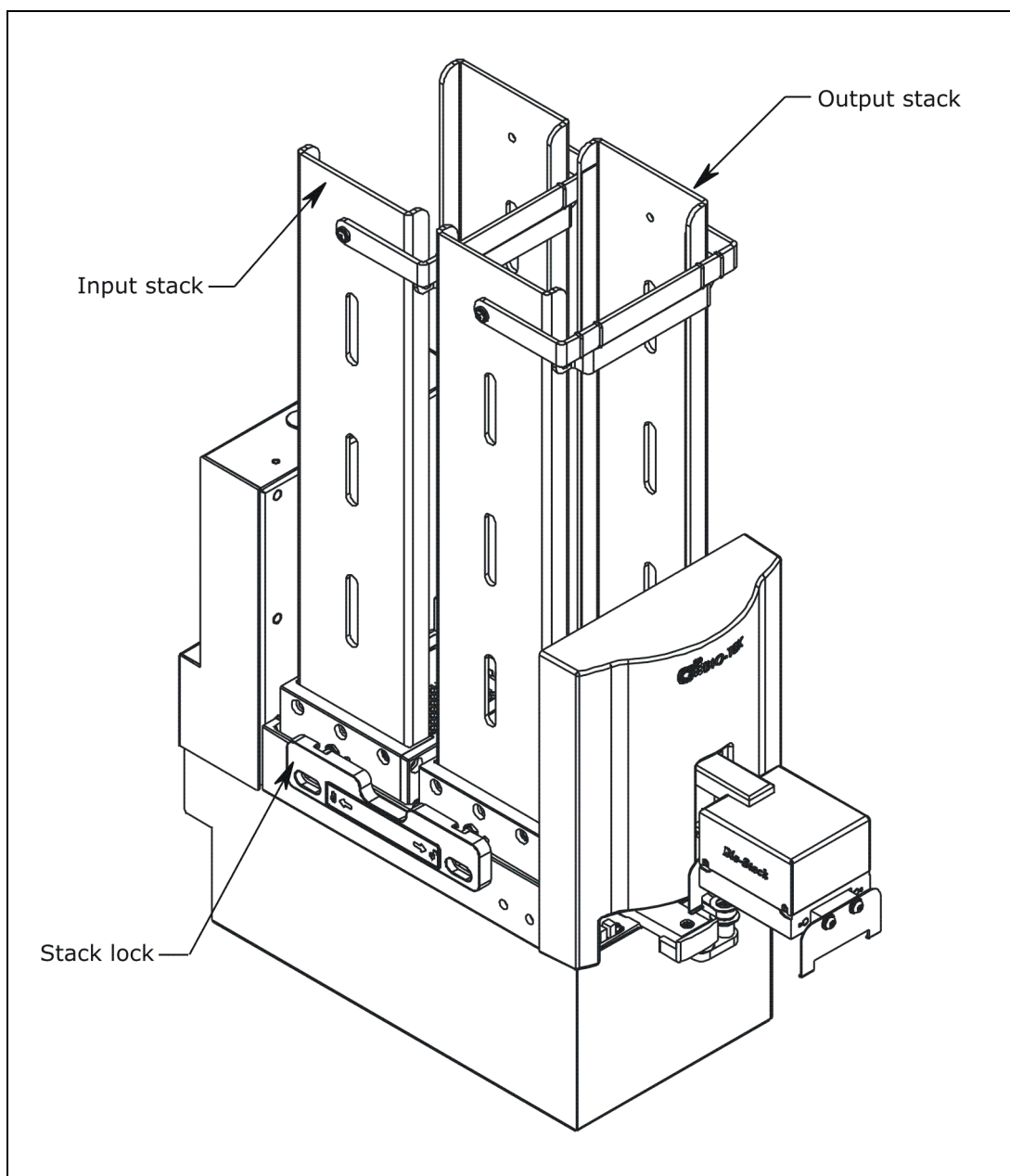
1. Ensure that the Bio-Stack has been homed according to the instructions in the previous section.
2. Reconnect the power supply to the NanoQuot.
3. Turn on the Dispenser. The carrier should be in the home position. Leave the NanoQuot powered up.
4. Turn the Bio-Stack off.
5. Manually slide the Bio-Stack carrier all the way out and position it below the claw assembly. Refer to **Figure 37** on the following page.
6. Place a microplate on the Bio-Stack carrier.
7. Manually lower the claw assembly down to the microplate and pick up the microplate (open the gripper to get around the plate and close it to pick up the plate). Raise the claw assembly carefully to ensure that the microplate does not change positions in the claw.
8. Slide the Bio-Stack carrier out of the way.
9. Lower the claw assembly until the microplate is just above the carrier of the NanoQuot.
10. Manually adjust the Bio-Stack on the tabletop so the microplate can be lowered into the carrier of the NanoQuot. The microplate carrier should be positioned as if it was just homed by the NanoQuot. If the NanoQuot's carrier or the microplate has been moved, home the instruments, remove the microplate from the Bio-Stack claw, then repeat steps 4 through 10.
11. When you are satisfied with the microplate positioning relative to the carrier of the NanoQuot (look carefully at the top-down drawing in **Figure 37** on the next page, to see how the plate should fit in the carrier), finger-tighten the aligning plate locking hardware in both places.
12. Repeat all of the steps a couple of times to ensure that the microplate does not change positions and that it rides smoothly in and out of the carriers.



**Figure 37:** Aligning the Bio-Stack™ with the NanoQuot™

## Install the Plate Stacks

Locate the stack locks on the side of the Bio-Stack™. Make sure the locks are both in the “unlocked” position. Install the stacks as shown in **Figure 38** below and then close the stack locks.



**Figure 38:** Installing the Plate Stacks

## Connect the Host Computer to the Bio-Stack™

- ❖ To obtain software versions for the Bio-Stack (Checksum Test) and to vertically align the Bio-Stack's claw/gripper with the NanoQuot's microplate carrier, you must *temporarily* connect the Bio-Stack to a host computer that has the Bio-Stack™ PC Control Software installed.
- ❖ The Bio-Stack Alignment Kit for the NanoQuot™ includes two serial cables: a 9-pin to 9-pin male/male cable and 9-pin to 25-pin male/female cable. The **DB9M** end of either cable must be connected to the serial port on the Bio-Stack.

Perform these steps to connect the host computer to the Bio-Stack:

1. If the Bio-Stack is on, turn it off.
2. Turn off the host computer. Place the computer in a location that is adjacent to both the Bio-Stack and the NanoQuot.
3. Using the *appropriate* serial cable, attach the DB9M end of the cable to the serial port on the rear of the Bio-Stack (refer to **Figure 9** on page 36 for an illustration of the serial port on the Bio-Stack).
4. Attach the other end of the cable to a serial port on the computer.
5. Tighten the securing screws on both ends of the cable.

## Install the Bio-Stack™ PC Control Software and Test Communication



**Warning!** Keep your hands away from the claw/gripper and carrier while the Bio-Stack is being powered up. The carrier and claw/gripper move quickly during the homing sequence.

- ❖ A CD containing the **Bio-Stack PC Control Software** and an installation guide are included in the Bio-Stack Alignment Kit for the NanoQuot™.

Perform these steps to install the Bio-Stack PC Control Software on the computer, and then test communication with the Bio-Stack:

1. Turn the computer and the Bio-Stack™ on. Allow the Bio-Stack to complete its Self-Test.
2. Follow the instructions provided in the **Bio-Stack PC Control Software Installation Guide** to install the software on the computer.
3. Launch the Bio-Stack PC Control Software.
4. From the software's main screen, click the **Configure Instruments** button.
5. When the 'Instrument Configuration' dialog appears, select the appropriate **COM Port** for the **Bio-Stack Configuration** and then click **Test Communications**.
  - If the test is **not** successful, ensure that the cable is properly connected and you have correctly identified the COM port number.

- ❖ The Bio-Stack and the Bio-Stack PC Control Software **must** be communicating before you can continue with the Installation Qualification.

6. If the test is successful, return to the main screen.



## Run the Checksum Test for the Bio-Stack™

Perform these steps to run the Checksum Test for the Bio-Stack and to record the software versions for the Bio-Stack™ PC Control Software and for the Bio-Stack:

❖ For your convenience, **Software Data Sheets** are provided in **Chapter 5, Instrument Qualification**, for recording the Bio-Stack software versions.

1. From the top menu bar in the Bio-Stack PC Control Software, select **Help > About Bio-Stack**.
2. The 'About Bio-Stack Software' dialog will open. Record the Bio-Stack PC Software Versions for the Installation CD, StackerContainer.exe, and BTIAutoStackerActiveX. Record the serial number listed on the Bio-Stack PC Control Software package.
3. Click **Get On-board values now**. If software version information is displayed and no errors occurred, the Checksum Test completed successfully.
4. Record the Bio-Stack onboard software versions for the basecode software, interface definition, and checksum. Record the serial number listed on the Bio-Stack.

## Align the Claw/Gripper with the NanoQuot's Plate Carrier

The Bio-Stack's claw/gripper mechanism must now be aligned vertically with the NanoQuot's plate carrier. The Bio-Stack™ PC Control Software has an **Instrument Alignment Utility** for this task.

Perform these steps to run the Instrument Alignment Utility:

1. Launch the Bio-Stack PC Control Software.
2. At the software's main screen, click the **Configure Instruments** button.
3. When the 'Instrument Configuration' dialog appears, select **PowerWave**.

❖ For the purpose of alignment only, the user must select 'PowerWave' for the NanoQuot™, since the NanoQuot uses the same Bio-Stack™ alignment scheme as the PowerWave™.

4. Click the **Instrument Alignment Utility** button.
5. Use the **Re-Alignment Control** buttons to position the Bio-Stack's claw/gripper mechanism to the desired height relative to the NanoQuot's plate carrier. To aid in this activity, place a microplate on the Dispenser's carrier. Lower the claw/gripper so that the gripper's "fingers" rest approximately 50-60 thousandths of an inch (1.3-1.5 mm) below the plate bottom or carrier surface (see **Figure 39** on the following page).

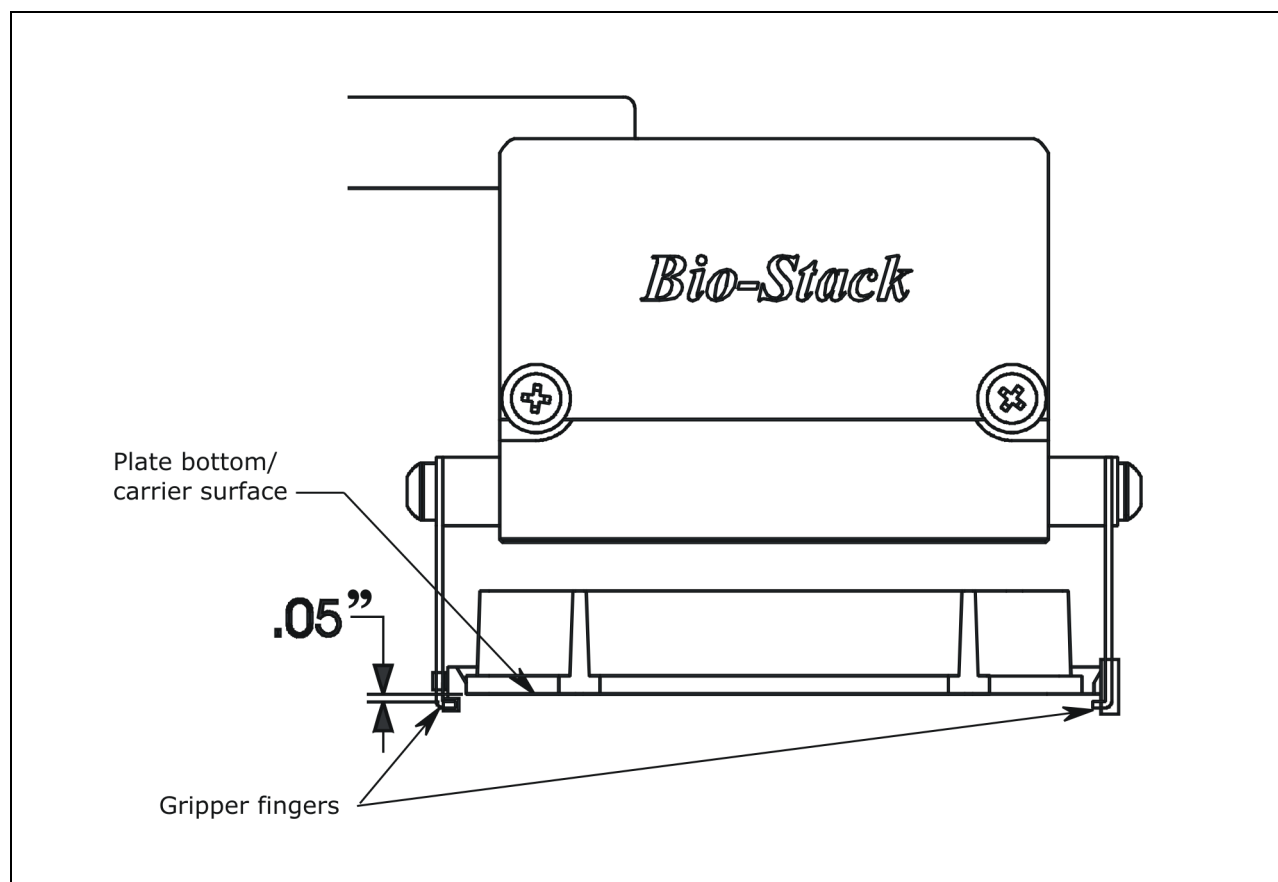
❖ If the Bio-Stack and Dispenser are located on an uneven surface, the gripper's fingers should rest below the lowest point of the plate bottom, to ensure proper plate delivery.

- Begin with the **Down** radio button selected. To avoid collision of the gripper with the Dispenser's carrier, click the **20 Step** button first, to see how far that goes, before clicking the **400 Step** button. Use the **400/20/1 Step** buttons to *gradually* lower the claw/gripper mechanism to the desired height.

If you go down too far, click the **Up** radio button and step up a bit.

❖ If the alignment is interrupted, and you receive an error code such as **2500**, the Bio-Stack™ will have to be homed to resolve the error. Click the **Home the Bio-Stack** button (in the **Instrument Alignment Utility** dialog) to home all axes on the Bio-Stack, then repeat step 5 above.

6. When you are satisfied with the position, click the **Save Position** button.
7. Remove the plate from the carrier.



**Figure 39:** Position of the Bio-Stack's Gripper Fingers Below the Plate Bottom (on the NanoQuot's Plate Carrier)

## Verify the Alignment

Perform the following test to verify alignment of the Bio-Stack™ with the NanoQuot™:

1. Place a dry microplate in the Bio-Stack's input stack.
  2. Launch the Bio-Stack™ PC Control Software.
  3. Click **Configure Instruments** to open the 'Instrument Configuration' dialog, then select **PowerWave** for the NanoQuot.
  4. Click **Instrument Alignment Utility**, then click the **Verify** button.
  5. Watch closely to confirm the following behavior (the claw/gripper will pause periodically; this is the expected behavior):
    - The Bio-Stack will transfer the plate from the input stack to the Bio-Stack plate carrier, and then eject the plate carrier.
    - The claw/gripper will pick up the plate, lower it toward the Dispenser's plate carrier, and then *smoothly* place the plate on the carrier.
- ❖ If the plate drops onto the carrier, the claw interface position has been set too high. Repeat the steps in the previous section: ***Align the Claw/Gripper with the NanoQuot's Plate Carrier.***

❖ It may also be necessary to adjust the NanoQuot's microplate carrier so the plate can move freely in the carrier. Using your fingers, loosen the screws that attach the two adjustable brackets to the carrier, then adjust the brackets to allow clearance for the microplate. Finger-tighten the screws in the brackets.
- The claw/gripper will come up a short distance. The gripper will then power-down, allowing its spring mechanism to tighten the gripper "fingers."
- ❖ If the gripper fingers catch on the top of the microplate, the claw interface position is set too low. An error code will appear in the software. Repeat the steps in ***Align the Claw/Gripper with the NanoQuot's Plate Carrier.***
- If the gripper fingers did not catch on the plate, the "Verify plate placement" message will appear. Click **OK** to continue.
  - The claw/gripper will lower, pick up the plate, place the plate on the Bio-Stack's carrier, and then store the plate in the output stack.
6. If the alignment verification completed successfully and you have determined that the gripper fingers are positioned correctly, the Bio-Stack is now ready for operation with the NanoQuot.
  7. If the gripper fingers are not positioned correctly, perform the steps in ***Align the Claw/Gripper with the NanoQuot's Plate Carrier*** again, and then re-run the Verify Test. The Verify Test must pass before the Bio-Stack can be used to transfer microplates.

## Connect the Host Computer to the NanoQuot™

- ❖ To obtain software versions for the NanoQuot you must *temporarily* connect the NanoQuot to a host computer that has the NanoQuot™ PC Control Software installed.
- ❖ The NanoQuot is shipped with a 9-pin to 9-pin female/male serial cable, for connection to a host computer. The **DB9M** end of the cable must be connected to the serial port on the NanoQuot.

Perform these steps to connect the host computer to the NanoQuot:

1. Turn off the Bio-Stack™ and computer.
2. Disconnect the serial cable between the Bio-Stack and computer.
3. Turn off the NanoQuot.
4. Using the supplied DB9F to DB9M serial cable, attach the DB9F end of the cable to a serial port on the computer.
5. Attach the DB9M end of the cable to the serial port on the rear of the NanoQuot. Refer to **Chapter 2, Installation**, in the NanoQuot Operator's Manual (on CD part number 7151008) for a photo of the serial port on the Dispenser.
6. Tighten the securing screws on both ends of the cable.

## Install the NanoQuot™ PC Control Software and Test Communication

❖ The NanoQuot™ is shipped with a CD containing the **NanoQuot PC Control Software** (PN 7150202).

Perform these steps to install the NanoQuot PC Control Software, and then test communication with the NanoQuot:

1. Turn on the computer and NanoQuot. Allow the NanoQuot to complete its Self-Test.
2. Follow the instructions provided in **Chapter 2, Installation**, of the NanoQuot Operator's Manual on CD for installation of the software on the computer.
3. Launch the NanoQuot PC Control Software. When the software's main screen appears, verify that the Dispenser's **Serial No.** and **Instrument Software** information (basecode part number and version) are displayed and that the correct **COM Port** is selected.
4. Click **Test Communications**.
  - If the software does not display the serial number and instrument software version, verify that the instrument is turned on and the serial cable is connected properly. Click 'Test Communications' again.
  - If you receive the 'Communication test was successful' dialog, click **OK**.
  - If the test is not successful, try a different COM port or check the serial cable connections. Refer also to the Troubleshooting section of the PC Software's Help system for assistance.

## Record Software Information for the NanoQuot™

Perform these steps to record the software versions for the NanoQuot™ PC Control Software and for the NanoQuot:

- ❖ For your convenience, **Software Data Sheets** are provided in **Chapter 5, Instrument Qualification**, for recording the NanoQuot software versions.
- ❖ The NanoQuot basecode software does not include a Checksum.

1. From the top menu bar in the NanoQuot PC Control Software, select **Help > About NanoQuot PC Software**.
2. The 'About NanoQuot PC Control' dialog will open. Record the NanoQuot PC Control version as well as the three **Component Software** versions, then click **OK** to close the dialog. Record the serial number listed on the NanoQuot PC Control Software package.
3. At the software's main screen, record the NanoQuot's **Instrument Software** (basecode part number and version) and **Serial No.**

- ❖ The serial number displayed in the PC Software should match the serial number listed on the Dispenser.

## Connect the Bio-Stack™ to the NanoQuot™

- ❖ The Bio-Stack Alignment Kit for the NanoQuot, includes two serial cables: a 9-pin to 9-pin male/male cable and 9-pin to 25-pin male/female cable. The DB9M to DB9M cable must be used to connect the Bio-Stack to the NanoQuot.

Perform these steps to connect the Bio-Stack to the NanoQuot:

1. Turn off the computer and the NanoQuot.
2. Disconnect the serial cable between the computer and the NanoQuot.
3. Connect the DB9M to DB9M serial cable between the Bio-Stack and NanoQuot.
4. Turn on the Bio-Stack and allow the Self-Test to complete.

- ❖ It is recommended that the Bio-Stack be powered up *before* the NanoQuot.

5. Turn on the NanoQuot and allow the Self-Test to complete.

## Test Communication with the Bio-Stack™

Perform these steps to test communication between the Bio-Stack and the NanoQuot™, by using the NanoQuot's Initialization (**Init**) feature to home all axes on the Bio-Stack:

1. Set the **Mode** rocker switch on the NanoQuot to **Bio-Stack**.
2. Press the **Init** key.
  - If the communication test passes, the Bio-Stack will home all axes. The carrier will home and the claw assembly will move up.
  - If the communication test fails, the Bio-Stack will fail to home all axes, and the green light on the Bio-Stack may flash. If this happens, turn off the Bio-Stack and check the serial cable connection between the Bio-Stack and NanoQuot. If you cannot resolve the problem, contact BioTek's Technical Assistance Center for guidance.



## Install the Bio-Stack™ with the MicroFlo™ Select

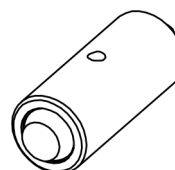
### Lay Out the Alignment Hardware

You will need the alignment hardware from the Bio-Stack Alignment Kit for the MicroFlo Select Microplate Dispenser (**PN 7310020**), illustrated below.

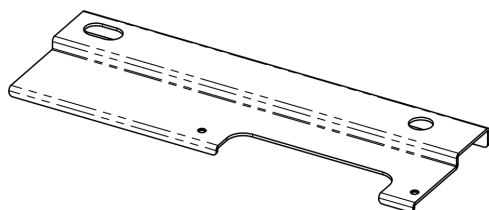
### *MicroFlo Select Alignment Kit 7310020*



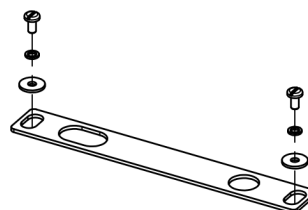
**Four aligning posts**  
(PN 7310524) for elevating the Bio-Stack to the correct height and for seating in the aligning plate.



**Four aligning caps**  
(PN 7170527) for elevating the MicroFlo Select to the correct height and for seating in the aligning plate.



**MicroFlo Select aligning plate**  
(PN 7172125) for preventing the instrument from sliding around and being misaligned with the Bio-Stack.



**Bio-Stack aligning plate**  
(PN 7312052) for attachment to the MicroFlo Select aligning plate.

Includes two each of mounting hardware: pan head screws (PN 12028), lock washers (PN 16017), and flat washers (PN 16068).

## Attach the Aligning Posts and Caps



**Important!** When attaching the four aligning posts (“feet”) to the Bio-Stack™, do not over-tighten the posts!

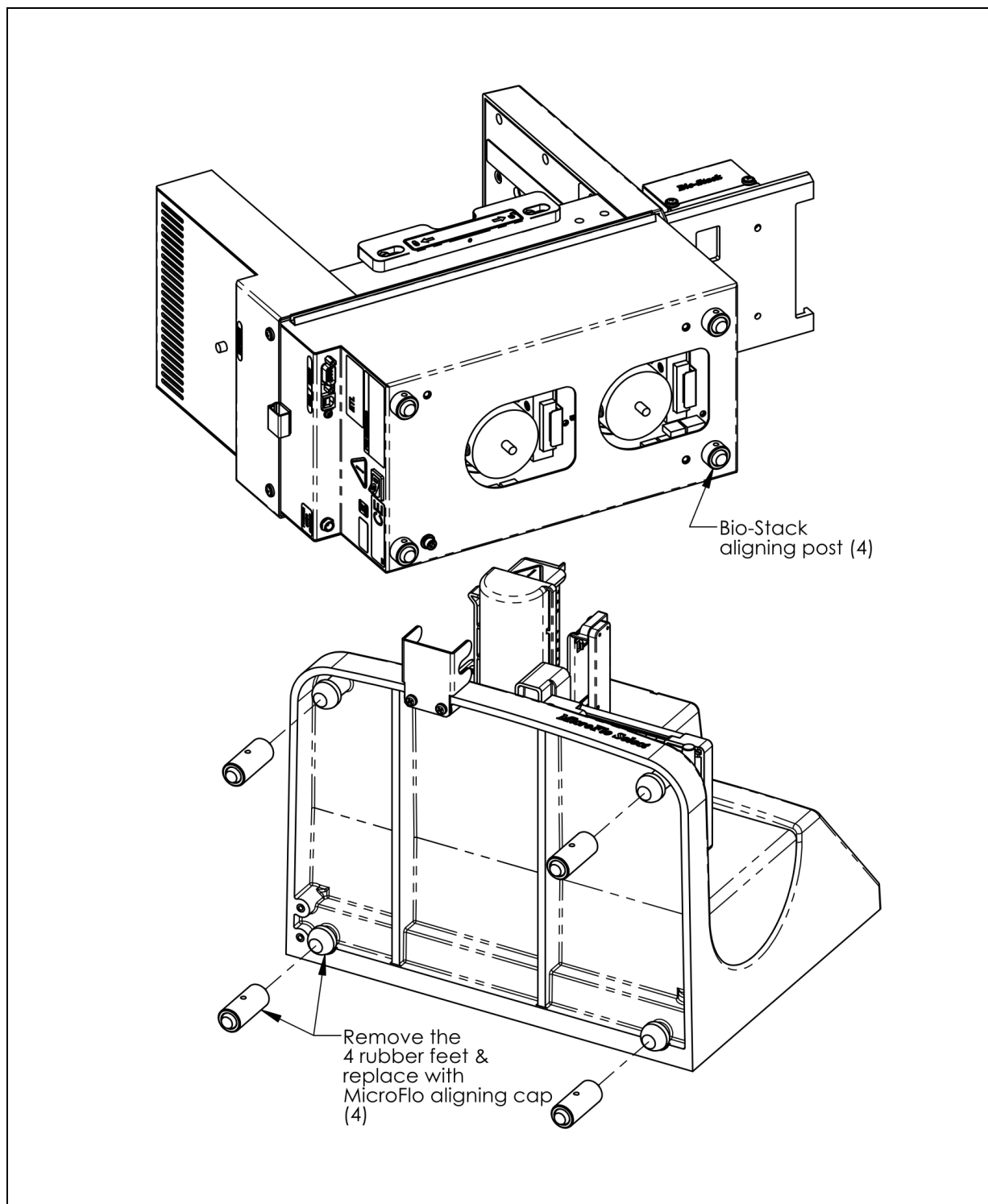
**Finger-tighten only!**

To avoid scratches to the Bio-Stack or to the MicroFlo™ Select, place a towel down before laying the instrument on its side or back.

❖ **Bio-Stack barcode scanner:** If you have installed the barcode scanner on the Bio-Stack (for operation with a PowerWave or Synergy reader or Precision instrument), lay the Bio-Stack on the opposite side of the scanner. Note that the scanner must be installed on the *left side* of the Bio-Stack for proper alignment with the MicroFlo. See **Appendix B, Bio-Stack Barcode Scanner** for more information.

Perform these steps to attach the aligning posts to the Bio-Stack and the aligning caps to the MicroFlo Select (refer to **Figure 40** on the following page):

1. Turn off the Bio-Stack.
2. Carefully lay the Bio-Stack on its side so the bottom is facing you.
3. Screw in all four aligning posts as shown. Return the Bio-Stack to the upright position.
4. Turn off the MicroFlo and disconnect the power supply cord from the dispenser.
5. Carefully lay the MicroFlo on its back so the bottom is facing you.
6. Remove the four rubber feet on the Dispenser.
7. Screw in all four aligning caps as shown. Return the MicroFlo to the upright position.



**Figure 40:** Attaching the Aligning Posts to the Bio-Stack™ and the Aligning Caps to the MicroFlo™ Select

## Seat the Instruments in the Aligning Plates

Perform these steps to seat the Bio-Stack and the MicroFlo Select in the aligning plates:

1. Place the MicroFlo aligning plate on a level surface.
2. Attach the Bio-Stack aligning plate as follows (see **Figure 41** on page 133):
  - Loosely attach the Bio-Stack aligning plate to the MicroFlo aligning plate by screwing in the pan head screw, lock washer, and flat washer only halfway.
  - Slide the MicroFlo's two front aligning caps into the slots provided on the MicroFlo aligning plate.
3. Slide the Bio-Stack's two front aligning posts into the slots provided on the Bio-Stack's plate.
4. Move both instruments back and forth in their slots until you are satisfied that they are positioned correctly next to each other (approximately). Ensure that all posts and caps are properly seated (not resting on top of the plates), and that the instruments are level.

## Turn on the Bio-Stack™ and Run a Self-Test



**Warning!** Keep your hands away from the claw/gripper and carrier while the Bio-Stack is being powered up. The carrier and claw/gripper move quickly during the homing sequence.

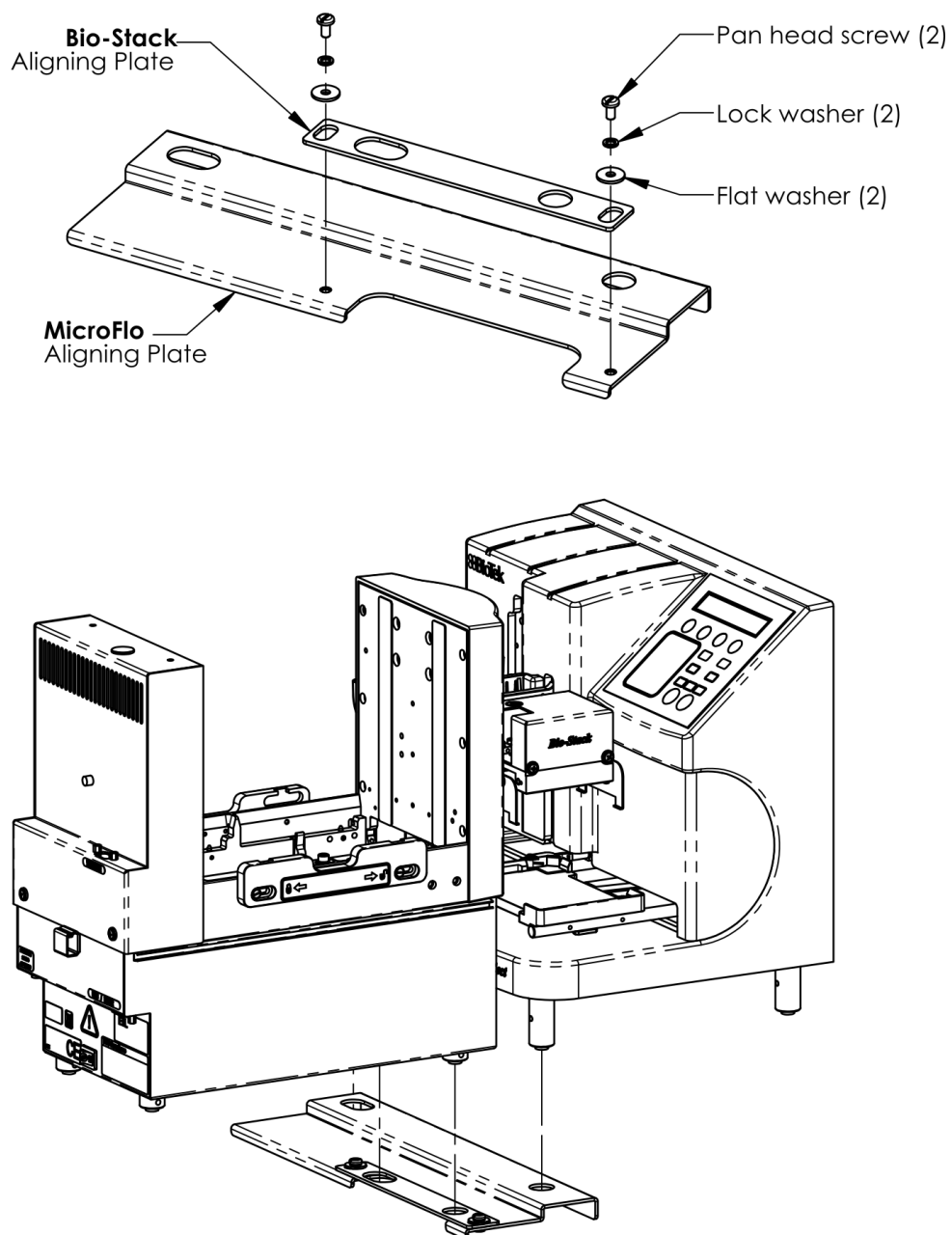


The Bio-Stack **must** pass the Self-Test for installation with the MicroFlo™ Select.

❖ The Bio-Stack does not need to be connected to the MicroFlo™ Select or to a host computer for this test.

Locate the Bio-Stack's power switch and turn on the instrument (see **Figure 9** on page 36 for the location of the switch). The Bio-Stack will home all axes (claw/gripper, carrier, input and output stack lifts) and then perform a system Self-Test.

- **If the Self-Test passes**, the green light will turn on and remain on.
- **If the Self-Test fails**, the green light will flash. If this happens, turn off the Bio-Stack and check for any obstructions. Ensure that all of the shipping hardware has been removed. If you cannot resolve the problem, contact BioTek's Technical Assistance Center for guidance.

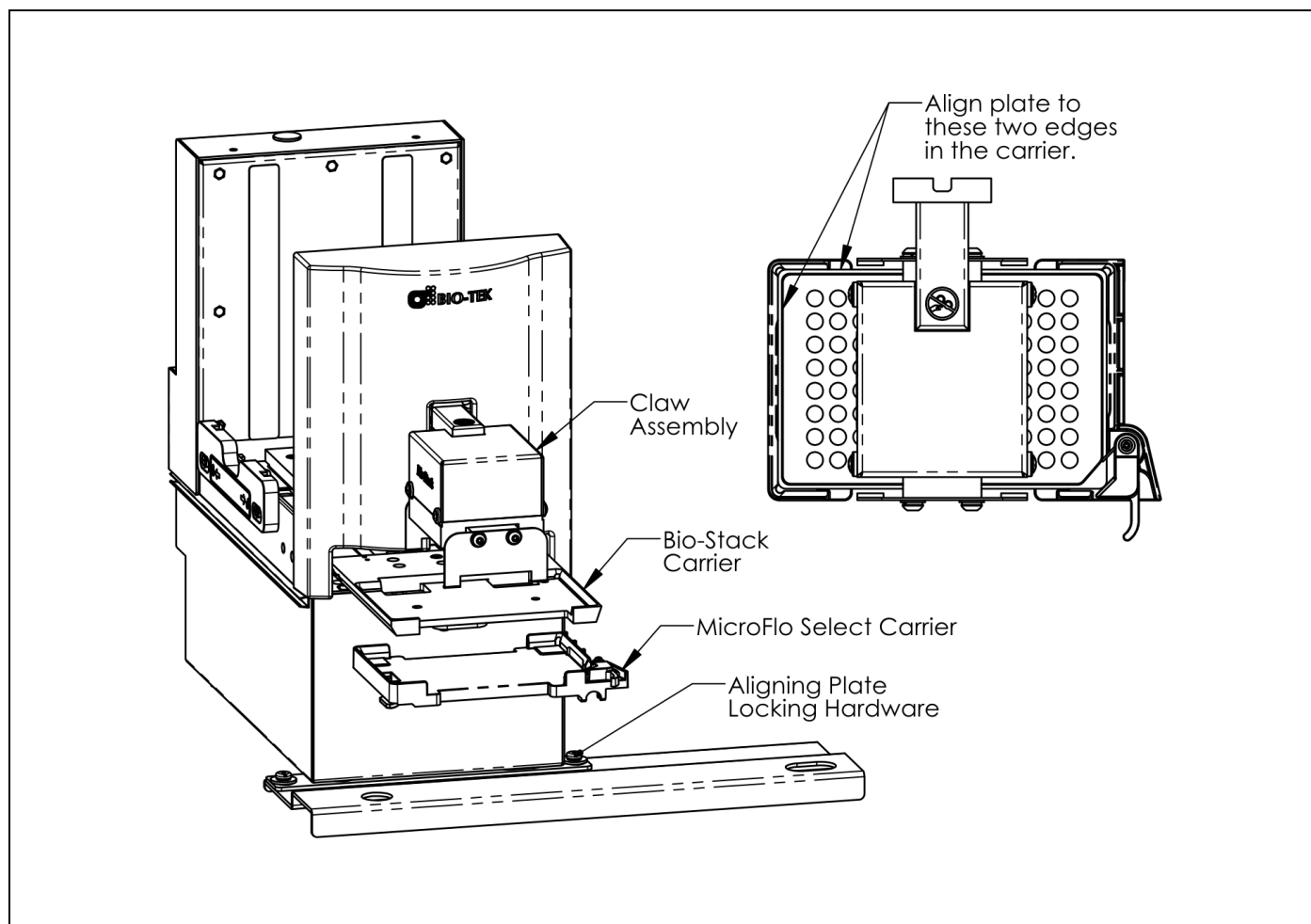


**Figure 41:** Seating the Bio-Stack™ and MicroFlo™ Select in the Aligning Plates

## Align the Bio-Stack™ with the MicroFlo™ Select

Perform these steps to align the Bio-Stack with the MicroFlo Select:

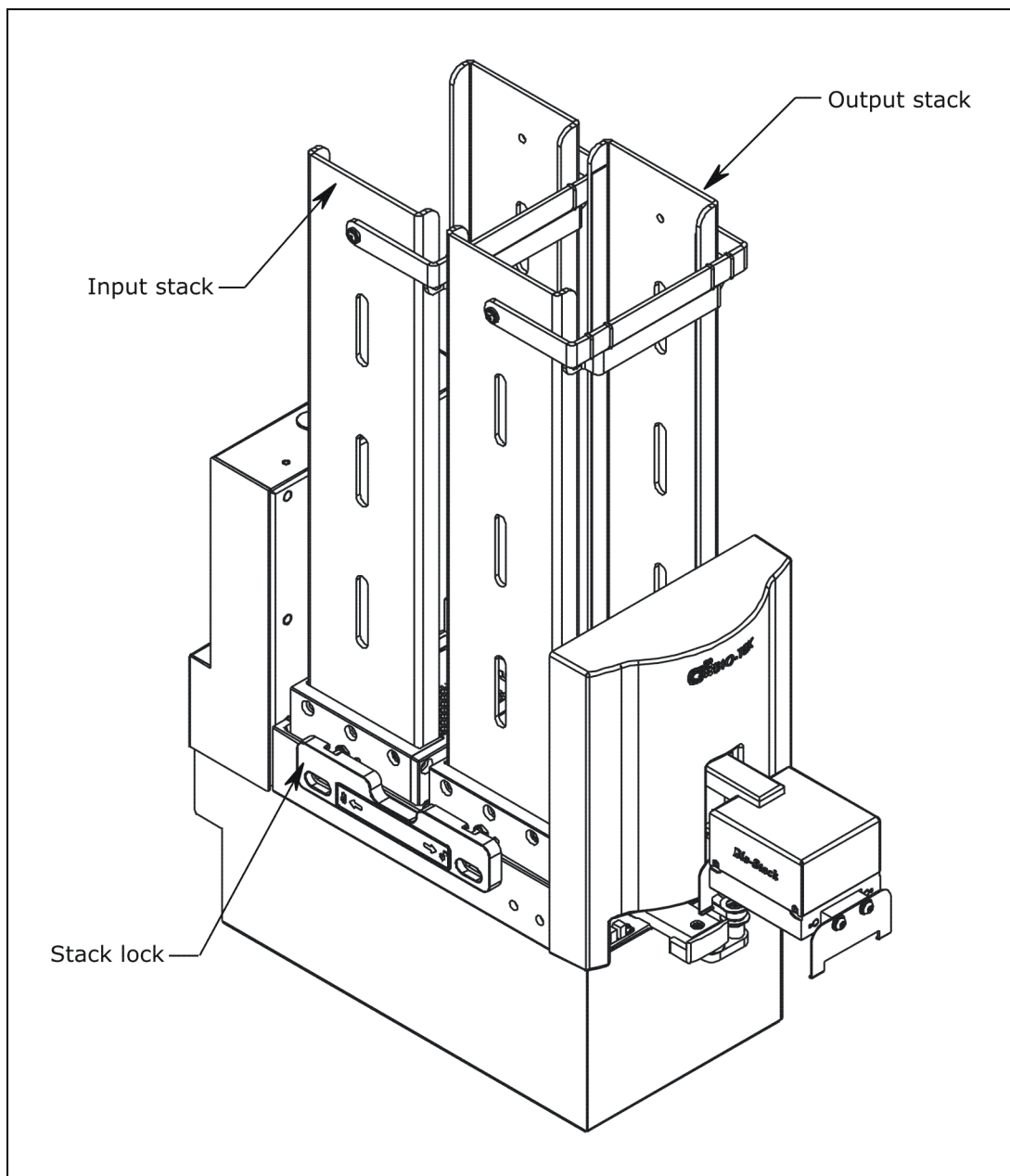
1. Ensure that the Bio-Stack is powered up and homed. If the Bio-Stack is off, turn it on to home all axes.
2. Reconnect the power supply cord to the MicroFlo and turn the instrument on. The carrier should be in the “out” (far right) position. Leave the MicroFlo powered up.
3. Turn the Bio-Stack off.
4. Manually slide the Bio-Stack carrier all the way out and position it below the claw assembly. Refer to **Figure 42** on the following page.
5. Place a microplate on the Bio-Stack carrier.
6. Manually lower the claw assembly down to the microplate and pick up the microplate (open the gripper to get around the plate and close it to pick up the plate). Raise the claw assembly carefully to ensure that the microplate does not change positions in the claw.
7. Slide the Bio-Stack carrier out of the way.
8. Lower the claw assembly until the microplate is just above the carrier of the MicroFlo.
9. Manually adjust the Bio-Stack on the tabletop so the microplate can be lowered into the carrier of the MicroFlo. The microplate carrier should be positioned as if it was just homed by the MicroFlo. If the MicroFlo’s carrier or the microplate has been moved, home the instruments, remove the microplate from the Bio-Stack claw, then repeat steps 3 through 9.
10. When you are satisfied with the microplate positioning relative to the carrier of the MicroFlo (look carefully at the top-down drawing in **Figure 42** on the next page, to see how the plate should fit in the carrier), finger-tighten the aligning plate locking hardware in both places.
11. Repeat all of the steps a couple of times to ensure that the microplate does not change positions and that it rides smoothly in and out of the carriers.



**Figure 42:** Aligning the Bio-Stack™ with the MicroFlo™ Select

## Install the Plate Stacks

Locate the stack locks on the side of the Bio-Stack™. Make sure the locks are both in the “unlocked” position. Install the stacks as shown in **Figure 43** below and then close the stack locks.



**Figure 43:** Installing the Plate Stacks



## Instrument Control of the Bio-Stack and MicroFlo Select (Pages 137 through 143)



If using **instrument control** of the Bio-Stack™ and MicroFlo™ Select via the MicroFlo keypad:

- Perform the steps in the sections below and on pages 138 through 143.

If using **PC control** of the Bio-Stack and MicroFlo Select via the Liquid Handling Control™ (LHC) Software:

- Perform the steps in the sections on pages 144 through 151.

## Connect the Bio-Stack™ to the MicroFlo™ Select

- ❖ The **Bio-Stack Alignment Kit** for the MicroFlo includes two serial cables: a 9-pin to 9-pin male/male cable and 9-pin to 25-pin male/female cable, a USB cable, and USB driver software CD. The USB cable may only be used for connection of the Bio-Stack to a host computer, for instance, if you will be using the Liquid Handling Control (LHC) Software to control the Bio-Stack and MicroFlo.

Perform these steps to connect the serial cable between the Bio-Stack and the MicroFlo Select:

1. Make sure that the Bio-Stack and MicroFlo are turned off.
2. Attach one end of the *appropriate* serial cable to the serial port on the rear of the Bio-Stack (refer to **Figure 9** on page 36 for an illustration of the serial port on the Bio-Stack).
3. Attach the other end of the cable to the serial port on the side of the MicroFlo.
4. Tighten the securing screws on both ends of the cable.

## Run the Checksum Test for the MicroFlo™ Select

Perform these steps to run the Checksum Test and record the basecode software versions for the MicroFlo Select:

❖ For your convenience, **Software Data Sheets** are provided in **Chapter 5, Instrument Qualification**, for recording the software versions for the MicroFlo.

1. Turn on the MicroFlo and allow its self-test to complete. After the initial powerup screen is displayed, the main menu screen will appear if the self-test passes:

```
( 9 6 )   C A S S ( 5 )   V O L : 0 0 1 0 u l
P R I M E   P U R G E   u P L A T E   - - >
```

2. From the main menu select - - > twice. The Dispenser Action Menu screen will appear:

```
D I S P E N S E R   A C T I O N   M E N U
D E F I N E   U T I L   S E T U P
```

3. Select **UTIL > CHKSUM**. The Version Checksum Info screen will appear with the three options as shown below:

```
V E R S I O N   C H E C K S U M   I N F O :
U I           M C           S T K R
```

- **UI** displays basecode software and checksum information for the User Interface processor. The UI processor communicates with the computer (during PC control of the MicroFlo), keyboard, display, and Bio-Stack.
- **MC** displays basecode software and checksum information for the Motor Controller processor. The MC processor is responsible for driving the motors on the instruments and working directly with the hardware.
- **STKR** displays basecode and checksum information for the Bio-Stack, if the Bio-Stack is connected to the MicroFlo and the dispenser's operating mode has been set to **BIOSTACK** (as instructed in the following section **Configure the MicroFlo for the Bio-Stack**.)

❖ If the dispenser's operating mode is set at **MANUAL**, an error will be displayed when the **STKR** option is selected from the Version Checksum Info screen.

4. Select **UI**. Record the basecode software version (X.XX) and checksum (XXXX) information:

7	1	7	0	2	0	0	V	E	R	S	I	O	N	X	.	X	X	
C	O	D	E	C	H	E	C	K	S	U	M	:	(	X	X	X	X	)

Press the **ENTER** or **Previous Screen** key to return to the Version Checksum Info screen.

5. Select **MC**. Record the basecode software version (X.XX) and checksum (XXXX) information:

7	1	7	0	2	0	0	V	E	R	S	I	O	N	X	.	X	X	
C	O	D	E	C	H	E	C	K	S	U	M	:	(	X	X	X	X	)

❖ **Note:** You will run the Checksum Test for the Bio-Stack in the section ***Test Communication with the Bio-Stack™*** on the following page.

6. Press the **Previous Screen** key until you return to the Dispenser Action Menu.
7. Record the MicroFlo serial number (listed on the instrument).

## Configure the MicroFlo™ Select for the Bio-Stack™

Perform these steps to configure the MicroFlo Select to recognize the Bio-Stack:

1. From the Dispenser Action Menu, select **SETUP > BIOSTACK > CONF > BIOSTACK**.
2. When the selection sequence is complete, the **RE-STACK?** screen will appear.
3. Press the **Main Menu** key.

## Test Communication with the Bio-Stack™



**Warning!** Keep your hands away from the claw/gripper and carrier while the Bio-Stack is being powered up. The carrier and claw/gripper move quickly during the homing sequence.

Perform these steps to test communication between the Bio-Stack and the MicroFlo™ Select and (optionally) to record the software versions for the Bio-Stack:

❖ For your convenience, **Software Data Sheets** are provided in **Chapter 5, Instrument Qualification**, for recording the software versions for the Bio-Stack.

1. **Important:** Turn off the MicroFlo.
2. Turn on the Bio-Stack and allow its self-test to complete.
3. Turn on the MicroFlo and allow its self-test to complete.
4. From the MicroFlo main menu, select **- - >** twice to get to the Dispenser Action Menu.
5. Select **UTIL > CHKSUM > STKR**.

The following screen should appear if the instrument is able to communicate with the Bio-Stack:

```
B I O - S T A C K :   X . X X ,   X . X X
C O D E   C H E C K S U M :           ( X X X X )
```

6. If communication is successful, record the Bio-Stack basecode software version (the first X.XX), the interface definition version (the second X.XX), and the checksum. Record the serial number listed on the Bio-Stack.
7. If the MicroFlo cannot communicate with the Bio-Stack, an error code will be displayed, with “Stacker Error” shown in the first line of the display. Consult **Chapter 7, Troubleshooting and Error Codes** for guidance.

## Align the Claw/Gripper with the MicroFlo Select Plate Carrier

The Bio-Stack's claw/gripper mechanism must now be aligned vertically with the microplate carrier on the MicroFlo™ Select. The MicroFlo has an on-board **Instrument Alignment Utility** for this task.

Perform these steps to align the Bio-Stack™ claw/gripper with the MicroFlo microplate carrier:

1. From the MicroFlo main menu, select **- - >** twice to get to the Dispenser Action Menu.
2. Select **SETUP > BIOSTACK > ALIGN > C-POS.**
3. The **FIND CLAW INTERFACE POS** menu will appear on the display with the following four selections:
 

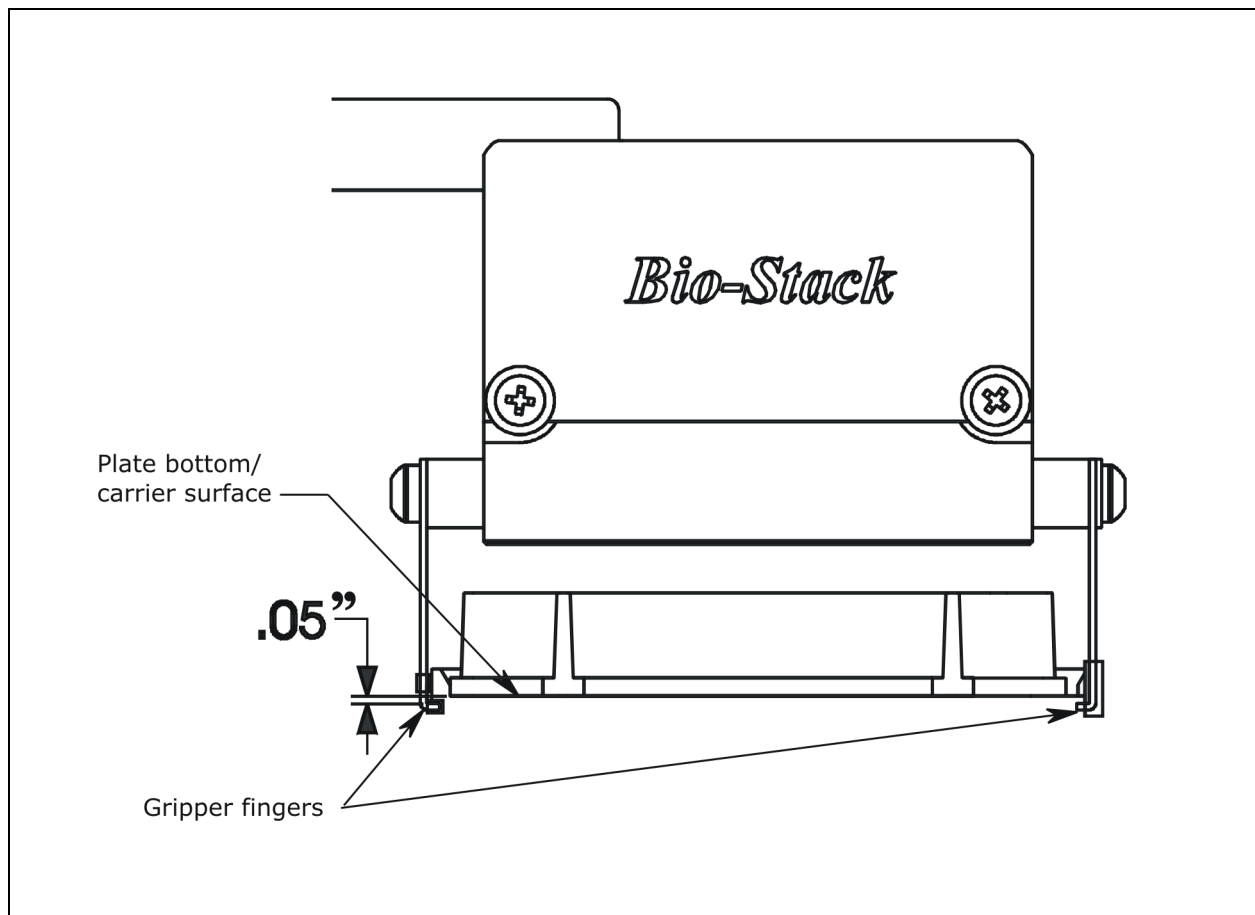
<b>-/+</b>	<b>+1</b>	<b>+20</b>	<b>+400</b>
------------	-----------	------------	-------------
4. Use the four softkeys on the MicroFlo keypad to position the Bio-Stack's claw/gripper mechanism to the desired height relative to the plate carrier on the MicroFlo. To help in this activity, place a microplate on the carrier of the MicroFlo (optional). Lower the mechanism so that the gripper's "fingers" rest approximately 50-60 thousandths of an inch (1.3-1.5 mm) below the plate bottom or carrier surface (see **Figure 44** on the next page).

❖ If the Bio-Stack and MicroFlo are located on an uneven surface, the gripper's fingers should rest below the lowest point of the plate bottom, to ensure proper plate delivery.

- To avoid collision of the gripper with the carrier on the MicroFlo, press the **+20** key first, to see how far that goes, before pressing the **+400** key. Use the **1/20/400** softkeys to *gradually* lower the claw/gripper mechanism to the desired height.
- If you go too far, press the **-/+** softkey to step up a bit.

❖ If the alignment is interrupted, and you receive an error code such as **2500**, the Bio-Stack will have to be homed to resolve the error. To home the Bio-Stack, press the **Previous Screen** key until you return to the Alignment Utility screen. Select **HOME > BIOSTACK**, then repeat steps 1 through 4 above.

5. When you are satisfied with the position, press the **Previous Screen** key until you return to the Alignment Utility screen and select **SAVE**.
6. At the **OK TO SAVE LOCATION?** screen, press **YES**, and then **ENTER**.
7. Remove the plate from the carrier on the MicroFlo.



**Figure 44:** Position of the Bio-Stack's Gripper Fingers Below the Plate Bottom (on the MicroFlo™ Select Plate Carrier)

## Verify the Alignment

Perform the following test to verify alignment of the Bio-Stack™ with the MicroFlo™ Select:

1. Ensure that both instruments are turned on.
2. Place a dry microplate in the Bio-Stack's input stack.
3. From the Dispenser Action Menu, select **SETUP > BIOSTACK > VERIFY**. Press the **ENTER** key.
4. Watch closely to confirm the following behavior (the claw/gripper will pause periodically; this is the expected behavior):
  - The Bio-Stack will transfer the plate from the input stack to the Bio-Stack plate carrier, and then eject the plate carrier.
  - The claw/gripper will pick up the plate, lower it toward the MicroFlo's plate carrier, and then *smoothly* place the plate on the carrier.

❖ If the plate drops onto the carrier, the claw interface position is set too high. Repeat the instructions in ***Align the Claw/Gripper with the MicroFlo Select Plate Carrier*** on page 141.

- The claw/gripper will come up a short distance. The gripper will then power-down, allowing its spring mechanism to tighten the gripper "fingers."

❖ If the gripper fingers catch on the top of the microplate, the claw interface position is set too low. An error code will display on the MicroFlo. Repeat the instructions in ***Align the Claw/Gripper with the MicroFlo Select Plate Carrier*** on page 141.

- If the gripper fingers did not catch on the plate, the MicroFlo will display **VERIFY PLATE PLACEMENT**. Press **ENTER** to continue.
  - The claw/gripper will lower, pick up the plate, place the plate on the Bio-Stack's plate carrier, and then store the plate in the output stack.
  - The MicroFlo will display **BIOSTACK UTILITIES**. From here you can select **VERIFY** to run the program again, or press **Main Menu**.
5. If the alignment verification completed successfully and you have determined that the gripper fingers are positioned correctly, return to the instrument's main menu.
    - If the gripper fingers are not positioned correctly, repeat the instructions in ***Align the Claw/Gripper with the MicroFlo Select Plate Carrier***, and then re-run the Verify Test.

❖ The Verify Test must pass before the Bio-Stack can be used to transfer microplates.

## PC Control of the Bio-Stack and MicroFlo Select (Pages 144 through 151)



For computer control of the Bio-Stack™ and MicroFlo™ Select using the **Liquid Handling Control™ (LHC) Software**, you will need appropriate versions of the MicroFlo™ Select Interface Software, dispenser basecode software, Bio-Stack™ PC Control Software, and Bio-Stack basecode software. **Note:** Any version of the LHC Software may be used to control the Bio-Stack and MicroFlo.

Refer to **Appendix D, Required Software Versions**, or contact BioTek for more information on required software versions.

During PC control of the Bio-Stack and MicroFlo Select, both instruments are controlled by BioTek's Liquid Handling Control (LHC) Software running on a host computer. The LHC Software uses the MicroFlo Select Interface Software to control all functions of the MicroFlo, and uses a component of the Bio-Stack PC Control Software to control all functionality of the Bio-Stack.

- ❖ The **LHC Help system** contains a detailed description of the LHC Software, and how it interacts with the MicroFlo Select Interface Software and Bio-Stack PC Control Software to control the instruments.

Perform the instructions below and on the following pages, for computer control of the Bio-Stack and MicroFlo using the LHC Software.

### Prerequisites

- Verify that the host PC meets the minimum system requirements specified in the **Liquid Handling Control Software Installation Guide** and **Bio-Stack PC Control Software Installation Guide**.
- Verify Administrator privileges. BioTek software requires the user who is installing the software application to have Administrator privileges for the Windows® 2000/XP/Vista systems. If a user with restricted access attempts to install the application, errors may occur. Contact your organization's system administrator if you are uncertain about your privileges.



## Connect the Host Computer to the Bio-Stack™ and MicroFlo™ Select



### For operation of the Bio-Stack with the MicroFlo Select:

The host computer must be equipped with at least two communication (COM) ports: one serial port and a second serial or USB port.

- ❖ The **Bio-Stack Alignment Kit** for the MicroFlo includes two RS-232 serial cables (a 9-pin to 9-pin male/male cable and 9-pin to 25-pin male/female cable), a USB cable, and USB driver software CD. The USB cable may be used instead of a serial cable for connection of the Bio-Stack to the host computer.
- ❖ The **shipping accessories** for the MicroFlo include a USB cable and USB driver software CD. Use the USB cable for connection of the MicroFlo to the host computer.

Perform these steps to connect the host computer to both the Bio-Stack and the MicroFlo Select (refer to **Figure 9** on page 36 for an illustration of the serial and USB ports):

1. If the Bio-Stack is on, turn it off.
2. Place the computer in a location adjacent to the Bio-Stack and the MicroFlo.
3. Connect the computer to the Bio-Stack™ and MicroFlo, using the serial and USB cables.

- ❖ A standard 9-pin to 9-pin male/female serial cable may be used to connect the MicroFlo to the PC.

### Connect the serial cable:

- Using the *appropriate* serial cable, attach one end of the cable to a serial port on the computer.
- Attach the other end of the cable to the serial port on the Bio-Stack or MicroFlo.
- Tighten the securing screws on both ends of the cable.

### Connect the USB cable and install the USB driver:

- Attach one end of the supplied USB cable to a USB port on the computer. Attach the other end of the cable to the USB port on the Bio-Stack or MicroFlo.
- Turn the computer on.

- Place the USB Virtual COM Driver Software CD in the computer's CD ROM drive.
- Turn on the Bio-Stack or MicroFlo. Instructions should appear on the screen for performing the installation.
- If necessary, using Microsoft® Explorer or other file management software, find the installation guide appropriate for your computer's operating system (e.g., WXPInstall.pdf). Follow the directions provided within the document to install the driver software.

❖ In the section **Test Communication** on page 147, you will need to know which COM number is associated with the USB port on your computer. You'll select this number in the Liquid Handling Control™ (LHC) Software port selection dialog for the MicroFlo™ Select or Bio-Stack™. The COM port can be customized to use any number port that is not currently defined by the System. For customization instructions, consult the **ComPortGuide.doc** or **ComPortGuide.pdf** file on the USB driver CD.

## Install the Liquid Handling Control (LHC) Software

- ❖ A CD containing the **Liquid Handling Control™ Software** and an installation guide are included in the LHC Software package (part number LHCMFS) for the MicroFlo™. The package also includes a CD containing version 1.01.0 or greater of the **MicroFlo™ Select Interface Software** and instructions for installing the software.
- ❖ MicroFlo basecode software PN 7170200, version 1.04.0 or greater, is required for use of the LHC Software.

There is a certain sequence of events that *must* be followed to ensure that the Liquid Handling Control Software is properly installed and configured on the host PC. You will also need to install the MicroFlo Select Interface Software on the PC.

Please follow the instructions provided in the **Liquid Handling Control™ Software Installation Guide** to install and configure the Liquid Handling Control Software and any other necessary software components. Record the serial number listed on the software package.

## Install the Bio-Stack™ PC Control Software

- ❖ A CD containing version 2.00.10 or greater of the **Bio-Stack PC Control Software** and an installation guide are included in the Bio-Stack™ Alignment Kit for the MicroFlo™ Select (PN 7310020). Version 2.00.10 (or greater) is required for compatibility with the Liquid Handling Control™ Software.

There is a certain sequence of events that *must* be followed to ensure that the Bio-Stack PC Control Software is properly installed and configured on the host PC. Please follow the instructions provided in the **Bio-Stack PC Control Software Installation Guide** to install the software. Record the serial number listed on the software package.

## Test Communication

Perform these steps to test communication between the LHC Software and the instruments:

1. Turn the MicroFlo and Bio-Stack on.
2. Launch the LHC Software.
3. **Test communication between the LHC Software and the MicroFlo:**

- When the LHC main screen opens, click **Name** in the **Instrument** field. The 'MicroFlo Select Communications' dialog will appear.

- ❖ If more than one instrument's interface software is found on your PC by the LHC Software, clicking **Name** will open the 'Installed Instruments' dialog. Select **MicroFlo Select** and click **OK**. The 'MicroFlo Select Communications' dialog will then appear.

- Select the correct **COM Port** for the serial or USB cable connection to the MicroFlo, and then click **Test Communications**.

If the test passes, click **OK**. The 'MicroFlo Select Settings' dialog will appear. If the test fails, check the serial/USB cable connections or try a different COM port.

- At the 'MicroFlo Select Settings' dialog, select the correct **Instrument** model: **MFS** or **MFS1536**, and then click **OK**.

4. **Test communication between the LHC Software and the Bio-Stack:**

- Click the **Bio-Stack** box.
- Click **Port** to open the 'Bio-Stack Communications' dialog. Select the correct **COM Port** for the serial or USB connection to the Bio-Stack, and then click **Test Communications**.

If the test passes, click **OK**. If the test fails, check the serial/USB cable connections or try a different COM port.

## Run the Checksum Test for the MicroFlo™ Select

- ❖ The Checksum Test for the MicroFlo allows you to obtain checksum values for the User Interface (**UI**) Processor and Motor Controller (**MC**) Processor.

The **UI** processor communicates with the computer (during PC control of the MicroFlo), keyboard, display, and Bio-Stack.

The **MC** processor is responsible for driving the motors on the instruments and working directly with the hardware.

Perform these steps to run the Checksum Test and record the software versions for the Liquid Handling Control™ Software and for the MicroFlo:

- ❖ For your convenience, **Software Data Sheets** are provided in **Chapter 5, Instrument Qualification**, for recording the MicroFlo software versions.

1. Make sure that the dispenser is powered on, the dispenser UI (User Interface) is at the main menu, and the serial or USB cable connected from the PC to the dispenser.
2. At the LHC Software's main screen, select **Help > About Liquid Handling Control**.
3. The 'Help About' dialog will open. Record the Liquid Handling Control Build Version and Installation Version.
4. Click **Close** to return to the main screen.
5. Select **Tools > Instrument Utilities**. The 'MicroFlo Select Utilities' screen will open.
6. Click **Test Communications**. If software version information is displayed and no errors occurred, the Checksum Test completed successfully.
7. Record the MicroFlo Select Interface Software Version and Data Version, and the MicroFlo Select Basecode Software Version and Data Version, and the Checksums for the UI Processor and the MC Processor. Record the dispenser's serial number (listed on the MicroFlo).
8. Click **Exit** to close the MicroFlo Select Utilities screen.
9. Close the LHC Software.

## Run the Checksum Test for the Bio-Stack

Perform these steps to test communication between the Bio-Stack PC Control Software and the Bio-Stack, run the Checksum Test, and record the software versions for the Bio-Stack™ PC Control Software and for the Bio-Stack™:

❖ For your convenience, **Software Data Sheets** are provided in **Chapter 5, Instrument Qualification**, for recording the Bio-Stack software versions.

1. Make sure that the Bio-Stack is powered on, and the serial or USB cable connected from the PC to the Bio-Stack.
2. Launch the Bio-Stack PC Control Software.
3. Click the **Configure Instruments** button.
4. Set the **COM Port** and click **Test Communications**. If the test fails, check the cable and/or try another Com port. Return to the main screen.
5. From the top menu bar in the Bio-Stack PC Control Software, select **Help > About Bio-Stack**. The 'About Bio-Stack Software' dialog will open.
6. Record the Bio-Stack PC Software Versions for the Installation CD, StackerContainer.exe, and BTIAutoStackerActiveX. Record the serial number listed on the Bio-Stack PC Control Software package.
7. Click **Get On-board values now**. If software version information is displayed and no errors occurred, the Checksum Test completed successfully.
8. Record the Bio-Stack onboard software versions for the basecode software, interface definition, and checksum. Record the Bio-Stack's serial number listed on the Bio-Stack.
9. Close the Bio-Stack PC Control Software.

## Align the Claw/Gripper with the MicroFlo™ Select Plate Carrier

The Bio-Stack's claw/gripper mechanism must now be aligned vertically with the microplate carrier on the MicroFlo Select. The Liquid Handling Control™ Software has an **Instrument Alignment Utility** for this task.

Perform these steps to align the Bio-Stack™ claw/gripper with the MicroFlo microplate carrier:

1. Start the LHC Software and select **Tools > Bio-Stack Utilities**.
2. Click **Alignment Utility**.
3. From the 'Bio-Stack Instrument Alignment Utility,' use the drop-down arrow in the **Selected Instrument** field to select the **µFill Dispenser**.

❖ For the purpose of alignment only, the user must select 'µFill Dispenser' for the MicroFlo, since the MicroFlo uses the same Bio-Stack alignment scheme as the µFill.

4. To configure the alignment of the Bio-Stack to the MicroFlo, begin with the **Home the Bio-Stack** function.
5. After all axes have been homed on the Bio-Stack, place a microplate on the MicroFlo's plate carrier. Then use the **Re-alignment Control** buttons to position the Bio-Stack's claw/gripper so that the gripper "fingers" rest approximately 50-60 thousandths of an inch (1.3-1.5 mm) below the plate bottom or carrier surface: click **Begin**.

The gripper's fingers open. (See **Figure 44** on page 142.)

❖ If the Bio-Stack and MicroFlo dispenser are located on an uneven surface, the gripper's fingers should rest below the lowest point of the plate bottom, to ensure proper plate delivery.

- Begin with the **Down** radio button selected. To avoid collision of the gripper with the carrier on the MicroFlo, click the **20 Steps** button first, to see how far that goes, before clicking the **400 Steps** button. Use the **400 Steps**, **20 Steps**, and **1 Step** buttons to gradually lower the claw/gripper to the desired height.
- If you have moved the gripper too far below the plate bottom, click the **Up** radio button and step up a bit.

❖ If the alignment is interrupted, and you receive an error code such as **2500**, the Bio-Stack will have to be homed to resolve the error. Click the **Home the Bio-Stack** button to home all axes on the Bio-Stack, then repeat step 5 above.

6. When you're satisfied with the positioning of the gripper, click **Save Position**.
7. Remove the microplate from the dispenser's carrier.

## Verify the Alignment

Perform the following test to verify alignment of the Bio-Stack™ with the MicroFlo™ Select:

1. Place a dry microplate in the Bio-Stack's input stack.
2. At the Liquid Handling Control™ Software's main screen, select **Tools > Bio-Stack Utilities**.
3. Click **Alignment Utility**.
4. From the 'Bio-Stack Instrument Alignment Utility,' click the **Verify** button.
5. Watch closely to confirm the following behavior (the claw/gripper will pause periodically; this is the expected behavior):
  - The Bio-Stack will transfer the plate from the input stack to the Bio-Stack plate carrier, and then eject the plate carrier.
  - The claw/gripper will pick up the plate, lower it toward the MicroFlo's plate carrier, and then *smoothly* place the plate on the carrier.

❖ If the plate drops onto the carrier, the claw interface position is set too high. Repeat the steps in the preceding section, ***Align the Claw/Gripper with the MicroFlo Select Plate Carrier***.

- The claw/gripper will come up a short distance. The gripper will then power-down, allowing its spring mechanism to tighten the gripper "fingers."

❖ If the gripper fingers catch on the top of the microplate, the claw interface position is set too low. An error code will be displayed in the LHC Software. Repeat the steps in the preceding section.

- If the gripper fingers did not catch on the plate, the LHC Software issues a "Verify plate placement" message and delays the Bio-Stack's movement to give you time to observe the action. Click **OK** to continue.
  - The claw/gripper will lower, pick up the plate, place the plate on the Bio-Stack's plate carrier, and then store the plate in the output stack.
  - If the gripper fingers are not positioned correctly, repeat the steps in the preceding section and then re-run the Verify Test.
6. Click **OK**, then **Exit** to return to the main screen.

❖ The Verify Test must pass before the Bio-Stack can be used to transfer microplates.





## Repackaging and Shipping

If you need to ship the Bio-Stack™ to BioTek for service or repair, be sure to use the original packaging materials. Other forms of commercially available packaging are not recommended and can void the warranty.




If the original packaging materials have been damaged or lost, contact BioTek to order **PN 7313002** for the packaging materials, **PN 7313001** for the microplate stacks shipping materials, and **PN 7310014** for the shipping hardware. See **Product Support & Service** in **Chapter 1** for contact information.

The following tables list the materials that are included in the part numbers referenced above.

Packaging materials included in PN 7313002	PN's
Outer shipping container	7112063
Inner shipping container	7112064
Foam shipping blocks (8)	7112197
Inner sleeve	7312082
Plywood shipping panel	7112067
Stacks shipping materials included in PN 7313001	PN's
Shipping container	6022002
Shipping end caps (2)	7312081
Shipping hardware included in PN 7310014	PN's
Shipping panel mounting screws, flat washers (4)	12185, 17057
Shipping panel handles (2)	44285
Rubber feet for shipping panel (4)	49064
Screws, lock washers, and flat washers for handles (4)	12121, 16016, 17054
Shipping block	7312080
Shipping block mounting screws (4)	12189
Carrier shipping screw	19513

- ❖ Part numbers are subject to change over time. Please contact BioTek Customer Care if you have any questions.
- ❖ The instrument's packaging design is subject to change over time. If the instructions in this section do not appear to apply to the packaging materials you are using, please contact BioTek's Technical Assistance Center for guidance.

## Before Repackaging the Instrument

	<b>Warning!</b> If the Bio-Stack™ has been exposed to potentially hazardous material, decontaminate it to minimize the risk to all who come in contact with the instrument during shipping, handling, and servicing. Decontamination prior to shipping is required by the U.S. Department of Transportation regulations.
	<b>Important!</b> Perform the following steps in the order presented before repackaging the instrument for shipment.
	<b>Important!</b> The shipping panel and block, mounting screws, and carrier shipping screw must be re-attached to the Bio-Stack before the instrument can be shipped.

1. Turn the Bio-Stack off and disconnect the power supply cord.
2. Remove all alignment hardware and the microplate stacks.
 

❖ The microplate stacks do not have to be returned with the Bio-Stack unless a problem has occurred with plates in the stacks.
3. **Decontaminate** the Bio-Stack as necessary. Refer to the **Decontamination** section in **Chapter 6, Preventive Maintenance**, for complete instructions.
4. (Optional) If the Bio-Stack barcode scanner is installed, remove the scanner according to the instructions in **Appendix B, Bio-Stack Barcode Scanner**.
 

❖ The optional barcode scanner does not have to be returned with the Bio-Stack unless there is a problem with the scanner.
5. Replace all shipping hardware and repackage the instrument as described on the following pages. Failure to comply with these packaging instructions can **void the instrument's warranty**.
6. Obtain a **Return Materials Authorization (RMA)** number from BioTek's Technical Assistance Center through BioTek's website, fax, or e-mail address listed in **Chapter 1**.

When obtaining the RMA, explain whether the Bio-Stack requires calibration, cleaning, periodic maintenance, warranty work, and/or repair. Make a note of any error messages that were displayed on the controlling PC or on the controlling instrument, and their frequency.

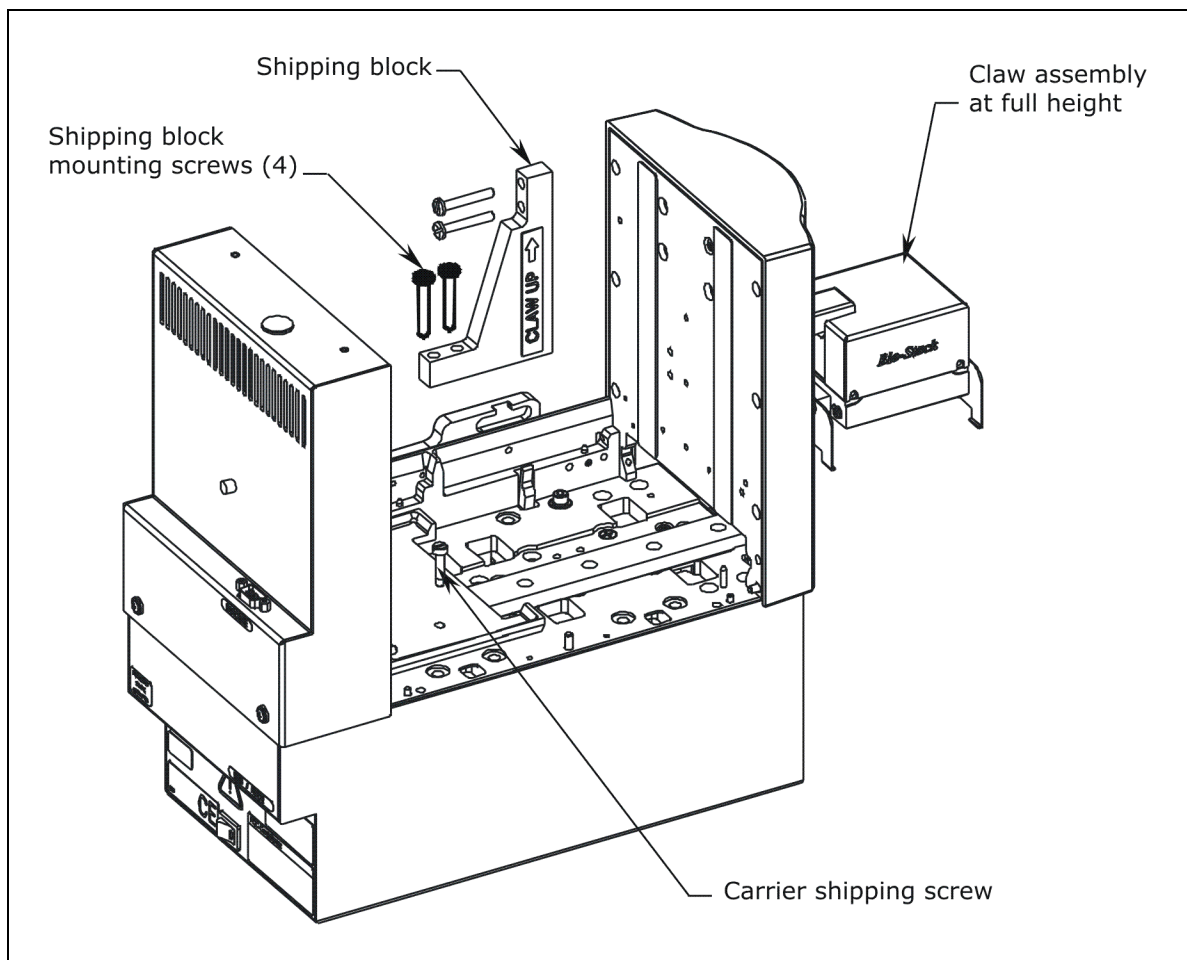
Provide BioTek with the name and contact information of a person who may be contacted if questions arise.

## Attach the Shipping Hardware

1. Place the Bio-Stack™ upright on a flat surface (see **Figure 45**), connect the power supply, and power up the instrument to home all axes. The claw assembly must be at its full height in order to mount the shipping block.

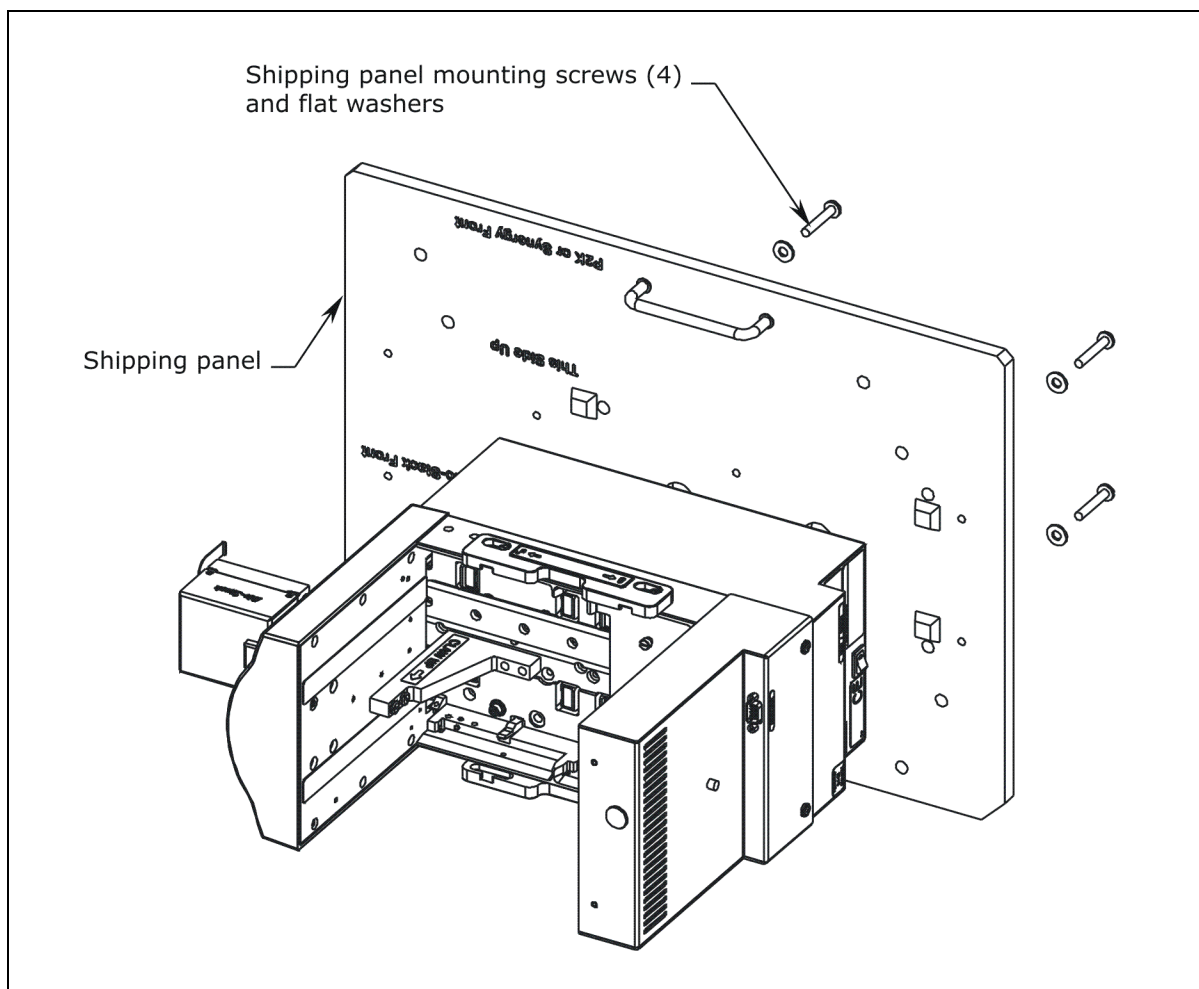
❖ If power cannot be applied, **manually raise the claw** to full height and hold it in that position while installing the top shipping block mounting screw in step 2 below.

2. **Power down the instrument and disconnect the power supply.** Loosely install the shipping block so the top shipping block mounting screw is protruding out below the claw assembly screw block.
3. Tighten the two bottom shipping block mounting screws, then loosen them by one-quarter turn.
4. Tighten the two top mounting screws and then the two bottom screws.
5. Slide the carrier back to the position shown; install the carrier shipping screw.



**Figure 45:** Attaching the Shipping Block and Mounting Screws

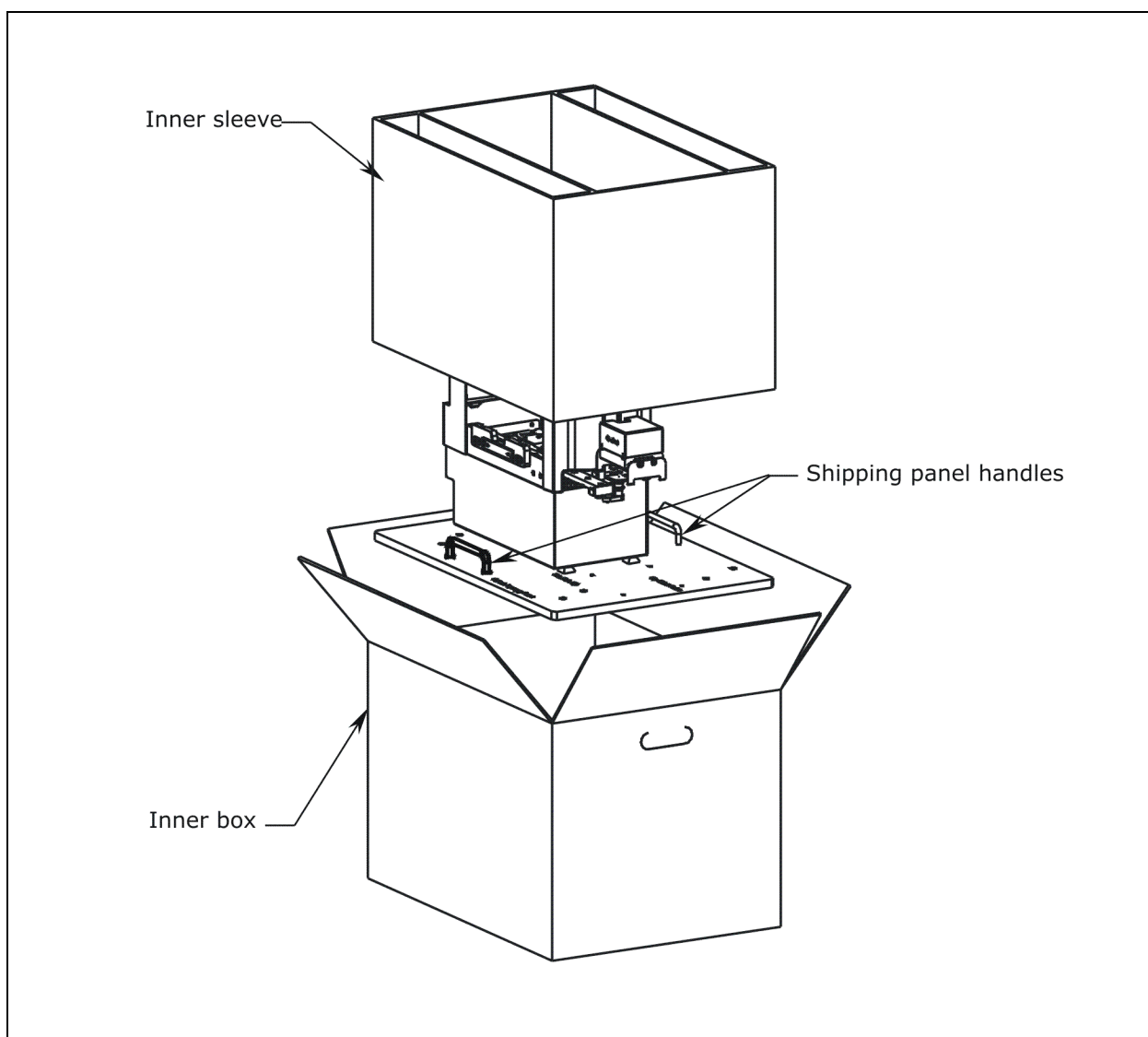
6. Carefully lay the Bio-Stack™ on its side, with the bottom of the instrument facing you and flush against the edge of the work surface (see **Figure 46**).
7. Remove the four aligning posts/legs. Keep the posts with the accessories package.
8. Install the shipping panel with the accompanying mounting screws and washers. (Note the orientation of the panel to the unit.)
9. Lift the instrument until it is resting upright on the work surface.



**Figure 46:** Attaching the Shipping Panel

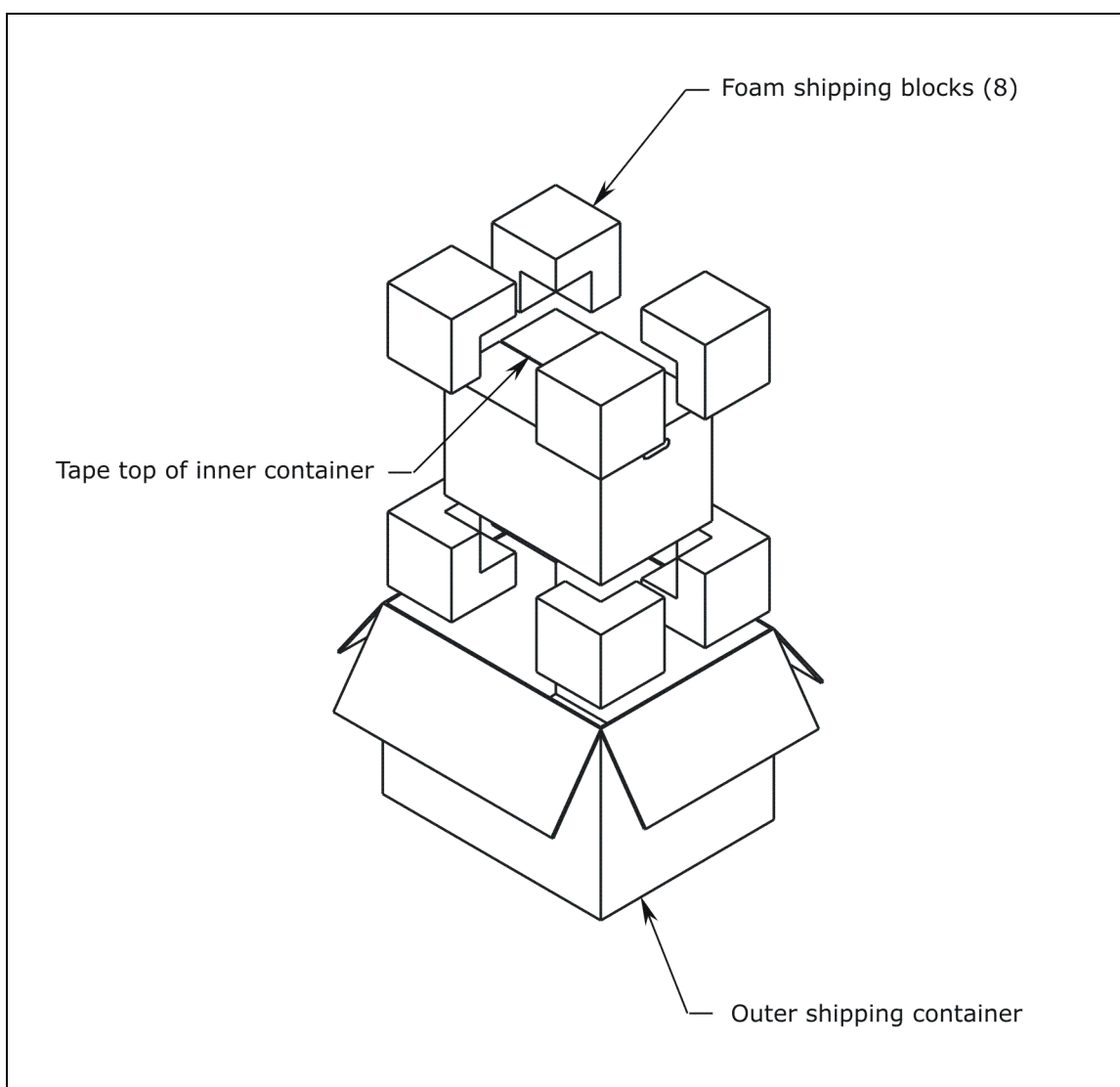
## Repackage the Bio-Stack™

1. Grasp the shipping handles and carefully lower the Bio-Stack into the inner shipping box (see **Figure 47** below).
2. Lower the inner sleeve into the inner shipping box as shown.
3. **Optional barcode scanner:** If you are returning the Bio-Stack's barcode scanner, repackage the scanner and installation kit components using the original shipping materials (plastic bag and small shipping box). Place the box in the inner sleeve.



**Figure 47:** Repackaging the Bio-Stack

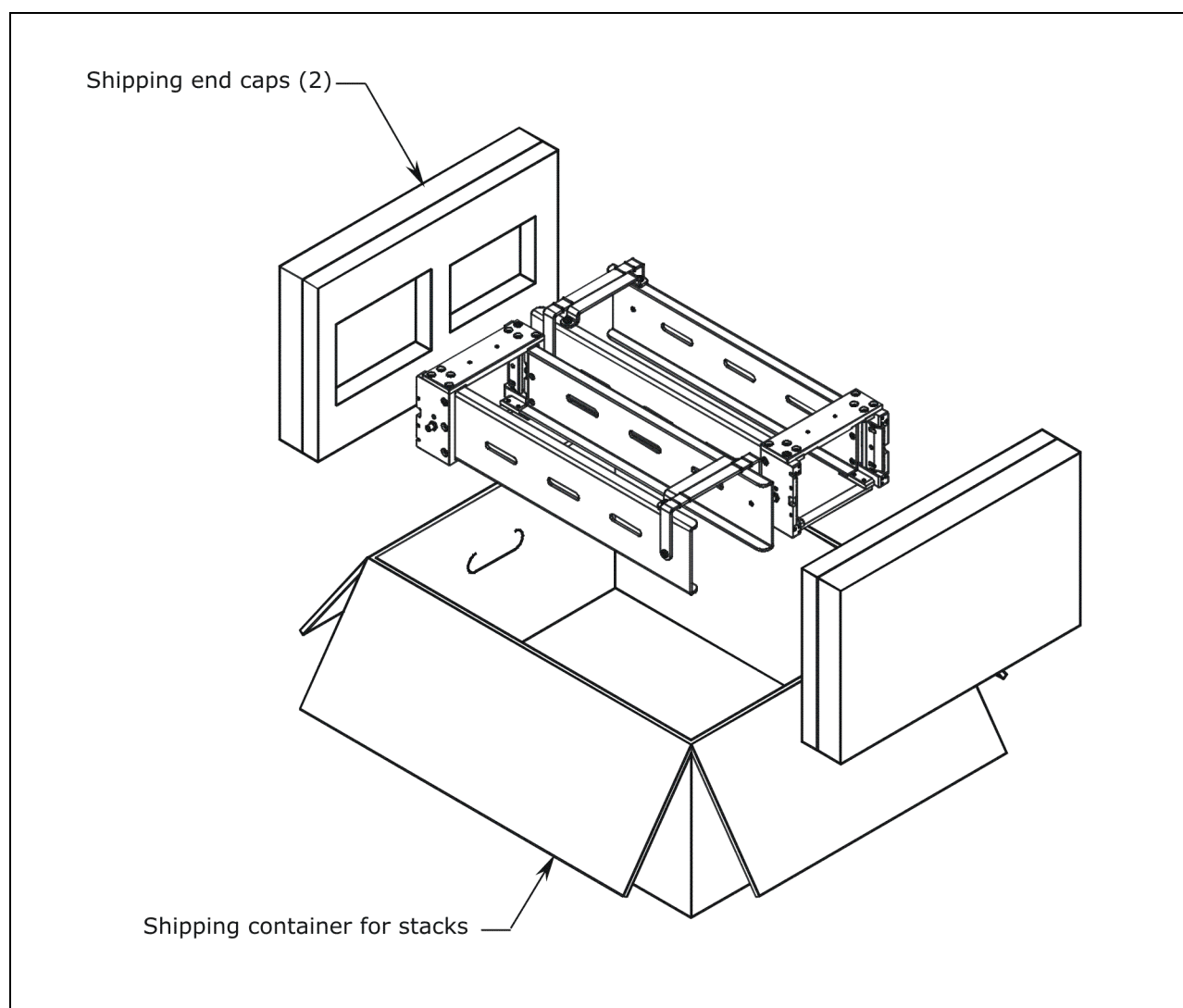
4. Ensure that all the foam shipping blocks are attached to the inner shipping container; reattach if necessary.
5. Close the top of the inner shipping container and tape it shut.
6. Lower the inner shipping container into the outer shipping container (see **Figure 48** below).
7. Close the top of the outer shipping container and tape it shut.
8. Write “RMA” and the RMA number in large, clear letters on the outside of the shipping container.
9. Insure the Bio-Stack™ for full value and ship the instrument to the BioTek address provided in the **Product Support & Service** section of **Chapter 1**.



**Figure 48:** Preparing the Outer Shipping Container

## Repackage the Microplate Stacks

1. Place the microplate stacks into their shipping end caps as shown in **Figure 49** below.
2. Lower the stacks into their shipping container.
3. Close the top of the shipping container and tape it shut.
4. On the outside of the container, write “RMA” and the same RMA number that you wrote on the shipping container for the Bio-Stack.
5. Ship the stacks with the Bio-Stack™ to BioTek.



**Figure 49:** Repackaging the Microplate Stacks





## Chapter 4

# Operation

This chapter includes instructions for operating the Bio-Stack™ with compatible Bio-Stack Instruments.

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## Before You Start



**Important!** The Bio-Stack™ must be installed with the interfacing instrument as instructed in **Chapter 3, Installation**, before you can operate the instruments! Review the Installation Qualification (IQ) checklist (provided in **Chapter 5, Instrument Qualification**), to ensure that every installation task/test has been successfully performed.

If the instruments have been moved since installation, perform the Verify Test to verify alignment. Check all serial/USB cable and power cord/power supply connections to ensure that they have not become loose.

Ensure that **all components** of the interfacing instruments have been installed according to the installation sections of their operator's manuals.

## Review Principles of Operation

Please take a few minutes to review the following principles of operation of the Bio-Stack:

1. The **input stack lifter** picks up a plate from the **input stack** and places it on the **carrier**.
2. The carrier transfers the plate to the **claw/gripper**, which picks up the plate and places it on the interfacing instrument for processing.

❖ If the **optional barcode scanner** is installed on the Bio-Stack, the scanner automatically scans the barcode label on a microplate at the Bio-Stack's extended carrier position during plate transfers between the Bio-Stack and reader or Precision instrument.

3. Once the plate has been processed, the claw/gripper picks up the plate and places it back on the carrier, which moves it to the **output stack**.

Because there is **no on-board keypad** or user interface to allow an operator to control the Bio-Stack directly, the Bio-Stack is either **computer-controlled** (via the Bio-Stack™ PC Control Software, Precision Power™ Software, or Liquid Handling Control™ Software) or **instrument-controlled** by the µFill™, NanoQuot™, ELx405™, or MicroFlo™ Select.

❖ **ELx405 or MicroFlo Select:** The Bio-Stack with the ELx405 or MicroFlo Select may be either computer controlled using the Liquid Handling Control (LHC) Software, or instrument controlled using the keypad on the ELx405 or MicroFlo.

Instructions for operating the Bio-Stack™ with the interfacing instruments are located in this chapter as follows:

- **Operate the Bio-Stack™ with the PowerWave™ or Synergy™ Readers:** page 169
- **Operate the Bio-Stack™ with the Precision™/XS:** page 171
- **Operate the Bio-Stack™ with the µFill™:** page 175
- **Operate the Bio-Stack™ with the ELx405™ (Instrument Control):** page 187
- **Operate the Bio-Stack™ with the ELx405™ (PC Control):** page 199
- **Operate the Bio-Stack™ with the NanoQuot™:** page 203
- **Operate the Bio-Stack™ with the MicroFlo™ Select (Instrument Control):** page 205
- **Operate the Bio-Stack™ with the MicroFlo™ Select (PC Control):** page 215

## Review Microplate Requirements

Please review the following microplate requirements to ensure that the plates you will be using meet specifications (refer also to the **Specifications** section in **Chapter 1, Installation**).

- The microplates must be robot-compatible, stackable plates of single-piece construction.
- Use Society for Biomolecular Screening (SBS) standard-height 96- and 384-well microplates or other laboratory microplates that conform to the following standardized dimensions:
  - **Width:** 3.365" (85.48 mm) ± 0.020" (0.5 mm)
  - **Length:** 5.030" (127.76 mm) ± 0.020" (0.5 mm)
  - **Height:** 0.565" (14.35 mm) ± 0.030" (0.76 mm)

❖ **Shorter profile plates:** 1536-well and low volume 384-well microplates are shorter than standard-height plates, and **can** be processed in the Bio-Stack. These plates have a minimum height of 0.400" (10.16 mm).

The maximum rim height for plates with an overall height that is less than 0.450" (11.43 mm) is 0.100" (2.54 mm).

To run plates shorter than 0.565" (14.35 mm), you will need Bio-Stack basecode software version 1.25.1 or greater installed in the Bio-Stack.

❖ **Half-height plates:** Some half-height plates may require Bio-Stack basecode version 1.27.1 or greater, as well as reconfiguration of the Bio-Stack. One microplate known to require this reconfiguration is MJ Research's *Hard-Shell* 384-well PCR plate. See **Appendix C, Reconfiguration of the Bio-Stack** for more information.

- The microplates must “nest” or stack easily with each other. Some brands or models of plates that have ribs or other small, sharp edges on their base may not stack easily, and may “catch” when moving down the stack.

❖ Plastic “flash” (burrs and extra plastic) on the edges of plates, and strip plates that are not as rigid or flat, may also cause problems.

Perform the following simple test to determine whether a particular brand of plates will nest easily:

- Stack one plate on top of another, then check to see if the top plate is slightly (1 mm or 1/16”) off to the side or front-to-back. If this is the case, the plates may “catch” when moving down the stack.
- If you will be attaching barcode labels to microplates for use with the Bio-Stack's **optional barcode scanner**, use plates with flat, vertical sidewalls so that the labels will lie flat upon the surface (see **Appendix B, Bio-Stack Barcode Scanner**).

## Load the Microplates into the Input Stack



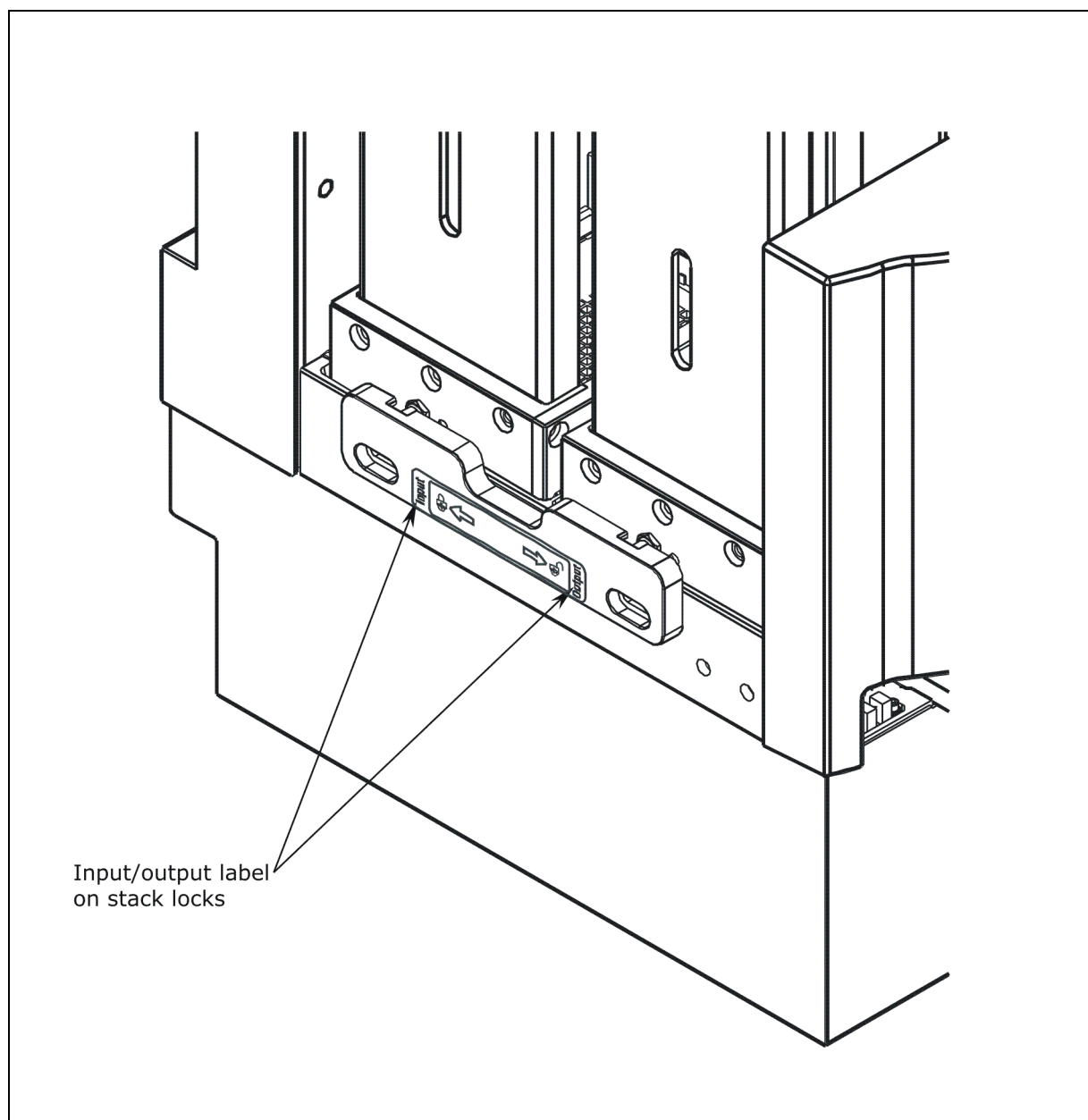
**Important!** Ensure that when the microplates are stacked, the wells are not overfilled with fluid. If the wells are overfilled, the plates may stick together due to suction, and they will not separate for processing.

Before starting a program with the Bio-Stack™, load all of the microplates you plan to process into the **input stack**.

❖ You can load up to 30 of the standard-height 96- and 384-well plates or at least 40 of the shorter profile plates.

You can designate either one of the stacks as the input stack, since, mechanically, they are identical. However, whichever one you choose should be placed onto the Bio-Stack in the **input stack position** (rear), as indicated on the labels attached to both stack locks (see **Figure 50** on the next page).

A **plate-stacking pedestal** (PN 7312083) is included in your Bio-Stack package contents for ease in loading and unloading the plates, however, you may also stack the plates without using the pedestal.



**Figure 50:** Close-Up View of the Input/Output Label on the Stack Lock

### ***Load the Plates Using the Plate-Stacking Pedestal***

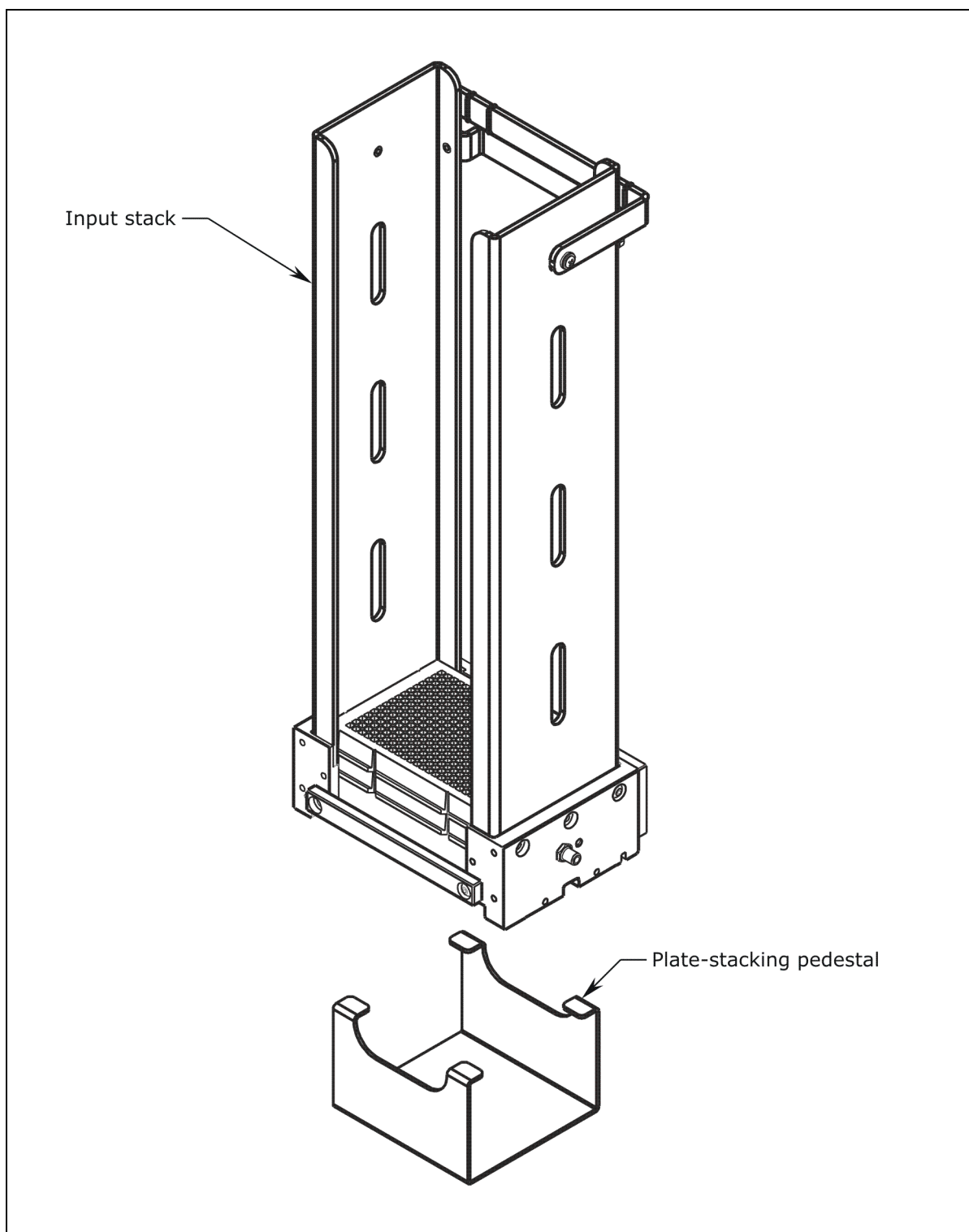
❖ If you are loading 30 of the standard-height 96-/384-well plates or 40 of the shorter profile plates into the input stack while using the pedestal, the last couple of plates will be resting above the top of the input stack. This should not be a problem, since 1) the plates should be stackable, and 2) when you lift the input stack off the pedestal, the complete stack is lowered down onto the dogs.

1. Place the pedestal upright (legs up) on a flat surface.
2. Unlock the stack locks on the sides of the Bio-Stack™ and lift out the input stack (see **Figure 50** on the previous page).
3. Place the input stack over the top of the pedestal, and lower it until the stack completely covers the pedestal and is resting on the surface (see **Figure 51** on the next page).
4. Taking one or more microplates, lower them from the top of the stack down to the bottom, resting the bottom plate on the pedestal legs.  
As you are lowering the plates, it is recommended that your hand/arm be on the opposite side of the stabilizing bracket located at the top of the stack.
5. After you have loaded all of the plates that you plan to process, gently lift the input stack off the pedestal. The stack of plates should lower smoothly onto the stack dogs.
6. Lower the input stack back into position on the Bio-Stack and close the stack locks.

### ***Load the Plates without the Plate-Stacking Pedestal***

BioTek recommends that you perform the following instructions using empty microplates first, until you are comfortable with the process of loading and unloading the plates into the stacks.

1. Unlock the stack locks on the sides of the Bio-Stack (see **Figure 50** on the previous page). Lift out the input stack and place the stack on a flat surface.
2. Taking one or more plates, lower them from the top of the stack down to the bottom, resting the bottom plate on the two dogs at the side of the stack.
3. As you are lowering the plates, it is recommended that your hand/arm be on the opposite side of the stabilizing bracket located at the top of the stack. It is also recommended that you not touch the bottoms of the plates.
4. When you have finished loading all of the plates that you plan to process, lower the input stack back into position on the Bio-Stack and close the stack locks.



**Figure 51:** Pedestal for Loading/Unloading Plates in the Stacks





## Operate the Bio-Stack™ with the PowerWave™ or Synergy™ Readers



**Warning!** Keep your hands away from the claw/gripper and carrier while the Bio-Stack is being powered up. The carrier and claw/gripper move quickly during the homing sequence.



**Important!** If you are using half-height plates and the Bio-Stack is passing multiple plates at once from the input stack to the Bio-Stack carrier, the instrument may need to be reconfigured to accommodate your microplates. Refer to **Appendix C, Reconfiguration of the Bio-Stack**, for more information.

During operation of the Bio-Stack with the PowerWave/XS or Synergy HT/Synergy 2/Synergy 4 readers, the **Bio-Stack™ PC Control Software** controls all functionality of the Bio-Stack™ and runs **Gen5™** or **KC4™** software in the background to control the PowerWave/XS or Synergy HT/Synergy 2/Synergy 4.

- ❖ Gen5 is required for the Synergy 2 and Synergy 4 readers (KC4 does not support the Synergy 2/Synergy 4).

When operating the Bio-Stack with the reader, you will run Gen5 or KC4 as a stand-alone application

- *initially*, when creating KC4 protocols or Gen5 protocols and possibly Gen5 experiments, and
- *later*, when reviewing plate results, or manually exporting results.

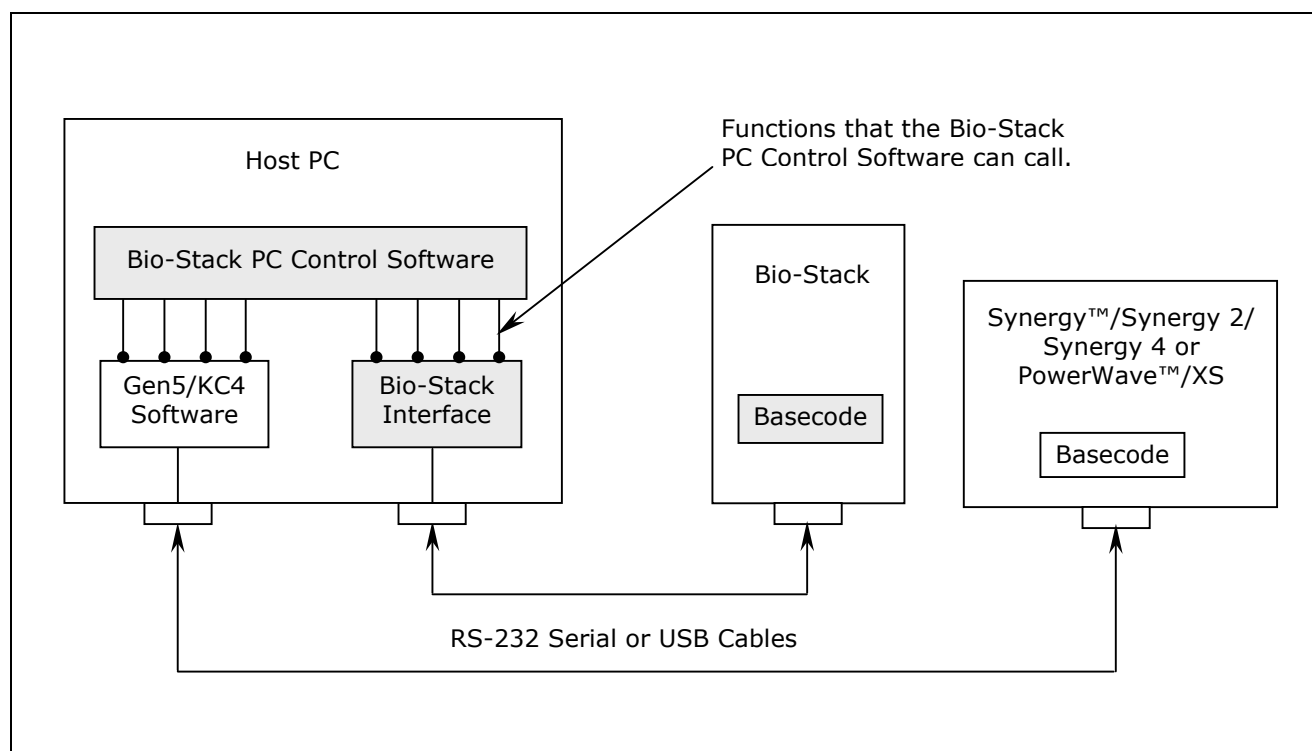
However, during the actual processing of plates, the Bio-Stack PC Control Software is your primary operating software and it automatically runs Gen5 or KC4 in OLE mode to send serial commands to the reader, while sending its own set of serial commands to the Bio-Stack to control plate transfers.

- ❖ You may also create Gen5 *experiments* in the Bio-Stack PC Control Software, however, *protocols* must be predefined in Gen5.
- ❖ When the Bio-Stack PC Control Software is running Gen5 experiments, it is *not* recommended that you also run Gen5 in standalone mode in order to modify or delete the experiments.
- ❖ When the Bio-Stack PC Control Software first initiates the KC4 software as an automatic background task, you will be able to see the KC4 application running, but it will be as if KC4 is running in “read-only” mode, since you will not be able to modify anything during that sequence of the program. Also, you should not modify any reader protocol while that protocol may be in-process under the Bio-Stack operation.

**Figure 52** below shows the relationship between the PC and its software (i.e., Bio-Stack™ PC Control Software and Gen5™ or KC4™) and the Bio-Stack™ and the microplate readers. The Bio-Stack PC Control Software sends the necessary RS-232 serial commands to control the physical plate transfers. To control the reader, the PC software “calls” various Gen5 or KC4 functions running in the background.

For a complete description of the Bio-Stack PC Control Software and its operation, please refer to its online Help system by selecting **Help > Help Topics** from the main menu. Refer also to the Help system for complete instructions for using the **Bio-Stack barcode scanner**.

- ❖ The Bio-Stack PC Control Software is primarily in control of the user interface, except in the case of processing errors that Gen5 or KC4 catch.
- ❖ If you have *both* Gen5 and KC4 applications *and* two readers connected to a PC, you may run Gen5 in stand-alone mode to control one reader, at the same time that the Bio-Stack PC Control Software uses KC4 to control another reader.
- ❖ When referring to the software configuration illustrated in **Figure 52** below, remember that KC4 does not support the Synergy™ 2/Synergy™ 4.



**Figure 52:** Bio-Stack PC Control Software Architecture

---

## Operate the Bio-Stack™ with the Precision™/XS



**Warning!** Keep your hands away from the claw/gripper and carrier while the Bio-Stack is being powered up. The carrier and claw/gripper move quickly during the homing sequence.



**Important!** If you are using half-height plates and the Bio-Stack is passing multiple plates at once from the input stack to the Bio-Stack carrier, the instrument may need to be reconfigured to accommodate your microplates. Refer to **Appendix C, Reconfiguration of the Bio-Stack**, for more information.

BioTek's **Precision Power™ Software** controls all functions of the Precision™ XS Microplate Sample Processor and Precision™ Microplate Pipetting System, and uses a component of the **Bio-Stack™ PC Control Software** to control all functionality of the Bio-Stack.

Using Precision Power, the operator may configure the Bio-Stack to interface with the desired supply platform stations on the Precision, and up to two Bio-Stacks may be simultaneously used with a Precision for high throughput plate processing.

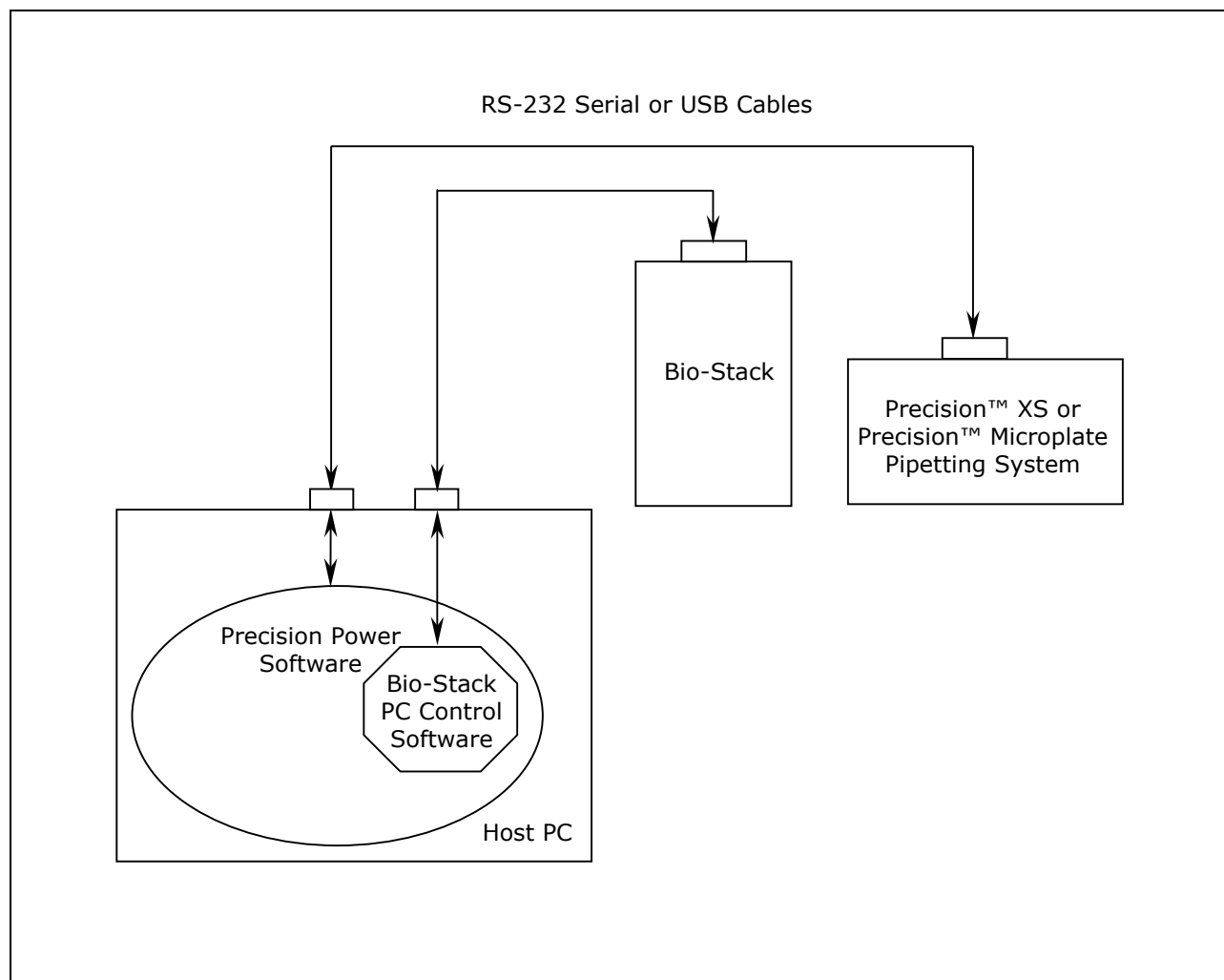
**Figure 53** on the next page shows the relationship between the PC and its software (i.e., Precision Power) and the Bio-Stack and a Precision.

**Figure 54** on page 173 illustrates the same relationship with two Bio-Stacks.

For a complete description of the Precision Power software and its operation, please refer to the Precision Power User's Guide or the online Help system by selecting **Help > Help Topics** from the main menu. Refer also to the Help system for complete instructions for using the **Bio-Stack barcode scanner**.

In **Figure 53** below, the Precision Power™ software uses

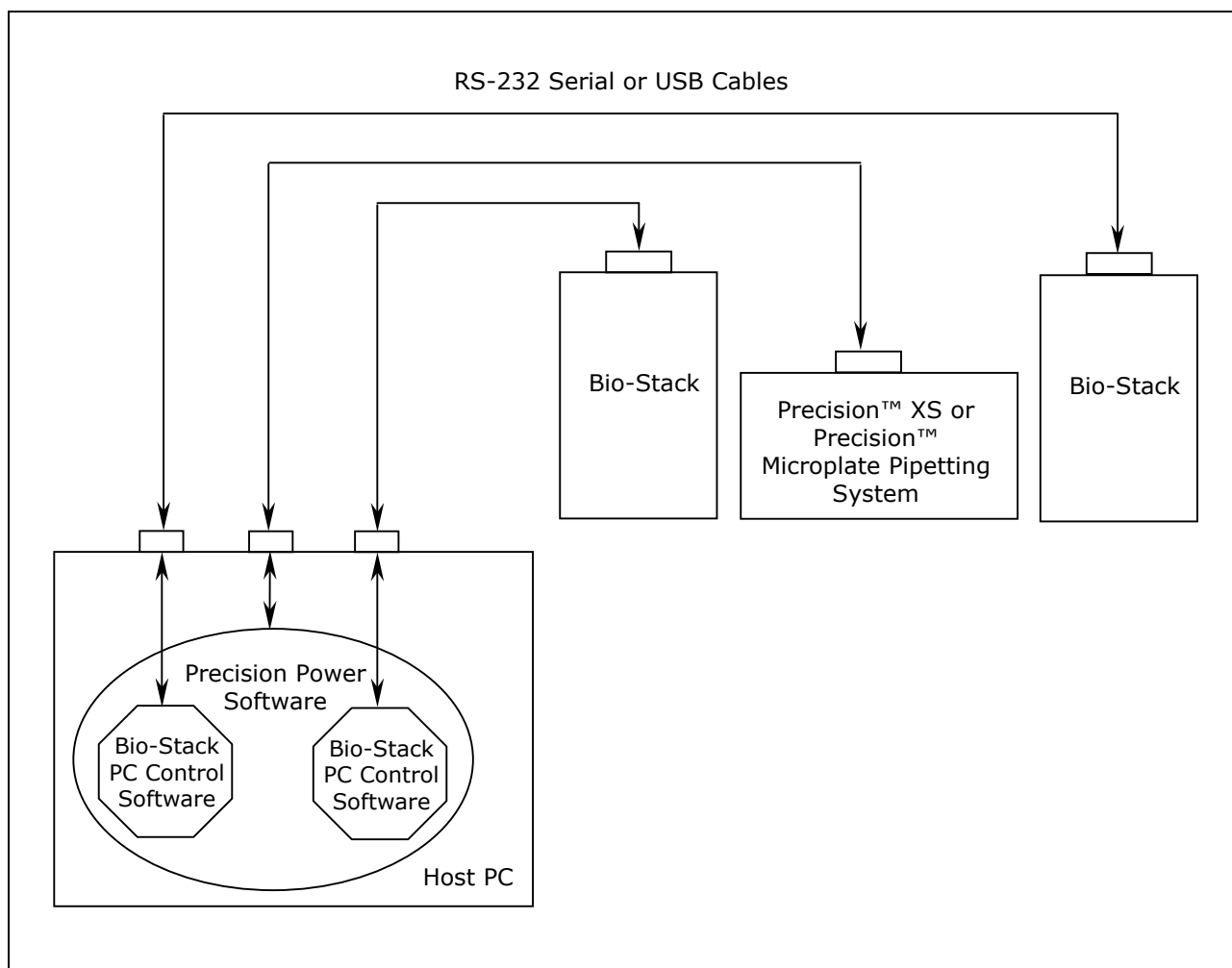
- one serial or USB port to control the Bio-Stack™ instrument plate transfers (via a component of the Bio-Stack™ PC Control Software); and
- one serial port to control all functionality of the interfacing instrument.



**Figure 53:** Bio-Stack/Precision Power Software Architecture (with One Bio-Stack)

In **Figure 54** below, the Precision Power™ software uses

- two serial or USB ports to control instrument plate transfers on two Bio-Stack™ instruments (via a component of the Bio-Stack™ PC Control Software); and
- one serial port to control all functions of the interfacing instrument.



**Figure 54:** Bio-Stack/Precision Power Software Architecture (with Two Bio-Stacks)



## Operate the Bio-Stack™ with the µFill™



**Warning!** Keep your hands away from the claw/gripper and carrier while the Bio-Stack is being powered up. The carrier and claw/gripper move quickly during the homing sequence.



**Important!** If you are using half-height plates and the Bio-Stack is passing multiple plates at once from the input stack to the Bio-Stack carrier, the instrument may need to be reconfigured to accommodate your microplates. Refer to **Appendix C, Reconfiguration of the Bio-Stack**, for more information.

The **µFill™ Microplate Dispenser** uses RS-232 serial commands to control the Bio-Stack and displays all Bio-Stack-related information, including error codes.

- ❖ The one exception to this is when the Bio-Stack is first powered up, and is not yet under the control of the µFill. At this point, it will run a series of self-test homing operations. The LED on the Bio-Stack will flash if there is a failure during this sequence. If a failure occurs, you may turn the µFill on, and it will determine the status of the Bio-Stack and display any errors (ensure that the serial cable is connected).

Perform the following steps to power up the µFill and Bio-Stack:

1. Ensure that the Bio-Stack is correctly positioned next to the µFill and that the alignment hardware and serial cable are attached. See **Install the Bio-Stack with the µFill or ELx405**, in **Chapter 3, Installation**.
2. Power up the Bio-Stack first before turning on the µFill. If the claw/gripper is not homed before the µFill is powered up, the Bio-Stack self-test will home the mechanism. Ensure that the claw/gripper has risen to its full height.
3. Power up the µFill. Before performing the self-test, the µFill will attempt to establish communication with the Bio-Stack. If communication is successful, and the Bio-Stack has passed its own self-test, the µFill will proceed with its self-test. If the Bio-Stack has failed the self-test, or communication could not be established, then the dispenser's self-test will fail, and the instrument will beep and display an error code (e.g., **B-8306**). Refer to **Chapter 7, Troubleshooting and Error Codes** for a listing of all error codes associated with the Bio-Stack that may be displayed on the µFill.
4. Once the Bio-Stack has been turned on, its LED will remain constantly on if the instrument is operating correctly. If the LED is off or flashing, an error has occurred. If the µFill is on, running, and properly connected, an error code may be displayed.

- ❖ By default, the  $\mu$ Fill™ is configured as a stand-alone instrument. The  $\mu$ Fill must be configured for Bio-Stack™ operation by using the Bio-Stack's **Configuration** utility. See **Bio-Stack™ Utilities Screen** on page 177.

## Startup Screens

- ❖ The screens listed below and on the following pages appear as menu selections in the bottom (second line) of the keypad LCD of the  $\mu$ Fill™. To make a selection, press the SoftKey below the menu function. To move to a previous menu, press the **Previous Screen** key. Refer to your  $\mu$ Fill Operator's Manual for a detailed illustration of the keypad and description of its functions. The  $\mu$ Fill Manual currently contains instructions for running the  $\mu$ Fill as a stand-alone instrument, whereas this manual describes the Bio-Stack™ specific operation.

When the  $\mu$ Fill is powered up, the following two screens are displayed, and the microplate carrier is homed:

```
P O W E R U P      S E Q U E N C E      V X . X X
I N I T I A L I Z I N G . . .
```

```
U F I L L      R E A G E N T      D I S P E N S E R
S Y S T E M      S E L F - T E S T . . .
```

The above screen is displayed while communication with the Bio-Stack is being established and the self-test has begun. If no communication occurs after 30 seconds, a timeout results and error **B-8306** is displayed. Press **ENTER** to display the Main Menu. If the self-test and homing sequence is successful, the  $\mu$ Fill main menu screen appears:

```
U F I L L      R E A G E N T      D I S P E N S E R
R U N          D E F I N E          M A I N T          U T I L
```

- ❖ If the communication fails, the  $\mu$ Fill software will display its Main Menu, but will not perform its homing sequence. This is to prevent collision of the  $\mu$ Fill carrier with the claw/gripper. Hence, once the serial communication problems are corrected, it is recommended that the  $\mu$ Fill be repowered so it can run its own homing sequence.



## Bio-Stack™ Utilities Screen

To access the Bio-Stack Utilities screen and configure the µFill™ for proper Bio-Stack operation, follow the screens below:

- Select **UTIL** from the main menu screen. The Select Utility screen will appear:

```

S E L E C T   U T I L I T Y :
T E S T S       S E T U P               A U T O P R M
  
```

- Select **SETUP**. The Edit Setup screen will appear:

```

E D I T   S E T U P :
L A N G           M A N       B I O S T A C K
  
```

- Select **BIOSTACK**. The Bio-Stack Utilities screen will appear with the three utilities as described below:

```

B I O S T A C K   U T I L I T I E S :
C O N F           A L I G N       V E R I F Y
  
```

1. **CONF:** The Configuration utility is used to describe the Bio-Stack operating mode.
2. **ALIGN:** The instrument Alignment utility is used to align the claw/gripper of the Bio-Stack to the carrier of the µFill (i.e., the z-height alignment).
3. **VERIFY:** The Verify utility is used to verify the z-height alignment.

## Configuration Utility

- Select **CONF** first. The Configuration screen gives you the options of running the  $\mu$ Fill™ either as a stand-alone instrument or with the Bio-Stack™. The default mode is to run the  $\mu$ Fill by itself (i.e., in Manual mode).

O P E R A T I N G	M O D E :	M A N
M A N U A L	B I O S T A C K	

MAN in the upper right corner indicates the instrument is set for manual operation. If **MANUAL** is selected, the Bio-Stack Utilities screen will be re-displayed.

- Select **BIOSTACK** to indicate that the  $\mu$ Fill will be operated with the Bio-Stack. (The next time this screen is displayed, **BIO** will appear in the upper right corner.) The Re-Stack screen will then appear:

R E - S T A C K ?	Y E S
Y E S	N O

Use this screen to indicate whether plates residing in the output stack at the end of a run shall be automatically re-stacked into the input stack.

- Select **YES** or **NO**. After a brief pause, the Bio-Stack Utilities screen will appear.

## Instrument Alignment Utility

- ❖ Ensure that the instrument alignment plate has already been mounted (per the instructions in **Chapter 3, Installation**) and the x and y positioning of the Bio-Stack™ to the µFill™ has been performed before proceeding with the z-height (vertical) alignment.

To align the z-height of the claw/gripper on the Bio-Stack with the carrier of the µFill, select **ALIGN** on the Bio-Stack Utilities screen. The Alignment screen will appear:

```

A L I G N M E N T      U T I L I T Y :
H O M E      C - P O S      S A V E

```

The instrument's Alignment Utility has three selections:

1. **HOME:** This allows you to home all axes for either the Bio-Stack or the µFill.
2. **C-POS:** This allows you to “step” the claw/gripper down to the µFill's carrier to find the proper interface position (the z-height).
3. **SAVE:** When the interface position has been found, the Save function is used to tell the Bio-Stack to save the z-height for proper plate seating.

### Home Selection

- ◆ Select **HOME**. The following screen will appear with the two options of homing all axes for either the µFill or for the Bio-Stack. Select **BIOSTACK** to home all its axes, then press the **PREVIOUS SCREEN** key on the keypad to return to the Alignment Utility Screen.

```

H O M E      A L L :
u F i l l      B I O S T A C K

```

### C-POS Selection

- ◆ Select **C-POS**. At this point, if the claw is not fully homed, it will rise to its full height (its home position) and the gripper will spread out to its full width. The Find Claw Interface Pos screen will then appear:

F	I	N	D	C	L	A	W	I	N	T	E	R	F	A	C	E	P	O	S	:
-	/	+					+ 1													

- ◆ The goal of this utility is to align the claw so that the gripper fingers are resting approximately 50-60 thousandths of an inch below the plate bottom or carrier surface. See **Figure 34** in **Chapter 3, Installation**, for an illustration of proper alignment of the claw/gripper with the plate.

To help in this activity, place a microplate on the carrier of the  $\mu$ Fill™ (optional). To avoid collision of the gripper with the plate or carrier on the  $\mu$ Fill, press the **+20** key first to see how far that goes, before pressing the **+400** key. Use the **+1/+20/+400** softkeys to *gradually* lower the claw/gripper to the precise location (i.e., .05" or .06" below the plate bottom or carrier surface).

❖ The C-POS measurement-to-inch ratios are: 1 = 0.001875", 20 = 0.0375", and 400 = 0.75".

- ◆ If you have moved the gripper too far below the carrier, press the **-/+** key to change direction.

### Save Selection

- ◆ If you are satisfied with the alignment, press the **PREVIOUS SCREEN** key to return to the Alignment screen and select **SAVE**. At the following screen, select **YES**, and then press the **ENTER** key.

O	K	T	O	S	A	V	E	L	O	C	A	T	I	O	N	?	Y	E	S
		Y	E	S				N	O										

At this point, the claw will home, the grippers will close, and the setting will be saved in the flash memory of the Bio-Stack™. After a brief wait, the Bio-Stack Utilities screen will appear.

## Verify Utility

- ❖ Remove the microplate (if one was used) from the µFill™ carrier before proceeding with the Verify sequence below, otherwise the plate that the claw gripper retrieves from the input stack to place on the carrier will collide with the plate in the carrier! Also, ensure that there is at least one plate in the input stack.

- At the Utilities screen, select **VERIFY**. The following screen will appear:

```
P L A C E      P L A T E      I N      I N - S T A C K
< E N T E R >   K E Y      T O      C O N T I N U E
```

- Place a plate in the input stack.
- Press **ENTER**. The claw will pick up a plate drawn from the input stack and place it onto the µFill carrier, with several delays during the place sequence. Watch to ensure that the gripper picks up the plate and gently sets it down in the carrier.

Two possible problems can occur at this point:

1. **The gripper fingers are too low**, so that after the gripper has released the plate, it will rise an inadequate distance before closing the gripper, thus catching the top of the plate. An error code will be displayed in this instance.
2. **The gripper fingers are too high**, in which case the gripper will drop the plate a little further than it should, possibly causing fluid in the microwells to spill.

If no error codes were displayed, the following screen will appear:

```
V E R I F Y      P L A T E      P L A C E M E N T
< E N T E R >   K E Y      T O      C O N T I N U E
```

- Press **ENTER**. The claw will pick up the plate and place it on the Bio-Stack™ carrier for transfer to the output stack. Ensure that the claw performs this correctly. After a brief pause, the Utilities screen will appear. Press the Main Menu key to return to the µFill main menu screen.

- ❖ Moving the Bio-Stack™, inserting a new µFill™ Dispenser, etc. can potentially change the alignment. If this is the case, you may have to repeat the x, y, and z alignment steps in **Chapter 3, Installation**.

## Running Programs

To run Dispense and Link programs, refer to your µFill Operator's Manual for instructions.

The following sections contain examples of screens that will appear on the µFill display during sample Dispense and Link programs when the µFill is operated with the Bio-Stack, in contrast to screens that appear on the µFill when it is used as a stand-alone.

- ❖ The Prime and Maintenance programs can only be run on the µFill when used without the Bio-Stack. You can run Dispense and Link programs whether the µFill is operated with or without the Bio-Stack.

### Starting Dispense/Link Programs

After indicating that you want to run a program and have selected the program type, one of the following screens is displayed. Pressing the **START** or the **ENTER** key will initiate the program.

With the Bio-Stack:

```
P L A C E      P L A T E S      O N      B I O S T A C K
P R E S S      < S T A R T >      K E Y
```

Without the Bio-Stack:

```
I N S E R T      M I C R O P L A T E
P R E S S      < S T A R T >      K E Y
```

### In-Process Programs

While a program is being processed, you will see one of the following screens. When the Dispense/Link Program Running screen is displayed, you may press the **STOP** key, if necessary, to stop the execution of the program.

With the Bio-Stack™:

P	L	A	T	E	#	#	R	U	N	N	I	N	G	.	.	.			
P	R	E	S	S	<	S	T	O	P	>	K	E	Y	T	O	Q	U	I	T

Without the Bio-Stack:

D	I	S	P	E	N	S	E	P	R	O	G	R	A	M	R	U	N	N	I	N	G
P	R	E	S	S	<	S	T	O	P	>	K	E	Y	T	O	Q	U	I	T		

L	I	N	K	P	R	O	G	R	A	M	R	U	N	N	I	N	G		
P	R	E	S	S	<	S	T	O	P	>	K	E	Y	T	O	Q	U	I	T

In either instance, if you press the **STOP** key while a plate is being processed on the µFill™, the µFill will abort the program and the Home All Axes screen will appear, as described in the **Abort Actions** section on the following page. Although the plate currently being processed will be aborted, the sequence described in the **Abort Actions** section not only provides a way to home all axes, but, if the Bio-Stack™ is being used, allows the remainder of the plates in the Bio-Stack to be run.

If you are using the Bio-Stack and you press the **STOP** key while the plate is being transferred to or from the Bio-Stack, the Bio-Stack will complete the transfer and the system will pause. The Abort/Proceed screen will appear:

A	B	O	R	T	P	R	O	C	E	E	D
---	---	---	---	---	---	---	---	---	---	---	---

This pause gives you the chance to add more plates to, or remove some plates from the Bio-Stack, without aborting the currently processing plate. Select **PROCEED** to resume program operation, or **ABORT** to abort the whole run.

### **Completing the Program**

At the completion of the selected program, if you are running the µFill with the Bio-Stack and have selected the Re-Stack option (see page 178), you will see the following display after the program has been run for all plates:

```

R E - S T A C K I N G
P L E A S E   W A I T

```

After 1) re-stacking is done, or, 2) if no re-stack was requested, or, 3) if you are running without the Bio-Stack™, one of the following screens will be displayed, once the program is complete:

With the Bio-Stack:

```

# #   P L A T E S   C O M P L E T E
      N E W       R E P E A T

```

Without the Bio-Stack:

```

D I S P   P R O G R A M   C O M P L E T E .
      N E W       R E P E A T

```

```

L I N K   P R O G R A M   C O M P L E T E .
      N E W       R E P E A T

```

### ***Abort Actions***

When the **STOP** key is pressed during execution of the Dispense or Link programs, the program immediately halts and the following screen is displayed:

With the Bio-Stack:

```

H O M E   A L L   A X I S ?               Y E S
      Y E S           N O

```

Without the Bio-Stack:



```
P R E S S   < E N T E R >   K E Y
T O   H O M E   A L L   A X I S
```

When you select **YES** or press **ENTER**, all motor axes will home while displaying the following message:

With the Bio-Stack™:

```
R U N N I N G   S T O P   P R O T O C O L
```

Without the Bio-Stack:

```
R U N N I N G   S T O P   P R O T O C O L
P L E A S E   W A I T . . .
```

At this point, if operating with the Bio-Stack, you have the option of homing the Bio-Stack and running the remainder of the plates:

```
H O M E   T H E   B I O - S T A C K ?   Y E S
Y E S           N O
```

```
R U N   R E S T   O F   P L A T E S ?   Y E S
Y E S           N O
```

Ensure that you remove the aborted plate from the µFill™ before selecting **YES**. The program will then continue to run and will display the count of the plate in process (-1 for the aborted plate).



---

## Operate the Bio-Stack™ with the ELx405™ (Instrument Control)



**Warning!** Keep your hands away from the claw/gripper and carrier while the Bio-Stack is being powered up. The carrier and claw/gripper move quickly during the homing sequence.

The **ELx405 Microplate Washer** (all models except the Magna) uses RS-232 serial commands to control the Bio-Stack and it displays all Bio-Stack related information, including error codes.

❖ The one exception to this is when the Bio-Stack is first powered up, and is not yet under the control of the washer. At this point, it will run a series of self-test homing operations. The LED on the Bio-Stack will flash if there is a failure during this sequence. If a failure occurs, you may turn the ELx405 on, and the washer will determine the status of the Bio-Stack and display any errors (ensure that the serial cable is connected).

Perform the following steps to power up the ELx405 and Bio-Stack:

1. Ensure that the Bio-Stack is correctly positioned next to the washer and that the alignment hardware and serial cable are attached. See **Install the Bio-Stack with the  $\mu$ Fill or ELx405** in **Chapter 3, Installation**.
2. Power up the Bio-Stack first before turning on the ELx405. If the claw/gripper is not homed before the ELx405 is powered up, the Bio-Stack self-test will home the mechanism. Ensure that the claw/gripper has risen to its full height.
3. Power up the ELx405. Before performing the self-test, the washer will attempt to establish communication with the Bio-Stack. If communication is successful, and the Bio-Stack has passed its own self-test, the washer will proceed with its self-test. If the Bio-Stack has failed the self-test, or communication could not be established, then the ELx405 self-test will fail, and the washer will beep and display an error code. Refer to **Chapter 7, Troubleshooting and Error Codes**, for a listing of all error codes associated with the Bio-Stack that are displayed on the ELx405.
4. Once the Bio-Stack has been turned on, its LED will remain constantly on if the instrument is operating correctly. If the LED is off or flashing, an error has occurred. If the ELx405 is on, running, and properly connected, an error code may be displayed.

❖ By default, the ELx405 is configured for operation as a stand-alone instrument. The washer must be configured for Bio-Stack operation by using the Bio-Stack's **Configuration** utility. See **Bio-Stack™ Utilities Screen** on page 189.

## Startup Screens

- ❖ The screens listed below and on the following pages appear as menu selections in the bottom (second line) of the keypad LCD on the ELx405™. To make a selection, press the SoftKey below the menu function. To move to a previous menu, press the **Previous Screen** key. Refer to your ELx405 Operator's Manual for a detailed illustration of the keypad and description of its functions. The ELx405 Manual contains instructions for running the washer as a stand-alone instrument, whereas this manual describes the Bio-Stack™ specific operation.

When the ELx405 is powered up, the following two screens are displayed, and the carrier is homed:

```
P O W E R U P   S E Q U E N C E   V X . X X
I N I T I A L I Z I N G . . .
```

```
B I O - T E K   E L x 4 0 5
S E L F - T E S T . . . . .
```

The above screen is displayed while communication with the Bio-Stack is being established and the self-test has begun. If no communication occurs after 30 seconds, a timeout will result and error **B-8306** is displayed. Press **ENTER** to display the main menu. If the self-test and homing sequence is successful, the ELx405 main menu screen will appear:

```
B I O - T E K   E L x 4 0 5
R U N           D E F I N E       M A I N T       U T I L
```

- ❖ If the communication fails, the ELx405 software will display its Main Menu, but will not perform its homing sequence. This is to prevent the ELx405 carrier from colliding with the claw/gripper. Therefore, it is recommended that once the serial communication problems are corrected, that the ELx405 be turned off/on so it can run its own homing sequence.

## Bio-Stack™ Utilities Screen

To access the Bio-Stack Utilities screen and configure the ELx405™ for proper Bio-Stack operation, follow the screens below:

- Select **UTIL** from the main menu screen. The Select Utility screen will appear:

```

S E L E C T   U T I L I T Y :
T E S T S   S E T U P               A U T O P R M
  
```

- Select **SETUP**.

```

E D I T   S E T U P :
R S 2 3 2   S E N S O R   A D J S T   * M O R E
  
```

- Select **\*MORE**:

```

E D I T   S E T U P :
P A R K       B I O S T A C K           * M O R E
  
```

- Select **BIOSTACK**.

```

B I O S T A C K   U T I L I T I E S :
C O N F           A L I G N           V E R I F Y
  
```

The Bio-Stack Utilities screen will appear with the three utilities as described below:

1. **CONF:** The Configuration utility is used to describe the Bio-Stack operating mode.
2. **ALIGN:** The instrument Alignment utility is used to align the claw/gripper of the Bio-Stack to the carrier of the ELx405 (i.e., the z-height alignment).
3. **VERIFY:** The Verify utility is used to verify the z-height alignment.

## Configuration Utility

- Select **CONF** first. The Configuration screen provides the options of running the ELx405™ either as a stand-alone instrument or with the Bio-Stack™. The default mode is to run the ELx405 by itself (i.e., in Manual mode).

O P E R A T I N G	M O D E :	M A N
M A N U A L	B I O S T A C K	

**MAN** in the upper right corner indicates the instrument is set for manual operation. If **MANUAL** is selected, the Bio-Stack Utilities screen will be re-displayed.

- Select **BIOSTACK** to indicate that the ELx405 will be operated with the Bio-Stack (the next time this screen is displayed, **BIO** will appear in the upper right corner). The Re-Stack screen will then appear:

R E - S T A C K ?	Y E S
Y E S	N O

The Re-Stack screen indicates whether plates residing in the output stack at the end of a run shall be automatically re-stacked into the input stack.

- Select **YES** or **NO**. After a brief pause, the Bio-Stack Utilities screen will reappear.

## Instrument Alignment Utility

- ❖ Ensure that the instrument alignment plate has already been mounted (per the instructions in **Chapter 3, Installation**) and the x and y positioning of the Bio-Stack™ to the ELx405™ has been performed before proceeding with the z-height (vertical) alignment.

To align the z-height of the claw/gripper on the Bio-Stack with the carrier of the ELx405, select **ALIGN** on the Bio-Stack Utilities screen. The Alignment Utility screen will appear:

```

A L I G N M E N T   U T I L I T Y :
H O M E           C - P O S           S A V E

```

The instrument Alignment Utility has three selections:

1. **HOME:** This allows the operator to home all axes for either the Bio-Stack or the ELx405.
2. **C-POS:** This allows the operator to “step” the claw/gripper down to the ELx405’s carrier to find the proper interface position (the z-height).
3. **SAVE:** When the interface position has been found, the Save function is used to tell the Bio-Stack to save the z-height for proper plate transferring.

### Home Selection

- ◆ Select **HOME**. The following screen will appear with the two options of homing all axes for either the ELx405 or for the Bio-Stack. Select **BIOSTACK** to home all its axes, then press the **PREVIOUS SCREEN** key on the keypad to return to the Alignment Utility screen.

```

H O M E   A L L :
E L x 4 0 5       B I O S T A C K

```

### C-POS Selection

- ◆ Select **C-POS**. At this point, if the claw is not fully homed, it will rise to its full height (its home position) and the gripper will spread out to its full width. The Find Claw Interface Pos screen will then appear:

F	I	N	D	C	L	A	W	I	N	T	E	R	F	A	C	E	P	O	S	:
-	/	+		+	1			+	2	0						+	4	0	0	

- ◆ The goal of this utility is to align the claw so that the gripper fingers are resting approximately 50-60 thousandths of an inch below the plate bottom or carrier surface. See **Figure 34** in **Chapter 3, Installation**, for an illustration of proper alignment of the claw/gripper with the plate.
- ◆ To help in this activity, place a microplate on the carrier of the ELx405™. To avoid collision of the gripper with the plate or carrier on the washer, press the **+20** key first to see how far that goes, before pressing the **+400** key. Use the **+1/+20/+400** softkeys to *gradually* lower the claw/gripper to the precise location (i.e., .05" or .06" below the plate bottom or carrier surface).

❖ The C-POS measurement-to-inch ratios are: 1 = 0.001875", 20 = 0.0375", and 400 = 0.75".

- ◆ If you have moved the gripper too far below the carrier, press the **-/+** key to change direction.

### Save Selection

- ◆ If you are satisfied with the alignment, press the **PREVIOUS SCREEN** key to return to the Alignment screen and select **SAVE**. At the following screen, press **YES**, and then the **ENTER** key.

O	K	T	O	S	A	V	E	L	O	C	A	T	I	O	N	?	Y	E	S
Y	E	S						N	O										

- ◆ At this point, the claw will home, the grippers will close, and the setting is saved in the flash memory of the Bio-Stack™. After a brief wait, the Bio-Stack Utilities screen will appear.



## Verify Utility

- ❖ Remove the microplate (if one was used) from the ELx405™ carrier before proceeding with the Verify sequence below, otherwise the plate that the claw gripper retrieves from the input stack to place on the carrier will collide with the plate in the carrier! Also, ensure that there is at least one plate in the input stack.

- At the Bio-Stack™ Utilities screen, select **VERIFY**. The following screen will appear:

```
P L A C E      P L A T E      I N      I N - S T A C K
< E N T E R >   K E Y      T O      C O N T I N U E
```

- Place a plate in the input stack.
- Press **ENTER**. The claw will pick up a plate drawn from the input stack and place it onto the ELx405 carrier, with several delays during the place sequence. Watch to ensure that the gripper picks up the plate and gently sets it down in the carrier.

Two possible problems can occur at this point:

1. **The gripper fingers are too low**, so that after the gripper has released the plate, it will rise an inadequate distance before closing the gripper, thus catching the top of the plate. An error will be displayed in this instance.
2. **The gripper fingers are too high**, in which case the gripper will drop the plate a little further than it should, possibly causing fluid in the microwells to spill.

If no errors are displayed, the following screen will appear:

```
V E R I F Y      P L A T E      P L A C E M E N T
< E N T E R >   K E Y      T O      C O N T I N U E
```

- Press **ENTER**. The claw will pick up the plate and place it on the Bio-Stack carrier for transfer to the output stack. Ensure that the claw performs this correctly. After a brief pause, the Bio-Stack Utilities screen will appear. Press the Main Menu key to return to the ELx405 main menu screen and the Run, Define, Maint or Util options.

- ❖ Moving the Bio-Stack™, inserting a new ELx405™ washer, etc. can potentially change the alignment. If this is the case, you may have to repeat the x, y, and z alignment steps in **Chapter 3, Installation**.

## Running Programs

To run Wash, Dispense, Aspirate, and Link programs, refer to your ELx405 Operator's Manual for instructions.

The following sections contain sample screens that will appear on the ELx405 display during Wash, Dispense, Aspirate and Link programs when the washer is operated with the Bio-Stack, in contrast to screens that appear on the ELx405 when it is used as a stand-alone.

- ❖ The Prime, Soak, and Maintenance programs can only be run on the ELx405 without the Bio-Stack. You can run ELx405 Wash, Dispense, Aspirate, and Link programs whether the washer is operated with or without the Bio-Stack.

## Starting Programs

After indicating that you want to run a program and have selected the program type, one of the following screens is displayed. Pressing the **START** or the **ENTER** key will initiate the program.

With the Bio-Stack:

```
P L A C E   P L A T E S   O N   B I O S T A C K
A N D   P R E S S   < S T A R T >   K E Y
```

Without the Bio-Stack:

```
P L A C E   P L A T E   I N   C A R R I E R
A N D   P R E S S   < S T A R T >   K E Y
```

## In-Process Programs

While a program is being processed, you will see one of the following screens. When the Wash, Dispense, Aspirate or Link Program Running screen is displayed, you may press the **STOP** key, if necessary, to stop the execution of the program.

With the Bio-Stack™:

```
P L A T E      # #      R U N N I N G . . .
P R E S S      < S T O P >   K E Y      T O      Q U I T
```

Without the Bio-Stack:

```
W A S H      P R O G R A M      R U N N I N G . . .
P R E S S      < S T O P >   K E Y      T O      Q U I T
```

```
D I S P E N S E      P R O G R A M      R U N N I N G
P R E S S      < S T O P >   K E Y      T O      Q U I T
```

```
A S P I R      P R O G R A M      R U N N I N G
P R E S S      < S T O P >   K E Y      T O      Q U I T
```

```
L I N K      P R O G R A M      R U N N I N G
P R E S S      < S T O P >   K E Y      T O      Q U I T
```

In either instance, if you press the **STOP** key while a plate is being processed on the ELx405™, the washer will abort the program and the Home All Axes screen will appear, as described in the **Abort Actions** section on page 197. Although the plate currently being processed will be aborted, the sequence described in the **Abort Actions** section not only provides a way to home all axes, but, if the Bio-Stack is being used, allows the remainder of the plates in the Bio-Stack to be run.

If you are using the Bio-Stack and you press the **STOP** key while the plate is being transferred to or from the Bio-Stack, the Bio-Stack will complete the transfer and the system will pause. The Abort Continue screen will appear:

```
A B O R T      C O N T I N U E
```

This pause gives you the chance to add more plates to, and remove some plates from, the Bio-Stack™ without aborting the currently processing plate. Select **CONTINUE** to resume program operation, or **ABORT** to abort the whole run.

### ***Completing the Program***

At the completion of the selected program, if you are running the ELx405™ with the Bio-Stack and have selected the Re-Stack option (see page 190), you will see the following display after the program has been run for all plates:

```
R E - S T A C K I N G
P L E A S E   W A I T
```

After 1) re-stacking is done, or, 2) if no re-stack was requested, or, 3) if you are running without the Bio-Stack, one of the following screens will be displayed, once the program is complete:

With the Bio-Stack:

```
# #   P L A T E S   C O M P L E T E
P R E S S   < E N T E R >   K E Y
```

Without the Bio-Stack:

```
W A S H   P R O G R A M   C O M P L E T E
P R E S S   < E N T E R >   K E Y
```

```
D I S P   P R O G R A M   C O M P L E T E
P R E S S   < E N T E R >   K E Y
```

```
A S P I R   P R O G R A M   C O M P L E T E
P R E S S   < E N T E R >   K E Y
```

```

L I N K   P R O G R A M   C O M P L E T E
P R E S S   < E N T E R >   K E Y

```

### ***Abort Actions***

When the **STOP** key is pressed during execution of the Wash, Aspirate, Dispense or Link programs, the program immediately halts and the following screen is displayed:

With the Bio-Stack™:

```

H O M E   A L L   A X I S ?                               Y E S
Y E S           N O

```

Without the Bio-Stack:

```

P R E S S   < E N T E R >   K E Y
T O   H O M E   A L L   A X I S

```

When you select **YES** or press **ENTER**, all motor axes will home while displaying one of the following messages:

With the Bio-Stack:

```

R U N N I N G   S T O P   P R O T O C O L

```

Without the Bio-Stack:

```

R U N N I N G   S T O P   P R O T O C O L
P L E A S E   W A I T . . .

```

At this point, if operating with the Bio-Stack™, you have the option of homing the Bio-Stack and running the remainder of the plates:

H O M E	T H E	B I O - S T A C K ?	Y E S
Y E S	N O		

R U N	R E S T	O F	P L A T E S ?	Y E S
Y E S	N O			

Ensure that you remove the aborted plate from the ELx405™ before selecting **YES**. The program will then continue to run and will display the count of the plate in process (-1 for the aborted plate).

---

## Operate the Bio-Stack™ with the ELx405™ (PC Control)



**Warning!** Keep your hands away from the claw/gripper and carrier while the Bio-Stack is being powered up. The carrier and claw/gripper move quickly during the homing sequence.

BioTek's **Liquid Handling Control™ (LHC) Software** uses the **ELx405™ Interface Software** to control all functions of the ELx405, and uses a component of the **Bio-Stack™ PC Control Software** to control all functionality of the Bio-Stack.

Using LHC, the operator may configure the Bio-Stack to interface with the microplate carrier on the ELx405, and up to two Bio-Stacks may be simultaneously used with two ELx405 washers for high throughput plate processing.

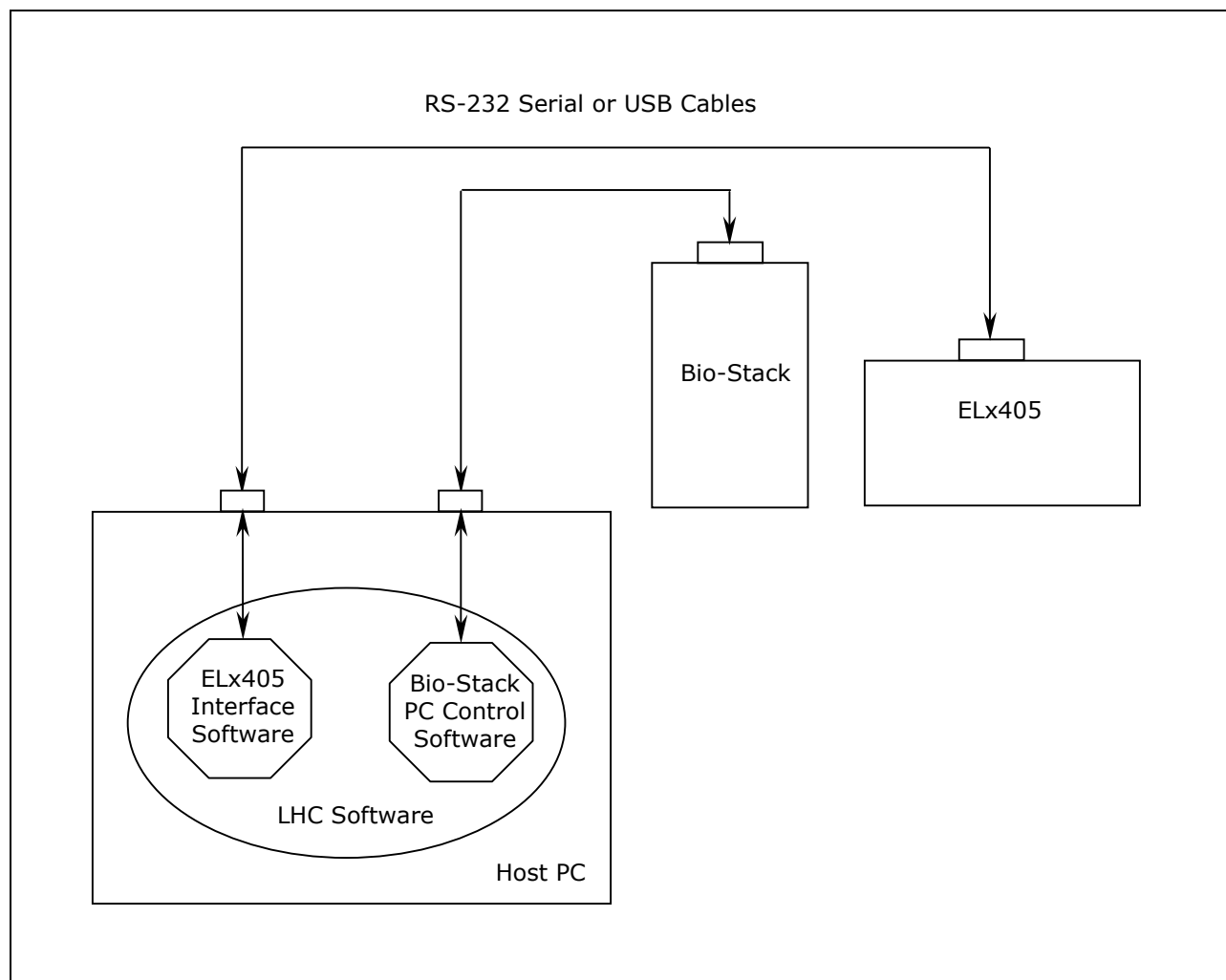
**Figure 55** on the next page shows the relationship between the PC and its software (i.e., LHC) and the Bio-Stack and an ELx405.

**Figure 56** on page 201 illustrates the same relationship with two Bio-Stacks and two ELx405 washers.

For a complete description of the LHC Software and its operation, please refer to the **Liquid Handling Control Software Installation Guide** or the online Help system by selecting **Help > About Liquid Handling Control** from the software's main menu.

In **Figure 55** below, the LHC™ software uses

- one serial or USB port to control the Bio-Stack™ instrument plate transfers (via a component of the Bio-Stack™ PC Control Software); and
- one serial port to control all functionality of the ELx405 washer (via the ELx405™ Interface Software).

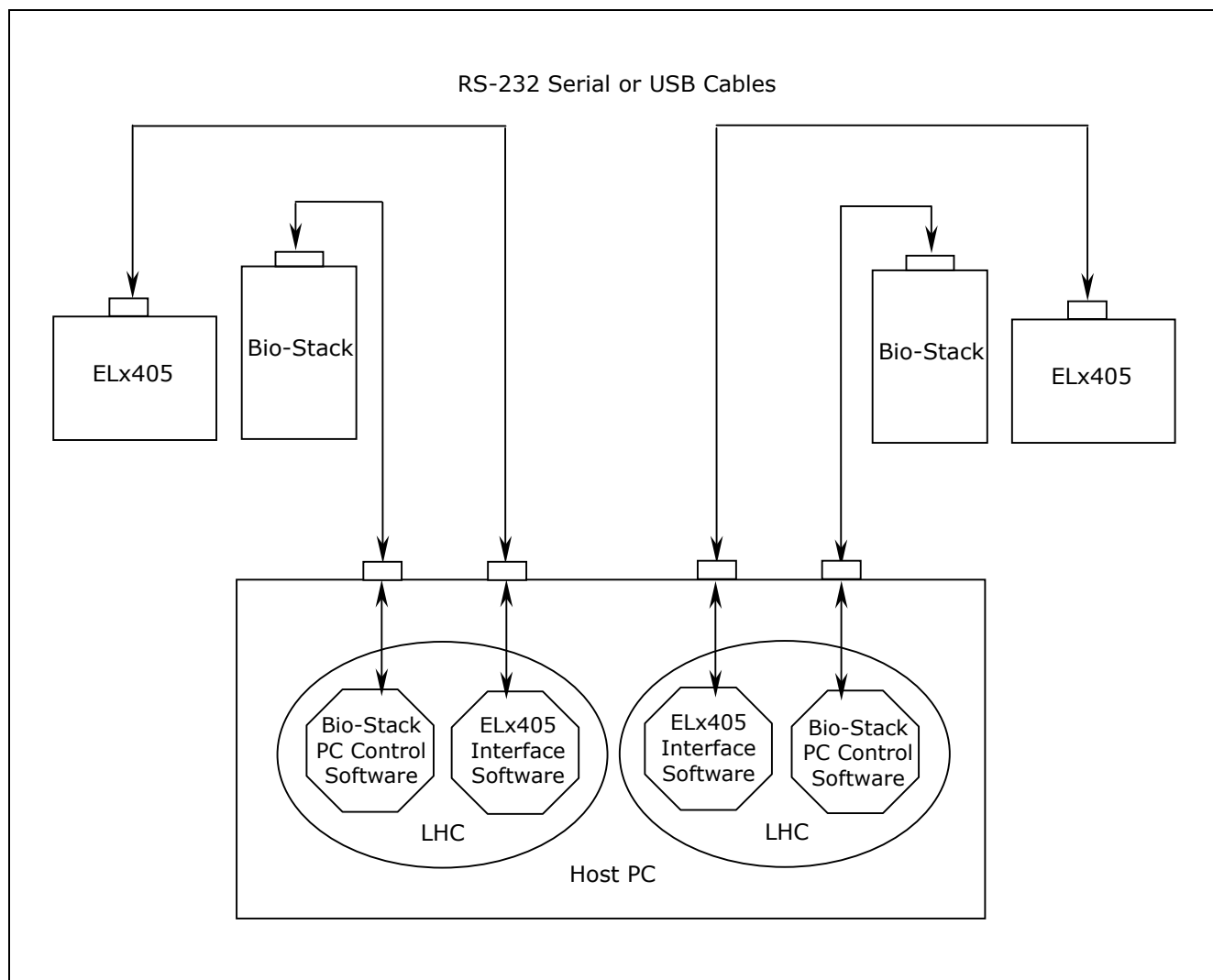


**Figure 55:** Bio-Stack/LHC Architecture (with One Bio-Stack and One Washer)



In **Figure 56** below, the LHC™ software uses




- two serial or USB ports to control instrument plate transfers on two Bio-Stack™ instruments (via a component of the Bio-Stack™ PC Control Software); and
- two serial ports to control all functions of the two ELx405 washers (via the ELx405™ Interface Software).



**Figure 56:** Bio-Stack/LHC Architecture (with Two Bio-Stacks and Two Washers)



## Operate the Bio-Stack™ with the NanoQuot™

	<b>Warning!</b> Keep your hands away from the claw/gripper and carrier while the Bio-Stack is being powered up. The carrier and claw/gripper move quickly during the homing sequence.
	<b>Warning! Pressure Hazard!</b> Before operating the Bio-Stack with the NanoQuot, ensure that the inlet pressure on the Dispenser's compressor does not exceed 30 psi and the pressure to the NanoQuot's supply bottle does not exceed 15 psi! Pressures outside the specified limit may cause the bottle to burst and result in possible injury.
	<b>Important!</b> If you are using half-height plates and the Bio-Stack is passing multiple plates at once from the input stack to the Bio-Stack carrier, the instrument may need to be reconfigured to accommodate your microplates. Refer to <b>Appendix C, Reconfiguration of the Bio-Stack</b> , for more information.

The **NanoQuot Microplate Dispenser** uses RS-232 serial commands to control the Bio-Stack, when the Dispenser is in **Bio-Stack** mode (selected via the **Mode** rocker switch on the Dispenser).

Perform the following steps to power up the Bio-Stack and NanoQuot:

1. Ensure that the Bio-Stack is correctly positioned next to the NanoQuot and that the alignment hardware and serial cable are attached between the two instruments. See **Install the Bio-Stack with the NanoQuot**, in **Chapter 3, Installation**.
2. Power up the Bio-Stack first before turning on the NanoQuot. If the claw/gripper is not homed before the Bio-Stack is powered up, the Bio-Stack self-test will home the mechanism. Ensure that the claw/gripper has risen to its full height.
3. Power up the NanoQuot and allow the self-test to complete.
4. Once the Bio-Stack has been turned on, its LED will remain constantly on if the instrument is operating correctly. If the LED is off or flashing, an error has occurred.

To display error codes, you will need to temporarily disconnect the Bio-Stack from the NanoQuot, then connect the Dispenser to a host computer that has the NanoQuot™ PC Control Software installed. Refer to **Chapter 7, Troubleshooting and Error Codes** in this manual, for instructions for retrieving error codes that occur during operation of the Bio-Stack with the NanoQuot.

## Run Plates

1. Prime the NanoQuot™, if necessary, before running plates with the Bio-Stack™. (Refer to **Chapter 3, Operation**, in the NanoQuot Operator's Manual for instructions for running a **Prime** program.)
2. Place the number of plates you wish to run into the Bio-Stack's input stack.
3. Set the **Mode** rocker switch on the Dispenser to **Bio-Stack**.
4. Set the program parameters using the NanoQuot's rocker switches, thumbwheels and keypad:
  - Select a Liquid Profile (only necessary when *changing* liquids):
    - Use the Plate/Liquid Profile rocker switch to select the desired Liquid Profile (**LP1**, **LP2**, or **LP3**).
    - Press and hold the **Cal** key until the **Alert** light repeatedly flashes. The **Alert** light will then verify the Liquid Profile selected by blinking once for **LP1**, twice for **LP2**, and three times for **LP3**. The carrier will then home.
  - Set a desired volume with the **Volume** thumbwheels.
  - Set the ending column number with the **Cols** thumbwheels.

❖ The starting column is pre-defined as column 1. Starting columns cannot be changed when operating the NanoQuot via the Dispenser's keypad.

- Select the plate type with the plate type (**96**, **384**, **1536**) rocker switch.
5. Ensure that the pressure setting is not above 15 psi for the Dispenser's supply bottle. The generally recommended pressure setting is 12.5 psi; however, the actual pressure should correspond with that set when the liquid profile was defined.
6. Press the **Start/Run** key on the NanoQuot to begin processing. All plates in the input stack will be processed then stacked in the output stack.

## Restack Plates

To restack plates that have been processed, press the **Cal/Restack** key on the Dispenser. The Bio-Stack will move all of the plates that are stacked in the output stack back into the input stack.

## Home the Bio-Stack

To home the Bio-Stack, press the **Home** key on the NanoQuot. The Bio-Stack will home all axes.

---

## Operate the Bio-Stack™ with the MicroFlo™ Select (Instrument Control)



**Warning!** Keep your hands away from the claw/gripper and carrier while the Bio-Stack is being powered up. The carrier and claw/gripper move quickly during the homing sequence.

The **MicroFlo Select Dispenser** uses RS-232 serial commands to control the Bio-Stack and it displays all Bio-Stack related information, including error codes.

- ❖ The one exception to this is when the Bio-Stack is first powered up, and is not yet under the control of the dispenser. At this point, it will run a series of self-test homing operations. The LED on the Bio-Stack will flash if there is a failure during this sequence. If a failure occurs, you may turn the MicroFlo on, and the dispenser will determine the status of the Bio-Stack and display any errors (ensure that the serial cable is connected).

Perform the following steps to power up the MicroFlo and Bio-Stack:

1. Ensure that the Bio-Stack is correctly positioned next to the dispenser and that the alignment hardware and serial cable are attached. See ***Install the Bio-Stack with the MicroFlo Select*** in **Chapter 3, Installation**.
2. Power up the Bio-Stack first before turning on the MicroFlo. If the claw/gripper is not homed before the MicroFlo is powered up, the Bio-Stack self-test will home the mechanism. Ensure that the claw/gripper has risen to its full height.
3. Power up the MicroFlo. Before performing the self-test, the dispenser will attempt to establish communication with the Bio-Stack. If communication is successful, and the Bio-Stack has passed its own self-test, the dispenser will proceed with its self-test. If the Bio-Stack has failed the self-test, or communication could not be established, then the MicroFlo self-test will fail, and the dispenser will “chirp” and display an error code. Refer to **Chapter 7, Troubleshooting and Error Codes**, for a listing of all error codes associated with the Bio-Stack that are displayed on the MicroFlo.
4. Once the Bio-Stack has been turned on, its LED will remain constantly on if the instrument is operating correctly. If the LED is off or flashing, an error has occurred. If the MicroFlo is on, running, and properly connected, an error code may be displayed.

- ❖ By default, the MicroFlo is configured for operation as a stand-alone instrument. The dispenser must be configured for Bio-Stack operation by using the Bio-Stack’s **Configuration** utility. See ***Bio-Stack™ Utilities Screen*** on page 207.

## Startup Screens

- ❖ The screens listed below and on the following pages appear as menu selections in the bottom (second line) of the keypad LCD on the MicroFlo™ Select. To make a selection, press the SoftKey below the menu function. To move to a previous menu, press the **Previous Screen** key. Refer to your MicroFlo Select Operator's Manual for a detailed illustration of the keypad and description of its functions. The MicroFlo Operator's Manual contains instructions for running the dispenser as a stand-alone instrument, whereas this manual describes the Bio-Stack™ specific operation.

When the MicroFlo is powered up, the following screen is displayed, and the carrier is homed:

```

      M i c r o F l o   S e l e c t
7 1 7 0 2 0 0   V e r s i o n   X . X X
  
```

The above screen is displayed while communication with the Bio-Stack is being established and the self-test has begun. If no communication occurs after 30 seconds, a timeout will result and error **B-8306** is displayed. Press **ENTER** to display the Main Menu. If the self-test and homing sequence is successful, the MicroFlo Main Menu screen will appear:

```

( 9 6 )   C A S S ( 5 )   V O L : 0 0 1 0 u l
P R I M E   P U R G E   u P L A T E   - - >
  
```

- ❖ If the communication fails, the MicroFlo software will display its Main Menu, but will not perform its homing sequence. This is to prevent the MicroFlo carrier from colliding with the claw/gripper. Therefore, it is recommended that once the serial communication problems are corrected, that the MicroFlo be turned off/on so it can run its own homing sequence.

## Bio-Stack™ Utilities Screen

To access the Bio-Stack Utilities screen and configure the MicroFlo™ Select for proper Bio-Stack operation, follow the screens below:

- At the MicroFlo main menu screen, select - - > twice. The Dispenser Action Menu screen will appear:

```

D I S P E N S E R   A C T I O N   M E N U
D E F I N E       U T I L       S E T U P
  
```

- Select **SETUP**.

```

S E T U P   O P T I O N S :
C A L       C A S S       B I O S T A C K   - - >
  
```

- Select **BIOSTACK**.

```

B I O S T A C K   U T I L I T I E S :
C O N F       A L I G N       V E R I F Y
  
```

The Bio-Stack Utilities screen will appear with the three utilities as described below:

1. **CONF:** The Configuration utility is used to describe the Bio-Stack operating mode.
2. **ALIGN:** The instrument Alignment utility is used to align the claw/gripper of the Bio-Stack to the carrier of the MicroFlo (i.e., the z-height alignment).
3. **VERIFY:** The Verify utility is used to verify the z-height alignment.

### Configuration Utility

- Select **CONF** first. The Configuration screen provides the options of running the MicroFlo™. Select either as a stand-alone instrument or with the Bio-Stack™. The default mode is to run the MicroFlo by itself (i.e., in Manual mode).

O P E R A T I N G	M O D E :	M A N
M A N U A L	B I O S T A C K	

**MAN** in the upper right corner indicates the instrument is set for manual operation. If **MANUAL** is selected, the Bio-Stack Utilities screen will be re-displayed.

- Select **BIOSTACK** to indicate that the MicroFlo will be operated with the Bio-Stack (the next time this screen is displayed, **BIO** will appear in the upper right corner). The Re-Stack screen will then appear:

R E - S T A C K ?	Y E S
Y E S	N O

The Re-Stack screen indicates whether plates residing in the output stack at the end of a run shall be automatically re-stacked into the input stack.

- Select **YES** or **NO**. After a brief pause, the Bio-Stack Utilities screen will reappear.



## Instrument Alignment Utility

- ❖ Ensure that the instrument alignment plate has already been mounted (per the instructions in **Chapter 3, Installation**) and the x and y positioning of the Bio-Stack™ to the MicroFlo™ Select has been performed before proceeding with the z-height (vertical) alignment.

To align the z-height of the claw/gripper on the Bio-Stack with the carrier of the MicroFlo, select **ALIGN** on the Bio-Stack Utilities screen. The Alignment Utility screen will appear:

```

A L I G N M E N T   U T I L I T Y :
H O M E           C - P O S           S A V E

```

The instrument Alignment Utility has three selections:

1. **HOME:** This allows the operator to home all axes for either the Bio-Stack or the MicroFlo.
2. **C-POS:** This allows the operator to “step” the claw/gripper down to the MicroFlo’s carrier to find the proper interface position (the z-height).
3. **SAVE:** When the interface position has been found, the Save function is used to tell the Bio-Stack to save the z-height for proper plate transferring.

### Home Selection

- ◆ Select **HOME**. The following screen will appear with the two options of homing all axes for either the dispenser or for the Bio-Stack. Select **BIOSTACK** to home all its axes, then press the **Previous Screen** key on the keypad to return to the Alignment Utility screen.

```

H O M E   A L L :
D I S P           B I O S T A C K

```

### C-POS Selection

- ◆ Select **C-POS**. At this point, if the claw is not fully homed, it will rise to its full height (its home position) and the gripper will spread out to its full width. The Find Claw Interface Pos screen will then appear:

F	I	N	D	C	L	A	W	I	N	T	E	R	F	A	C	E	P	O	S	:
-	/	+			+	1					+	2	0				+	4	0	0

- ◆ The goal of this utility is to align the claw so that the gripper fingers are resting approximately 50-60 thousandths of an inch below the plate bottom or carrier surface. See **Figure 44** in **Chapter 3, Installation**, for an illustration of proper alignment of the claw/gripper with the plate.
- ◆ To help in this activity, place a microplate on the carrier of the MicroFlo™. To avoid collision of the gripper with the plate or carrier on the dispenser, press the **+20** key first to see how far that goes, before pressing the **+400** key. Use the **+1/+20/+400** softkeys to *gradually* lower the claw/gripper to the precise location (i.e., .05" or .06" below the plate bottom or carrier surface).

❖ The C-POS measurement-to-inch ratios are: 1 = 0.001875", 20 = 0.0375", and 400 = 0.75".

- ◆ If you have moved the gripper too far below the carrier, press the **-/+** key to change direction.

### Save Selection

- ◆ If you are satisfied with the alignment, press the **Previous Screen** key to return to the Alignment Utility screen and select **SAVE**. At the following screen, press **YES**, and then the **ENTER** key.

O	K	T	O	S	A	V	E	L	O	C	A	T	I	O	N	?
Y	E	S						N	O							

- ◆ At this point, the claw will home, the grippers will close, and the setting is saved in the flash memory of the Bio-Stack™. After a brief wait, the Bio-Stack Utilities screen will appear.

## Verify Utility

❖ Remove the microplate (if one was used) from the MicroFlo™ Select carrier before proceeding with the Verify sequence below, otherwise the plate that the claw gripper retrieves from the input stack to place on the carrier will collide with the plate in the carrier! Also, ensure that there is at least one plate in the input stack.

- At the Bio-Stack™ Utilities screen, select **VERIFY**. The following screen will appear:

```
P L A C E      P L A T E      I N      I N - S T A C K
< E N T E R >      T O      C O N T I N U E
```

- Place a plate in the input stack.
- Press **ENTER**. The claw will pick up a plate drawn from the input stack and place it onto the MicroFlo carrier, with several delays during the place sequence. Watch to ensure that the gripper picks up the plate and gently sets it down in the carrier.

Two possible problems can occur at this point:

1. **The gripper fingers are too low**, so that after the gripper has released the plate, it will rise an inadequate distance before closing the gripper, thus catching the top of the plate. An error will be displayed in this instance.
2. **The gripper fingers are too high**, in which case the gripper will drop the plate a little further than it should, possibly causing fluid in the microwells to spill.

If no errors are displayed, the following screen will appear:

```
V E R I F Y      P L A T E      P L A C E M E N T
< E N T E R >      T O      C O N T I N U E
```

- Press **ENTER**. The claw will pick up the plate and place it on the Bio-Stack carrier for transfer to the output stack. Ensure that the claw performs this correctly. After a brief pause, the Bio-Stack Utilities screen will appear. Press the **Main Menu** key twice to return to the MicroFlo main menu screen.

❖ Moving the Bio-Stack™, inserting a new MicroFlo™ Select, etc., can potentially change the alignment. If this is the case, you may have to repeat the x, y, and z alignment steps in **Chapter 3, Installation**.

## Running Dispense Programs

The MicroFlo Select allows you the flexibility of running either a “Quick Dispense” or a Dispense protocol. To run Dispense programs, refer to your MicroFlo Select Operator’s Manual for instructions.

The following section contains sample screens that will appear on the MicroFlo display during a Dispense program when the MicroFlo is operated with the Bio-Stack.

### Starting Dispense Programs

After you have selected (and, if applicable, created/edited) the Dispense program you wish to run, one of the following screens is displayed. Pressing the **START** or the **ENTER** key will initiate the program.

With the Bio-Stack:

P	L	A	C	E	P	L	A	T	E	S	O	N	B	I	O	S	T	A	C	K
P	R	E	S	S	<	S	T	A	R	T	>	K	E	Y						

Without the Bio-Stack:

I	N	S	E	R	T	M	I	C	R	O	P	L	A	T	E					
P	R	E	S	S	<	S	T	A	R	T	>	K	E	Y						

### In-Process Dispense Programs

While a Dispense program is being processed, you will see the following screen. You may press the **STOP** key, if necessary, to stop the execution of the program.

With or without the Bio-Stack:

D	I	S	P	E	N	S	I	N	G	.	.	C	A	S	S	:	X	u	L
P	R	E	S	S	<	S	T	O	P	>	K	E	Y	T	O	Q	U	I	T

If you press the **STOP** key while a plate is being processed on the MicroFlo™ Select, the dispenser will pause the dispense operation and you will have the option to Cancel or Resume:

C A N C E L      R E S U M E

Cancel will discontinue the dispense operation and the dispenser will be homed. Resume will continue execution where the instrument left off and complete the dispense operation.

If you press the **STOP** key while the plate is being transferred to or from the Bio-Stack, the Please Wait screen will be displayed until the Bio-Stack has completed its action. At that point, the Cancel or Resume screen will be displayed:

P L E A S E      W A I T . . .

C A N C E L      R E S U M E

Cancel will discontinue the dispense operation, and the dispenser will be homed. Resume will continue execution where the instrument left off and complete the dispense operation.

### ***Completing the Dispense Program***

The following screen will be displayed, once the Dispense program is complete:

D I S P E N S E      P R O G      C O M P L E T E  
N E W      R E P E A T



---

## Operate the Bio-Stack™ with the MicroFlo™ Select (PC Control)



**Warning!** Keep your hands away from the claw/gripper and carrier while the Bio-Stack is being powered up. The carrier and claw/gripper move quickly during the homing sequence.

BioTek's **Liquid Handling Control™ (LHC) Software** uses the **MicroFlo™ Select Interface Software** to control all functions of the MicroFlo Select, and uses a component of the **Bio-Stack™ PC Control Software** to control all functionality of the Bio-Stack.

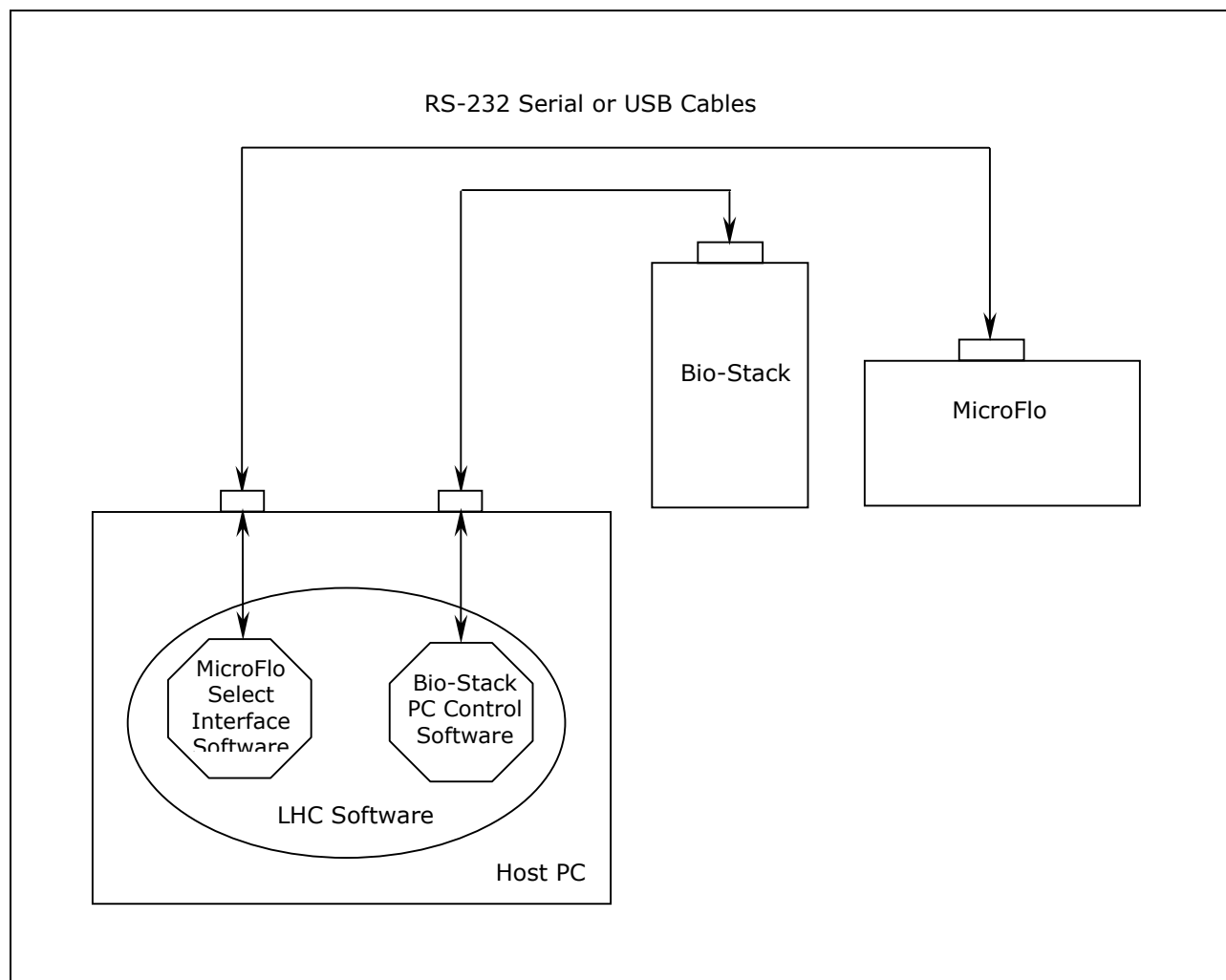
Using LHC, the operator may configure the Bio-Stack to interface with the microplate carrier on the MicroFlo.

**Figure 57** on the next page shows the relationship between the PC and its software (i.e., LHC) and the Bio-Stack and a MicroFlo.

For a complete description of the LHC Software and its operation, please refer to the **Liquid Handling Control Software Installation Guide** or the online Help system by selecting **Help > About Liquid Handling Control** from the software's main menu.

In **Figure 57** below, the LHC™ software uses

- one serial or USB port to control the Bio-Stack™ instrument plate transfers (via a component of the Bio-Stack™ PC Control Software); and
- one USB port to control all functionality of the MicroFlo Select dispenser (via the MicroFlo™ Select Interface Software).



**Figure 57:** Bio-Stack/LHC Architecture (with Bio-Stack and MicroFlo Dispenser)



**Chapter 5**

**Instrument Qualification**

This chapter discusses the tasks and tests necessary for qualification of the instrument on an ongoing basis.

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## Overview

Equipment qualification of the Bio-Stack™ involves two activities:

- Qualification of installation and setup
- Qualification of routine capability

This chapter refers to these activities as **Installation Qualification (IQ)** and **Operational Qualification (OQ)**.

❖ An **instrument qualification package (PN 7310530)** for the Bio-Stack is available for purchase. The package contains thorough procedures for performing Installation/Operational Qualification (IQ/OQ) and Preventive Maintenance (PM). Extensive Checklists and Logbooks are included for recording results. Contact your local dealer for more information.

Qualification tasks and tests for the Bio-Stack include installing the Bio-Stack with the interfacing instrument, and running the **System Self-Test**, **Checksum Test**, **Instrument Alignment Utility**, and **Verify Test**. If the optional barcode scanner has been installed, a test is performed to verify proper installation.

- The **System Self-Test** verifies the Bio-Stack's system components, such as the input and output stack lifters, carrier, and claw/gripper.
- The **Checksum Test** verifies the basecode software of the Bio-Stack or interfacing instrument against internal checksum values to ensure that no corruption has occurred.

If the Checksum Test is run manually, the version numbers and checksum for the basecode are displayed

- **on the computer** during operation of the Bio-Stack with the PowerWave™/XS, Synergy™ HT/Synergy™ 2/Synergy™ 4, Precision™/XS, NanoQuot™, ELx405™, or MicroFlo™ Select; or
- **on the display** of the µFill™, ELx405, or MicroFlo Select. (The assay configuration software information will also be displayed on the ELx405.)

- ❖ **Bio-Stack with NanoQuot:** To obtain basecode software information for the Bio-Stack and NanoQuot, you will need a host computer that has the Bio-Stack™ PC Control Software and NanoQuot™ PC Control Software installed, respectively. **Note:** The NanoQuot basecode software information includes a part number and version only; there is no Checksum.
- ❖ **Bio-Stack with ELx405 or MicroFlo Select:** The Bio-Stack and ELx405 or MicroFlo may be instrument controlled via the keypad on the ELx405 or MicroFlo, or PC controlled via the Liquid Handling Control™ (LHC) Software.

- An **Instrument Alignment Utility** is provided in the
  - **Bio-Stack™ PC Control Software** for aligning the claw/gripper with the height of the carrier on the PowerWave™/XS and Synergy™ HT/Synergy™ 2/Synergy™ 4 readers and NanoQuot™ Dispenser
  - **Precision Power™ Software** for aligning the claw/gripper with the height of the selected supply station on the Precision™/XS
  - **Liquid Handling Control™ (LHC) Software** for aligning the claw/gripper with the height of the carrier on the ELx405™ or MicroFlo™ Select during PC control of the Bio-Stack and ELx405 or MicroFlo
  - **basecode software** of the µFill™, ELx405, or MicroFlo for aligning the claw/gripper with the height of the carrier on these instruments
- The **Verify Test** confirms whether or not the Bio-Stack's claw/gripper has been properly aligned with the interfacing instrument's carrier or supply station (Precision/XS).

## Qualification Schedule

The following schedule defines BioTek's recommended intervals for qualification task and tests. The risk factors associated with your tests may require that the Operational procedures be performed more or less frequently than shown below.

	<b>IQ</b>	<b>OQ</b>
<b>TASKS/TESTS</b>	<b>Initially</b>	<b>Every 3 months</b>
Install/set up Bio-Stack™ and its components	✓	
Attach alignment hardware	✓	
Run Self-Test	✓	✓
Align Bio-Stack with interfacing instrument	✓	
Install microplate stacks	✓	
<b>PC Control:</b> Connect host computer to Bio-Stack and interfacing instrument, install software, and test communication	✓	
<b>Instrument Control:</b> Connect Bio-Stack to interfacing instrument	✓	
Run Checksum Tests	✓	✓
Run Instrument Alignment Utility	✓	If Verify Test fails
Run Verify Test	✓	✓
<b>Readers and Precision™ instruments only:</b>		
(Optional) Install Bio-Stack barcode scanner and run Scanner Test	✓	✓

❖ The Instrument Alignment Utility and Verify Test should also be performed whenever the instruments are **moved** from one location to another within the laboratory.

---

## Installation Qualification (IQ)

**Installation Qualification** confirms that the Bio-Stack™ and its components have been supplied as ordered, and ensures that they are assembled and configured properly for your lab environment.

- The recommended IQ procedure consists of setting up the Bio-Stack, and performing the Self-Test, Checksum Test, Instrument Alignment Utility, and Verify Test as described in **Chapter 3, Installation**. If applicable, the IQ procedure also consists of setting up the Bio-Stack's optional barcode scanner (Readers and Precision instruments only), and performing the Scanner Test as described in **Appendix B, Bio-Stack Barcode Scanner**.
- When performing the Checksum Test, record the software versions in the Software Data Sheets at the end of this chapter.
- The IQ procedure should be performed *initially* (before the Bio-Stack is used for the first time). Some of the IQ steps should be performed if the instruments are moved from one location to another within the laboratory.
- The successful completion of the IQ procedure verifies that the instruments and their components are installed correctly.

---

## Operational Qualification (OQ)

**Operational Qualification** confirms that the Bio-Stack's onboard software is operating properly and verifies the claw/gripper-to-instrument carrier alignment (even if the instruments have not been moved).

- The recommended OQ procedure consists of performing the Self-Test, Checksum Test, and Verify Test, as described in **Chapter 3, Installation**. The Instrument Alignment Utility should be run if the Verify Test fails. If applicable, the OQ procedure also consists of performing the Scanner Test as described in **Appendix B, Bio-Stack Barcode Scanner**.
- The OQ procedure should be performed *every three months*. It should also be performed after any major repair or upgrade to the hardware or software.
- The successful completion of the OQ procedure confirms that the Bio-Stack is operating correctly.

---

## **IQ Procedure/Checklist**

Date: \_\_\_\_\_ Bio-Stack™ Serial Number: \_\_\_\_\_

### **All instruments:**

- ☐ Unpack and inspect the Bio-Stack
- ☐ Check required and optional components
- ☐ Select an appropriate location
- ☐ Remove the shipping hardware
- ☐ Connect the power supply

### **PowerWave™/XS or Synergy™ HT/Synergy™ 2/Synergy™ 4**

- ☐ Attach the aligning posts and aligning caps
- ☐ Seat the instruments in the aligning plates
- ☐ Turn on the Bio-Stack and run a Self-Test
- ☐ Align the Bio-Stack with the reader
- ☐ Install the plate stacks
- ☐ Connect the host PC to the Bio-Stack and reader
- ☐ Install software on the host PC/test communication (run Checksum Tests)
- ☐ Align the claw/gripper with the reader's carrier (run Instrument Alignment Utility)
- ☐ Verify the alignment by running a Verify Test
- ☐ (Optional) Install the Bio-Stack barcode scanner and perform the Scanner Test

### **Precision™/XS:**

- ☐ Attach the aligning posts, aligning caps, and roller extensions for the supply platform
- ☐ Seat the instruments in the aligning plates
- ☐ Turn on the Bio-Stack and run a Self-Test
- ☐ Connect the host PC to the Bio-Stack and Precision/XS
- ☐ Install software on the host PC/test communication (run Checksum Tests)/configure Precision Power™
- ☐ Align the Bio-Stack with the Precision/XS
- ☐ Install the plate stacks
- ☐ Align the claw/gripper with Precision supply station (run Instrument Alignment Utility)
- ☐ Verify the alignment by running a Verify Test
- ☐ (Optional) Install the Bio-Stack barcode scanner and perform the Scanner Test

---

## **IQ Procedure/Checklist, *Cont'd***

### **μFill™ or ELx405™ - Instrument Control:**

- ☐ Attach the aligning posts and aligning caps
- ☐ Seat the instruments in the aligning plates
- ☐ Turn on the Bio-Stack™ and run a Self-Test
- ☐ Align the Bio-Stack with the μFill or ELx405
- ☐ Install the plate stacks
- ☐ Connect the Bio-Stack to the μFill or ELx405
- ☐ Run the Checksum Test
- ☐ Configure the μFill or ELx405 for the Bio-Stack
- ☐ Test communication (run Checksum Test again)
- ☐ Align the claw/gripper with the μFill or ELx405 plate carrier (run Instrument Alignment Utility)
- ☐ Verify the alignment by running a Verify Test

### **ELx405™ - PC Control:**

- ☐ Attach the aligning posts and aligning caps
- ☐ Seat the instruments in the aligning plates
- ☐ Turn on the Bio-Stack™ and run a Self-Test
- ☐ Align the Bio-Stack with the ELx405
- ☐ Install the plate stacks
- ☐ Connect the host PC to the Bio-Stack and ELx405
- ☐ Install software on the host PC and, if necessary, upgrade basecode software on the ELx405
- ☐ Test Communication
- ☐ Run Checksum Tests
- ☐ Align the claw/gripper with the ELx405 plate carrier (run Instrument Alignment Utility)
- ☐ Verify the alignment by running a Verify Test

---

## **IQ Procedure/Checklist, *Cont'd***

### **NanoQuot™:**

- ☐ Attach the aligning posts
- ☐ Seat the instruments in the aligning plates
- ☐ Turn on the Bio-Stack and run a Self-Test
- ☐ Align the Bio-Stack with the NanoQuot
- ☐ Install the plate stacks
- ☐ Connect the host PC to the Bio-Stack
- ☐ Install the Bio-Stack PC Control Software
- ☐ Run the Checksum Test for the Bio-Stack
- ☐ Align the claw/gripper with the NanoQuot plate carrier (run Instrument Alignment Utility)
- ☐ Verify the alignment by running a Verify Test
- ☐ Connect the host PC to the NanoQuot
- ☐ Install the NanoQuot PC Control Software
- ☐ Obtain software information for the NanoQuot
- ☐ Connect the Bio-Stack to the NanoQuot
- ☐ Test communication



---

## **IQ Procedure/Checklist, *Cont'd***

### **MicroFlo™ Select - *Instrument Control:***

- ☐ Attach the aligning posts and aligning caps
- ☐ Seat the instruments in the aligning plates
- ☐ Turn on the Bio-Stack™ and run a Self-Test
- ☐ Align the Bio-Stack with the MicroFlo
- ☐ Install the plate stacks
- ☐ Connect the Bio-Stack to the MicroFlo
- ☐ Run the Checksum Test
- ☐ Configure the MicroFlo for the Bio-Stack
- ☐ Test communication (run Checksum Test again)
- ☐ Align the claw/gripper with the MicroFlo plate carrier (run Instrument Alignment Utility)
- ☐ Verify the alignment by running a Verify Test

### **MicroFlo Select - *PC Control:***

- ☐ Attach the aligning posts and aligning caps
- ☐ Seat the instruments in the aligning plates
- ☐ Turn on the Bio-Stack™ and run a Self-Test
- ☐ Align the Bio-Stack with the MicroFlo
- ☐ Install the plate stacks
- ☐ Connect the host PC to the Bio-Stack and MicroFlo
- ☐ Install software on the host PC
- ☐ Test Communication
- ☐ Run Checksum Tests
- ☐ Align the claw/gripper with the MicroFlo plate carrier (run Instrument Alignment Utility)
- ☐ Verify the alignment by running a Verify Test

---

## OQ Procedure/Checklist

Date: \_\_\_\_\_ Bio-Stack™ Serial Number: \_\_\_\_\_

- ☐ Perform the Self-Test
- ☐ Perform the Checksum Test
- ☐ Perform the Verify Test

### If the Verify Test fails:

- ☐ Run the Instrument Alignment Utility
- ☐ Repeat the Verify Test

### Readers and Precision™ instruments only:

- ☐ (Optional) Perform the Scanner Test

---

## Software Data Sheets

Record Bio-Stack and interfacing instrument software/serial number information in the appropriate data sheet:

- PowerWave™/XS, page 227
- Synergy™ HT/Synergy™ 2/Synergy™ 4, page 228
- Precision™/XS, page 229
- µFill™, page 230
- ELx405™
  - Instrument Control, page 231
  - PC Control, page 232
- NanoQuot™, page 233
- MicroFlo™ Select
  - Instrument Control, page 234
  - PC Control, page 235

## PowerWave/XS Software Data Sheet

<b>Check one:</b> PowerWave <input type="checkbox"/> PowerWave XS <input type="checkbox"/>	
<b>Gen5™ Software</b>	
<b>Serial #:</b> _____	
Installation Version:	
Build Version:	
Reader Control Version:	
(Optional) Diagnostics Version:	
<b>KC4™ Software</b>	
<b>Serial #:</b> _____	
Version:	Revision:
<b>PowerWave™/PowerWave™ XS</b>	
<b>Serial #:</b> _____	
Basecode Software Part Number:	
Version:	
Checksum:	
<b>Bio-Stack™ PC Control Software</b>	
<b>Serial #:</b> _____	
Installation CD Version:	
StackerContainer.exe Version:	
BTIAutoStacker ActiveX Version:	
<b>Bio-Stack™</b>	
<b>Serial #:</b> _____	
Basecode Software Version:	
Interface Definition Version:	
Checksum:	

**Synergy HT/Synergy 2/Synergy 4 Software Data Sheet**

<b>Check one:</b> Synergy HT <input type="checkbox"/> Synergy 2 <input type="checkbox"/> Synergy 4 <input type="checkbox"/>	
<b>Gen5™ Software</b> <b>Serial #:</b> _____	
Installation Version:	
Build Version:	
Reader Control Version:	
(Optional) Diagnostics Version:	
<b>KC4™ Software</b> <b>Serial #:</b> _____	
Version:	Revision:
<b>Synergy™ HT/Synergy™ 2/Synergy™ 4</b> <b>Serial #:</b> _____	
Basecode Software Part Number:	
Version:	
Checksum:	
<b>Bio-Stack™ PC Control Software</b> <b>Serial #:</b> _____	
Installation CD Version:	
StackerContainer.exe Version:	
BTIAutoStacker ActiveX Version:	
<b>Bio-Stack™</b> <b>Serial #:</b> _____	
Basecode Software Version:	
Interface Definition Version:	
Checksum:	

## Precision/XS Software Data Sheet

<b>Check one:</b> Precision <input type="checkbox"/> Precision XS <input type="checkbox"/>	
<b>Bio-Stack™ PC Control Software</b> <b>Serial #:</b> _____	
Installation CD Version:	
StackerContainer.exe Version:	
BTIAutoStacker ActiveX Version:	
<b>Bio-Stack™</b> <b>Serial #:</b> _____	
Basecode Software Version:	
Interface Definition Version:	
Checksum:	
<b>Precision Power™ Software</b> <b>Serial #:</b> _____	
Installation CD Version:	
PrecisionPower#.exe Version:	
BTIAutoDispenserActiveX Version:	
<b>Precision™ / Precision™ XS</b> <b>Serial #:</b> _____	
Basecode Software Part Number:	
Function Version:	
Structure Version:	

**µFill Software Data Sheet**

<b>µFill™</b>		<b>Serial #:</b> _____
Basecode Software Part Number:		
Version:		
Checksum:		
<b>Bio-Stack™</b>		<b>Serial #:</b> _____
Basecode Software Version:		
Interface Definition Version:		
Checksum:		

## ELx405 Software Data Sheet (Instrument Control)

<b>ELx405™</b>		<b>Serial #:</b> _____
Basecode Software Part Number:	<input style="width: 100%;" type="text"/>	
Version:	<input style="width: 100%;" type="text"/>	
Checksum:	<input style="width: 100%;" type="text"/>	
Assay Configuration Part Number:	<input style="width: 100%;" type="text"/>	
Version:	<input style="width: 100%;" type="text"/>	
<b>Bio-Stack™</b>		<b>Serial #:</b> _____
Basecode Software Version:	<input style="width: 100%;" type="text"/>	
Interface Definition Version:	<input style="width: 100%;" type="text"/>	
Checksum:	<input style="width: 100%;" type="text"/>	

## ELx405 Software Data Sheet (PC Control)

<b>LHC™ Software</b>		<b>Serial #:</b> _____
Build Version:		
Installation Version:		
<b>ELx405™ Interface Software</b>		<b>Serial #:</b> _____
Interface Software Version:		
Interface Functional Version:		
<b>ELx405™</b>		<b>Serial #:</b> _____
Basecode SW Version:		
Basecode SW Checksum:		
<b>Bio-Stack™ PC Control Software</b>		<b>Serial #:</b> _____
Installation CD Version:		
StackerContainer.exe Version:		
BTIAutoStacker ActiveX Version:		
<b>Bio-Stack™</b>		<b>Serial #:</b> _____
Basecode Software Version:		
Interface Definition Version:		
Checksum:		



## NanoQuot Software Data Sheet

<b>Bio-Stack™ PC Control Software</b>		<b>Serial #:</b> _____
Installation CD Version:		
StackerContainer.exe Version:		
BTIAutoStacker ActiveX Version:		
<b>Bio-Stack™</b>		<b>Serial #:</b> _____
Basecode Software Version:		
Interface Definition Version:		
Checksum:		
<b>NanoQuot™ PC Control Software</b>		<b>Serial #:</b> _____
Version:		
BTINanoQuotClassLibrary Version:		
BTICommonMessagesClassLibrary Version:		
BTICommunicationsClassLibrary Version:		
<b>NanoQuot™</b>		<b>Serial #:</b> _____
Basecode Software Part Number:		
Version:		

### MicroFlo Select Software Data Sheet (Instrument Control)

<b>MicroFlo™ Select</b>		<b>Serial #:</b> _____
Basecode Software Part Number:	<input style="width: 100%;" type="text"/>	
Version:	<input style="width: 100%;" type="text"/>	
Checksums:	UI:	<input style="width: 100%;" type="text"/>
	MC:	<input style="width: 100%;" type="text"/>
<b>Bio-Stack™</b>		<b>Serial #:</b> _____
Basecode Software Version:	<input style="width: 100%;" type="text"/>	
Interface Definition Version:	<input style="width: 100%;" type="text"/>	
STKR Checksum:	<input style="width: 100%;" type="text"/>	

## MicroFlo Select Software Data Sheet (PC Control)

<b>LHC™ Software</b>		<b>Serial #:</b> _____
Build Version:		
Installation Version:		
<b>MicroFlo™ Select Interface Software</b>		<b>Serial #:</b> _____
Interface Software Version:		
Data Version:		
<b>MicroFlo™ Select</b>		<b>Serial #:</b> _____
Basecode Software Version:		
Data Version		
Checksums:	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;">UI:</div> <div style="width: 45%;"></div> </div>	
	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;">MC:</div> <div style="width: 45%;"></div> </div>	
<b>Bio-Stack™ PC Control Software</b>		<b>Serial #:</b> _____
Installation CD Version:		
StackerContainer.exe Version:		
BTIAutoStacker ActiveX Version:		
<b>Bio-Stack™</b>		<b>Serial #:</b> _____
Basecode Software Version:		
Interface Definition Version:		
Checksum:		



**Chapter 6**

**Preventive Maintenance**

This chapter describes how to clean, decontaminate, and maintain the Bio-Stack™.

---

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---

## Overview

**Preventive Maintenance (PM)** represents a set of procedures that should be performed regularly to maintain equipment in top condition. For example, during normal operation, debris and dust from plate wear can accumulate on the microplate stacks, carrier surface and other plate transport components.

Preventive maintenance of the Bio-Stack™ is the responsibility of the user and is required for continuous problem-free operation. Adherence to the **Recommended Maintenance Schedule** below reduces problems caused by dust and debris, maximizes running time, and extends the life of the Bio-Stack.

This chapter includes instructions for the following:

- Routine Cleaning Procedure
- Decontamination
- Cleaning and Lubrication of the Linear Ways

## Recommended Maintenance Schedule

The following chart recommends preventative maintenance tasks, the frequency with which each task should be performed, and where to find more information.

MAINTENANCE				
TASK	Daily/ as needed	Monthly	Every 6 months	Before Storage or Shipment
Clean plate carrier, stacks, and all exposed surfaces, p. 241	✓			✓
Decontaminate the instrument, and, if applicable, the barcode scanner, p. 242		✓		✓
Clean and lubricate linear ways, p. 244			✓	✓

---

## Required Materials

- Mild detergent
- Deionized or distilled water
- Clean, lint-free cotton cloths or towels
- 70% isopropyl alcohol (or ethanol)
- Safety glasses
- Surgical mask
- Protective gloves
- Lab coat
- Biohazard trash bags
- 125 ml beakers
- Cotton swabs or paper towels
- Toothbrush
- BioTek grease kit (PN 7110017)

### **Optional barcode scanner:**

- Lens cleaning agent
- Tissue or soft cloth

---

## Warnings & Precautions

Please read the following before performing any maintenance procedures.

	<b>Important!</b> Do not immerse the instrument, spray it with liquid, or use a “wet” cloth. Do not allow water or other cleaning solution to run into the interior of the instrument. If this happens, contact BioTek’s Technical Assistance Center.
	<b>Warning! Internal Voltage.</b> Turn off and disconnect the Bio-Stack™ from its power supply for all cleaning and decontamination operations.
	<b>Warning!</b> Wear prophylactic gloves when handling contaminated instruments. Gloved hands should be considered contaminated at all times; keep gloved hands away from eyes, mouth, nose, and ears. Eating and drinking while decontaminating instruments is not advised.
	<b>Warning!</b> Mucous membranes are considered prime entry routes for infectious agents. Wear eye protection and a surgical mask when there is a possibility of aerosol contamination. Intact skin is generally considered an effective barrier against infectious organisms; however, small abrasions and cuts may not always be visible. Wear protective gloves when handling contaminated instruments.
	<b>Caution: Barcode scanner.</b> The Bio-Stack’s optional barcode scanner is housed in a protective cover. Do not allow cleaning solution to seep into the narrow opening in the cover, where it may come into contact with the scanner. Be very careful not to scratch or damage the mirror during cleaning!



## Routine Cleaning Procedure



**Important!** Turn off the Bio-Stack™ and disconnect it from the power supply for the cleaning procedure.

### Purpose

A daily cleaning regimen is recommended to keep the instrument free of debris and dust from plate wear. Exposed surfaces may be cleaned (not decontaminated) with a cloth moistened (not soaked) with water or water and a mild detergent.

### Procedure

Perform these steps *daily* and *before storage or shipment* to clean the carrier surface and microplate stacks, all other exposed surfaces, and, if applicable, the barcode scanner:

1. Turn off and disconnect the Bio-Stack.
2. Remove the microplate stacks for cleaning: locate the stack locks on the side of the Bio-Stack, open the locks, and lift the stacks out.
3. Moisten a clean cotton cloth with water, or with water and mild detergent. Do **not** soak the cloth.
4. Wipe the inside and outside of the stacks and the plate-stacking pedestal (if used).
5. Wipe the carrier surface, lifts, claw/gripper, and all other exposed surfaces of the Bio-Stack.
6. **If the optional barcode scanner is installed:**

❖ **Do not allow solution to come into contact with the scanner:** Ensure that cleaning solution does not seep into the narrow opening in the cover that protects the scanner.

❖ Lens cleaning solution and lens tissue may also be used to clean the mirror. **Be very careful not to scratch or damage the mirror!**

- Gently wipe the external surface of the scanner assembly, including the scanner's protective cover, mounting bracket, cable, and mirror.
7. If detergent (or lens cleaning solution on the scanner) was used, wipe all surfaces with a cloth moistened with water.
  8. Use a clean, dry cloth to dry all wet surfaces.
  9. Reinstall the stacks and then close the stack locks.

---

## Decontamination

### Purpose

Any laboratory instrument that has been used for research or clinical analysis is considered a biohazard and requires **decontamination** prior to handling.

Decontamination minimizes the risk to all who come into contact with the instrument during shipping, handling, and servicing. Decontamination is required by the **U.S. Department of Transportation** regulations.

Persons performing the decontamination process must be familiar with the basic setup and operation of the instrument.



**Important!** BioTek Instruments, Inc. recommends the use of the following decontamination solutions and methods based on our knowledge of the instrument and recommendations of the **Centers for Disease Control and Prevention (CDC)**. Neither BioTek nor the CDC assumes any liability for the adequacy of these solutions and methods. Each laboratory must ensure that decontamination procedures are adequate for the Biohazard(s) they handle.



**Important!** Turn off the Bio-Stack™ and disconnect it from the power supply for the decontamination procedure.

### Procedure

Perform these steps *monthly* and *before storage or shipment*:

1. Turn off the Bio-Stack and disconnect it from the power supply.
2. Remove the microplate stacks: locate the stack locks on the side of the Bio-Stack, open the locks, and then lift the stacks out.
3. Moisten a clean cotton cloth with 70% alcohol. Do **not** soak the cloth.
4. Wipe the inside and outside of the stacks and plate-stacking pedestal (if used).
5. Wipe the carrier surface, lifts, claw/gripper, and all other exposed surfaces of the Bio-Stack.

6. **If the optional barcode scanner is installed:**

- ❖ **Do not allow solution to come into contact with the scanner:** Ensure that decontamination solution does not seep into the narrow opening in the cover that protects the scanner.
- ❖ Lens cleaning solution and lens tissue may also be used to clean the mirror. **Be very careful not to scratch or damage the mirror!**

- Gently wipe the external surface of the scanner assembly, including the scanner's protective cover, mounting bracket, cable, and mirror.
7. Wait 20 minutes. Moisten a cloth with deionized or distilled water and wipe all surfaces of the instrument and barcode scanner that have been cleaned with the alcohol.
  8. Use a clean, dry cloth to dry all wet surfaces.
  9. Discard the used gloves and cloths using a Biohazard trash bag and an approved Biohazard container.
  10. Reinstall the stacks and then close the stack locks.

---

## Cleaning and Lubrication of the Linear Ways

### Purpose

Periodic cleaning and lubrication of the linear ways and screws on the two stack lifters and the plate carrier is necessary to ensure optimum performance of these components during all plate transfer operations.

A **grease kit** (PN 7110017) has been included in your Bio-Stack™ package contents. Use a clean towel, rubber gloves, a toothbrush and cotton swabs or paper towels (moistened with alcohol to assist the process), and the lubricant contained in the kit when performing the following procedure. Refer to **Figure 58** on the next page for an illustration of the Bio-Stack's linear ways.

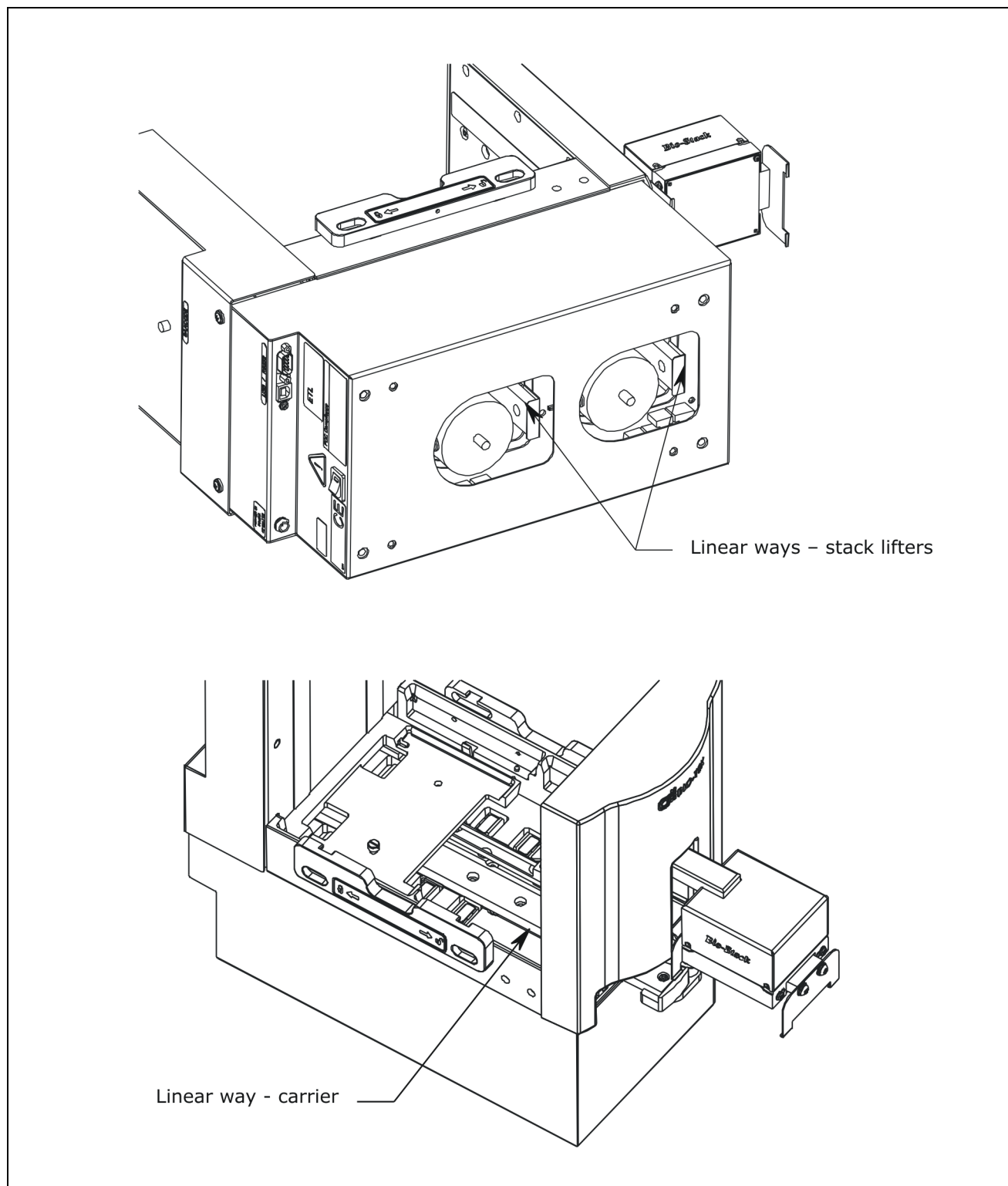
### Procedure

Perform these steps *every six months* and *before storage or shipment*:

1. Turn off the Bio-Stack and disconnect it from the power supply.
2. Gently turn the instrument onto its side so that the bottom of the Bio-Stack is facing you. If the **optional barcode scanner** is installed, turn the Bio-Stack on the side without the scanner.
3. Using cotton swabs or paper towels, remove old, possibly contaminated grease from the three linear ways (see **Figure 58**).
4. Allow these parts to dry completely.
5. Apply a small amount of new lubricant to all surfaces of the linear ways and screws, spreading thin layers and working the grease into the surfaces with a toothbrush.

❖ Ensure that you lubricate the sides of the linear ways, since ball bearings travel on these surfaces.
---

6. Return the Bio-Stack to its upright position and connect it to the power supply.
7. Turn on the Bio-Stack and run a **Verify Test** to confirm that moving the Bio-Stack did not compromise its alignment with the interfacing instrument. Perform the appropriate set of instructions in **Chapter 3, Installation**.
  - If the Verify Test passes, the Bio-Stack is ready to resume normal operation.
  - If the Verify Test fails, you may need to re-align the claw/gripper with the plate carrier. Perform the appropriate set of instructions in **Chapter 3** and run the Verify Test again. If the test still fails, contact BioTek's Technical Assistance Center.



**Figure 58:** Lubrication of the Bio-Stack's Linear Ways



## Chapter 7

# Troubleshooting and Error Codes

This chapter contains instructions for obtaining software versions and describes the error codes that may appear in the Bio-Stack™ PC Control Software, Precision Power™ Software, NanoQuot™ PC Control Software, Liquid Handling Control™ Software, or on the µFill™, ELx405™, or MicroFlo™ Select instrument display, during operation with the Bio-Stack™.

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## Overview



**Warning! Crush/Pinch Hazard.** Moving parts during operation of the instrument can present crushing or pinching hazards. Always **turn off and disconnect the instrument** from the power supply for all hands-on troubleshooting procedures.

Every effort has been made to ensure that the Bio-Stack™ Microplate Stacker is extremely reliable and easy to use. If you encounter problems during operation of the Bio-Stack, however, you will need to **obtain software versions** for the Bio-Stack and interfacing instrument, and **note any error codes** that may be displayed.

This information will be needed by BioTek's **Technical Assistance Center (TAC)** for troubleshooting any problems.

- **For instructions on obtaining software versions**, refer to the following sections:
  - PowerWave™ or Synergy™ readers: page 249
  - Precision™/XS: page 250
  - µFill™: page 251
  - ELx405™ (Instrument Control): page 252
  - ELx405™ (PC Control): page 253
  - NanoQuot™: page 254
  - MicroFlo (Instrument Control): page 255
  - MicroFlo (PC Control): page 256
- **For descriptions of the different error code types** that may be displayed during Bio-Stack operation, refer to the following sections:
  - PowerWave or Synergy readers: page 257
  - Precision/XS: page 259
  - µFill or ELx405 (Instrument Control): page 261
  - ELx405 (PC Control): page 262
  - NanoQuot: page 264
  - MicroFlo (Instrument Control): page 266
  - MicroFlo (PC Control): page 267
- **For lists of the error codes**, refer to **Error Code Tables** on page 269 and to the error code tables that follow.



---

## Obtain Software Versions for PowerWave™ or Synergy™ Readers

### Bio-Stack Software

Perform the following steps to obtain software versions for the Bio-Stack™ PC Control Software and for the Bio-Stack™ onboard software:

1. From the top menu in the Bio-Stack PC Control Software, select **Help > About Bio-Stack**.
2. Record the Bio-Stack PC Control Software versions for the Installation CD, StackerContainer.exe, and BTIAutoStackerActiveX (the Gen5™ or KC4™ Software version and revision number are also available on this screen).
3. Click **Get On-Board Values Now**.
4. Record the Bio-Stack onboard software versions for the basecode software, interface definition, and checksum.

### Gen5 Software and Reader Software

Perform the following steps to obtain software versions for Gen5™ Software and for the reader's basecode version and checksum:

1. At Gen5's main screen, select **Help > Gen5**.
2. Record Gen5's Installation Version, Build Version, Reader Control Version, and Diagnostics Version (if the Diagnostics Utility was installed).
3. Return to the main menu and select **System > Reader Control**, then click the appropriate reader to open the 'Reader Control' dialog.
4. At the Reader Control dialog, select the **Information** tab to display the reader's basecode software information.
5. Record the reader's basecode part number, version number, and checksum.

### KC4 Software and Reader Software

Perform the following steps to obtain software versions for KC4™ Software and for the reader's basecode version and checksum:

1. At KC4's main screen, select **About > KC4**.
2. Record KC4's version and revision numbers.
3. Return to the main menu and select **System > Reader Control**.
4. Record the reader's basecode part number, version number, and checksum.

❖ KC4 does not support the Synergy™ 2/Synergy™ 4 reader.

---

## Obtain Software Versions for Precision™/XS

### Bio-Stack Software

Perform the following steps to obtain software versions for the Bio-Stack™ PC Control Software and for the Bio-Stack™ onboard software:

1. From the top menu in the Bio-Stack PC Control Software, select **Help > About Bio-Stack**.
2. Record the Bio-Stack PC Control Software versions for the Installation CD, StackerContainer.exe, and BTIAutoStackerActiveX.
3. Click **Get On-Board Values Now**.
4. Record the Bio-Stack onboard software versions for the basecode software, interface definition, and checksum.

### Precision Power Software and Precision/XS Software

Perform the following steps to obtain software versions for Precision Power™ Software and for the Precision/XS:

1. At Precision Power's main screen, select **Help > About Precision Power**.
2. Record the Precision Power software versions for the Installation CD, Precision Power#.exe and BTIAutoDispenserActiveX. Click **OK** to return to the main screen.
3. Select **Instrument > Precision Series Configuration > Test Comm**, then select **ActiveX/Instrument Versions > Instrument Version**.
4. Record the Precision instrument's basecode software part number, Function Version, and Structure Version.

## Obtain Software Versions for µFill™

Perform the following steps to obtain software versions for the µFill and Bio-Stack™.

1. At the µFill's Main Menu select **UTIL > TESTS > CHKSUM**.
2. Record the µFill basecode software part number, version number, and checksum, as shown in the **first screen**:

```
X X X X X X X   V E R S I O N   X . X X
C O D E   C H E C K S U M :   ( X X X X )
```

3. The **second screen** will display the following information, which does not need to be recorded:

```
D E F A U L T   C O N F I G   D A T A
```

4. If the µFill is not running with the Bio-Stack, the **SELECT UTILITY** screen will then appear. If the µFill **is** running with the Bio-Stack, wait while the **third screen** is displayed:

```
P L E A S E   W A I T . . .
```

❖ If the µFill cannot communicate with the Bio-Stack, an error message will be displayed.

5. Record the Bio-Stack basecode software version, interface definition version, and checksum, as shown in the **fourth screen**:

```
B I O - S T A C K :   X . X X ,   X . X X
C O D E   C H E C K S U M :   ( X X X X )
```

## Obtain Software Versions for ELx405™ (Instrument Control)

Perform the following steps to obtain software versions for the ELx405 and Bio-Stack™.

1. At the ELx405's Main Menu, select **UTIL > TESTS > CHKSUM**.
2. Record the ELx405 basecode software part number, version number, and checksum, as shown in the **first screen**:

```

X X X X X X X X   V E R S I O N   X . X X
C O D E   C H E C K S U M :   ( X X X X )

```

3. Record the assay configuration software part number and version number, as shown in the **second screen**:

```

X X X X X X X X   V E R S I O N   X . X X

```

4. If the ELx405 is not running with the Bio-Stack™, the **SELECT UTILITY** screen will then appear. If the ELx405 **is** running with the Bio-Stack, wait while the **third screen** is displayed:

```

P L E A S E   W A I T   . . .

```

❖ If the instrument cannot communicate with the Bio-Stack™, an error message will be displayed.

5. Record the Bio-Stack basecode software version, interface definition version, and checksum, as shown in the **fourth screen**:

```

B I O - S T A C K :   X . X X ,   X . X X
C O D E   C H E C K S U M :   ( X X X X )

```

---

## Obtain Software Versions for ELx405™ (PC Control)

### Bio-Stack Software

Perform the following steps to obtain software versions for the Bio-Stack™ PC Control Software and for the Bio-Stack™ onboard software:

1. Make sure that the Bio-Stack is powered on, and the cable is connected between the PC and the Bio-Stack.
2. From the top menu in the Bio-Stack PC Control Software, select **Help > About Bio-Stack**.
3. Record the Bio-Stack PC Control Software versions for the Installation CD, StackerContainer.exe, and BTIAutoStackerActiveX.
4. Click **Get On-Board Values Now**.
5. Record the Bio-Stack basecode software version, interface definition version, and checksum.

### Liquid Handling Control™ (LHC) Software and ELx405™ Software

Perform the following steps to obtain software versions for the LHC Software and for the ELx405:

1. Make sure that the washer is powered on, and the cable is connected between the PC and the washer.
2. At the LHC Software's main screen, select **Help > About Liquid Handling Control**.
3. The 'Help About' dialog will open. Record the Liquid Handling Control Build Version and Installation Version.
4. Click **Close** to return to the main screen.
5. Select **Tools > Instrument Utilities**. The 'ELx405 Washer Utilities' screen will open.
6. Record the ELx405 Interface Software Version, Interface Functional Version, Basecode SW Version, and Basecode SW Checksum.

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## Obtain Software Versions for NanoQuot™



In order to obtain software information for the Bio-Stack™ and NanoQuot, you will need the **Bio-Stack™ PC Control Software** and **NanoQuot™ PC Control Software** installed on a host computer.

### Bio-Stack™ Software

- ❖ For the following instructions, ensure that the Bio-Stack has been disconnected from the NanoQuot, and is connected to the host computer via one of the two serial cables that are included with the Bio-Stack: a 9-pin to 9-pin male/male cable or 9-pin to 25-pin male/female cable.

Perform the following steps to obtain software versions for the Bio-Stack PC Control Software and for the Bio-Stack onboard software:

1. Open the Bio-Stack PC Control Software. From the top menu in the Bio-Stack PC Control Software, select **Help > About Bio-Stack**.
2. Record the Bio-Stack PC Control Software versions for the Installation CD, StackerContainer.exe, and BTIAutoStackerActiveX.
3. Click **Get On-Board Values Now**.
4. Record the Bio-Stack basecode software version, interface definition version, and checksum.

### NanoQuot Software

- ❖ For the following instructions, ensure that the NanoQuot has been disconnected from the Bio-Stack, and is connected to the host computer via the 9-pin to 9-pin female/male serial cable that is included with the NanoQuot.

Perform the following steps to obtain software versions for the NanoQuot™ PC Control Software and for the NanoQuot onboard software:

1. Open the NanoQuot PC Control Software. From the software's main screen, select **Help > About NanoQuot PC Software**.
2. Record the NanoQuot PC Control version as well as the three **Component Software** versions, then click **OK** to close the dialog.
3. Record the NanoQuot's **Instrument Software** (basecode part number and version) and **Serial No. Note:** The NanoQuot basecode software does not include a checksum.

## Obtain Software Versions for MicroFlo™ Select (Instrument Control)

Perform the following steps to obtain software versions for the MicroFlo Select Dispenser and Bio-Stack™.

1. At the dispenser's Main Menu, select **- - >** twice to get to the Dispenser Action Menu.
2. Select **UTIL > CHKSUM**. The Version Checksum Info screen will appear:

```
V E R S I O N   C H E C K S U M   I N F O :
U I           M C           S T K R
```

3. Select **UI** to display basecode and checksum information for the User Interface processor:

```
7 1 7 0 2 0 0   V E R S I O N   X . X X
C O D E   C H E C K S U M :           ( X X X X )
```

Record the basecode software version (X.XX) and checksum (XXXX) information. Press the **ENTER** or **Previous Screen** key to return to the Version Checksum Info screen.

4. Select **MC** to display basecode and checksum information for the Motor Controller processor:

```
7 1 7 0 2 0 0   V E R S I O N   X . X X
C O D E   C H E C K S U M :           ( X X X X )
```

Record the basecode software version (X.XX) and checksum (XXXX) information. Press the **ENTER** or **Previous Screen** key to return to the Version Checksum Info screen.

5. Select **STKR** to display basecode and checksum information for the Bio-Stack:

❖ If the instrument cannot communicate with the Bio-Stack™, an error message will be displayed.

```
B I O - S T A C K :   X . X X ,   X . X X
C O D E   C H E C K S U M :           ( X X X X )
```

Record the Bio-Stack basecode software version (first X.XX), interface definition version (second X.XX), and checksum (XXXX).

---

## Obtain Software Versions for MicroFlo™ Select (PC Control)

### Bio-Stack Software

Perform the following steps to obtain software versions for the Bio-Stack™ PC Control Software and for the Bio-Stack™ onboard software:

1. Make sure that the Bio-Stack is powered on, and the cable is connected between the PC and the Bio-Stack.
2. From the top menu in the Bio-Stack PC Control Software, select **Help > About Bio-Stack**.
3. Record the Bio-Stack PC Control Software versions for the Installation CD, StackerContainer.exe, and BTIAutoStackerActiveX.
4. Click **Get On-Board Values Now**.
5. Record the Bio-Stack basecode software version, interface definition version, and checksum.

### Liquid Handling Control™ (LHC) Software and MicroFlo™ Select Software

Perform the following steps to obtain software versions for the LHC Software and for the MicroFlo:

1. Make sure that the dispenser is powered on, the dispenser UI is at the main menu, and the cable is connected between the PC and the dispenser.
2. At the LHC Software's main screen, select **Help > About Liquid Handling Control**.
3. The 'Help About' dialog will open. Record the Liquid Handling Control Build Version and Installation Version.
4. Click **Close** to return to the main screen.
5. Select **Tools > Instrument Utilities**. The 'MicroFlo Select Utilities' screen will open.
6. Record the MicroFlo Select Interface Software Version and Data Version, and the MicroFlo Select Basecode Software Version, Data Version, and Checksum.



## Errors During Operation of Bio-Stack™ with PowerWave™ or Synergy™ Readers

The **Bio-Stack™ PC Control Software** controls all functionality of the Bio-Stack and uses Gen5™ or KC4™ Software in OLE mode to control the readers. All errors are displayed in the Bio-Stack PC Control Software on the controlling PC.

- Errors generated when the Bio-Stack PC Control Software is driving the Bio-Stack include **serial communication errors** and **Bio-Stack instrument errors**.
- Errors generated when the Bio-Stack PC Control Software is driving the reader via Gen5 include **Gen5 function call errors** and **reader instrument errors**.
- Errors generated when the Bio-Stack PC Control Software is driving the reader via KC4 include **KC4 function call errors** and **reader instrument errors**.

The following sections contain brief descriptions of each error code type.

### Serial Communication Errors

Errors detected by the portion of the Bio-Stack PC Control Software responsible for performing the serial communications with the Bio-Stack are displayed as negative value error codes, for example: **-1**, **-401**. Serial communication errors include errors found when sending messages to the instrument, and receiving messages back from the instrument, as well as timer-based errors when waiting for a response.

- Refer to **Table 1** on page 269 for a list of serial communication errors.

### Bio-Stack Instrument Errors

Errors detected by the Bio-Stack basecode software that are related to operation of the Bio-Stack hardware during the self-test or plate transfers are displayed as 4-digit hexadecimal codes, along with some textual description.

❖ These error codes are prefixed with a **B-** to distinguish them from similar hexadecimal reader instrument error codes. For example, **B-0200** indicates a **0x0200** error generated by the Bio-Stack, rather than by a reader.

- Refer to **Table 2** on page 272 for a list of Bio-Stack instrument errors.
- Refer to **Table 3**, **Table 4**, and **Table 5** on pages 278 to 280 for lists of the sensors, motors, and interfacing instruments referenced in **Table 2**.

## Gen5™ Function Call Errors

Errors detected by Gen5 Software following calls to Gen5 functions by the Bio-Stack™ PC Control Software are displayed in a negative value format, for example: **-8**, **-100**, **-2010**. These errors can occur when Gen5 is requested to open an invalid Gen5 experiment file, during serial communication between Gen5 and the reader, or during post-reading activities performed by Gen5, including data reduction and results exporting.

- Refer to **Table 6** on page 281 for a list of Gen5 function call errors.

## KC4™ Function Call Errors

Errors detected by KC4 Software following calls to KC4 functions by the Bio-Stack™ PC Control Software are displayed as negative value 4-digit codes. These errors can occur when KC4 is requested to open an invalid KC4 protocol file, during serial communication between KC4 and the reader, or during post-reading activities performed by KC4, including data reduction and results exporting.

- Refer to **Table 7** on page 297 for a list of KC4 function call errors.

## Reader Instrument Errors

Errors detected by the reader's basecode software and transmitted back to Gen5/KC4 (and, ultimately, to the Bio-Stack PC Control Software), which are related to operation of the reader's hardware are displayed as 4-digit hexadecimal error codes, along with some textual description. These errors can occur during self-test, plate reading, drawer opening/closing, barcode scanning, etc.

❖ As noted in the previous section on **Bio-Stack Instrument Errors**, in order to distinguish reader error instrument error codes from Bio-Stack instrument error codes, the Bio-Stack™ codes are prefixed with a **B-**.

- Refer to the **PowerWave™/XS** or **Synergy™ HT/Synergy™ 2/Synergy™ 4 Operator's Manuals** for lists of reader error codes.

## Errors During Operation of Bio-Stack™ with Precision™/XS

**Precision Power™ Software** controls all functionality of the Precision/XS instruments, and uses a component of the Bio-Stack™ PC Control Software to control the Bio-Stack. All errors are displayed in Precision Power on the controlling PC.

- Errors generated when Precision Power is driving the Bio-Stack, via a component of the Bio-Stack PC Control Software, include **serial communication errors** and **Bio-Stack instrument errors**.
- Errors generated when Precision Power Software is driving the Precision instrument include **program validation errors** and **Precision/XS instrument errors**.

### Serial Communication Errors

Errors detected by the Bio-Stack PC Control Software during serial communication between the host PC and the Bio-Stack are displayed as text messages (in English). Serial communication errors include errors found when sending messages to the instrument, and receiving messages back from the instrument, as well as timer-based errors when waiting for a response.

❖ Occasionally an error code may appear without the text; these codes are always in a negative value format, for example: **-3**, **-401**.

- Refer to **Table 1** on page 269 for a list of serial communication errors (refer also to the **Precision/XS Operator's Manuals**).

### Bio-Stack Instrument Errors

Errors detected by the Bio-Stack basecode software that are related to operation of the Bio-Stack hardware during self-test or plate transfers are displayed as text messages (in English).

❖ Occasionally an error code may appear without the text; these codes are displayed in four-digit format, for example: **1000**, and are sometimes preceded by **0x**, as in **0x1000**.

- Refer to **Table 2** on page 272 for a list of Bio-Stack instrument errors (refer also to the **Precision/XS Operator's Manuals**).
- Refer to **Table 3**, **Table 4**, and **Table 5** on pages 278 to 280 contain lists of the sensors, motors, and interfacing instruments referenced in **Table 2**.

## Program Validation Errors

Program validation errors detected by the Precision™/XS basecode software and transmitted back to Precision Power™ Software, occur when a fluid-transfer program fails to meet internally programmed validation criteria. These errors are displayed as four-digit codes beginning with the number **4**, and may include additional information, such as program name and command, loop and run numbers.

- Refer to the ***Precision Power User's Guide*** or help system for lists of program validation errors.

## Precision/XS Instrument Errors

Errors detected by the Precision/XS basecode software and transmitted back to Precision Power Software, which are related to operation of the Precision instrument's hardware are displayed as 4-digit hexadecimal error codes. These errors can occur during self-test, dispense or aspiration, pick-up of tips, etc.

- Refer to the ***Precision/XS Operator's Manuals*** for lists of Precision instrument run time errors.

## Errors During Operation of Bio-Stack™ with µFill™ or ELx405™ (Instrument Control)

Error codes that appear on the displays of the µFill Dispenser and ELx405 Washer during instrument control of the Bio-Stack can include

- Communication errors between the Bio-Stack and the µFill or ELx405
- Bio-Stack instrument errors
- µFill or ELx405 instrument errors

### Communication Errors

Communication errors during instrument control of the Bio-Stack by the µFill or ELx405 are displayed as 4-digit error codes, and may be generated by the Bio-Stack itself, or by the interfacing instrument.

❖ Error codes generated by the Bio-Stack are prefixed by a **B-** to distinguish them from codes generated by the µFill or ELx405.

- Refer to **Table 8** on page 304 for a list of communication error codes.

### Bio-Stack Instrument Errors

Errors detected by the Bio-Stack basecode software that are related to operation of the Bio-Stack hardware during self-test or plate transfers are displayed as 4-digit hexadecimal codes.

❖ Bio-Stack instrument error codes are prefixed with a **B-** to distinguish them from similar hexadecimal error codes generated by the µFill or ELx405. For example, **B-0200** indicates a **0x0200** error generated by the Bio-Stack, rather than by the µFill or ELx405.

- Refer to **Table 2** on page 272 for a list of Bio-Stack instrument errors.
- Refer to **Table 3**, **Table 4**, and **Table 5** on pages 278 to 280 for lists of the sensors, motors, and interfacing instruments referenced in **Table 2**.

### µFill™ or ELx405™ Instrument Errors

Errors detected by the µFill or ELx405 basecode software, that are related to operation of the µFill or ELx405 hardware are displayed as 4-digit hexadecimal error codes. These errors can occur during self-test, dispense, aspiration, etc.

- Refer to the **µFill Operator's Manual** or **ELx405 Operator's Guide** for a list of these codes.

---

## Errors During Operation of Bio-Stack™ with ELx405™ (PC Control)

**Liquid Handling Control™ (LHC) Software** uses a component of the Bio-Stack™ PC Control Software to control the Bio-Stack, and the ELx405 Interface Software to control all functionality of the ELx405. All errors are displayed in LHC on the controlling PC.

- Errors generated when LHC Software is driving the Bio-Stack, via a component of the Bio-Stack PC Control Software include **serial communication errors** and **Bio-Stack instrument errors**.
- Errors generated when LHC Software is driving the ELx405 washer, via the ELx405 Interface Software include **serial communication errors** and **ELx405 instrument errors**.

### Serial Communication Errors

Errors detected by the Bio-Stack PC Control Software during serial communication between the host PC and the Bio-Stack, or as detected by the ELx405 Interface Software during serial communication between the host PC and the ELx405 washer, are displayed as text messages (in English). Serial communication errors include errors found when sending messages to the instrument, and receiving messages back from the instrument, as well as timer-based errors when waiting for a response.

❖ Occasionally an error code may appear without the text; these codes are always in a negative value format, for example: **-3**, **-401**.

- Refer to **Table 1** on page 269 for a list of serial communication errors.

### Bio-Stack Instrument Errors

Errors detected by the Bio-Stack basecode software that are related to operation of the Bio-Stack hardware during self-test or plate transfers are displayed as text messages (in English).

❖ Occasionally an error code may appear without the text; these codes are displayed in four-digit format, for example: **1000**, and are sometimes preceded by **0x**, as in **0x1000**.

- Refer to **Table 2** on page 272 for a list of Bio-Stack instrument errors.
- Refer to **Table 3**, **Table 4**, and **Table 5** on pages 278 to 280 contain lists of the sensors, motors, and interfacing instruments referenced in **Table 2**.

## **ELx405 Instrument Errors**

Errors detected by the ELx405 basecode software and transmitted back to the LHC Software, which are related to operation of the ELx405 washer's hardware are displayed as 4-digit hexadecimal error codes, along with a textual message.

- Refer to the ***ELx405 Operator's Manual*** for examples of ELx405 instrument errors.

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## Errors During Operation of Bio-Stack™ with NanoQuot™

Errors that occur during instrument control of the Bio-Stack by the NanoQuot may be

- Communication errors between the Bio-Stack and the NanoQuot
- Bio-Stack instrument errors
- NanoQuot instrument errors

Error codes may be displayed by connecting the NanoQuot to a host computer that has the NanoQuot™ PC Control Software installed (see **Display Error Codes** on the next page). The NanoQuot PC Control Software will identify whether the errors are NanoQuot errors (which includes communication errors detected by the NanoQuot when trying to communicate with the Bio-Stack), or if they are Bio-Stack errors.

### Communication Errors

Communication errors during instrument control of the Bio-Stack by the NanoQuot are displayed in the NanoQuot PC Control Software as NanoQuot 4-digit hexadecimal codes. There will also be a textual description of the error.

Serial communication errors that are detected by the Bio-Stack™ PC Control Software during computer control of the Bio-Stack (e.g., when running the Instrument Alignment Utility), are displayed in the Bio-Stack PC Control Software as negative value error codes, for example: **-504**, **-506**.

- Refer to **Table 1** on page 269 for a list of serial communication errors.

### Bio-Stack Instrument Errors

Errors detected by the Bio-Stack basecode software that are related to operation of the Bio-Stack hardware during self-test or plate transfers are displayed in the NanoQuot PC Control Software as 4-digit hexadecimal codes. There will also be a textual description of the error.

- Refer to **Table 2** on page 272 for a list of Bio-Stack instrument errors.
- Refer to **Table 3**, **Table 4**, and **Table 5** on pages 278, 279, and 280 for lists of the sensors, motors, and interfacing instruments referenced in **Table 2**.



## NanoQuot™ Instrument Errors

Errors detected by the NanoQuot basecode software, that are related to operation of the NanoQuot hardware are displayed in the NanoQuot™ PC Control Software as 4-digit hexadecimal error codes, along with a textual description. These errors can occur during self-test, dispense, etc.

- Refer to the **NanoQuot Operator's Manual** for a list of these codes.

## Display Error Codes



**Important!** You will need a host computer that has the NanoQuot PC Control Software installed for the following instructions.

- ❖ Two serial cables are supplied with the Bio-Stack™: a 9-pin to 9-pin male/male serial cable and a 9-pin to 25-pin male/female serial cable. The DB9M to DB9M serial cable must be used to connect the Bio-Stack to the NanoQuot.
- ❖ A 9-pin to 9-pin female/male serial cable is shipped with the NanoQuot, for connecting the Dispenser to a computer. The **DB9M** end of the cable must be connected to the NanoQuot.

To display errors that occur during operation of the Bio-Stack with the NanoQuot:

1. Turn off the Bio-Stack and NanoQuot, then disconnect the DB9M to DB9M serial cable between the two instruments.
2. Turn off the computer. Connect the DB9F end of the DB9F to DB9M serial cable to a serial port on the computer.
3. Connect the DB9M end of the serial cable to a serial port on the rear of the NanoQuot. Refer to **Chapter 2, Installation**, in the NanoQuot Operator's Manual (on CD part number 7151008) for a photo of the serial port on the Dispenser.
4. Open the PC Software, and at the main screen, click the **Get System Status** button to retrieve any current error codes. The dialog displayed will show both NanoQuot instrument errors as well as Bio-Stack instrument errors.
5. Click **OK** to clear the error stored on the NanoQuot. Also, refer to **Table 2, Bio-Stack Instrument Errors**, in this chapter to identify the cause and remedy for any Bio-Stack error. (For NanoQuot instrument errors, refer to the tables in **Appendix A, Error Codes**, of the NanoQuot Operator's Manual.)
6. Disconnect the serial cable between the NanoQuot and computer, then reconnect the DB9M to DB9M cable between the Bio-Stack and Dispenser.

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## Errors During Operation of Bio-Stack™ with MicroFlo™ Select (Instrument Control)

Error codes that appear on the display of the MicroFlo Select during instrument control of the Bio-Stack can include

- Communication errors between the Bio-Stack and the MicroFlo
- Bio-Stack instrument errors
- MicroFlo instrument errors

### Communication Errors

Communication errors during instrument control of the Bio-Stack by the MicroFlo are displayed as 4-digit error codes, with “**Stacker Error**” in the first line of the display. These errors may be generated by the Bio-Stack itself, or by the MicroFlo.

❖ Error codes generated by the Bio-Stack are prefixed by a **B-** to distinguish them from codes generated by the MicroFlo.

- Refer to **Table 8** on page 304 for a list of communication error codes.

### Bio-Stack Instrument Errors

Errors detected by the Bio-Stack basecode software that are related to operation of the Bio-Stack hardware during self-test or plate transfers are displayed as 4-digit hexadecimal codes, with “**Stacker Error**” in the first line of the display.

❖ Bio-Stack instrument error codes are prefixed with a **B-** to distinguish them from similar hexadecimal error codes generated by the MicroFlo. For example, **B-0200** indicates a **0x0200** error generated by the Bio-Stack, rather than by the MicroFlo.

- Refer to **Table 2** on page 272 for a list of Bio-Stack instrument errors.
- Refer to **Table 3**, **Table 4**, and **Table 5** on pages 278 to 280 for lists of the sensors, motors, and interfacing instruments referenced in **Table 2**.

### MicroFlo Select Instrument Errors

Errors detected by the MicroFlo Select basecode software, that are related to operation of the MicroFlo hardware are displayed as 4-digit hexadecimal error codes. These errors can occur during self-test, dispense, etc.

- Refer to the **MicroFlo Select Operator's Manual** for a list of these codes.

## Errors During Operation of Bio-Stack™ with MicroFlo™ Select (PC Control)

**Liquid Handling Control™ (LHC) Software** uses a component of the Bio-Stack™ PC Control Software to control the Bio-Stack, and the MicroFlo™ Select Interface Software to control all functionality of the MicroFlo Select. All errors are displayed in LHC on the controlling PC.

- Errors generated when LHC Software is driving the Bio-Stack, via a component of the Bio-Stack PC Control Software include **serial communication errors** and **Bio-Stack instrument errors**.
- Errors generated when LHC Software is driving the MicroFlo dispenser, via the MicroFlo Select Interface Software include **serial communication errors**, **MicroFlo instrument errors**, and **MicroFlo Select Interface Software errors**.

### Serial Communication Errors

Errors detected by the Bio-Stack PC Control Software during serial communication between the host PC and the Bio-Stack, or as detected by the MicroFlo Select Interface Software during serial communication between the host PC and the MicroFlo dispenser, are displayed as text messages (in English). Serial communication errors include errors found when sending messages to the instrument, and receiving messages back from the instrument, as well as timer-based errors when waiting for a response.

❖ Occasionally an error code may appear without the text; these codes are always in a negative value format, for example: **-505**, **-506**.

- Refer to **Table 1** on page 269 for a list of serial communication errors.

### Bio-Stack Instrument Errors

Errors detected by the Bio-Stack basecode software that are related to operation of the Bio-Stack hardware during self-test or plate transfers are displayed as text messages (in English).

❖ Occasionally an error code may appear without the text; these codes are displayed in four-digit format, for example: **1000**, and are sometimes preceded by **0x**, as in **0x1000**.

- Refer to **Table 2** on page 272 for a list of Bio-Stack instrument errors.
- Refer to **Table 3**, **Table 4**, and **Table 5** on pages 278 to 280 contain lists of the sensors, motors, and interfacing instruments referenced in **Table 2**.

## MicroFlo™ Select Instrument Errors

Errors detected by the MicroFlo Select basecode software and transmitted back to the LHC Software, which are related to operation of the MicroFlo dispenser's hardware are displayed as 4-digit hexadecimal error codes, along with a textual message.

- Refer to the ***MicroFlo Select Dispenser's Operator's Manual*** for examples of MicroFlo instrument errors.

## MicroFlo™ Select Interface Software Errors

Errors generated by the MicroFlo Select Interface Software are displayed in the LHC Software as 4-digit hexadecimal error codes, along with a textual message. These errors include program validation errors (when a dispense program/protocol fails to meet programmed validation criteria) and serial communication errors.

- Refer to the **Table 9** on page 305 for examples of errors generated by the MicroFlo Select Interface Software.

## Error Code Tables

**Table 1**  
**Serial Communication Errors**

Serial communication errors are displayed in the Bio-Stack™ PC Control Software during Bio-Stack™ operation with the PowerWave™/XS or Synergy™ HT/Synergy™ 2/Synergy™ 4 Readers, in Precision Power™ Software during Bio-Stack operation with the Precision™/XS, and in Liquid Handling Control™ (LHC) Software during Bio-Stack operation with the ELx405™ or MicroFlo™ Select. Serial communication errors may also be displayed in the Bio-Stack PC Control Software during installation of the Bio-Stack with the NanoQuot™, when the PC Software's Instrument Alignment Utility is used to align the Bio-Stack's claw/gripper with the NanoQuot's plate carrier.

❖ Precision errors usually are displayed as text messages (in English), and occasionally as an error code without the text.

Code	Probable Causes
-1	<p><b>General failure in talking to instrument driver software.</b></p> <p>This error indicates that something is not correct with the driver software, or with the communications.</p> <ul style="list-style-type: none"> <li>Try closing the application and restarting. If this has no effect, try re-booting the PC.</li> </ul>
-3	<p><b>Operation cancelled by user.</b></p> <p>There is a problem with the driver software or with the communications.</p> <ul style="list-style-type: none"> <li>Try closing the application and restarting. If this has no effect, try re-booting the PC.</li> </ul>
-4	<p><b>Unable to start delay timer associated with waiting for message response from instrument.</b></p> <p>This error indicates that there may be too many applications using timers on the PC (there are only 8 timers available), or the delay timer is already set.</p> <ul style="list-style-type: none"> <li>Close the application and try again.</li> <li>Close one or more other applications that may be using timers.</li> </ul>
-5	<p><b>Invalid request.</b></p> <p>The Bio-Stack is not in the correct mode for handling this request.</p> <ul style="list-style-type: none"> <li>Re-start the Bio-Stack.</li> </ul>

**Table 1 (Cont'd)**

<b>Code</b>	<b>Probable Causes</b>
<b>-6</b>	<p><b>Unable to process request.</b></p> <p>The Bio-Stack™ is not in the correct mode for handling this request.</p> <p>Re-start the Bio-Stack.</p>
<b>-401</b>	<p><b>Object doesn't exist.</b></p> <p>This error indicates that the driver software has somehow lost information on the instrument it is trying to communicate with.</p> <ul style="list-style-type: none"> <li>• Re-start the application.</li> </ul>
<b>-504</b>	<p><b>Unable to open a serial port.</b></p> <p>This error indicates that either another application is using the serial port, or the port was opened either by another application or by the Bio-Stack™ PC Control Software, but was not closed properly.</p> <ul style="list-style-type: none"> <li>• Close the other application.</li> <li>• If that doesn't work, close the Bio-Stack PC Control software and re-start it.</li> <li>• Lastly, re-boot the PC.</li> </ul>
<b>-505</b>	<p><b>Unable to write all of the serial data.</b></p> <ul style="list-style-type: none"> <li>• Try re-starting the application.</li> </ul>
<b>-506</b>	<p><b>Timeout while reading in serial data, or incorrect number of serial characters were read in.</b></p> <ul style="list-style-type: none"> <li>• Check the serial cable connection to ensure it is not loose.</li> <li>• Check to see if any other application is very CPU intensive.</li> <li>• Try re-starting the application.</li> </ul>
<b>-507</b>	<p><b>Checksum error with the serial data read in.</b></p> <ul style="list-style-type: none"> <li>• Attempt the operation again.</li> <li>• Try re-starting the application.</li> </ul>

Table 1 (Cont'd)

Code	Probable Causes
-508	<p><b>When attempting to talk to the instrument, the instrument basecode software returned a NAK, indicating it did not recognize the request.</b></p> <ul style="list-style-type: none"> <li>• Attempt the operation again.</li> <li>• Try re-starting the instrument.</li> <li>• Try re-starting the application.</li> </ul>
-509	<p><b>PC software received back more data than it was expecting.</b></p> <ul style="list-style-type: none"> <li>• Unlikely to be seen. It is expected that a -506 would be sent instead.</li> <li>• Try re-starting the application.</li> </ul>
-510	<p><b>Invalid message object.</b></p> <p>This error indicates that either the instrument basecode software or the PC software doesn't recognize the message sent. This is unlikely to be seen, but could possibly happen if the software fell out-of-sync with the characters sent back and forth.</p> <ul style="list-style-type: none"> <li>• Try re-starting the application and the instrument.</li> </ul>
-511	<p><b>Invalid message body size.</b></p> <p>This error indicates that either the instrument basecode software or the PC software received an invalid count of expected characters for a specific message. This is unlikely to be seen, but could possibly happen if the software fell out-of-sync with the characters sent back and forth.</p> <ul style="list-style-type: none"> <li>• Try re-starting the application and the instrument.</li> </ul>
-512	<p><b>Serial message timeout waiting for response from the instrument.</b></p> <ul style="list-style-type: none"> <li>• Check the instrument to ensure it has been powered-up correctly and is in a good operational state (i.e., the light is on, but NOT flashing).</li> <li>• Check the cable connections and the cable itself.</li> <li>• Try re-starting the application.</li> </ul>

**Table 2**  
**Bio-Stack Instrument Errors**

Bio-Stack™ instrument errors are displayed in the Bio-Stack™ PC Control Software, Precision Power™ Software, NanoQuot™ PC Control Software, Liquid Handling Control™ (LHC) Software, and on the displays of the µFill™, ELx405™, or MicroFlo™ Select.

❖ In Precision Power, these errors usually are displayed as text messages (in English), and occasionally as an error code without the text (e.g., **1000** or **0x1000**). Refer also to the ***Precision/XS Operator's Manuals*** for a list of Bio-Stack™ instrument errors ("operational errors").

Code	Probable Causes
<b>020#</b> <b>(#=sensor)</b>  Refer to <b>Table 3</b> on page 278 for a list of sensor numbers.	<b>Couldn't find opto sensor.</b>  This error indicates that a sensor was not tripped. <ul style="list-style-type: none"> <li>Plates sticking because wells are overfilled, causing a jam.</li> <li>Plate not seated properly, causing a jam.</li> <li>Plate stack not installed properly.</li> <li>Shipping block still installed.</li> <li>Plate dimensions are incompatible with Bio-Stack.</li> </ul>
<b>030#</b> <b>(#=motor)</b>  Refer to <b>Table 4</b> on page 279 for a list of motor numbers.	<b>Jig contact not made in required steps.</b>  This error indicates that the autocalibration jig is either not installed properly, or the gold contacts have a film on them that is not allowing the current to transfer. <ul style="list-style-type: none"> <li>Verify that the autocalibration jig is installed properly.</li> <li>Clean the contacts with alcohol.</li> </ul>

❖ Calibration errors ("Jig contact not made in required steps") will normally be displayed only during calibration or repair of the instrument by BioTek TAC.



Table 2 (Cont'd)

Code	Probable Causes
<b>040#</b> <b>(#=motor)</b> Refer to <b>Table 4</b> on page 279 for a list of motor numbers.	<b>Failed positional verify.</b> <p>This error indicates that an axis failed its positional verify test. After moving a predefined number of steps from a home position, the motor should return to the home position in the proper amount of time and steps. If the axis moves back to its home position in the wrong amount of time, or uses too few or too many steps, the test fails.</p> <p>A belt may be slipping due to incorrect tension, a loose motor pulley, or a loose belt clamp. This can also be caused by a defective motor drive circuit.</p>
<b>0600</b>	<b>Necessary configuration data missing.</b> <ul style="list-style-type: none"> <li>The basecode software and/or assays may need to be re-downloaded. Contact BioTek Technical Assistance Center (TAC).</li> </ul>
<b>0700</b>	<b>Failed configuration checksum test.</b> <p>This error indicates that the internal software may be corrupted.</p> <ul style="list-style-type: none"> <li>Turn the instrument off/on. If the error persists, contact BioTek TAC.</li> </ul>
<b>080#</b> <b>(#=motor)</b> Refer to <b>Table 4</b> for motor numbers.	<b>Not homed successfully.</b> <p>This error is usually only seen during the autocalibration sequence. See the probable causes for 020# on the preceding page.</p>
<b>0900</b>	<b>Memory allocation failure.</b> <p>This error indicates that the memory has failed or is corrupt. Contact BioTek TAC.</p>
<b>1000</b>	<b>Autocalibration data checksum failed at power-up.</b> <ul style="list-style-type: none"> <li>Turn the instrument off/on. If the error persists, contact BioTek TAC.</li> </ul>

❖ Calibration errors ("Autocalibration data checksum failed at power-up") will normally be displayed only during calibration or repair of the instrument by BioTek TAC.

**Table 2 (Cont'd)**

<b>Code</b>	<b>Probable Causes</b>
<b>1300</b>	<p><b>Timeout sending or receiving serial data.</b></p> <ul style="list-style-type: none"> <li>• Cable not connected, or loose.</li> <li>• Incorrect cable.</li> <li>• ELx405™, µFill™, NanoQuot™, or MicroFlo™ Select not set up properly.</li> <li>• Gen5™, KC4™, Bio-Stack™ PC Control Software, Precision Power™, NanoQuot™ PC Control Software, or Liquid Handling Control™ (LHC) Software not set up properly.</li> </ul>
<b>1600</b>	<p><b>Failed attempted plate transfer from output stack to input stack.</b></p> <p>This error indicates that no plate was found on the Bio-Stack™ carrier after attempted plate retrieval from the output stack.</p> <ul style="list-style-type: none"> <li>• Plate stack not installed properly.</li> <li>• Plate dimensions are incompatible with Bio-Stack.</li> </ul>
<b>1601</b>	<p><b>Failed attempted plate transfer from instrument carrier to output stack.</b></p> <p>This error indicates that no plate was found on the Bio-Stack carrier after transfer from claw to carrier.</p> <ul style="list-style-type: none"> <li>• Plate stack not installed properly.</li> <li>• Plate dimensions are incompatible with Bio-Stack.</li> <li>• Need realignment between Bio-Stack and interfacing instrument. Run the Instrument Alignment Utility.</li> <li>• Plate is sticking to carrier or claw.</li> </ul>
<b>1602</b>	<p><b>Failed attempted plate transfer from input stack to Bio-Stack carrier.</b></p> <p>This error indicates that no plate was found on the carrier after attempted plate retrieval from the input stack.</p> <ul style="list-style-type: none"> <li>• Plate dimensions are incompatible with Bio-Stack.</li> <li>• Plates are sticking because wells are overfilled.</li> <li>• Plate stack not installed properly.</li> </ul>

Table 2 (Cont'd)

Code	Probable Causes
<b>1700</b>	<b>Failed attempted plate transfer from Bio-Stack carrier to instrument.</b> This error indicates that no plate was found in the gripper after attempted plate retrieval from the carrier. <ul style="list-style-type: none"> <li>Plates are sticking because wells are overfilled.</li> <li>Plate dimensions are incompatible with the Bio-Stack™.</li> <li>Instrument needs calibration.</li> </ul>
<b>1701</b>	<b>Failed attempted plate transfer from instrument to output stack.</b> This error indicates that no plate was found in the gripper after an attempted plate retrieval from the instrument. <ul style="list-style-type: none"> <li>Plates are sticking because wells are overfilled.</li> <li>Need realignment between Bio-Stack and interfacing instrument. Run the Instrument Alignment Utility.</li> <li>Plate dimensions are incompatible with the Bio-Stack.</li> </ul>
<b>180#</b> <b>(#=motor)</b>  Refer to <b>Table 4</b> on page 279 for a list of motor numbers.	<b>Undefined.</b> <ul style="list-style-type: none"> <li>Turn the instrument off/on. If the error persists, contact BioTek TAC.</li> </ul>
<b>1900</b>	<b>Plate found in gripper during power-up.</b> <ul style="list-style-type: none"> <li>Power down the Bio-Stack and remove the plate.</li> </ul>
<b>1901</b>	<b>Failed attempted plate transfer from carrier to instrument.</b> This error indicates that a plate was still in the gripper after move. <ul style="list-style-type: none"> <li>Plates are sticking because wells are overfilled.</li> <li>Plate dimensions are incompatible with the Bio-Stack.</li> </ul>
<b>2000</b>	<b>Plate found on carrier during power-up.</b> <ul style="list-style-type: none"> <li>Power down the Bio-Stack and remove the plate.</li> </ul>

**Table 2 (Cont'd)**

Code	Probable Causes
<b>2001</b>	<b>Failed attempted plate transfer from output stack to input stack.</b> This error indicates that the sensor check failed. <ul style="list-style-type: none"> <li>• Plate in instrument.</li> <li>• The Bio-Stack's shipping block is still installed.</li> </ul>
<b>2002</b>	<b>Failed attempted plate transfer from output stack to input stack.</b> This error indicates that the plate was left on the carrier after retrieval from the output stack. <ul style="list-style-type: none"> <li>• Power down the Bio-Stack™ and remove the plate.</li> </ul>
<b>2003</b>	<b>Failed attempted plate transfer from instrument to output stack.</b> This error indicates that the plate was left on the carrier after retrieval from the instrument. <ul style="list-style-type: none"> <li>• Power down the Bio-Stack and remove the plate.</li> </ul>
<b>210#</b> <b>(#=motor)</b> Refer to <b>Table 4</b> on page 279 for a list of motor numbers.	<b>Requested motor axis is unknown to the Bio-Stack.</b> <ul style="list-style-type: none"> <li>• Turn the instrument off/on. If the error persists, contact BioTek TAC.</li> </ul>
<b>220#</b> <b>(#=instrument)</b> Refer to <b>Table 5</b> on page 280 for a list of instrument numbers.	<b>Instrument set to interface with is unknown to the Bio-Stack.</b> The instrument is not an ELx405™, µFill™, MicroFlo™ Select, PowerWave™/PowerWave™ XS, Synergy™ HT/Synergy™ 2/Synergy™ 4, Precision XS™ Microplate Sample Processor, or Precision™ Microplate Pipetting System.
<b>2300</b>	<b>Gripper width saved is outside allowed range.</b> <ul style="list-style-type: none"> <li>• Incorrect measurement entered.</li> <li>• Incorrect units.</li> </ul>

Table 2 (Cont'd)

Code	Probable Causes
2500	<b>Invalid alignment.</b> <ul style="list-style-type: none"> <li>Z-alignment (vertical alignment) is incomplete or incorrect. Rerun the Instrument Alignment Utility to clear the error.</li> <li>Incorrect instrument type is selected.</li> </ul>
2600	<b>Claw/instrument interface error.</b> <ul style="list-style-type: none"> <li>Rerun the Instrument Alignment Utility to clear the error.</li> </ul>
2700	<b>Error attempting to run the barcode scanner SET command.</b> <ul style="list-style-type: none"> <li>A response returned from the scanner is invalid.</li> </ul>
2701	<b>Error attempting to run the barcode scanner SET command.</b> <ul style="list-style-type: none"> <li>The command message is calling out an invalid barcode location. Valid numbers are 1-4.</li> </ul>
2702	<b>Error attempting to get barcode scanner information regarding one of the barcode types.</b> <ul style="list-style-type: none"> <li>The barcode type returned by the scanner is not one of those expected. See <b>Appendix B, Bio-Stack Barcode Scanner</b> for required barcode types.</li> </ul>
2703	<b>Barcode type is not supported.</b> <ul style="list-style-type: none"> <li>One of the four default barcode types is not supported by the scanner. See <b>Appendix B, Bio-Stack Barcode Scanner</b> for required barcode types.</li> </ul>
2704	<b>Error disabling start/stop character transmission.</b> <ul style="list-style-type: none"> <li>While attempting to tell the scanner to disable the transmission of start and stop characters along with the barcode value for the Codeabar barcode type, an error occurred.</li> </ul>
2800	<b>Out of range error.</b> <ul style="list-style-type: none"> <li>An attempt was made to set a configuration parameter, using an out-of-range value.</li> </ul>
3200	<b>Error running serial (or USB) port test.</b> <ul style="list-style-type: none"> <li>Incorrect cable.</li> <li>Cable loose.</li> </ul>

**Table 3**  
**Bio-Stack™ Sensor Numbers Referenced in Table 2**

Sensor	Number
Claw Home	0
Output Stack Cam1 Home	1
Output Stack Lift Home	2
Input Stack Cam1 Home	3
Input Stack Lift Home	4
Input Stack Cam2 Home	5
Output Stack Cam2 Home	6
Gripper Home	7
Carrier Home	8
Autocalibration	9
Plate Present	A
Carrier Out	B
Input Stack Lift Up	C
Output Stack Lift Up	D

**Table 4**  
**Bio-Stack™ Motor Numbers Referenced in Table 2**

Motor	Number
Claw	0
Output Stack Cam1	1
Output Stack Lift	2
Input Stack Cam1	3
Input Stack Lift	4
Input Stack Cam2	5
Output Stack Cam2	6
Gripper	7
Carrier	8

**Table 5**  
**Interfacing Instrument Numbers Referenced in Table 2**

Instrument	Number
PowerWave™/XS	0
Synergy™ HT/Synergy™ 2/ Synergy™ 4	1
ELx405™	2
µFill™	3
Precision™/XS	4
Reserved for specific customer	5
Custom instrument	6
Custom instrument	7
Custom instrument	8

- ❖ If you are operating the Bio-Stack™ with the **NanoQuot™**, the interfacing instrument number will be **0**, since the NanoQuot uses the same Bio-Stack alignment scheme as the **PowerWave**.
- ❖ If you are operating the Bio-Stack™ with the **MicroFlo™ Select**, the interfacing instrument number will be **3**, since the MicroFlo uses the same Bio-Stack alignment scheme as the **µFill**. This is true when operating the Bio-Stack from the dispenser's keypad or from the Liquid Handling Control™ Software.



**Table 6**  
**Gen5™ Function Call Errors**

Gen5 function call error codes are displayed in the Bio-Stack™ PC Control Software during Bio-Stack™ operation with the PowerWave™/XS or Synergy™ HT/Synergy™ 2/Synergy™ 4.

- ❖ **Gen5 Function Call Errors** are usually only seen by software developers when using BioTek's ActiveX component or serial programming to control the Bio-Stack. If the information provided in this table does not help you resolve the problem, contact BioTek TAC for assistance.
- ❖ The **Label** column is for use by robotic application developers, and corresponds to the labels found in the **BTIStatusCodes.h** file that is included with the Gen5 installation (if "Custom Installation" was selected to install Gen5's OLE Automation tool). These labels may also be beneficial to the developers of the Bio-Stack PC software, to troubleshoot problems associated with Bio-Stack PC software/Gen5 operations.

Code	Label	Probable Cause
-8	BTI_UNKNOWN_CHARACTERISTIC_ID	There are no values associated with the characteristic ID used.
-100	BTI_FILE_DOES_NOT_EXIST	The system cannot find the file specified.
-101	BTI_UNABLE_TO_OPEN_FILE	Unable to open the file.
-102	BTI_FILE_ALREADY_EXISTS	File already exists.
-103	BTI_FILE_READ_ONLY	Read file only.
-104	BTI_INVALID_PATHNAME	The path name is invalid.
-105	BTI_FILE_LOCKED	Unable to access the file because another process has locked the file.
-106	BTI_FILE_SHARING_VIOLATION	Unable to access the file because it is being used by another process.
-107	BTI_FILE_WRITE_ERROR	Error writing a file.
-108	BTI_FILE_READ_ERROR	A system error occurred while reading from the file.
-109	BTI_READ_FROM_FILE_EOF_ERROR	The end of the file was reached before all needed data was read.
-110	BTI_READ_FROM_FILE_TIME_STAMP_NOT_FOUND	The import file does not contain a valid timestamp.
-200	BTI_INVALID_RECORD_FORMAT	Invalid record format.

**Table 6 (Cont'd)**

Code	Label	Probable Cause
-201	BTI_INVALID_PARAMETER_LIST	Invalid parameter list.
-202	BTI_UNKNOWN_RECORD_TYPE	Unknown record type.
-300	BTI_INVALID_FIELD_OPTION	Invalid field option.
-301	BTI_FIELD_BELOW_MIN_RANGE	Field below minimum range.
-302	BTI_FIELD_ABOVE_MAX_RANGE	Field above maximum range.
-303	BTI_FIELD_TOO_LONG	Field too long.
-304	BTI_FIELD_TOO_SHORT	Field too short.
-400	BTI_OBJECT_CREATION_ERROR	Object creation error.
-401	BTI_OBJECT_DOES_NOT_EXIST	Object does not exist.
-402	BTI_INSUFFICIENT_FIELDS	Insufficient fields.
-403	BTI_NAME_REQUIRED	Name required.
-450	BTI_DEVICE_PROXY_CREATION_ERROR	Device proxy creation error.
-451	BTI_DEVICE_MGR_NO_AVAIL_READERS	Device manager: no available reader.
-500	BTI_BAUD_RATE_INVALID	Invalid baud rate.
-501	BTI_DATA_BITS_INVALID	Invalid number of data bits.
-502	BTI_STOP_BITS_INVALID	Invalid number of stop bits.
-503	BTI_PARITY_INVALID	Invalid parity setting.
-504	BTI_SERIAL_PORT_ERROR	Serial port error.
-505	BTI_SERIAL_WRITE_ERROR	Serial write error.
-506	BTI_SERIAL_READ_ERROR	Serial read error.
-507	BTI_CHECKSUM_ERROR	Checksum error.
-508	BTI_SERIAL_NAK_ERROR	Serial NAK error. Message not acknowledged.
-509	BTI_EXCESS_DATA_RECEIVED	Excess serial data received.
-510	BTI_INVALID_MSG_OBJECT	Invalid serial message object.

**Table 6 (Cont'd)**

Code	Label	Probable Cause
-511	BTI_INVALID_MSG_BODY_SIZE	Invalid serial message body size.
-512	BTI_PURGE_COMM_FAILURE	Failure purging the COM port.
-513	BTI_PORT_NOT_OPEN	COM port not open failure.
-514	BTI_PORT_HANDLE_ERROR	COM port handle error.
-515	BTI_SERIAL_STREAM_ERROR	The reader output was not in the correct format.
-516	BTI_SEND_CMD_HEADER_ERROR	Communication output failure. Reader may not be attached or turned on.
-517	BTI_SEND_CMD_BODY_ERROR	Command body error with the sent message.
-518	BTI_RECEIVE_CMD_BODY_ERROR	Command body error with the received message.
-519	BTI_RECEIVE_CMD_STATUS_ERROR	Request sent to reader, but no response received.
-520	BTI_RECEIVE_BODY_SIZE_MISMATCH	Received serial message body size mismatch.
-521	BTI_RECEIVE_STATUS_SIZE_MISMATCH	Received serial message status size mismatch.
-522	BTI_COM_PORT_ALREADY_IN_USE	COM port already in use. Please select another.
-523	BTI_SET_TIMEOUT_ERROR	Error setting timeout.
-524	BTI_SET_DCB_BLOCK_FAILURE	DCB block failure with serial communication.
-525	BTI_CREATE_FILE_HANDLE_ERROR	Error creating file handle.
-526	BTI_CREATE_FILE_NO_PORT_ERROR	The specified COM port does not exist.
-527	BTI_CREATE_FILE_PORT_IN_USE	The specified COM port is in use by another application.
-528	BTI_COULD_NOT_MATCH_BAUD_RATE	Attempted, but could communicate with reader. Please cycle power to the reader and try again.
-529	BTI_READER_NOT_CONNECTED	Communication output failure. Reader may not be attached or turned on.

**Table 6 (Cont'd)**

Code	Label	Probable Cause
-600	BTI_UNKNOWN_READER	Unknown reader type.
-601	BTI_READER_STATUS_ERROR	Reader status error.
-602	BTI_READER_NO_ACKNOWLEDGE	Reader failed to acknowledge request
-603	BTI_TEMP_RANGE_NOT_FOUND	Temperature range not found.
-605	BTI_GEOMETRY_INVALID	Invalid plate geometry.
-606	BTI_READ_TIMEOUT_ERROR	The current process timed out before receiving a reader response.
-607	BTI_ABS_READER_DATA_NEW_ERROR	New error on reader absorbance data.
-608	BTI_READER_INV_WAVELENGTH	Invalid reader wavelength.
-609	BTI_READER_INV_NUM_FILTER_SETS	Invalid number of reader filter sets.
-610	BTI_FLUOR_READER_DATA_NEW_ERROR	New error on reader fluorescence data.
-611	BTI_READER_COMMANDS_NULL	Reader commands are empty (NULL).
-612	BTI_SPECTRAL_SCAN_DATA_NEW_ERROR	New error on reader spectrum scan data.
-613	BTI_EVENT_MISMATCH_IN_DATA_RESPONSE	Plate and well synch modes expected event did not match event of data from reader.
-614	BTI_SPECTRAL_SCAN_DATA_STATE_ERROR	State error on reader spectrum data.
-615	BTI_AREA_SCAN_DATA_NEW_ERROR	New error on reader area scan data.
-616	BTI_LINEAR_SCAN_DATA_NEW_ERROR	New error on reader linear scan data.
-617	BTI_AREA_LINEAR_SCAN_DATA_NEW_ERROR	New error on reader area scan or linear scan data.
-618	BTI_READER_VERSION_NOT_SUPPORTED	Gen5 does not support the version of the firmware installed on this reader. Please contact BioTek Service for assistance.
-619	BTI_READ_TYPE_NOT_VALID	Invalid read type for Absorbance detection method.

**Table 6 (Cont'd)**

Code	Label	Probable Cause
-620	BTI_GET_SENSITIVITY_INVALID_FILTER_SET	Invalid filter set for get sensitivity command.
-621	BTI_SET_PROBE_HEIGHT_INVALID_HEIGHT	Invalid set probe height value.
-622	BTI_SET_PROBE_HEIGHT_INVALID_SELECTION	Invalid selection for set probe height.
-623	BTI_INCUBATION_TEMP_INVALID	The temperature specified in the procedure is outside the range of the instrument.
-624	BTI_INCUBATION_NOT_SUPPORTED	Temperature control is not supported by this reader
-625	BTI_FLUOR_LUMIN_S_CMD_RSP_DATA_ERR	Error with response data associated with luminescence or fluorescence 'S' command.
-626	BTI_CFLUORESCENCEREADERDATA_ERROR	'C' command fluorescence reader data error.
-627	BTI_FLUOR_LUMIN_DATA_CHECKSUM_ERROR	Fluorescence or luminescence data checksum error.
-628	BTI_SYSTEM_TEST_NOT_SUPPORTED	System test not supported.
-629	BTI_SYSTEM_TEST_TIMER_READ_DATA_FAIL	System test timer read data failure.
-630	BTI_MSG_DIALOG_START_TIMER_FAILED	Message dialog start timer failed.
-631	BTI_TIMEOUT_ERROR	Timeout error.
-632	BTI_ABORT_ERROR	Abort error.
-633	BTI_NO_ENDPOINT_DATA_PRESENT	No endpoint data is available.
-634	BTI_ABSORBANCE_DATA_CHECKSUM_ERROR	Absorbance data checksum error.
-635	BTI_NO_SPECTRAL_SCAN_DATA_PRESENT	No spectrum scan data present.
-636	BTI_UNDEFINED_SPECTRAL_VALUE	Undefined spectral value.
-637	BTI_SPECTRAL_DATA_CHECKSUM_ERROR	Spectral data checksum error.

**Table 6 (Cont'd)**

Code	Label	Probable Cause
-638	BTI_SPECTRAL_DATA_COMMAND_ERROR	Spectral data command error.
-639	BTI_NO_AREA_SCAN_DATA_PRESENT	No area scan data present.
-640	BTI_READER_IN_USE	The reader is in use and the operation selected is not available.
-641	BTI_EXECUTE_READ_PARAM_TRY_CATCH	Software exception on an execute read command.
-642	BTI_NO_MONITOR_WELL_DATA_PRESENT	No monitor well data present.
-643	BTI_AUXILIARY_DATA_PRESENT	Auxiliary data found (BioCell, Pathlength Correction, etc) and should be empty.
-644	BTI_AUXILIARY_DATA_TRY_CATCH	Software exception on auxiliary data read.
-645	BTI_NO_AUXILIARY_DATA_PRESENT	No auxiliary data present.
-646	BTI_NO_WELL_DATA_PRESENT	No well data present.
-647	BTI_READER_DATA_PRESENT	Data found when list should be empty.
-648	BTI_NO_SENSITIVITY_VALUE_MATCH	Could not find match for auto sensitivity value.
-649	BTI_EDIT_READ_PARAM_TRY_CATCH	Software exception on edit read parameters attempt.
-650	BTI_RDR_NO_ABSORBANCE_SUPPORT	Absorbance detection not supported by reader
-651	BTI_RDR_NO_FLUORESCENCE_SUPPORT	Fluorescence detection not supported by reader
-652	BTI_RDR_NO_LUMINESCENCE_SUPPORT	Luminescence detection not supported by reader
-653	BTI_RDR_MIN_WAVELENGTH_EXCEEDED	Wavelength must be between value 1 and value 2
-654	BTI_RDR_MAX_WAVELENGTH_EXCEEDED	Wavelength must be between value 1 and value 2
-655	BTI_RDR_NO_INCUBATION_SUPPORT	Incubation not supported by this reader.
-656	BTI_RDR_MIN_TEMP_EXCEEDED	Temperature must be between value 1 and value 2

**Table 6 (Cont'd)**

Code	Label	Probable Cause
-657	BTI_RDR_MAX_TEMP_EXCEEDED	Temperature must be between value 1 and value 2
-658	BTI_RDR_NO_SHAKE_SUPPORT	Shaking is not supported by this reader
-659	BTI_FEATURE_NOT_IMPLEMENTED	The feature has not been implemented at this time.
-660	BTI_PROBE_HEIGHT_OUT_OF_RANGE	The probe height is out of range for the current plate type.
-661	BTI_RDR_REQUIRES_SPECIFIC_PROTOCOL	The reader requires a specific protocol.
-662	BTI_PROTOCOL_REQUIRES_SPECIFIC_RDR	The protocol requires a specific reader.
-663	BTI_RDR_NO_SPECTRUM_SCAN_SUPPORT	The reader does not support spectrum scanning.
-664	BTI_RDR_NO_AREA_SCAN_SUPPORT	The reader does not support area scanning.
-665	BTI_RDR_NO_LINEAR_SCAN_SUPPORT	The reader does not support linear scanning.
-666	BTI_RDR_NO_DISPENSER_SUPPORT	The reader does not support dispensing.
-667	BTI_RDR_MAX_DISPENSERS_EXCEEDED	The maximum dispensers supported for the reader has been exceeded.
-668	BTI_RDR_NO_WELL_MODE_SUPPORT	The reader does not support well mode.
-669	BTI_RDR_WELL_MODE_READS_EXCEEDED	The maximum well mode reads has been exceeded.
-670	BTI_RDR_WELL_MODE_SHAKES_EXCEEDED	The maximum well mode shake cycles have been exceeded.
-671	BTI_RDR_WELL_MODE_DISPENSES_EXCEEDED	The maximum well mode dispenses have been exceeded.
-672	BTI_RDR_NO_SYNC_PLATE_MODE_SUPPORT	The reader does not support plate mode.
-673	BTI_RDR_SYNC_PLATE_MODE_READS_EXCEEDED	The maximum synchronized plate mode reads have been exceeded.
-674	BTI_RDR_SYNC_PLATE_MODE_SHAKES_EXCEEDED	The maximum synchronized plate mode shake cycles have been exceeded.

**Table 6 (Cont'd)**

Code	Label	Probable Cause
<b>-675</b>	BTI_RDR_SYNC_PLATE_MODE_DISPNS_EXCEEDED	The maximum synchronized plate mode dispenses have been exceeded.
<b>-676</b>	BTI_RDR_SYNC_PLATE_MODE_STEPS_EXCEEDED	The maximum synchronized plate mode steps have been exceeded.
<b>-677</b>	BTI_RDR_NO_PATHLEN_CORRECTION_SUPPORT	The reader does not support pathlength correction.
<b>-678</b>	BTI_DATA_FORMAT_ERROR	The expected data has not been received. Possible reasons are: Your computer is not able to retrieve the data in a timely fashion. Your reader cable is loose or damaged. (Press Help for more information)
<b>-679</b>	BTI_KINETIC_DURATION_LESS_THAN_INTERVAL	The kinetic read time must exceed the kinetic interval.
<b>-697</b>	BTI_RDR_MIRROR_NOT_DEFINED	The required mirrors are not defined on the reader.
<b>-700</b>	BTI_NO_PLATE_TYPE_DEFINED	The Plate Type specified is invalid or the definition no longer exists.
<b>-701</b>	BTI_UNSUPPORTED_READ_PARAM_STEP	The read parameter step is invalid or not currently supported.
<b>-702</b>	BTI_INVALID_ORDER_PAUSE_STEP	Invalid order for a pause step.
<b>-703</b>	BTI_INVALID_ORDER_INCUBATE_STEP	Invalid order for an incubate step.
<b>-704</b>	BTI_INVALID_ORDER_CARRIER_IN_OUT_STEP	Invalid order for a carrier in/out step.
<b>-705</b>	BTI_INVALID_ORDER_READ_STEP	Invalid order for a read step.
<b>-706</b>	BTI_INVALID_ORDER_KINETIC_END_STEP	The Kinetic End step is missing or is in an invalid order.
<b>-707</b>	BTI_NO_READ_PARAMETERS	No read parameters.
<b>-708</b>	BTI_INVALID_RESUME_INDEX	The Resume index is invalid for the current read parameters.
<b>-709</b>	BTI_INSUFFICIENT_KINETIC_READ_PARAMS	Illegal kinetic read structure defined.
<b>-710</b>	BTI_NO_KINETIC_SCANS_ALLOWED	Kinetic reads of Spectrum, Linear and Area scanning are not supported.



**Table 6 (Cont'd)**

Code	Label	Probable Cause
-711	BTI_AUTOSENSITIVITY_ERROR	Error during determination of Auto Sensitivity value.
-712	BTI_STOP_RESUME_LAST_STEP_ERROR	A Stop/Resume step cannot be the last step in the sequence.
-713	BTI_STOP_RESUME_NEXT_STEP_ERROR	Error obtaining Resume step number.
-714	BTI_ILLEGAL_PRODUCT_DELINEATION_SETTING	An illegal product delineation setting was sent to the ActiveX.
-715	BTI_READER_CONFIG_NOT_SUPPORTED_PD	Reader configuration not supported.
-716	BTI_DISPENSE_MEASURE_NOT_SUPPORTED	Dispense measure not supported.
-717	BTI_INVALID_MESSAGE_RESP_SIZE	Invalid message response size.
-718	BTI_E_COMMAND_CHECKSUM_FAILURE	'E' command checksum failure.
-719	BTI_E_COMMAND_RATES_SUPPORTED_ERROR	'E' command rates supported error.
-720	BTI_INVALID_ORDER_MODE_END_STEP	Invalid order for a mode End step.
-721	BTI_MAX_G_COMMAND_TOTAL_EVENTS_EXCEEDED	The maximum number of events in a mode block has been exceeded.
-722	BTI_MAX_G_COMMAND_SHAKE_EVENTS_EXCEEDED	The maximum number of shake events in a block has been exceeded.
-723	BTI_MAX_G_COMMAND_READ_EVENTS_EXCEEDED	The maximum number of read events in a mode block has been exceeded.
-724	BTI_MAX_G_COMMAND_DISPENSE_EVENTS_EXCEEDED	The maximum number of dispense events in a mode block has been exceeded.
-725	BTI_ILLEGAL_STEP_TYPE_FOUND_IN_BLOCK	An illegal step type was found within the current block.
-726	BTI_G_COMMAND_MISMATCH_RESPONSE_SIZE	The length of the response from the 'G' command did not match the expected length.
-727	BTI_G_COMMAND_CHECKSUM_FAILURE	'G' command checksum failure.

**Table 6 (Cont'd)**

Code	Label	Probable Cause
-728	BTI_INVALID_ORDER_MONITOR_WELL_END_STEP	Invalid order for a monitor well step.
-729	BTI_DISPENSER1_NOT_PRIMED	Dispenser 1 is not primed. Please prime before running protocol.
-730	BTI_DISPENSER2_NOT_PRIMED	Dispenser 2 is not primed. Please prime before running protocol.
-731	BTI_INVALID_WELL_MODE_EVENT_TYPE	An invalid event type for well mode was detected when creating the 'G' command request body.
-732	BTI_INVALID_PLATE_MODE_EVENT_TYPE	Invalid plate mode event type.
-733	BTI_WELL_MODE_DATA_ERROR	Well mode data error.
-734	BTI_WELL_MODE_EVENT_MISMATCH_ERROR	The event number in the data stream did not match the expected event number.
-735	BTI_WELL_MODE_END_OF_WELL_ERROR	Error with the end of well data stream from the reader.
-736	BTI_WELL_MODE_HEADER_ERROR	Error in header of well mode response.
-737	BTI_WELL_MODE_DELAY_FROM_START_ERROR	Delay step is not long enough. Increase the Delay step prior to action step number # within the Well Mode Block. Action steps are Read, Shake and Dispense.
-738	BTI_AREA_SCAN_PROBE_SIZE_CHANGED	The Probe size used in the area scanning calculations has changed since the Read Step was last modified. To correct this situation, have the desired reader connected and in a ready state, then edit the Read Step that has Area Scanning specified. The Area Scanning matrix will be re-evaluated based on the reader's limitations, current probe size, and plate type.
-739	BTI_AREA_SCAN_SPACING_SIZE_CHANGED	The Spacing size used in the area scanning calculations has changed since the Read Step was last modified. To correct this situation, have the desired reader connected and in a ready state, then edit the Read Step that has Area Scanning specified. The Area Scanning matrix will be re-evaluated based on the reader's limitations, current probe size, and plate type.

**Table 6 (Cont'd)**

Code	Label	Probable Cause
-740	BTI_AREA_SCAN_MATRIX_SIZE_CHANGED	The Matrix size used in the area scanning calculations has changed since the Read Step was last modified. To correct this situation, have the desired reader connected and in a ready state, then edit the Read Step that has Area Scanning specified. The Area Scanning matrix will be re-evaluated based on the reader's limitations, current probe size, and plate type.
-741	BTI_BIOCELL_READ_FROM_FILE_ERROR	Error reading the BioCell=x.xxxx value from the data file.
-742	BTI_Y_COMMAND_CHECKSUM_FAILURE	'Y' command checksum error.
-743	BTI_UNKNOWN_DETECTION_METHOD	Unknown detection error.
-744	BTI_BLOCK_MODE_DELAY_ERROR	Delay step error. Delay steps are not allowed inside a kinetic loop or in sequence back to back.
-746	BTI_ABS_KINETIC_INTERVAL_ERROR	The kinetic interval is too short for the defined parameters.
-747	BTI_FLUORLUMIN_KINETIC_INTERVAL_ERROR	The kinetic interval is too short for the defined parameters.
-748	BTI_WELL_MODE_KINETIC_INTERVAL_ERROR	The kinetic interval is too short for the defined parameters.
-754	BTI_DISPENSERS_NOT PRIMED	Neither dispenser 1 or 2 is primed. Please prime both before running protocol.
-755	BTI_WELL_MODE_DELAY_TOO_SHORT	Well mode Delay step is too short.
-756	BTI_USER_OVERRIDE_SET_TEMPERATURE	The temperature had not reached the setpoint when the user chose to override.
-757	BTI_INVALID_READER_TYPE	The assigned reader type is unknown and cannot be configured.
-758	BTI_LUMINESCENCE_DATA_FORMAT_ERROR	Luminescence data format error.
-759	BTI_NO_WELL_MODE_SIMULATION	Well mode simulation is not supported.

**Table 6 (Cont'd)**

Code	Label	Probable Cause
-760	BTI_NO_PLATE_SYNC_MODE_SIMULATION	Plate synchronous mode simulation is not supported.
-761	BTI_EVENT_START_TIME_EXCEEDS_LIMIT	The start time of one of the steps inside the 'Mode' block exceeds the limit of 16:39.99 mm:ss.msec in well mode or 27:46:39 hh:mm:ss in plate mode.
-762	BTI_WELL_MODE_KINETIC_INTERVAL_EXCEEDED	The well mode kinetic interval cannot exceed 1:39.99 m:ss.msec.
-763	BTI_PLATE_MODE_KINETIC_INTERVAL_EXCEEDED	The plate mode kinetic interval cannot exceed 02:46:39 hh:mm:ss.
-764	BTI_STAND_ALONE_SHAKE_NOT_SUPPORTED	The current order of the shake step is illegal. The reader does not support stand alone shake steps.
-765	BTI_MONITOR_WELL_ILLEGAL_DEFINITION	A Monitor well sequence must contain one read step. An optional shake step before the Monitor Well loop or before the read step inside the Monitor Well loop is allowed for absorbance and luminescence reads.
-766	BTI_NO_APPEND_IN_MULTIMODE_BLOCK	When two or three read steps are in a Kinetic loop, appending kinetic data is not supported.
-767	BTI_FLUORESCENCE_DATA_TERMINATOR_INVALID	Invalid fluorescence data stream termination character found.
-768	BTI_MULTI_MODE_KINETIC_INTERVAL_EXCEEDED	The kinetic interval is too small for the read steps defined.
-769	BTI_OLD_STATUS_FORMAT	The reader attached only supports an old style status format. Any error produced should have been displayed by the reader.
-772	BTI_SYNERGY_WELL_SYNC_NUM_KINETIC_READS	The Synergy in plate or well synch mode is limited to 999 reads in a kinetic read step.
-773	BTI_SYNERGY_PLATE_SYNC_NUM_KINETIC_READS	The Synergy in plate or well synch mode is limited to 999 reads in a kinetic read step.
-774	BTI_MULTI_MODE_NUM_KINETIC_READS_ERROR	Luminescence and Multi-Mode kinetics are limited to 999 reads.
-775	BTI_FLUORESCENCE_KINETIC_READS_ERROR	Fluorescence kinetic reads area limited to 300 reads.

**Table 6 (Cont'd)**

Code	Label	Probable Cause
<b>-776</b>	BTI_ABSORBANCE_KINETIC_READS_ERROR	Absorbance kinetic reads error.
<b>-777</b>	BTI_KINETIC_DURATION_VS_INTERVAL_ERROR	The kinetic read time must exceed the kinetic interval.
<b>-778</b>	BTI_ERROR_DETECTED_DURING_BULB_WARMUP	Error detected during bulb warmup. Excitation filter cartridge removal is the most likely cause.
<b>-780</b>	BTI_FINAL_STATUS_ERROR	Status was not received after completion of read step. This could be due to an error that should be displayed on the reader.
<b>-781</b>	BTI_CONTINUOUS_SHAKE_MULTIMODE_ERROR	Continuous shake option is not allowed in a kinetic block with multiple read steps.
<b>-782</b>	BTI_PLATE_MODE_DELAY_FROM_START_ERROR	Delay step is not long enough. Increase the Delay step prior to action step number # within the Plate Mode Block. Action steps are Read, Shake and Dispense.
<b>-2010</b>	BTI_AUTM_DOCUMENT_ALREADY_IN_MEMORY	Automation error: Experiment already in memory.
<b>-2011</b>	BTI_AUTM_INVALID_INDEX	Automation error: Invalid index.
<b>-2012</b>	BTI_AUTM_DATABASE_GENERIC_ERROR	Automation error: Generic database error.
<b>-2013</b>	BTI_AUTM_FILE_GENERIC_ERROR	Automation error: Generic file error.
<b>-2014</b>	BTI_AUTM_FILE_FILE_NOT_FOUND	Automation error: File not found.
<b>-2015</b>	BTI_AUTM_FILE_BAD_PATH	Automation error: Bad file pathname.
<b>-2100</b>	BTI_AUTM_APP_NEW_EXP_GENERIC_ERROR	Automation error: Application object, Generic error creating new experiment.
<b>-2101</b>	BTI_AUTM_APP_OPEN_EXP_GENERIC_ERROR	Automation error: Application object, Generic error opening experiment.
<b>-2120</b>	BTI_AUTM_APP_SET_CLIENT_WINDOW_GENERIC_ERROR	Automation error: Application object, Error setting client window.
<b>-2130</b>	BTI_AUTM_APP_BROWSE_FOR_FILE_GENERIC_ERROR	Automation error: Application object, Generic error browsing for a file.
<b>-2140</b>	BTI_AUTM_APP_BROWSE_FOR_FOLDER_GENERIC_ERROR	Automation error: Application object, Browse for folder generic error.

**Table 6 (Cont'd)**

Code	Label	Probable Cause
-2145	BTI_AUTM_APP_READER_OPERATION_READER_NOT_CONFIGURED	Automation error: Application object, Reader not configured.
-2150	BTI_AUTM_APP_CONFIGURE_OLE_READER_GENERIC_ERROR	Automation error: Application object, OLE reader configuration failed.
-2160	BTI_AUTM_APP_CONFIGURE_COM_READER_GENERIC_ERROR	Automation error: Application object, COM reader configuration failed.
-2161	BTI_AUTM_APP_CONFIGURE_COM_READER_INVALID_READER_TYPE	Automation error: Application object, Invalid COM reader type.
-2162	BTI_AUTM_APP_CONFIGURE_COM_READER_INVALID_COM_PORT	Automation error: Application object, Invalid COM port.
-2163	BTI_AUTM_APP_CONFIGURE_COM_READER_INVALID_BAUD_RATE	Automation error: Application object, Invalid baud rate.
-2170	BTI_AUTM_APP_CARRIER_IN_GENERIC_ERROR	Automation error: Application object, Carrier in generic error.
-2175	BTI_AUTM_APP_CARRIER_OUT_GENERIC_ERROR	Automation error: Application object, Carrier out generic error.
-2180	BTI_AUTM_APP_GET_LAST_READER_ERROR_GENERIC_ERROR	Automation error: Application object, Get last reader error generic error.
-2300	BTI_AUTM_EXP_PLATES_GENERIC_ERROR	Automation error: Experiment object, plates generic error.
-2310	BTI_AUTM_EXP_SAVE_GENERIC_ERROR	Automation error: Experiment object, save generic error.
-2320	BTI_AUTM_EXP_SAVE_AS_GENERIC_ERROR	Automation error: Experiment object, save as generic error.
-2330	BTI_AUTM_EXP_CLOSE_GENERIC_ERROR	Automation error: Experiment object, close generic error.
-2331	BTI_AUTM_EXP_EXPERIMENT_IS_CLOSED	Automation error: Experiment object, experiment is closed error.
-2400	BTI_AUTM_PLATES_GET_PLATE_GENERIC_ERROR	Automation error: Plates object get plate error.
-2410	BTI_AUTM_PLATES_ADD_MULTI_PLATE_ASSAY_PROTOCOL	Automation error: Plates object, the addition of plates is not supported in a multi-plate assay protocol.

**Table 6 (Cont'd)**

<b>Code</b>	<b>Label</b>	<b>Probable Cause</b>
<b>-2420</b>	BTI_AUTM_PLATES_ADD_GENERIC_ERROR	Automation error: Plates object, add generic error.
<b>-2500</b>	BTI_AUTM_PLATE_START_READ_GENERIC_ERROR	Automation error: Plate object start read error.
<b>-2501</b>	BTI_AUTM_PLATE_RESUME_READ_READ_NOT_PAUSED	Automation error: Plate object, resume read error.
<b>-2502</b>	BTI_AUTM_PLATE_READ_FROM_FILE_INVALID_SEPARATOR	Automation error: Plate object, read from file error – invalid separator.
<b>-2503</b>	BTI_AUTM_PLATE_BARCODE_GENERIC_ERROR	Automation error: Plate object, barcode generic error.
<b>-2504</b>	BTI_AUTM_PLATE_ID_GENERIC_ERROR	Automation error: Plate object, plate ID generic error.
<b>-2505</b>	BTI_AUTM_PLATE_NAME_GENERIC_ERROR	Automation error: Plate object, plate name generic error.
<b>-2506</b>	BTI_AUTM_PLATE_PLATE_TYPE_GENERIC_ERROR	Automation error: Plate object, plate type generic error.
<b>-2507</b>	BTI_AUTM_PLATE_READ_STATUS_GENERIC_ERROR	Automation error: Plate object, read status generic error.
<b>-2510</b>	BTI_AUTM_PLATE_ABORT_READ_GENERIC_ERROR	Automation error: Plate object, abort read error.
<b>-2511</b>	BTI_AUTM_PLATE_ABORT_READ_READ_NOT_IN_PROGRESS	Automation error: Plate object, abort called while plate was not being read.
<b>-2520</b>	BTI_AUTM_PLATE_DELETE_GENERIC_ERROR	Automation error: Plate object, delete generic error.
<b>-2521</b>	BTI_AUTM_PLATE_DELETE_MULTI_PLATE_ASSAY_PROTOCOL	Automation error: Plate object, the deletion of plates is not supported in a multi-plate assay protocol.
<b>-2522</b>	BTI_AUTM_PLATE_DELETE_PLATE_IS_CALIBRATE	Automation error: Plate object, the deletion of calibration plates is not supported.
<b>-2523</b>	BTI_AUTM_PLATE_DELETE_LAST_PLATE	Automation error: Plate object, the last plate of the experiment cannot be deleted.
<b>-2524</b>	BTI_AUTM_PLATE_PLATE_IS_DELETED	Automation error: Plate object, plate has been deleted.

**Table 6 (Cont'd)**

<b>Code</b>	<b>Label</b>	<b>Probable Cause</b>
<b>-2525</b>	BTI_AUTM_PLATE_READ_IN_PROGRESS	Automation error: Plate object, read in progress.
<b>-2530</b>	BTI_AUTM_PLATE_POWER_EXPORT_GENERIC_ERROR	Automation error: Plate object, Power Export generic error.
<b>-2531</b>	BTI_AUTM_PLATE_POWER_EXPORT_NOT_DEFINED	Automation error: Plate object, Power Export not defined.
<b>-2540</b>	BTI_AUTM_PLATE_FILE_EXPORT_GENERIC_ERROR	Automation error: Plate object, file export generic error.
<b>-2541</b>	BTI_AUTM_PLATE_FILE_EXPORT_NOT_DEFINED	Automation error: Plate object, file export not defined.
<b>-2550</b>	BTI_AUTM_PLATE_PRINT_REPORT_GENERIC_ERROR	Automation error: Plate object, print report generic error.
<b>-2551</b>	BTI_AUTM_PLATE_PRINT_REPORT_NOT_DEFINED	Automation error: Plate object, print report not defined.
<b>-2560</b>	BTI_AUTM_PLATE_IMPORT_SAMPLE_IDS_GENERIC_ERROR	Automation error: Plate object, import sample IDs generic error.
<b>-2561</b>	BTI_AUTM_PLATE_IMPORT_SAMPLE_IDS_FILE_CONTAINS_EXTRA_IDS	Automation error: Plate object, import file contained more sample IDs than the plate.
<b>-2562</b>	BTI_AUTM_PLATE_DISCONTINUOUS_KINETIC_GENERIC_ERROR	Automation error: Plate object, discontinuous kinetic generic error.
<b>-2563</b>	BTI_AUTM_PLATE_DISCONTINUOUS_KINETIC_INTERVAL_GENERIC_ERROR	Automation error: Plate object, discontinuous kinetic interval generic error.
<b>-2564</b>	BTI_AUTM_PLATE_DISCONTINUOUS_KINETIC_RUNTIME_GENERIC_ERROR	Automation error: Plate object, discontinuous kinetic runtime generic error.



**Table 7**  
**KC4™ Function Call Errors**

KC4 function call error codes are displayed in the Bio-Stack™ PC Control Software during Bio-Stack™ operation with the PowerWave™/XS or Synergy™ HT.

- ❖ If there are problems with a protocol, launch KC4 in standalone mode, open the protocol, and try to read a plate. Refer to the KC4 User's Guide or Help System for more information. If you cannot resolve the problem, contact BioTek TAC for assistance.
- ❖ KC4 does not support the Synergy™ 2/Synergy™ 4 readers.

Code	Probable Cause
-1000	<b>Generic error when opening the KC4 protocol file.</b> <ul style="list-style-type: none"> <li>Close the application and try to open the protocol in KC4 under manual mode, then retry.</li> </ul>
-1001	<b>Either a plate or a protocol was already open in the KC4 memory, when a new plate or protocol was to be opened.</b> <ul style="list-style-type: none"> <li>Close the plate or protocol and retry.</li> </ul>
-1002	<b>Incompatible reader type defined in the KC4 protocol.</b> <ul style="list-style-type: none"> <li>Correct the reader type in the protocol, or create a new protocol for the correct reader type.</li> </ul>
-1003	<b>Incorrect protocol or plate file extension.</b> <ul style="list-style-type: none"> <li>Correct the file extension.</li> </ul>
-1004	<b>Plate or protocol file not found.</b> <ul style="list-style-type: none"> <li>Select a different plate or protocol.</li> </ul>
-1050	<b>Generic error when opening new KC4 plate file</b> <ul style="list-style-type: none"> <li>Close the application and try to open the protocol in KC4 under manual mode, then retry.</li> </ul>
-1086	<b>Expected response never received</b> <ul style="list-style-type: none"> <li>Check the cable connection to the reader; re-boot the reader if necessary.</li> </ul>
-1087	<b>Out of range parameter during read</b> <ul style="list-style-type: none"> <li>Correct the parameter in the protocol. Launch KC4 and review the protocol parameters. Initiate a plate read via KC4 to test the protocol.</li> </ul>

**Table 7 (Cont'd)**

<b>Code</b>	<b>Probable Cause</b>
<b>-1088</b>	<b>Defective reader connected</b> <ul style="list-style-type: none"> <li>• Replace or repair the reader.</li> </ul>
<b>-1089</b>	<b>Checksum error during read operation</b> <ul style="list-style-type: none"> <li>• Check the protocol and reader to make sure they are compatible, and retry.</li> </ul>
<b>-1090</b>	<b>Unexpected response during read operation</b> <ul style="list-style-type: none"> <li>• Close the application and retry.</li> </ul>
<b>-1091</b>	<b>Software error message during read operation</b> <ul style="list-style-type: none"> <li>• Close the application and retry.</li> </ul>
<b>-1092</b>	<b>Reader error during read operation</b> <ul style="list-style-type: none"> <li>• Check the reader. Re-boot if necessary.</li> </ul>
<b>-1093</b>	<b>Negative acknowledgement during read operation</b> <ul style="list-style-type: none"> <li>• Check the connection to the reader; re-boot the reader if necessary.</li> </ul>
<b>-1095</b>	<b>Abnormal error during read operation</b> <ul style="list-style-type: none"> <li>• Check the reader. Re-boot if necessary.</li> </ul>
<b>-1096</b>	<b>Reading pending</b> <ul style="list-style-type: none"> <li>• Check the reader. Re-boot if necessary.</li> </ul>
<b>-1097</b>	<b>Communication port busy</b> <ul style="list-style-type: none"> <li>• Make sure no other application has the port open. Close the application and retry.</li> </ul>
<b>-1098</b>	<b>Communication port error</b> <ul style="list-style-type: none"> <li>• Close the application and retry.</li> </ul>
<b>-1099</b>	<b>Reading stopped</b> <ul style="list-style-type: none"> <li>• Check the reader. Re-boot if necessary.</li> </ul>
<b>-1100</b>	<b>No response from reader</b> <ul style="list-style-type: none"> <li>• Check the connection to the reader; re-boot the reader if necessary.</li> </ul>
<b>-1150</b>	<b>No plate in memory during read operation</b> <ul style="list-style-type: none"> <li>• Close the application and retry.</li> </ul>

Table 7 (Cont'd)

Code	Probable Cause
-1151	<b>No protocol in memory during read operation</b> <ul style="list-style-type: none"> <li>Close the application and retry. Make sure a valid KC4™ protocol is selected.</li> </ul>
-1152	<b>Plate already read</b> <ul style="list-style-type: none"> <li>Select a different plate.</li> </ul>
-1153	<b>Can't read reader's filter table</b> <ul style="list-style-type: none"> <li>Close the application and see if a plate with the same protocol can be read via KC4 manually, then retry.</li> </ul>
-1154	<b>Filter table mismatch</b> <ul style="list-style-type: none"> <li>Correct the protocol to match the reader's filter table.</li> </ul>
-1155	<b>Filter not found in filter read table</b> <ul style="list-style-type: none"> <li>Correct the protocol to match the reader's filter table.</li> </ul>
-1156	<b>Incorrect filter selection</b> <ul style="list-style-type: none"> <li>Correct the protocol to match the reader's filter table.</li> </ul>
-1157	<b>Kinetic read interrupted</b> <ul style="list-style-type: none"> <li>Check the reader. Re-boot if necessary.</li> </ul>
-1158	<b>Abnormal end to kinetic read</b> <ul style="list-style-type: none"> <li>Check the reader. Re-boot if necessary.</li> </ul>
-1159	<b>Reading parameters not supported</b> <ul style="list-style-type: none"> <li>Correct the protocol.</li> </ul>
-1160	<b>Monitor well not supported</b> <ul style="list-style-type: none"> <li>Correct the protocol (disable well monitoring in protocol).</li> </ul>
-1161	<b>Probe size error</b> <ul style="list-style-type: none"> <li>Correct the protocol.</li> </ul>
-1163	<b>Auto save failed</b> <ul style="list-style-type: none"> <li>Launch KC4 manually, then open the protocol and try to read a plate. If there are problems with the protocol or with the reader, KC4 will display prompts to fix the problems.</li> </ul>

**Table 7 (Cont'd)**

<b>Code</b>	<b>Probable Cause</b>
<b>-1199</b>	<b>Generic error during read operation</b> <ul style="list-style-type: none"> <li>• Check the reader. Re-boot if necessary.</li> </ul>
<b>-1200</b>	<b>Generic error during plate closing</b> <ul style="list-style-type: none"> <li>• Check the reader. Re-boot if necessary.</li> </ul>
<b>-1201</b>	<b>Invalid plate file name during plate closing</b> <ul style="list-style-type: none"> <li>• Correct the plate file name. If the file name is to be created using a barcode value, make sure the barcode does not have illegal file name characters.</li> </ul>
<b>-1250</b>	<b>Generic error during file export operation</b> <ul style="list-style-type: none"> <li>• Correct the export file name in the KC4™ protocol.</li> </ul>
<b>-1251</b>	<b>No plate in memory during file export operation</b> <ul style="list-style-type: none"> <li>• Check the protocol to see if it is set up correctly for exporting.</li> </ul>
<b>-1252</b>	<b>No protocol in memory during export operation</b> <ul style="list-style-type: none"> <li>• Check the protocol to see if it is set up correctly for exporting.</li> </ul>
<b>-1253</b>	<b>Nothing to export</b> <ul style="list-style-type: none"> <li>• Close the application and attempt to run a plate with the same protocol via KC4 manually, then retry.</li> </ul>
<b>-1254</b>	<b>File creation error during export operation</b> <ul style="list-style-type: none"> <li>• Check the protocol to see if it is set up correctly for exporting, and that there is a valid export filename.</li> </ul>
<b>-1300</b>	<b>Generic error during protocol closing</b> <ul style="list-style-type: none"> <li>• Check the protocol.</li> </ul>
<b>-1350</b>	<b>Unable to start KC4 via Bio-Stack™ software</b> <ul style="list-style-type: none"> <li>• Make sure that KC4 has been installed, and that there is not another instance of KC4 already running.</li> </ul>
<b>-1400</b>	<b>Generic error during file importing</b> <ul style="list-style-type: none"> <li>• Correct the import filename.</li> </ul>
<b>-1401</b>	<b>No plate in memory during file importing</b> <ul style="list-style-type: none"> <li>• Check the protocol to see if it is correct for importing.</li> </ul>

Table 7 (Cont'd)

Code	Probable Cause
-1402	<b>Invalid filename for file importing</b> <ul style="list-style-type: none"> <li>Correct the filename.</li> </ul>
-1403	<b>File not found for file importing</b> <ul style="list-style-type: none"> <li>Check the protocol to see if it is correct for importing.</li> </ul>
-1404	<b>Invalid parameter format during file importing</b> <ul style="list-style-type: none"> <li>Check the protocol to see if it is correct for importing.</li> </ul>
-1450	<b>Generic error during plate opening</b> <ul style="list-style-type: none"> <li>Correct the plate file name.</li> </ul>
-1451	<b>Plate already in memory during plate opening</b> <ul style="list-style-type: none"> <li>Close the application and retry.</li> </ul>
-1452	<b>No protocol in memory during plate opening</b> <ul style="list-style-type: none"> <li>Close the application and retry.</li> </ul>
-1453	<b>Protocol already in memory during plate opening</b> <ul style="list-style-type: none"> <li>Close the application and retry.</li> </ul>
-1454	<b>Incorrect file extension for plate opening</b> <ul style="list-style-type: none"> <li>Correct the file extension.</li> </ul>
-1455	<b>File not found during plate opening</b> <ul style="list-style-type: none"> <li>Correct the filename or file path.</li> </ul>
-1456	<b>Incompatible reader during plate opening</b> <ul style="list-style-type: none"> <li>Correct the reader type called out in the protocol or select a different protocol.</li> </ul>
-1457	<b>Incompatible reading parameter during plate opening</b> <ul style="list-style-type: none"> <li>Correct the protocol.</li> </ul>
-1500	<b>Error getting the plate barcode value – either because the scanning failed, or because there is no scanner</b> <ul style="list-style-type: none"> <li>If there is a scanner, make sure that there is a valid, readable barcode on the plate, in the correct location and orientation. See <b>Appendix B, Bio-Stack Barcode Scanner</b>, for required barcode types and proper position on the microplates.</li> </ul>

**Table 7 (Cont'd)**

❖ For data reduction errors (–1600 to –1613), launch KC4™ in standalone mode, open the plate and protocol, and initiate a plate read to determine why the error occurred. Refer to the KC4 User's Guide and Help System for more information.

Code	Probable Cause
<b>-1600</b>	<b>Calculation error</b> <ul style="list-style-type: none"> <li>Correct the protocol.</li> </ul>
<b>-1601</b>	<b>Log axis incompatibility</b> <ul style="list-style-type: none"> <li>Correct the protocol's curve-fitting parameters.</li> </ul>
<b>-1602</b>	<b>Curve could not be not calculated</b> <ul style="list-style-type: none"> <li>Correct the protocol.</li> </ul>
<b>-1603</b>	<b>Curve is ambiguous</b> <ul style="list-style-type: none"> <li>Correct the protocol.</li> </ul>
<b>-1604</b>	<b>Not enough valid standards on the plate</b> <ul style="list-style-type: none"> <li>Re-try the test, or modify the protocol's plate layout in the location specified in the protocol. See note above.</li> </ul>
<b>-1605</b>	<b>Archived curve not loaded</b> <ul style="list-style-type: none"> <li>Make sure the archived curve is available.</li> </ul>
<b>-1606</b>	<b>Data to interpolate not available</b> <ul style="list-style-type: none"> <li>Correct the protocol; make sure the read was properly performed.</li> </ul>
<b>-1607</b>	<b>Cut-off values not calculated</b> <ul style="list-style-type: none"> <li>Correct the protocol; make sure the read was properly performed.</li> </ul>
<b>-1608</b>	<b>Cut-off values not in increasing order</b> <ul style="list-style-type: none"> <li>Correct the protocol; make sure the read was properly performed.</li> </ul>
<b>-1609</b>	<b>Single plate transfer data is not available</b> <ul style="list-style-type: none"> <li>Correct the protocol; make sure the read was properly performed.</li> </ul>
<b>-1610</b>	<b>Kinetic calculation data to process is not available</b> <ul style="list-style-type: none"> <li>Correct the protocol; make sure the read was properly performed.</li> </ul>

**Table 7 (Cont'd)**

<b>Code</b>	<b>Probable Cause</b>
<b>-1611</b>	<b>Validation condition failure</b> <ul style="list-style-type: none"> <li>This is probably a valid failure.</li> </ul>
<b>-1612</b>	<b>4-parameter curve-fit not converging</b> <ul style="list-style-type: none"> <li>Correct the protocol; make sure the read was properly performed.</li> </ul>
<b>-1613</b>	<b>Multi-plate transfer data is not available</b> <ul style="list-style-type: none"> <li>Correct the protocol; make sure the read was properly performed.</li> </ul>
<b>-4000</b>	<b>Generic database error</b> <ul style="list-style-type: none"> <li>Close the application and attempt to run the plate and protocol in KC4™ manually. Refer to the KC4 User's Guide for database troubleshooting information.</li> </ul>

❖ Warning codes indicate that the data might be questionable because something went wrong, but KC4 didn't have enough information to accept or reject the results.

<b>Warning Code</b>	<b>Warning Code Description</b>
<b>1000</b>	<b>Expected incubation temperature not reached</b> <ul style="list-style-type: none"> <li>Make sure expected incubation temperature has been reached on the reader before starting the processing of plates.</li> </ul>
<b>1001</b>	<b>Barcode read failure</b> <ul style="list-style-type: none"> <li>Make sure that the barcode reader is working properly, and that the plate has a valid barcode label, which is properly positioned on the microplate. See <b>Appendix B, Bio-Stack Barcode Scanner</b>, for required barcode types and proper position on the microplates.</li> </ul>

**Table 8**  
**Communication Errors Displayed on the  $\mu$ Fill™, ELx405™, or MicroFlo™ Select**

Communication errors appear on the displays of the  $\mu$ Fill, ELx405, or MicroFlo Select during operation with the Bio-Stack™, and indicate that the software may be corrupted. Contact BioTek TAC if you receive these errors.

- ❖ When communication errors are generated by the Bio-Stack, the error code appears on the display of the  $\mu$ Fill, ELx405, or MicroFlo Select prefixed with a **B-**. "Stacker Error" also appears in the first line of the display of the MicroFlo.

Code	Probable Cause
<b>8300</b>	An invalid password was sent to the Bio-Stack during a protected operation. This error can only occur when the Bio-Stack is under serial control, using a software program other than the Bio-Stack™ PC Control Software.
<b>8301</b>	The Bio-Stack was requested to send some configuration data to the controlling software, and the Bio-Stack did not know about the requested data.
<b>8302</b>	A checksum was generated following a code download, which did not match what was expected. Turn the $\mu$ Fill, ELx405, or MicroFlo off then on, and re-try the operation.
<b>8303</b>	The Bio-Stack is in an invalid mode for receiving a message. Turn the $\mu$ Fill, ELx405, or MicroFlo off then on again, and re-try the operation.
<b>8304</b>	The Bio-Stack didn't properly acknowledge a message sent to it. Turn the $\mu$ Fill, ELx405, or MicroFlo off then on again, and re-try the operation.
<b>8305</b>	An invalid message response was received from the Bio-Stack. Turn the $\mu$ Fill, ELx405, or MicroFlo off then on again, and re-try the operation.
<b>8306</b>	The serial communications timed out. Turn the $\mu$ Fill, ELx405, or MicroFlo off then on again, and re-try the operation.



**Table 9**  
**MicroFlo™ Select Interface Software Errors Displayed**  
**in the LHC™ Software**

MicroFlo Select Interface Software errors are displayed in the Liquid Handling Control Software during Bio-Stack™ operation with the MicroFlo Select Dispenser.

Code	Probable Cause
<b>6000</b>	General communication error during download.
<b>6001</b>	COM port created by USB converter no longer active.
<b>6010</b>	The data is invalid or out-of-range.
<b>6012</b>	This step type can not be downloaded.
<b>6014</b>	Illegal characters in protocol name; valid characters are letters, numbers, spaces, or symbols (_ - % &).
<b>6016</b>	The protocol name length must be 16 characters or less.
<b>6018</b>	A 1536 well plate is not supported by this instrument.
<b>6020</b>	The specified volume exceeds the cassette maximum limit.
<b>6022</b>	The Volume is out-of-range.
<b>6024</b>	Invalid Flow rate.
<b>6026</b>	Invalid number of pre-dispenses.
<b>6028</b>	Invalid Horizontal dispense position.
<b>6030</b>	Invalid dispense height.
<b>6032</b>	Invalid plate clear height.
<b>6034</b>	Invalid column selection value (must be 0 or 1).
<b>6036</b>	Invalid protocol step type.
<b>6038</b>	The Definition String contains invalid data.
<b>6040</b>	Invalid baud rate
<b>6041</b>	Invalid data bits selection
<b>6042</b>	Invalid stop bits selection
<b>6043</b>	Invalid parity selection

**Table 9 (Cont'd)**

<b>Code</b>	<b>Probable Cause</b>
<b>6044</b>	Serial port error
<b>6045</b>	Serial write error
<b>6046</b>	Serial read error
<b>6047</b>	Checksum error
<b>6048</b>	Serial NAK error
<b>6049</b>	Excess data, or not enough data, received
<b>6050</b>	Invalid message header
<b>6051</b>	Invalid message object
<b>6052</b>	Invalid message body size
<b>6053</b>	Serial message timeout
<b>6054</b>	Port handle error
<b>6055</b>	Read timeout value is invalid
<b>6056</b>	Unauthorized to open the COM port
<b>6057</b>	Out of range parameter for the open port function
<b>6058</b>	Unable to open the COM port
<b>6059</b>	Unable to clear the transmission buffer
<b>6060</b>	Unable to close the port
<b>6061</b>	Port is no longer available

## Appendix A

# Computer Control

This appendix describes how to obtain the information necessary to serially control the Bio-Stack without using the Bio-Stack™ PC Control Software, Precision Power™ Software, or Liquid Handling Control™ (LHC) Software.

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## Computer Control

If you wish to serially control a Bio-Stack™ instrument without using the Bio-Stack™ PC Control Software, Precision Power™ Software, or Liquid Handling Control™ Software, you will need to write your own application to control the Bio-Stack. BioTek recommends using one of the following two methods:

- **Write a container application to interface with the Bio-Stack ActiveX component** (recommended for a **Microsoft® Windows™** operating system). The Bio-Stack ActiveX, which is included with the Bio-Stack PC Control Software installation, handles all of the low-level serial communication, providing higher-level methods and properties for a container application to access.

Refer to the **Bio-Stack ActiveX Programmer's Reference Guide** for details, by selecting **Start > All Programs > BioTek Instruments > Bio-Stack > Developer**.

- **Write an application to directly control serial communication, without using the Bio-Stack ActiveX** (recommended for a **non-Windows** operating system). To do this, you will need to learn about the serial message protocol recognized by the instrument software.

Refer to the **Bio-Stack User Guide to Serial Programming** for details, by selecting **Start > All Programs > BioTek Instruments > Bio-Stack > Developer**.

**Appendix B**

**Bio-Stack™ Barcode Scanner**

This appendix contains instructions for installing the Bio-Stack’s optional barcode scanner, and the specifications for barcode label format and position on the microplate.

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## Step 1: Install the Bio-Stack™ Barcode Scanner



**Warning! Laser Radiation.** Do not look directly into the laser beam during operation of the scanner. Serious eye injury may occur if you stare directly into the beam. Please note the warning label on the outside of the scanner's protective cover.



Be very careful not to scratch or damage the mirror when unpacking or installing the barcode scanner!



Ensure that you have performed all of the instructions for installation of the Bio-Stack with the interfacing instrument **before** you install the Bio-Stack barcode scanner (see **Chapter 3, Installation**).

### Overview

- ❖ **For operation of the Bio-Stack barcode scanner**, your Bio-Stack must be equipped with the scanner's cable connection (on the rear panel of the Bio-Stack) and the appropriate basecode software version.

You will also need appropriate versions of the Bio-Stack™ PC Control Software and Gen5™, KC4™, or Precision Power™ Software. Refer to **Appendix D** for information on required software versions.

The Bio-Stack barcode scanner is supported when the Bio-Stack is used with the following interfacing instruments:

- PowerWave™/XS and Synergy™ HT/Synergy™ 2/Synergy™ 4 readers
- Precision™/XS instruments

The barcode scanner may be installed on **either the right side or left side** of the Bio-Stack (as you are facing the claw/gripper) for operation with the Synergy HT/Synergy 2/Synergy 4 readers and Precision instruments. The scanner must be installed on the **left side** of the Bio-Stack for operation with the PowerWave/XS readers.

- ❖ The **MicroFlo Select Dispenser** does not support the Bio-Stack barcode scanner. If you wish to alternate use of the Bio-Stack with the MicroFlo and with another BioTek instrument that *does* support the barcode scanner, you will need to install the scanner on the **left side** of the Bio-Stack, before you can align the MicroFlo with the Bio-Stack.

The following sections describe how to install the barcode scanner, which label format to use, and how to verify the installation by performing the Scanner Test.

## Unpack the Barcode Scanner Installation Kit



Be very careful not to scratch or smudge the mirror when unpacking the barcode scanner!

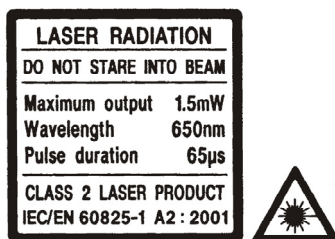
1. Turn off and unplug the Bio-Stack™.
2. Open the shipping container for the barcode scanner kit, and carefully remove the kit (enclosed in a plastic bag). The kit should contain the following components:
  - Barcode scanner assembly: scanner (housed in a protective cover), scanner cable, and mirror attached to a removable mounting bracket
  - 2 shoulder screws and washers for attaching the mounting bracket to the Bio-Stack™
  - Cable duct and cable clip for fastening the cable to the Bio-Stack
  - Combination Phillips head/flat head screwdriver
  - Installation instructions

## Install the Scanner on the Bio-Stack

The barcode scanner is shipped already attached to the mounting bracket for installation on the right side of the Bio-Stack, as you are facing the claw/gripper. If necessary, the scanner may be removed from the bracket and reassembled for installation on the left side of the Bio-Stack.

- **Synergy readers and Precision instruments:** Refer to the instructions on pages 312 to 313 for right-side installation of the scanner.
- **PowerWave/XS and Synergy readers, and Precision instruments:** Refer to the instructions on pages 314 to 315 for left-side installation of the scanner.

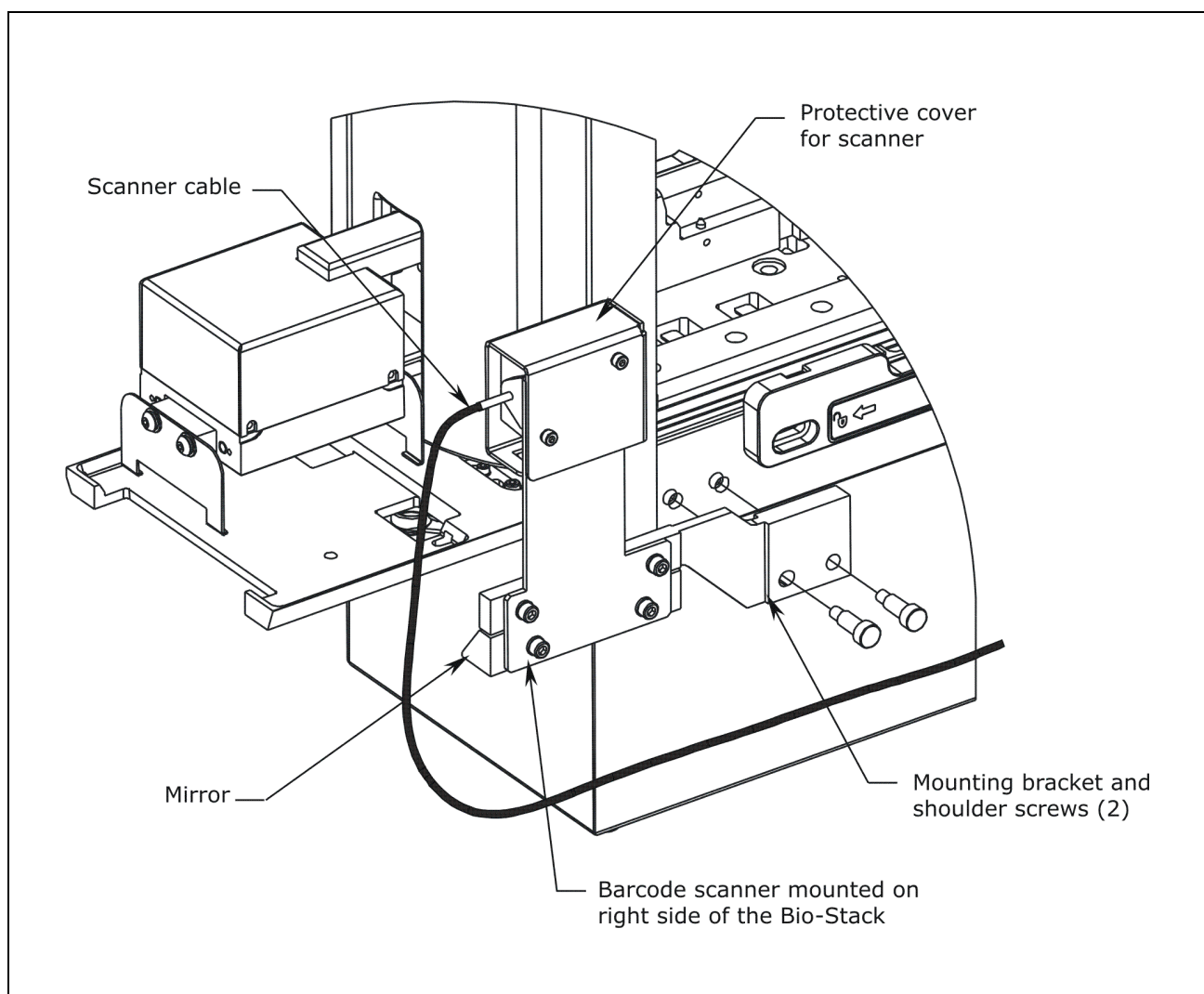
After you have installed the scanner, take a minute to read the “Laser Radiation” label (shown below) that is attached to the scanner’s protective cover. This warning is to remind you to avoid looking directly at the laser beam during operation of the scanner.



### ***Mount the Scanner on the Right Side of the Bio-Stack™***

Refer to **Figure 59** for the following instructions.

1. Align the two holes in the mounting bracket with the two holes on the **right** side of the Bio-Stack, as shown.
2. Using the screwdriver and the two shoulder screws, attach the bracket to the Bio-Stack.
3. Using lens tissue or a soft cloth moistened with lens cleaner, carefully wipe the mirror to remove any dust or particles.



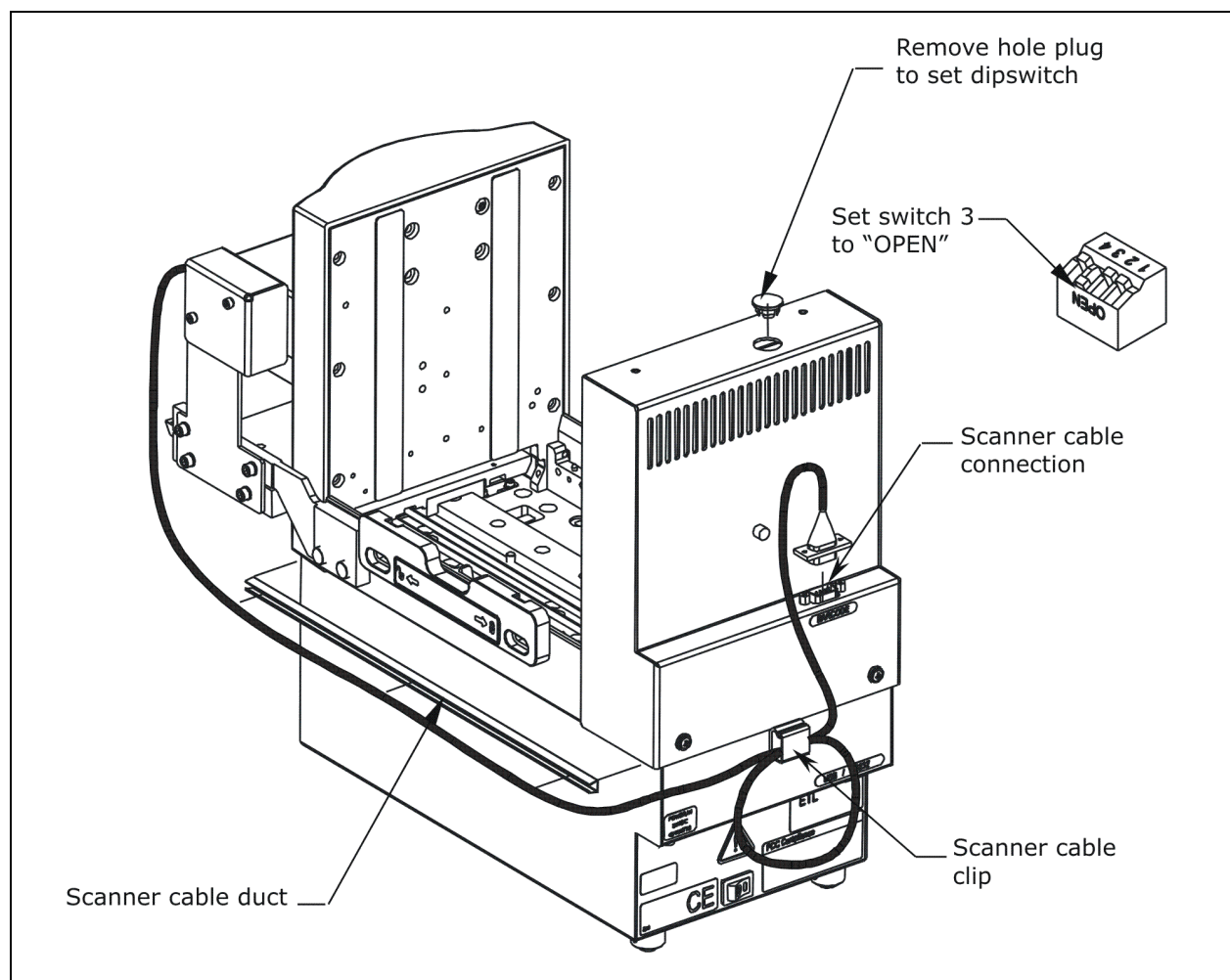
**Figure 59:** Installing the Barcode Scanner on the Right Side of the Bio-Stack



## Set the Dipswitch and Attach the Scanner Cable Hardware

In order for the Bio-Stack™ to “recognize” the scanner, you must set the dipswitch. Refer to **Figure 60** for the following instructions.

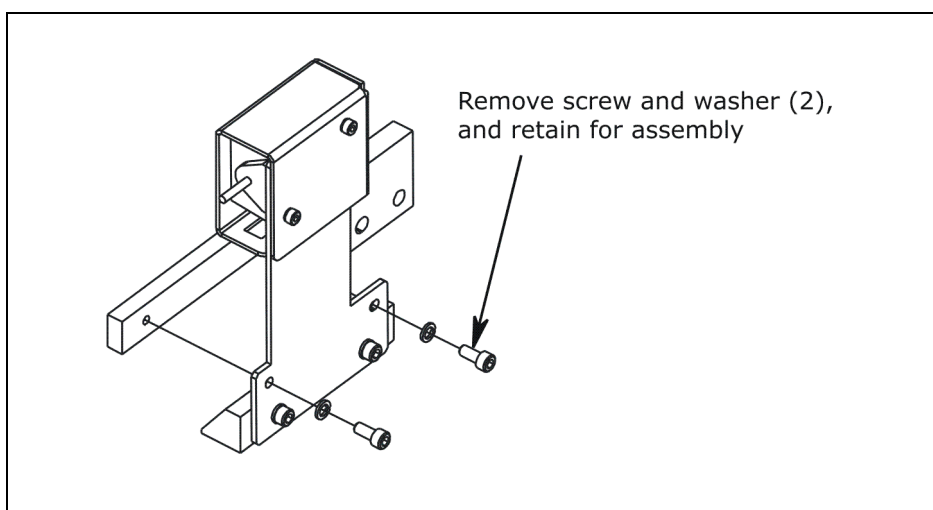
1. With the Bio-Stack still turned off, remove the hole plug for the dipswitches, and set dipswitch 3 to “OPEN.” Replace the hole plug.
2. Using a clean, cotton cloth moistened with alcohol, clean the scanner cable duct, then remove the adhesive backing from the duct.
3. Attach the duct to the **same side** of the Bio-Stack as the scanner’s mounting bracket, and center the duct front to back.
4. Push the scanner cable into the duct.
5. Remove the adhesive backing on the cable clip and attach the clip to the back panel of the Bio-Stack.
6. Loop the excess cable into the clip, and plug the scanner cable into the cable connection on the back panel of the Bio-Stack.



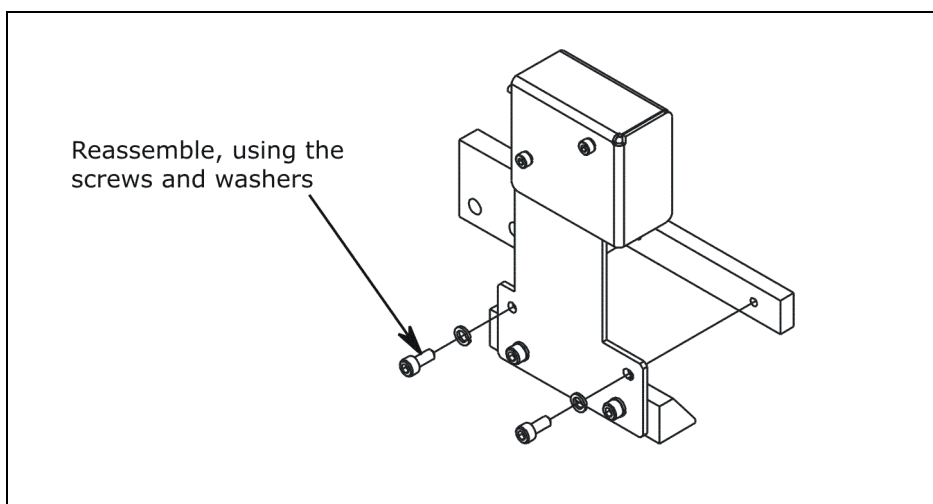
**Figure 60:** Setting the Dipswitch and Attaching the Cable Hardware

### ***Reassemble the Scanner Bracket for Mounting on the Left Side***

1. Using the supplied screwdriver, remove the two screws and washers that attach the scanner assembly to the mounting bracket, as shown in **Figure 61** and set them aside.
2. Using a 9/64" hex wrench, remove the scanner from the bracket. **Be very careful not to scratch or damage the mirror!**
3. Position the scanner on the opposite side of the bracket, as shown in **Figure 62** and align the mounting holes.
4. Reassemble, using the two screws and washers.



**Figure 61:** Removing the Scanner from the Mounting Bracket

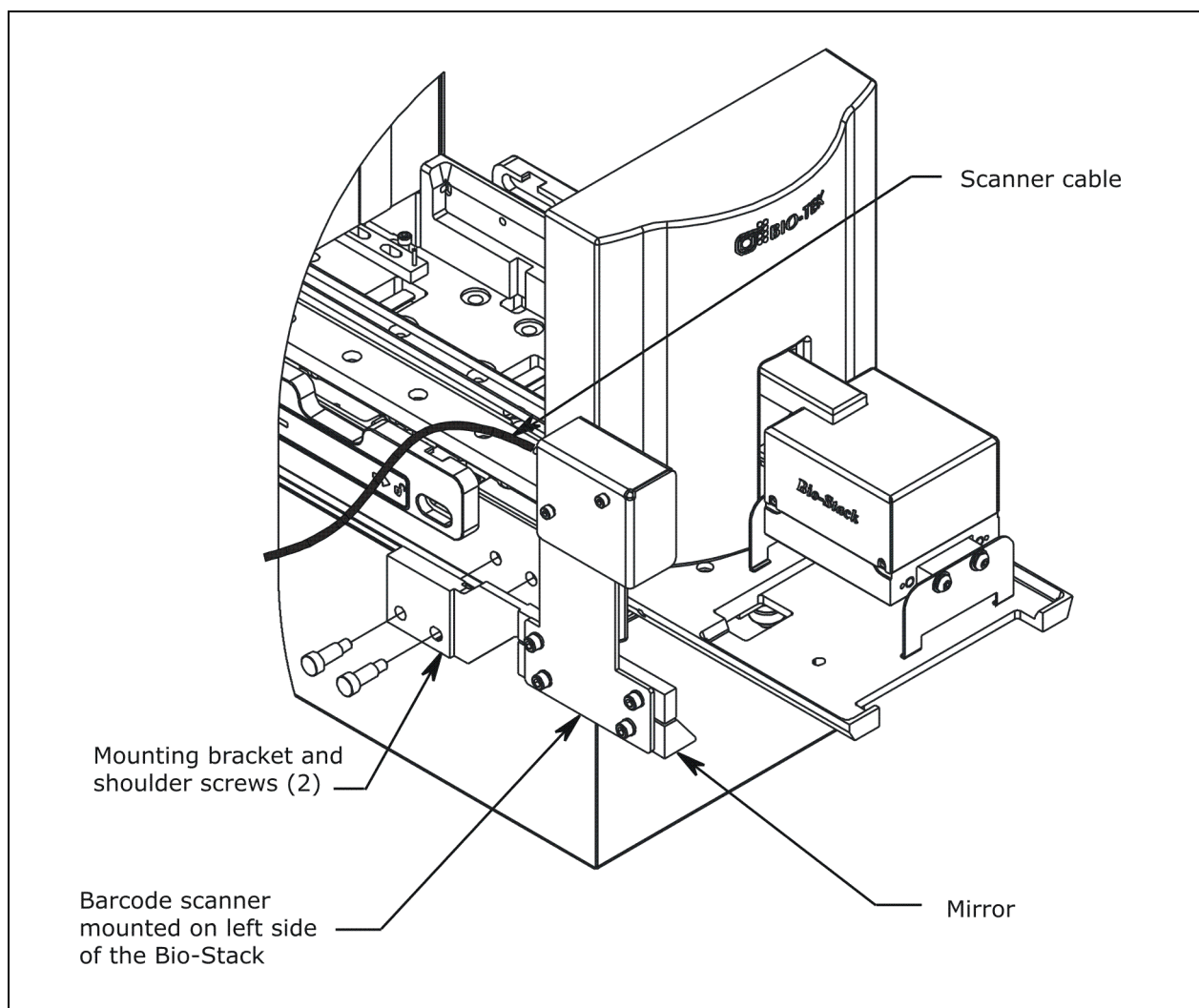


**Figure 62:** Reattaching the Scanner to the Mounting Bracket for Left Side Installation

**Mount the Scanner on the Left Side of the Bio-Stack™**

Refer to **Figure 63** for the following instructions.

1. Align the two holes in the scanner mounting bracket with the two holes on the **left** side of the Bio-Stack, as shown.
2. Using the screwdriver and two shoulder screws, attach the scanner to the Bio-Stack.
3. Using lens tissue or a soft cloth moistened with lens cleaner, carefully wipe the mirror to remove any dust or particles.
4. To complete the installation, follow the instructions in **Set the Dipswitch and Attach the Scanner Cable Hardware** on page 313 for setting the dipswitch, and for mounting the cable duct and cable clip. Ensure that you mount the cable duct on the *left* side of the Bio-Stack!



**Figure 63:** Installing the Barcode Scanner on the Left Side of the Bio-Stack

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## Step 2: Prepare Barcode Labels

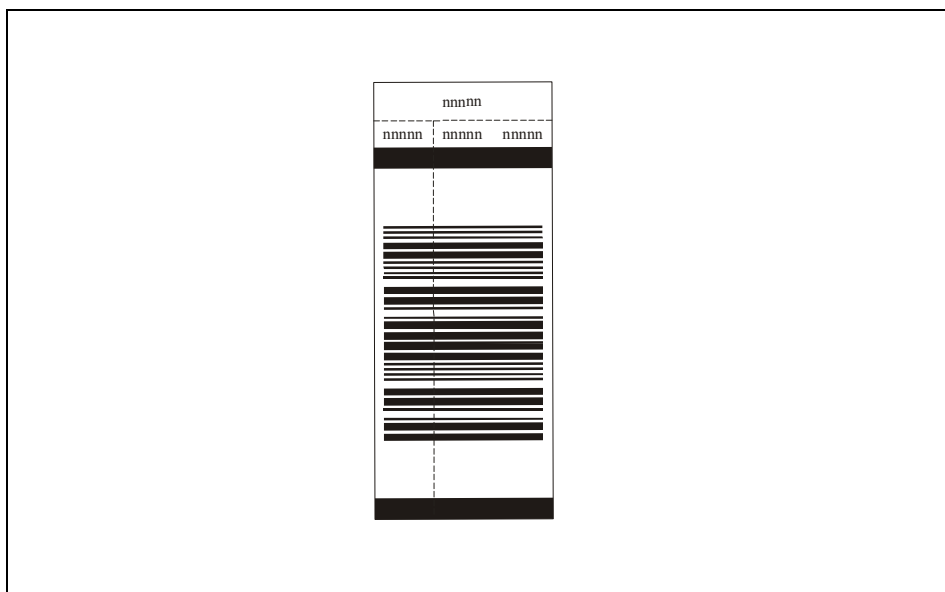
### Purchase or Create Labels to Specifications

Barcode labels are available for purchase from BioTek, or they may be created using barcode software and label products that meet the following specifications:

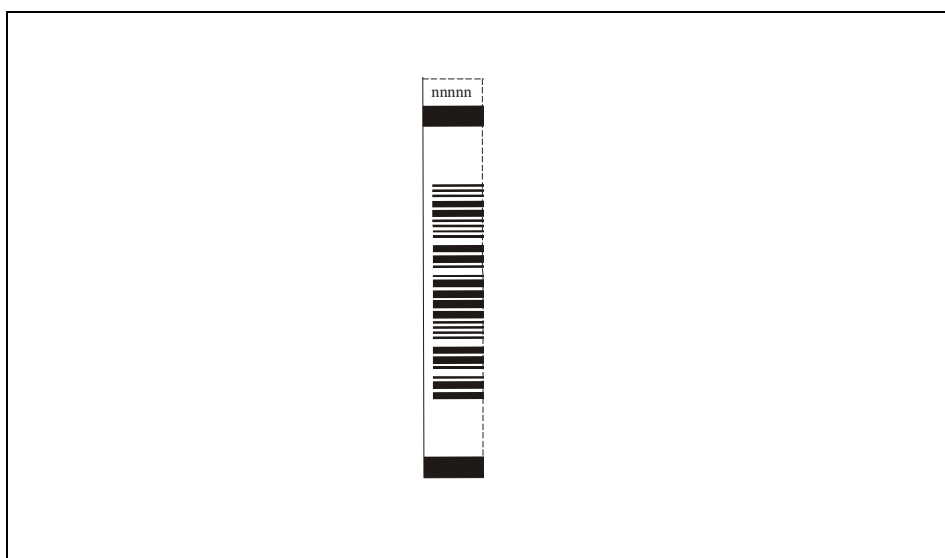
- **Label format (“symbology”):** Required formats are:
  - Code 39
  - Code 128
  - Codeabar
  - UPC/EAN
- **Industry Standards:** The labels should be made in accordance with Automation Identification Manufactures (AIM) uniform symbol specification for all codes supported. Label decodability should meet ANSI Specification X2, 182-199 “Bar-Code Print Quality Guideline” for a rating of A/05/880.
- **Label quality:** The labels should be printed on good-quality copier machines or laserjet printers.

BioTek offers pre-printed, self-adhesive barcode labels (PN 7121094), in rolls containing 500 labels, which meet the above specifications for format, industry standards, and quality. Each label features a perforated section that may be easily attached to the side of a 96-, 384- or 1536-well microplate. **Figure 64** and **Figure 65** on the following page are actual-size reproductions of one of the BioTek labels and its perforated section.

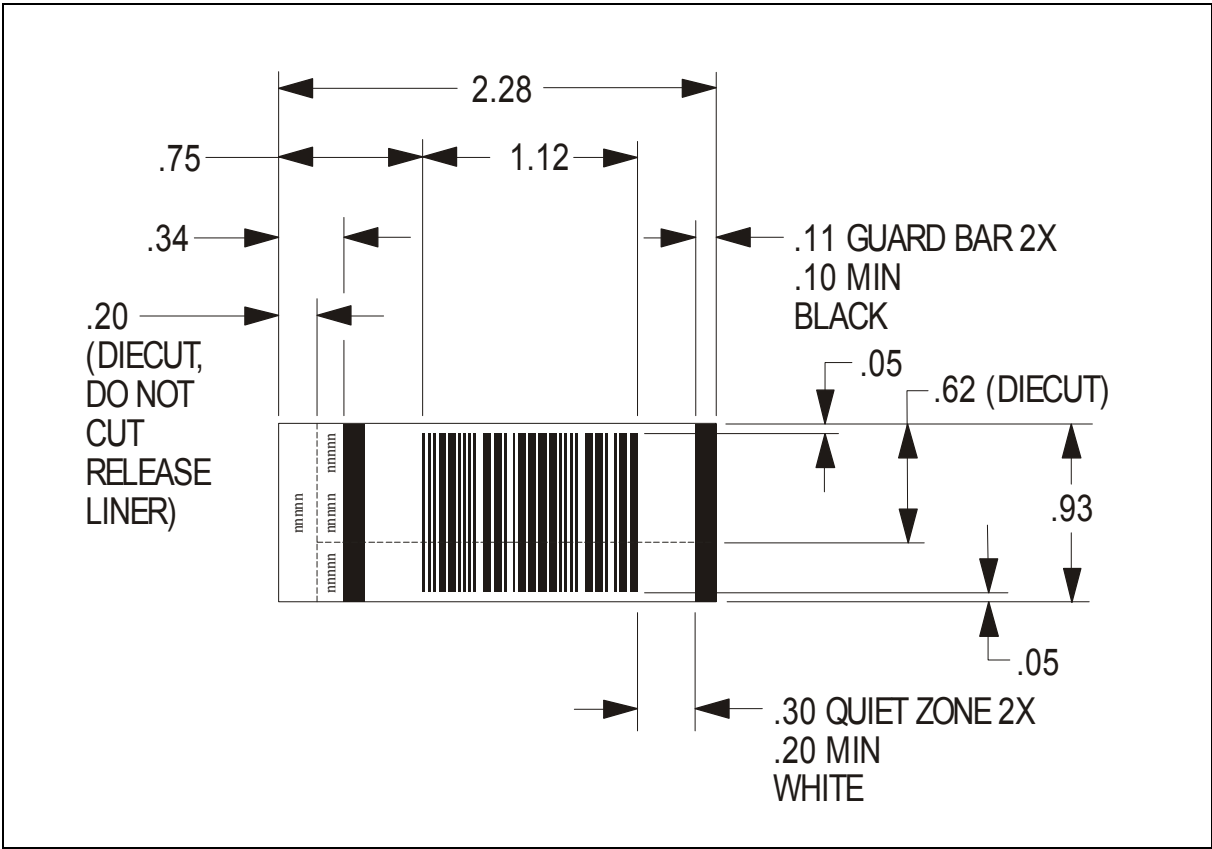
**Figure 66** on page 318 contains barcode label artwork that may be submitted to a print vendor for creation of labels that meet the code symbology and industry standards.



**Figure 64:** Sample of One BioTek Barcode Label from Roll (PN 7121094)



**Figure 65:** Section of Label for Attachment to Microplate



**Figure 66:** Barcode Label Artwork with Recommended Dimensions

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## Step 3: Verify Installation – Perform Scanner Test

Before using the Bio-Stack™ barcode scanner for the first time, verify the installation by performing the Scanner Test, as instructed in the following sections:

- **Scanner Test for Bio-Stack with Readers**, page 320.
- **Scanner Test for Bio-Stack with Precision Instruments**, page 328.

❖ **Readers:** The Bio-Stack™ PC Control Software Help system contains complete instructions for using the Bio-Stack barcode scanner, that include

- displaying barcodes that have been scanned next to the input and output stacks in the Bio-Stack PC Control Software main screen,
- using the barcodes as plate data file names (KC4™ only), and
- specifying how barcode scanning failures should be processed.

❖ **Precision instruments:** The Precision Power™ Software Help system contains complete instructions for using the Bio-Stack barcode scanner, that include

- using the Bio-Stack in a Supply Command, and
- using the Bio-Stack to build the To-Do List.

Refer also to the Precision Power User's Guide.

## Scanner Test for Bio-Stack™ with Readers

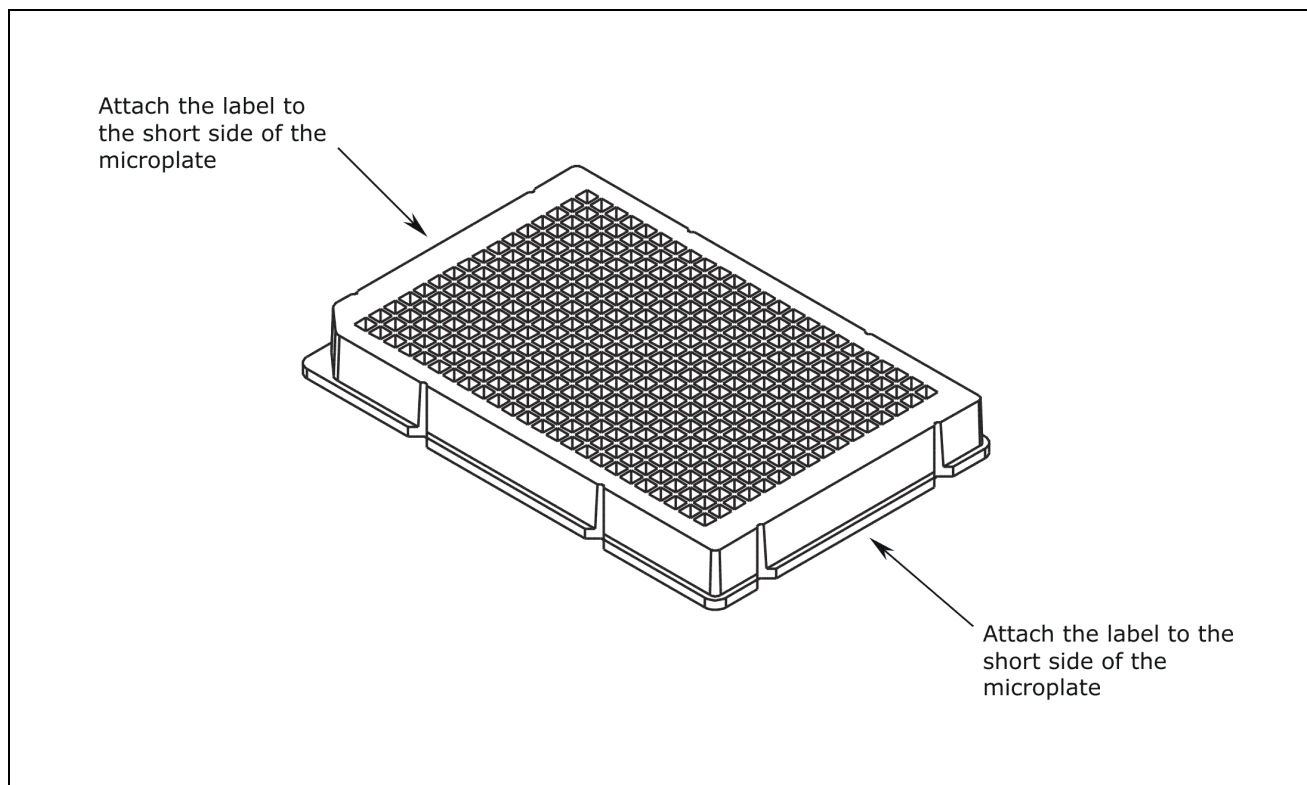
If you are operating the Bio-Stack and barcode scanner with the PowerWave™, PowerWave™ XS, Synergy™ HT, or Synergy™ 2/Synergy™ 4 readers, perform the instructions in this section for verifying installation of the scanner.

### *Prepare Microplates for the Scanner Test*

Refer to **Figure 67** on page 321 for the following instructions:

1. Assemble the required materials:
  - ◆ Purchased or custom-made barcode labels that meet label requirements and dimensions described in **Purchase or Create Labels to Specifications** on page 316.
  - ◆ Three “dry” (empty) 96-, 384-, or 1536-well microplates that meet plate specifications described on page 316, and that have **flat**, vertical sidewalls so the labels will lie flat upon the surface.
2. Place the labels on whichever “short” sides of the microplates that will be scanned. See **Figure 67**; a 384-well plate is shown. The labels should not extend above or below the edges of the plate, or the plates may stick to one another when they are stacked.
3. Load the barcode labeled plates into whichever stack you have designated as the **input** stack.





**Figure 67:** Positioning the Barcode Label on the Microplate  
(for Bio-Stack™ with Readers)

### Create a Gen5™ Experiment for the Scanner Test

- ❖ Gen5 Software does not need to be configured before creating the following experiment for the Scanner Test. However, prior to running the Bio-Stack™ PC Control Software with Gen5 on a regular basis, there are several Gen5 items that must be configured properly while running Gen5 as a stand-alone application. These include choosing a file storage mode, setting user preferences, etc.

Refer to the Gen5 Getting Started Guide or Help system for more information on configuration of Gen5.

The Bio-Stack™ PC Control Software links each plate in the input stack to a previously created and stored Gen5 experiment. Perform the following steps to create a simple Gen5 experiment for the Scanner Test:

1. Launch Gen5. Log in if prompted to do so (Gen5 Secure).
2. From Gen5's main menu, select **File > New Experiment**.
3. Select the **Default Protocol** then click **OK**. Gen5 will open the experiment workspace, which includes the New Experiment menu tree and the plate screen.
4. Double-click **Protocol** in the menu tree to open the Protocol menu. Double-click **Procedure** to open the Procedure dialog.
  - ◆ Gen5™ and Gen5™ Secure: If the 'Instrument Selection' dialog appears, highlight the appropriate reader, then click **OK**.
5. Select the appropriate **Plate Type** for the three microplates that you loaded into the input stack in **Prepare Microplates for the Scanner Test**, on page 320. If your particular plate is not in the list, select **96 WELL PLATE**.
6. Click **Read**. Keep the default settings for all parameters in the 'Read Step' dialog.
7. Click **OK > OK** to save all settings and return to the main menu.
8. Select **File > Save As**, and save the experiment, using a unique name (e.g., Scanner Test.xpt). Make a note of the file name and storage location.

- ❖ The default storage location is **C:\Program Files\BioTek\Gen5\Experiments** (if you selected a conventional installation of Gen5).

You will select this file in the Bio-Stack PC Control Software when you run the Scanner Test on page 326.

9. **Important!** Close Gen5 software.

## ***Configure KC4™ Software for the Scanner Test***

Perform the following steps to configure KC4 for the Scanner Test:

### **KC4 v3.x (non-Signature) Users:**

1. Launch KC4 v3.x.
2. Select **System > Setup** and click the 'Start-up' tab.
3. Check **Minimize KC4 when running in OLE mode** and then click **OK**.
4. Select **System > Administrator Login**, enter the **Administrator Password**, and then click **OK**. (The default password is **admin**.)
5. Select **System > Security** and click the 'Files' tab.
6. Select a **Preferred data file format** of .PLA or .GLB, according to your site's assay requirements. (Click the **Help** button for assistance.) Make a note of this selection for use with the Bio-Stack™ PC Control Software configuration in ***Configure Bio-Stack™ PC Control Software for the Scanner Test*** on page 325.
7. Click **OK** to return to KC4's main application window.

### **KC4 Signature Users:**

1. Launch KC4 *Signature*.
2. When the 'Login' dialog appears, enter the **Administrator Password** and click **OK**. (The default password is **admin**.)
3. Select **System > Setup** and click the 'Start-up' tab.
4. Check **Minimize KC4 when running in OLE mode** and then click **OK**.
5. Select **System > Security** and click the 'Files' tab.
6. Select a **Preferred data file format** of .PLA or .GLB, according to your site's assay requirements. (Click the **Help** button for assistance.) Make a note of this selection for use with the Bio-Stack PC Control Software configuration in ***Configure Bio-Stack™ PC Control Software for the Scanner Test*** on page 325.
7. Click **OK** to return to KC4's main application window.

### Create a KC4™ Protocol for the Scanner Test

The Bio-Stack™ PC Control Software links each plate in the input stack to a previously created and stored KC4 protocol. Perform the following steps to create a simple protocol for the Scanner Test:

1. Select **Data > New Plate**. If prompted to select a protocol, select **Empty Protocol** and click **OK**. If *not* prompted, select **Protocol > New**.
2. Select **Protocol > Reading**. Define the following parameters in the 'Reading' dialog:
  - ◆ (Synergy™ HT only) Select **Absorbance** for the **Detection method**.
  - ◆ Select **End Point** for the **Reading Type**.
  - ◆ Keep the default **Wavelength(s)**.
  - ◆ Select the appropriate **Plate Type** for the three microplates that you loaded into the input stack in **Prepare Microplates for the Scanner Test** on page 320. If your particular plate is not in the list, select **96 WELL PLATE**.
  - ◆ Keep the default settings for all other parameters in the Reading dialog.

❖ **PowerWave™ HT customers:** *Do not* select the **Read Barcode** parameter. The Read Barcode parameter is designed specifically for use with the *reader's* scanner.

- ◆ Click **OK** to verify the parameters and return to the main screen.
3. Select **Protocol > Save As** and save the protocol. Make a note of the file name and storage location. You will select this file in the Bio-Stack PC Control Software when you run the Scanner Test.
  4. (Optional) If you wish to specify the storage location for the plate data files, select **Protocol > Options**, and in the **Save Directory** box, enter the path of the folder in which to store the files.

❖ If the Save Directory box is left empty, the plate data files will be stored in the default KC4 folder, or in the secure database, depending on the KC4 license/configuration.

5. **Important!** Close KC4 software.
  - ◆ If **Save changes to New Plate** appears, click **No**.

## Configure Bio-Stack™ PC Control Software for the Scanner Test



**Warning!** Keep your hands away from the claw/gripper and carrier while the Bio-Stack™ is being powered up. The carrier and claw/gripper move quickly during the homing sequence.



Perform the following steps to configure the Bio-Stack PC Control Software for the Scanner Test:

1. Plug in and turn on the Bio-Stack.
2. Launch the Bio-Stack PC Control Software.
3. Click on **Change Current Settings** to open the 'Settings' dialog.
4. At the 'Plate Identification' tab, select **Auto-generated Plate ID**. Keep the default **Plate\_** for the **optional prefix**, and enter **1** for the **starting plate #**.

❖ The **Plate ID** labels are *only* used for the Bio-Stack PC Control Software stack *displays*, to make it easier to track a plate within the stacks. There is no automatic association between the Plate ID defined for a plate in the Bio-Stack software and the usage of plate barcode IDs in Gen5™/KC4™, or plate output file names in KC4.

5. At the 'Run Control' tab, select **Re-stack when processing is done** and **Provide re-try prompt following barcode scanning failures**.
6. At the 'Display Options' tab, select **Display Barcode Label** for both **Left of Input Stack** and **Right of Output Stack**.
7. KC4 only: At the 'KC4 Options' tab, select **KC4 data only (\*.PLA)** or **KC4 data and protocol (\*.GLB)**, as appropriate, for the **KC4 preferred output data file format**.
  - ◆ If you wish to use barcode IDs scanned by the Bio-Stack's barcode scanner as KC4 plate data file names: click **Have KC4 write out a plate file using Bio-Stack barcode ID for filename**. The files will be stored in the location you specified in **Create a KC4™ Protocol for the Scanner Test** on the previous page, or (if you did not specify a location) in the default KC4 folder or secure database.
8. Click **OK** to save and close the Settings dialog.

## Run the Scanner Test

	<p><b>Warning! Laser Radiation.</b> Do not look directly into the laser beam during operation of the scanner. Serious eye injury may occur if you stare directly into the beam. Please note the warning label on the outside of the scanner's protective cover.</p>
	<p>Ensure that you are not also running Gen5™ or KC4™ software in stand-alone mode when performing the Barcode Scanner Test.</p>

Perform the following steps to run the Bio-Stack™ Barcode Scanner test:

1. At the Bio-Stack™ PC Control Software's main screen, **Add New Plate** area, open the scanner test file that you created:

### Gen5

- ◆ Click **Existing Exper.** then click the three-dot button next to **Exper.** to open the 'Browse for Experiment' dialog.
- ◆ Search through the folders until you locate the Gen5 experiment file you created.
- ◆ Click **Open**, and the file path will now appear in the **Exper.** Field.

### KC4

- ◆ Click the three-dot button next to **Assay** to open the 'Browse for Protocol' dialog.
- ◆ Search through the folders until you locate the KC4 protocol file you created.
- ◆ Click **Open**, and the file path will now appear in the **Assay** field.

2. Click **Top of Input Stack**, then click **Add plate to Input Stack** three times to "add" the three plates that will be scanned. An image of each plate will be added to the **Input Stack** in the Bio-Stack PC Control Software.
3. Under **Run Control**, click **Start**. The Bio-Stack PC Control Software will run Gen5 or KC4 "in the background," to process each plate in accordance with the Gen5 experiment or KC4 protocol.

As the plates are transferred between the Bio-Stack™ and the reader, note whether the following activities occur:

- ◆ The red LED on the barcode scanner should flash as the scanner reads a barcode on a plate
    - during transfer from the input stack to the Bio-Stack's extended carrier position (before the plate is picked up by the claw/gripper for transfer to the reader's carrier), and
    - during transfer from the Bio-Stack's extended carrier position to the output stack (after the plate has been processed and transferred from the reader's carrier to the Bio-Stack carrier).
  - ◆ A barcode ID should appear
    - to the right of the **Output Stack** in the Bio-Stack™ PC Control Software as the claw/gripper is transferring a processed plate from the reader's carrier to the Bio-Stack carrier (for transfer to the Output Stack), and
    - to the left of the **Input Stack** in the Bio-Stack PC Control Software as a processed plate in the Output Stack is being lowered onto the carrier for transfer to the Input Stack.
4. If a scanning failure occurs, the Bio-Stack will pause while the 'Barcode Scan Failure' dialog appears with the options to retry the scan, manually enter the barcode, ignore the error, or abort the run.

- ❖ If you choose to manually enter the barcode and need to remove the plate from the Bio-Stack's carrier in order to read the barcode, ensure that you place the plate back onto the carrier.
- ❖ If you choose to ignore the error, the Bio-Stack PC Control Software will display a code (e.g., **###NoBarcode##**) to the right of the Output Stack and to the left of the Input Stack.

- ◆ Check for missing labels, invalid or illegible barcodes, or plates loaded into the input stack with the barcode label on the wrong side of the plate.
  - ◆ Correct the problem, then select **Retry Scan**.
  - ◆ If the test still doesn't pass, contact BioTek TAC.
5. Click **OK** when the "All plates have been completed" dialog appears.

- ❖ Check to ensure that **Done** appears above **Number of Runs** in the Bio-Stack PC Control Software.

## Scanner Test for Bio-Stack™ with Precision™ Instruments

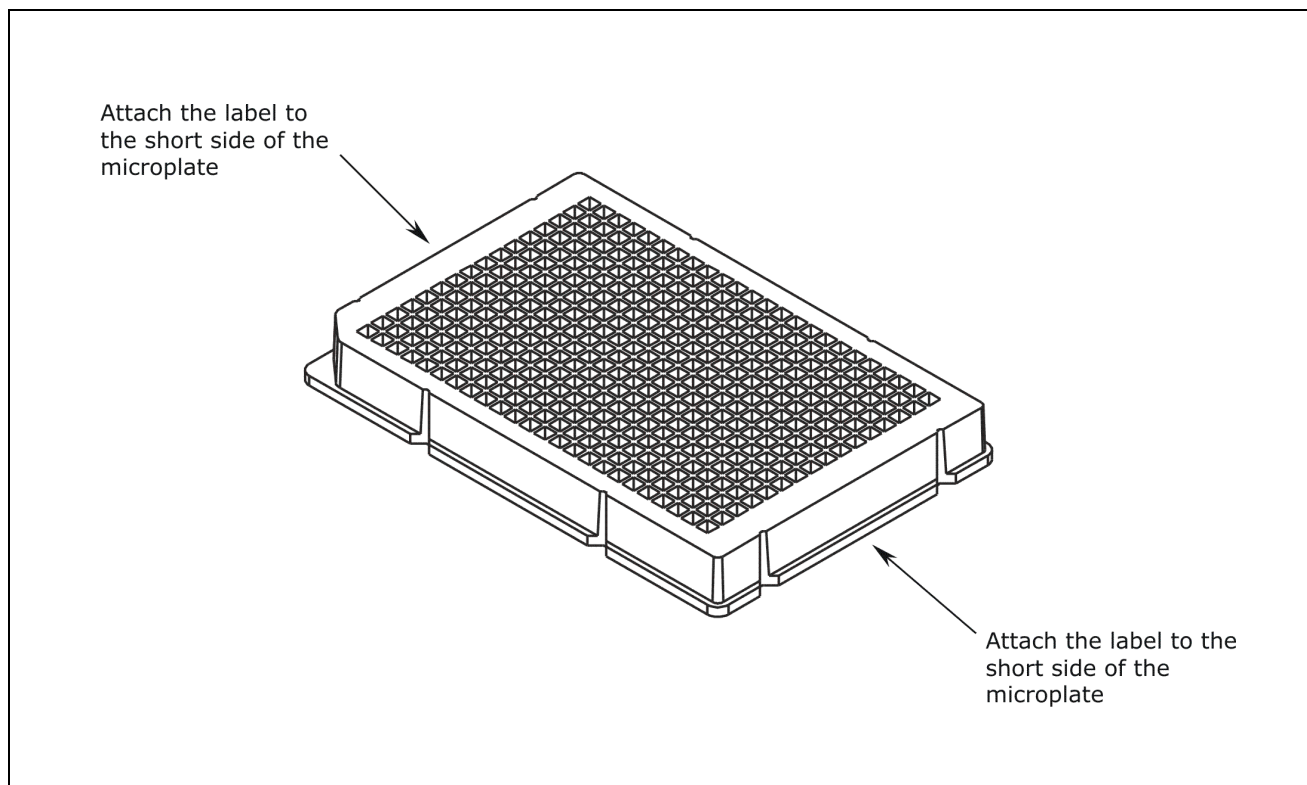
If you are operating the Bio-Stack and barcode scanner with the Precision™ Microplate Pipetting System or Precision™ XS, perform the instructions in this section for verifying installation of the scanner.

### ***Prepare Microplates for the Scanner Test***

Refer to **Figure 68** on page 329 for the following instructions:

1. Assemble the required materials:
  - ◆ Purchased or custom-made barcode labels that meet label requirements and dimensions described in **Purchase or Create Labels to Specifications** on page 316.
  - ◆ Three “dry” (empty) 96- or 384-well microplates that meet plate specifications described on page 316, and that have **flat**, vertical sidewalls so that the labels will lie flat upon the surface. The plates should also be compatible with Precision Power’s Vessel Specification files for 96- and 384-well plates.
2. Place the labels on whichever “short” sides of the microplate that will be scanned. See **Figure 68** on the next page (a 384-well plate is illustrated). The labels should not extend above or below the edges of the plate, or the plates may stick to one another when they are stacked.
3. Write down the barcode IDs for each plate. You will need to enter these numbers when you create the plate maps in the section **Create Plate Maps for the Scanner Test** on page 330.
4. Load the barcode-labeled plates into whichever stack you have designated as the **output stack**.





**Figure 68:** Positioning the Barcode Label on the Microplate  
(for Bio-Stack™ with Precision™ instruments)

### ***Create Plate Maps for the Scanner Test***

Perform the following steps in Precision Power™ to create simple plate maps that you will use in the Scanner Test:

1. Launch Precision Power Software.
2. Click the **Unprocessed Maps** icon on the toolbar.
3. At the 'Unprocessed Maps' dialog, click the **Add** button.
4. In the 'Add Plate/Rack Map' dialog:
  - ◆ At the **Plate/Rack ID** field, type the barcode number of the first plate that you loaded into the output stack.
  - ◆ Select a **Vessel Specification File** (from the pull-down menu) that is compatible with the plates you are using.
  - ◆ Click **Create** to continue setting up a new plate map.
5. In the 'Add Map' dialog:
  - ◆ At the **When processing is done** field, click **Leave in Unprocessed Folder**.
  - ◆ Keep the default settings for all other parameters in the Add Map dialog, and click **Save**.
6. At the Unprocessed Maps dialog:
  - ◆ Repeat the instructions in steps 3 through 5 for the other two plates, entering the barcode numbers for the plates in the Plate/Rack ID fields.
  - ◆ Click **Exit**.

**Run Scanner Test: Use Bio-Stack™ to Build To-Do List**

**Warning! Laser Radiation.** Do not look directly into the laser beam during operation of the scanner. Serious eye injury may occur if you stare directly into the beam. Please note the warning label on the outside of the scanner's protective cover.

Perform the following steps to test the scanner, using the Bio-Stack to build the To-Do List:

1. At the Precision Power™ main screen, click on the **To-Do List** icon on the toolbar.  
The 'Modifying the To-Do List' dialog will open, and the three barcode plate maps that you created and saved in the **Unprocessed** folder will appear in the **Available Plate Maps** list.
2. Select the option to **Add to To-Do List via Bio-Stack**.
3. Configure the **Options** as follows:
  - ◆ Use the drop-down list in the **Bio-Stack Selection** field to identify the Bio-Stack and supply station.
  - ◆ De-select **Limit by location count**.
  - ◆ Select **Ignore failures**.

❖ When the Ignore Failures is not selected and errors occur scanning the barcode or locating a matching plate map, Precision Power offers multiple options for resolving the error or continuing the process.

4. Click the **Generate List** button to start the Bio-Stack scanning process. The Bio-Stack scanner will scan each barcoded plate as it is moved from the output stack to the input stack.

Note whether the following activities occur:

- ◆ The red LED on the barcode scanner should flash as the scanner reads the barcode on the plate at the extended carrier position.
- ◆ Precision Power will look for an **Available Plate Map** with the same Plate ID as the scanned plate. As it finds a match, it moves the plate map to the **Assigned Plate Maps**, i.e., the **To-Do List**. All three barcode plate maps should now appear in the Assigned Plate Maps list.

If a failure occurs during the process, Precision Power™ puts a placeholder in the Assigned list marked with a red error icon. A barcode scanning error results in a placeholder name **No barcode #**.

- ◆ Remove the plate from the carrier, and check for a missing label, invalid or illegible barcode, or a barcode label on the wrong side of the plate in reference to the position of the scanner. Ensure that the barcode ID you entered in **Create Plate Maps for the Scanner Test** on page 330 matches the barcode ID on the plate.
- ◆ Correct the problem, place the plate back onto the output stack, and home the Bio-Stack™. Repeat steps 1 through 4.
- ◆ If the test doesn't pass, contact BioTek TAC.

**Appendix C**

# Reconfiguration of the Bio-Stack

This appendix contains instructions for reconfiguring the Bio-Stack™ to accommodate half-height plates.

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## Reconfigure the Bio-Stack™ for Half-Height Plates



**Important!** These instructions configure the Bio-Stack and the input/output stacks for use with a specific half-height plate. After performing these instructions, if you wish to use a plate type with distinctly different dimensions (e.g., a “standard height” plate) you must reconfigure the instrument and stacks for the new plate. Alternatively, consider purchasing an additional set of input/output stacks (PN 7310008S) and configuring them for the new plate type.

### Overview

If you are using **half-height plates** and the Bio-Stack is **passing multiple plates at once** from the input stack to the Bio-Stack carrier, the instrument may need to be reconfigured to accommodate your microplates. One microplate known to require this reconfiguration is MJ Research’s *Hard-Shell* 384-well PCR plate. To configure the Bio-Stack to prevent multiple half-height plates from passing to the carrier at once, you will perform four steps:

1. Ensure that the Bio-Stack’s on-board (basecode) software version is at least 1.27.1.

❖ Bio-Stacks manufactured after February 2007 meet this requirement.

2. “Open” an internal dipswitch.
3. Make minor adjustments to the input and output stacks.
4. Run the Bio-Stack in a special test mode with dry plates, to test the adjusted stacks.

Instructions are provided on the following pages. Please contact BioTek’s Technical Assistance Center with any questions or concerns (see **Chapter 1** for contact information).

### Required Materials

- 5/64” (2.0 mm) allen wrench
- 7 of the half-height microplates you are working with
- Small piece of paper approximately 0.02” (0.5 mm) thick

## Step 1: Check the Bio-Stack's Basecode Software Version

❖ Refer to **Appendix D, Required Software Versions**, for more information on software versions required for the Bio-Stack™ and interfacing instrument.

To check the Bio-Stack's basecode software version, refer to the instructions in **Chapter 3, Installation**.

If you are using the Bio-Stack™ with this instrument:	Refer to the instructions on this page in <b>Chapter 3</b> :
PowerWave™/XS or Synergy™ HT/Synergy 2/ Synergy 4	60
Precision™/XS	74
µFill™	99
ELx405™ (Instrument Control)	99
ELx405 (PC Control)	108
NanoQuot™	121
MicroFlo™ Select (Instrument Control)	140
MicroFlo Select (PC Control)	149

If the software version is less than 1.27.1, contact BioTek's Technical Assistance Center for upgrade instructions. Do not proceed to step 2 until you have upgraded the software.

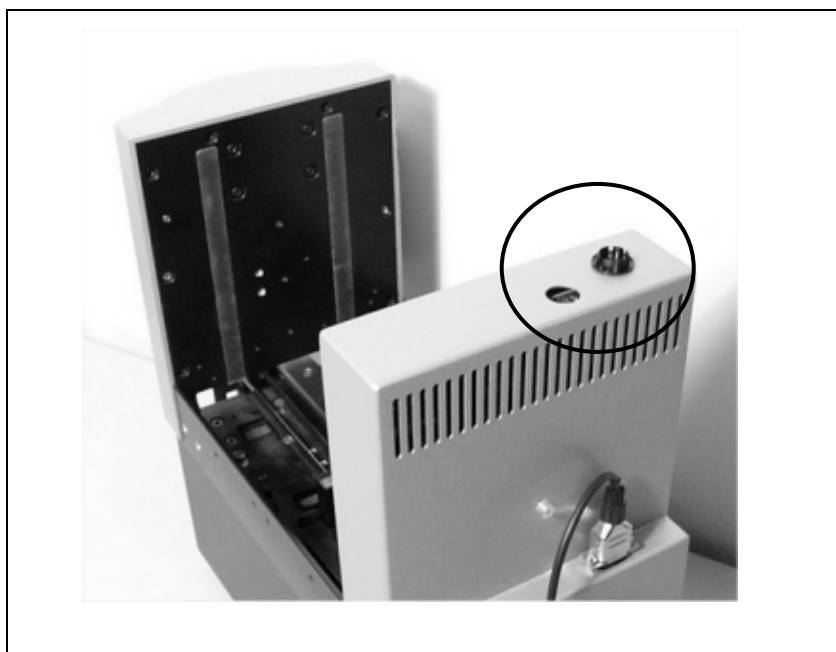
## Step 2: "Open" Dipswitch #1

❖ Perform step 2 only if dipswitch #1 is not already open. If it is already open, skip this step and go to step 3.

1. If the Bio-Stack is on, turn it off. Locate and remove the round dipswitch access cover on top of the Bio-Stack, as shown in **Figure 69** on the following page. Inside the hole you'll see a small panel with four numbered dipswitches.
2. Switch **#1** must be in its OPEN position, as shown in **Figure 70** on the following page. If the switch is "closed," use the end of a paper clip to move it to the OPEN position.



**Important!** Switch #1 must be moved back to its CLOSED position to process standard-height plates.



**Figure 69:** Dipswitch Access Cover



**Figure 70:** Switch #1 in OPEN Position



### Step 3: Adjust the Input and Output Stacks

Turn an empty stack upside down and identify its two movable brackets, one on each of the short sides of the stack. These are plate-grippers, called “dogs.” In **Figure 71** below, each arrow points to a stack dog.

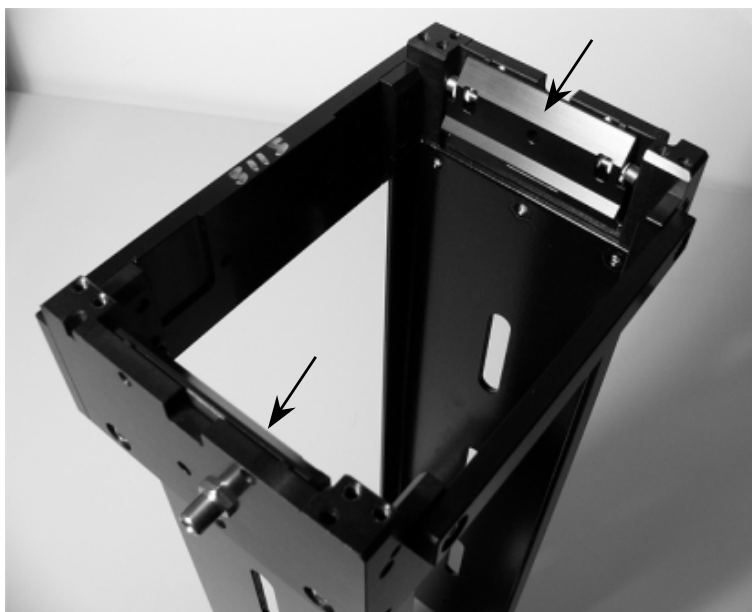
When multiple half-height plates are passing to the carrier at once, the factory-set dogs are gripping the plates in the wrong place. The cause is likely the length of the plate (slightly longer than standard) combined with the way the plates “nest” inside one another in the stack.

You will adjust the dogs slightly to increase the distance between them, to allow the plates to be gripped properly.

You’ll need a **5/64” (2.0 mm) allen wrench**, the **microplate** you are working with, and a small piece of **paper** that is approximately 0.02” (0.5 mm) thick.



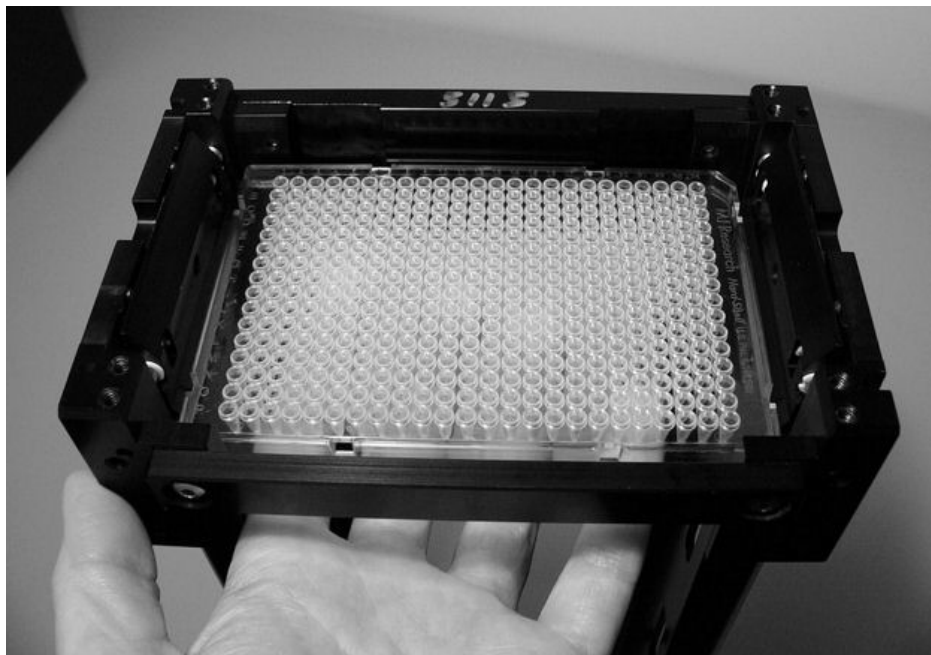
**Important!** The adjustment process may take a few tries. You’ll make a slight adjustment to the input and output stacks, and then run the Bio-Stack™ in a special test mode with seven empty plates to ensure that only one plate at a time passes from the stack to the carrier. You may find that the dogs were moved too far apart, or not quite far enough, and you’ll have to repeat the adjustment/test process. Once the dogs are set properly, you should not have to repeat this procedure for this plate type.



**Figure 71:** Stack “Dogs”

To make the adjustments (perform these steps for both the input and output stacks):

1. Turn the empty stack upside down and set it on a flat surface.
2. Hold the plate right-side up and slide it into the middle of the stack. Move it up until the plate's flange is flush against the bottoms of both dogs, as shown in **Figure 72**:

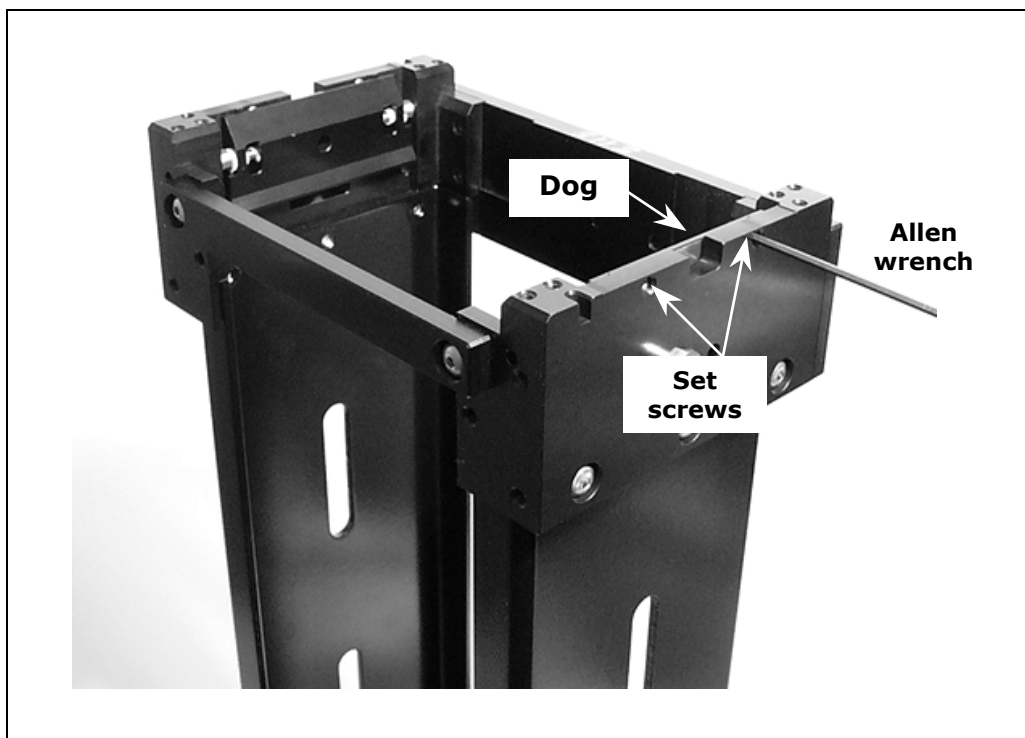


**Figure 72:** Positioning the Plate in the Stack

3. Attempt to slide the paper between the plate and the dog on one side; notice that the dog is too tight against the side of the plate to allow the paper to slide freely. Set the paper aside for now.

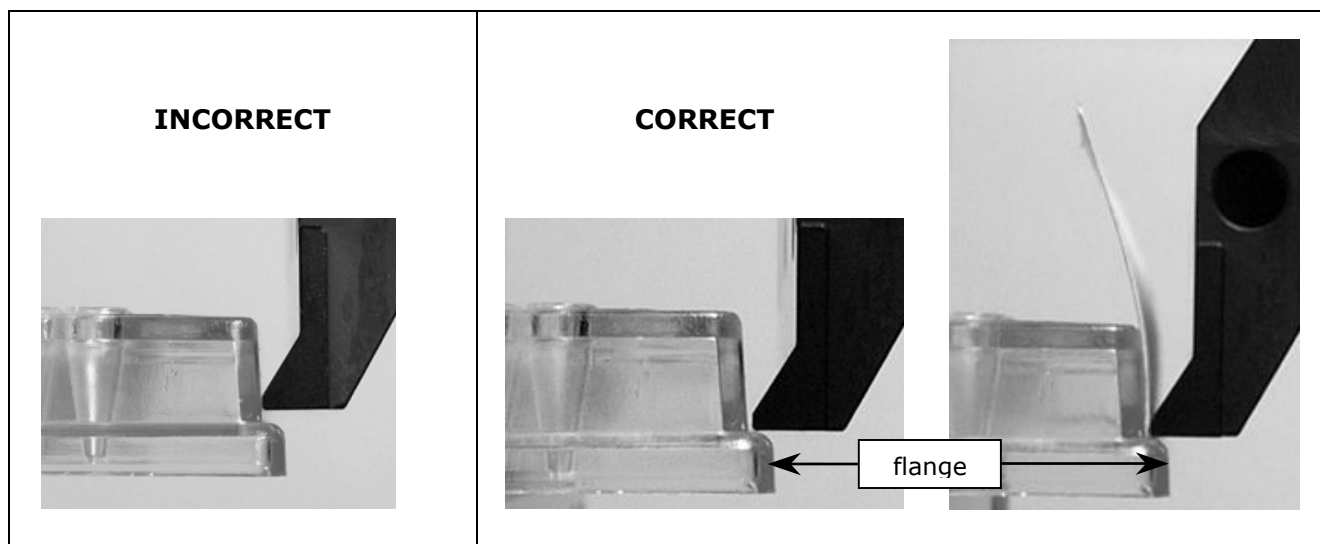
❖ Use the photos on the next page to help with the adjustments. Each dog is held in position by two set screws, as shown in **Figure 73**. **Figures 74** and **75** demonstrate incorrect and correct positioning of the dogs in relation to the plate when the plate is held in place as in **Figure 72**.

4. Using the allen wrench, turn one dog's set screws **clockwise** to increase the distance between the dog and the side of the plate to approximately 0.02" (0.5 mm). Repeat for the other dog. When the plate is held as shown in **Figure 72**, each dog should rest on the plate's flange and you should be able to insert and remove the test paper without friction between the dog and the side of the plate.



**Figure 73:** Turning the Dog's Set Screws

❖ **Figures 74 and 75** demonstrate incorrect and correct positioning of the dogs in relation to the plate when the plate is held in place as in **Figure 72**.



**Figure 74:** Incorrect Positioning of the Dogs

The dog is too high and it touches the side of the plate.

**Figure 75a and 75b:** Correct Positioning of the Dogs

The dog rests on the flange and does not touch the side of the plate. A piece of 0.02" (0.5 mm) thick paper easily slides between the dog and the plate.

## Step 4: Test the Adjusted Stacks



**Warning!** Keep your hands away from the claw/gripper and carrier while the Bio-Stack™ is being powered up. The carrier and claw/gripper move quickly during the homing sequence.

As mentioned on page 337 (in the **Important!** note), you'll need to test the adjusted stacks with seven dry plates, to see if the stacks are set properly or require further adjustment.

1. If the Bio-Stack™ is on, turn it off.
2. Remove the dipswitch access cover and move switch **#4** to the OPEN position.
3. Load the input stack with **seven** clean, dry microplates.
4. Install the input and output stacks.
5. Turn on the Bio-Stack.

Plates will begin to transfer from the input stack to the carrier and then to the output stack. When all plates have been transferred to the output stack, they will be transferred back to the input stack. This process will repeat until you turn off the Bio-Stack.

6. Observe the plate transfer process. Plates should pass one-at-a-time to the plate carrier.

If, after several transfers, you are satisfied with the performance, turn off the Bio-Stack and restore dipswitch #4 to its closed position.

If multiple plates continue to pass to the plate carrier, turn off the Bio-Stack and attempt to adjust the stacks again. Repeat the adjustment/test process until the plates are transferring to your satisfaction.



**Important!** When finished, be sure to attach **labels** to the stacks and the Bio-Stack to indicate that they are "Configured for <your plate type>."

"Configured for  
MJR Hard-Shell  
384/PCR on  
5/01/2007"

## Appendix D

# Required Software Versions

This appendix lists all software versions required for operation of the Bio-Stack™ with the PowerWave™/XS, Synergy™ HT/Synergy™ 2/Synergy™ 4 readers, Precision™/XS instruments, µFill™, NanoQuot™, and MicroFlo™ dispensers, and ELx405™ washer.

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## Overview

For operation of the Bio-Stack™ with an interfacing instrument, you will need the correct software versions installed on both instruments, and, if applicable, on the controlling computer.

Refer to the tables on the following pages to determine if you have all of the correct software versions. (See **Chapter 7, Troubleshooting and Error Codes** for instructions for obtaining software versions for the Bio-Stack and interfacing instruments.)

## Required Software Versions for Bio-Stack™ with PowerWave™ or Synergy™ Readers

❖ Software versions are subject to change over time. Contact BioTek Instruments for more information.

### Bio-Stack with PowerWave™/XS or Synergy™ HT

To operate the Bio-Stack with the <b>PowerWave, PowerWave XS, or Synergy HT</b>	using <b>Gen5™</b> , you will need these <i>minimum</i> software versions:	using <b>KC4™</b> , you will need these <i>minimum</i> software versions:
	<b>Gen5 Software</b> <ul style="list-style-type: none"> <li>✓ <b>1.00.14</b> with/without barcode scanner</li> </ul>	<b>KC4 Software</b> <ul style="list-style-type: none"> <li>✓ <b>3.3, Rev. 9</b> without barcode scanner</li> <li>✓ <b>3.4, Rev. 16</b> with barcode scanner</li> <li>✓ <b>3.4, Rev. 22</b> to have Bio-Stack scanned barcode appear in KC4 plate description dialog</li> </ul>
	<b>Reader basecode</b> <ul style="list-style-type: none"> <li>✓ <b>1.21.1</b> for PowerWave</li> <li>✓ <b>1.06</b> for PowerWave XS</li> <li>✓ <b>2.24</b> for Synergy HT</li> </ul>	<b>Reader basecode</b> <ul style="list-style-type: none"> <li>✓ Any version for PowerWave, PowerWave XS, or Synergy HT</li> </ul>
	<b>Bio-Stack basecode</b> <ul style="list-style-type: none"> <li>✓ <b>1.24.1</b> with/without barcode scanner (1- to 384-well standard height plates, PCR plates)</li> <li>✓ <b>1.25.1</b> (1536-well half plates)</li> <li>✓ <b>1.27.1</b> (Hard-shell 384-well PCR plates)</li> </ul>	<b>Bio-Stack basecode</b> <ul style="list-style-type: none"> <li>✓ <b>1.24.1</b> with barcode scanner</li> </ul>
	<b>Bio-Stack™ PC Control Software</b> <ul style="list-style-type: none"> <li>✓ <b>2.00.x</b></li> </ul>	<b>Bio-Stack PC Control Software</b> <ul style="list-style-type: none"> <li>✓ <b>1.02.8</b></li> </ul>

**Bio-Stack™ with Synergy™ 2 or Synergy™ 4**

❖ The Synergy 2 and Synergy 4 readers do not support KC4™ Software.

To operate the Bio-Stack with the <b>Synergy 2</b>	<p><b>using Gen5</b> you will need these <i>minimum</i> software versions:</p> <p><b>Gen5™ Software</b></p> <ul style="list-style-type: none"> <li>✓ <b>1.01.x</b> with/without barcode scanner</li> </ul> <p><b>Reader basecode</b></p> <ul style="list-style-type: none"> <li>✓ Any version</li> </ul> <p><b>Bio-Stack basecode</b></p> <ul style="list-style-type: none"> <li>✓ <b>1.24.1</b> with/without barcode scanner (1- to 384-well standard height plates, PCR plates)</li> <li>✓ <b>1.25.1</b> (1536-well half plates)</li> <li>✓ <b>1.27.1</b> (Hard-shell 384-well PCR plates)</li> </ul> <p><b>Bio-Stack™ PC Control Software</b></p> <ul style="list-style-type: none"> <li>✓ <b>2.00.3</b> with/without barcode scanner (96-/384-well plates)</li> <li>✓ <b>2.00.4</b> with/without barcode scanner (1536-well plates)</li> </ul>
To operate the Bio-Stack with the <b>Synergy 4</b>	<p><b>using Gen5</b> you will need these <i>minimum</i> software versions:</p> <p><b>Gen5™ Software</b></p> <ul style="list-style-type: none"> <li>✓ <b>1.04.x</b> with/without barcode scanner</li> </ul> <p><b>Reader basecode</b></p> <ul style="list-style-type: none"> <li>✓ Any version</li> </ul> <p><b>Bio-Stack basecode</b></p> <ul style="list-style-type: none"> <li>✓ <b>1.27.1</b> with/without barcode scanner (all plate types)</li> </ul> <p><b>Bio-Stack™ PC Control Software</b></p> <ul style="list-style-type: none"> <li>✓ <b>2.00.7</b> or greater with/without barcode scanner (all plate types)</li> </ul>



## Required Software Versions for Bio-Stack™ with Precision™ Instruments

❖ Software versions are subject to change over time. Contact BioTek Instruments for more information.

To operate the Bio-Stack with the <b>Precision or Precision XS</b>	you will need these <i>minimum</i> software versions:
	<b>Bio-Stack™ PC Control Software</b> <ul style="list-style-type: none"> <li>✓ <b>1.02.8</b> with/without barcode scanner (all plate types)</li> </ul>
	<b>Bio-Stack basecode</b> <ul style="list-style-type: none"> <li>✓ <b>1.24.1</b> with/without barcode scanner (1- to 384-well standard height plates; PCR plates)</li> <li>✓ <b>1.25.1</b> (1536-well half plates)</li> <li>✓ <b>1.27.1</b> (Hard-shell 384-well PCR plates)</li> </ul>
	<b>Precision Power™ Software</b> <ul style="list-style-type: none"> <li>✓ <b>2</b> without barcode scanner</li> <li>✓ <b>2.xx</b> with barcode scanner</li> </ul>
	<b>Precision instrument basecode</b> <ul style="list-style-type: none"> <li>✓ <b>2.14</b> for Precision Microplate Pipetting System</li> <li>✓ Any version for Precision XS</li> </ul>

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## Required Software Versions for Bio-Stack™ with μFill™ Dispenser

- ❖ Software versions are subject to change over time. Contact BioTek Instruments for more information.
- ❖ The μFill does not support the Bio-Stack barcode scanner.

To operate the Bio-Stack with the μFill	you will need these <i>minimum</i> software versions:
	<b>μFill basecode</b> ✓ <b>1.21.x</b>
	<b>Bio-Stack basecode</b> ✓ <b>1.24.1</b> (96-/384-well standard height plates) ✓ <b>1.25.1</b> (1536-well plates) ✓ <b>1.27.1</b> (Hard-shell 384-well plates)

## Required Software Versions for Bio-Stack™ with ELx405™ Washer

- ❖ Software versions are subject to change over time. Contact BioTek Instruments for more information.
- ❖ The Magna model of the ELx405 does not support the Bio-Stack.
- ❖ The ELx405 does not support the Bio-Stack barcode scanner.

### Instrument Control of the Bio-Stack

To operate the Bio-Stack with the <b>ELx405</b>	you will need these <i>minimum</i> software versions:
	<b>ELx405 basecode</b>
	✓ <b>1.88.x</b>
	<b>Bio-Stack basecode</b>
	✓ <b>1.24.1</b> (96-/384-well standard height plates)

### PC Control of the Bio-Stack

To operate the Bio-Stack with the <b>ELx405</b>  using the <b>LHC Software</b>	you will need these <i>minimum</i> software versions:
	<b>Liquid Handling Control™ (LHC) Software</b>
	✓ Any version
	<b>ELx405™ Interface Software</b>
	✓ <b>2.00.4</b>
	<b>ELx405 basecode (PN 7100227)</b>
	✓ <b>2.02.1</b>
	<b>Bio-Stack™ PC Control Software</b>
	✓ <b>2.00.10</b> (96-/384-well standard height plates)
	<b>Bio-Stack basecode</b>
	✓ <b>1.24.1</b> (96-/384-well standard height plates)

## Required Software Versions for Bio-Stack™ with NanoQuot™ Dispenser

- ❖ Software versions are subject to change over time. Contact BioTek Instruments for more information.
- ❖ The NanoQuot does not support the Bio-Stack barcode scanner.
- ❖ During operation of the Bio-Stack with the NanoQuot, the Bio-Stack is directly controlled by the basecode software onboard the NanoQuot. The Bio-Stack PC Control Software is used only to obtain Bio-Stack software versions or to align the two instruments. The NanoQuot PC Control Software is used only to obtain NanoQuot software versions or to operate the NanoQuot in PC mode, without the Bio-Stack.

To operate the Bio-Stack with the NanoQuot	you will need these <i>minimum</i> software versions:
	<b>NanoQuot™ PC Control Software</b> ✓ 1.00.4
	<b>NanoQuot basecode</b> ✓ Any version
	<b>Bio-Stack basecode</b> ✓ 1.24.1 (96-/384-well standard height plates) ✓ 1.25.1 (1536-well plates) ✓ 1.27.1 (Hard-shell 384-well plates)
	<b>Bio-Stack™ PC Control Software</b> ✓ 2.00.4

## Required Software Versions for Bio-Stack™ with MicroFlo™ Select Dispenser

❖ Software versions are subject to change over time. Contact BioTek Instruments for more information.

### Instrument Control of the Bio-Stack

To operate the Bio-Stack with the <b>MicroFlo</b>	you will need these <i>minimum</i> software versions:
	<b>MicroFlo basecode</b>
	✓ <b>1.04.0</b>
	<b>Bio-Stack basecode</b>
	✓ <b>1.24.1</b>

### PC Control of the Bio-Stack

To operate the Bio-Stack with the <b>MicroFlo</b> using the <b>LHC Software</b>	you will need these <i>minimum</i> software versions:
	<b>Liquid Handling Control™ (LHC) Software</b>
	✓ Any version
	<b>MicroFlo™ Select Interface Software</b>
	✓ <b>1.01.0</b>
	<b>MicroFlo basecode</b>
	✓ <b>1.04.0</b>
	<b>Bio-Stack™ PC Control Software</b>
	✓ <b>2.00.10</b>
	<b>Bio-Stack basecode</b>
	✓ <b>1.24.1</b> (96-/384-well standard height plates) MicroFlo Select models MFS and MFS1536
	✓ <b>1.25.1</b> (1536-well standard height plates) MicroFlo Select model MFS1536 only

