
CFX Automation System II

Instruction Manual

Catalog #1845075



BIO-RAD

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Bio-Rad Laboratories Resources

Bio-Rad provides many resources for scientists, including rich technical resources on a wide variety of methods and applications related to PCR, real-time PCR, and gene expression. Table 1 lists available resources and how to locate what you need.

Table 1. Bio-Rad resources.

Resource	How to Contact
Local Bio-Rad Laboratories representatives	Find local information and contacts on the Bio-Rad website (www.bio-rad.com) by selecting your country on the home page, and find the nearest contacts on the Contact Us page. Find the nearest international office listed on the back of this manual
Technical support scientists	Bio-Rad's technical support scientists provide our customer with practical and expert solutions. To find local technical support on the phone, contact your nearest Bio-Rad office. For technical support in the United States and Canada, call 1-800-424-6723 (toll-free), and select the technical support option
Service support engineers	Maintenance and repairs should be carried out only by authorized service support engineers For service support in the United States and Canada, call 1-800-424-6723 (toll-free), and select the technical support option to request service support
Technical notes and literature	Go to the Bio-Rad website (www.bio-rad.com). Type a term in the Search box and select Documents tab to find links to technical notes, manuals, and other literature

Writing Conventions Used in This Manual

This manual uses the writing conventions listed in Table 2.

Table 2. Conventions used in this manual.

Convention	Meaning
Tip:	Provides helpful information and instructions, including information explained in further detail elsewhere in this manual
Note:	Provides important information, including information explained in further detail elsewhere in this manual
WARNING!	Explains very important information about something that might injure the researcher, damage the instrument, or cause data loss
X > Y	Select X and then select Y from a toolbar, menu, or software window

Safety and Regulatory Compliance

For safe operation of the CFX Automation System II, we strongly recommend that you follow the safety specifications listed in this section and throughout the manual.

Safety Warning Labels

Warning labels posted on the instrument and in this manual warn you about sources of injury or harm. Refer to Table 3 to review the meaning of each safety warning label.

Table 3. Meaning of safety warning labels.



CAUTION: Risk of danger! This symbol identifies components that pose a risk of personal injury or damage to the instrument if improperly handled. Wherever this symbol appears, consult the manual for further information before proceeding

Instrument Safety Warnings

The warning labels shown in Table 4 are displayed on the instrument and refer directly to the safe use of the CFX Automation System II.

Table 4. Instrument safety warning labels.



Warning about risk of harm to body or equipment.

Risk of puncture injury. Keep clear of plate handler when in operation.

Operating the CFX Automation System II before reading this manual can constitute a personal injury hazard. For safe use, do not operate this instrument in any manner unspecified in this manual. Only qualified laboratory personnel trained in the safe use of electrical equipment should operate this instrument. Always handle all components of the system with care, and with clean, dry hands

Safe Use Specifications and Compliance

Electrical Safety Information and Classification

Table 5 lists the safe use specifications for the CFX Automation System II. Shielded cables (supplied) must be used with this unit to ensure compliance with the Class A FCC limits.

Table 5. Safe use specifications.

Safe Use Requirements	Specifications
Temperature	Ambient temperatures of 4–30°C. Relative humidity maximum of 85% noncondensing

WARNING! To reduce the risk of electric shock, do not remove the cover. No user serviceable parts are inside the CFX Automation System II. Refer to qualified service personnel if help is required.

WARNING! Use this product only in the manner described in this manual. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

FCC Warnings and Notes

- **Warning.** Changes or modifications to this unit not expressly approved by Bio-Rad Laboratories could void the user's authority to operate the equipment
- **Note.** 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. 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 harmful interference, in which case the user will be required to correct the interference, at his own expense
- **Note regarding FCC compliance.** Although this instrument has been tested and found to comply with Part 15, Subpart B of the FCC Rules for a Class A digital device, please note that this compliance is voluntary, for the instrument qualifies as an "exempted device" under 47 CFR 15.103(c), in regard to the cited FCC regulations in effect at the time of manufacture
- **Note regarding Canadian EMC compliance:** Le present appareil numerique n'emet pas de buits radioelectrique depassant les limites applicables aux appareils numeriques de class A prescrites dans le regulement sur le brouillage radioelectrique edicte par le Ministere des Communications du Canada

Regulatory Compliance

This instrument has been tested, and found to be in compliance with all applicable requirements of the following safety and electromagnetic standards:

- IEC 61010-1:2010 (3rd Ed.), EN61010-1:2010 (3rd Ed). Electrical Equipment for Measurement, Control, and Laboratory Use - Part 1: General requirements
- IEC 61010-2-081:2001+A1, EN61010-2-081:2002+A1. Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use. Part 2-081: Particular requirements for automatic and semi-automatic laboratory equipment for analysis and other purposes (includes Amendment 1)
- CAN/CSA-C22.2 NO. 60101-1:2012 Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use, Part 1: General Requirements
- CAN/CSA-C22.2 NO. 60101-2-081:2004 Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use, Part 2-081: Particular Requirements for automatic and semi-automatic laboratory equipment for analysis and other purposes

- EN 61326-1:2006 (Class A) Electrical Equipment for Measurement, Control and Laboratory Use. EMC requirements, Part 1: General requirements
- UL 61010-1:2012 Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use, Part 1: General requirements

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 harmful interference, in which case the user will be required to correct the interference at his own expense.

Warranty

The CFX Automation System II and associated accessories are covered by a standard Bio-Rad warranty. Contact your local Bio-Rad Laboratories office for details of the warranty.

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1 CFX Automation System II Installation

Read this chapter for information about installing the CFX Automation System II.

- CFX Automation System II Parts
- CFX Automation System II Compatibility
- CFX Automation System II Hardware Installation
- Software Installation
- CFX Automation System II Configuration and Calibration

CFX Automation System II Parts



Fig. 1. CFX Automation System II parts.

Table 6. CFX Automation System II part details.

Part	Function
Arm	Reach axis. Moves horizontally 11.25 in (28.5 cm) to 19.75 in (50.1 cm) from tower
Wrist	Rotates plate to appropriate position (270° rotation)
Gripper assembly	Gripper fingers open and close to grasp and release the plate
Tower	Vertical axis. Moves the arm up and down
Rotary axis	Rotates the arm 340° around the base of the CFX Automation System II
Barcode scanner	Scans plates prior to placing them into the CFX System
Rack	Holds source and waste plates. Each rack holds a maximum of 32 sealed 96-well plates or 48 sealed 384-well plates

CFX Automation System II Compatibility

Compatible CFX Systems

The CFX Automation System II is compatible with the following CFX Systems:

- CFX96 Touch™ Real-Time PCR Detection System
- CFX384 Touch™ Real-Time PCR Detection System
- CFX Connect™ Real-Time PCR Detection System
- CFX96 Touch Deep Well™ Real-Time PCR Detection System
- CFX96™ Real-Time PCR Detection System
- CFX384™ Real-Time PCR Detection System

Plastics Compatibility

The CFX Automation System II is compatible with Hard-Shell® Low-Profile 96-Well Skirted PCR Plates and Hard-Shell 384-Well Skirted PCR Plates. Table 7 lists the Bio-Rad catalog numbers for compatible plates. The same gripper fingers are compatible with both 96- and 384-well plates. PCR plates not listed in Table 7 may not be compatible with the gripper fingers, plate handler, or CFX Systems.

For more information, visit www.bio-rad.com/pcrplastics.

Table 7. PCR plate compatibility with CFX Automation System II.

PCR Plate	Barcode	Well Color	Catalog Number
Hard-Shell 384-Well Skirted	Barcoded	White	HSP-3905
	Nonbarcoded	White	HSP-3805
Hard-Shell Low Profile 96-Well Skirted	Barcoded	White	HSP-9955
		Clear	HSP-9901
	Nonbarcoded	White	HSP-9655
		Clear	HSP-9601

Seal Compatibility

Bio-Rad Hard-Shell Plates can be sealed with Microseal® 'B' Optically Clear Adhesive Seals (catalog #MSB-1001). After the plate is sealed, remove the end tabs before loading the plates into the racks.

Plates may also be heat sealed using Bio-Rad's PX1™ PCR Plate Sealer (catalog #181-4000) and Optically Clear Heat Seals (catalog #181-4030). This semi-automated heat sealer ensures a reproducible seal every time, helping minimize sample evaporation during thermal cycling. For more information, go to www.bio-rad.com/pcrplatesealer.

Minimum Computer Requirements

A computer with the Windows 7.8.1 or Windows 10 operating system is required to run CFX Automation Control Software version 2.1 or higher. The software package must be installed on the computer by a user with administrative privileges.

Note: CFX Manager™ Software version 3.1.1621 or higher must be installed before installing CFX Automation Control Software.

Table 8 lists the computer system requirements for CFX Manager Software and CFX Automation Control Software.

Table 8. Computer requirements.

System	Minimum	Recommended
Operating system	Windows 7.8.1 or Windows 10	Windows 7.8.1 or Windows 10
Drive	CD-ROM drive	CD-RW drive
Hard drive	10 GB	20 GB
Processor speed	2.0 GHz	2.0 GHz
RAM	1 GB RAM	2 GB RAM
Screen resolution	1,280 x 1,024 with true-color mode	1,280 x 1,024 with true-color mode
USB	USB 2.0 Hi-Speed port	USB 2.0 Hi-Speed port
Software		Microsoft Office Suite

CFX Automation System II Hardware Installation

Getting Started

Determine where the automation system will be installed. Remove any objects from the bench that will interfere with installation. Unplug and remove the CFX System(s) and computer from the laboratory bench before installing the plate handler (note the location of any cables connected to the instruments).

Determine the placement of the CFX System(s), plate handler, and computer on the lab bench. If a single CFX System will be integrated, the CFX System front panel must face forward and be located to the right of the plate handler (Figure 2A). If two CFX Systems will be integrated, the CFX Systems must be installed with their front panels oriented toward the plate handler (Figure 2B).

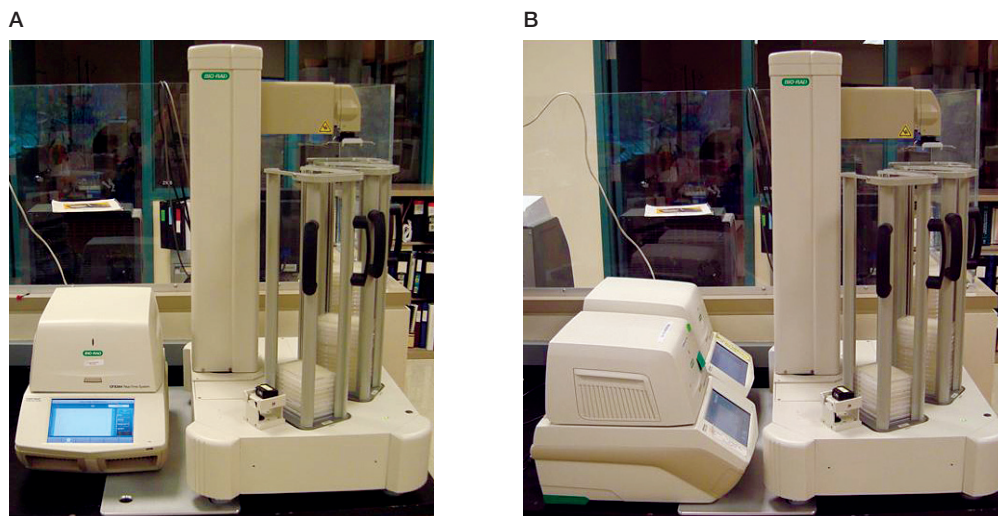


Fig. 2. Single and dual CFX Automation System II configurations.

Space Requirements

The CFX Automation System II must be assembled on a sturdy, level lab bench. The benchtop must be sturdy enough to support the weight of the computer, the plate handler, and the CFX System(s) without sagging. An uneven surface will result in misalignment of the automation system. Ensure there are sufficient electrical outlets available for the plate handler, CFX System(s) and the computer. Table 9 illustrates the space requirements needed for the system.

Table 9. CFX Automation System II dimensions.

Dimensions	Footprint			Operational Space Requirements*	
	Plate Handler Alone	Single CFX System Configuration	Dual CFX System Configuration	Single CFX System Configuration	Dual CFX System Configuration
Height, cm (in)	97 (38)	97 (38)	97 (38)	97 (38)	97 (38)
Width, cm (in)	53 (21)	91 (36)	99 (39)	91 (36)	114 (45)
Depth, cm (in)	77 (30)	77 (30)	77 (30)	86 (34)	86 (34)

* Operational space includes space for the plate handler arm travel and CFX System lid to open.

Tools required to assemble and install the CFX Automation System II include:

- Adjustable wrench
- Bubble level (provided with the system)

Unpacking the CFX Automation System II

WARNING! Use two people to lift the CFX Automation System II. The plate handler weighs approximately 110 lb (50 kg). Lift the plate handler with care. Do not lift the plate handler by the arm. Lift only by the base. Take precautions to avoid injury.

- Examine the carton for damage
- Remove the outer carton
- Remove the startup kit packaging on top of the plate handler. Make sure the startup kit is not stuck in the top of the outer carton
- Retain the box and packing materials. If the unit needs to be returned for any reason, you must use the original packing materials and box for shipping. If there has been damage to the instrument in transit, it is particularly important to retain the packaging for inspection

Parts List

The shipping cartons should include the following items:

- Plate handler with attached barcode scanner
- Three removable racks
- Declaration of Conformity
- Startup kit containing:
 - Power cord
 - Communications cable [6 ft (1.8 m), USB-B to USB-A]
 - Calibration block
 - Mounting plate
 - Bubble level
 - Eight extra gripper pads
 - Two plate lifters for use with CFX384 Systems
 - CFX Automation System II instruction manual
 - CFX Automation Control Software installation CD
 - Extra fuses
 - Warranty card
 - Software registration card

Position the Mounting Plate and Plate Handler

Position the mounting plate on the bench such that the two holes for the plate handler feet are on the right and the beveled edge faces up (Figure 3).

Lift the plate handler and place the two left feet inside the designated holes on the mounting plate. The barcode scanner should be located in the front left.

WARNING! The plate handler weighs 110 lb (50 kg). Do not lift the plate handler by the arm. Lift only by the base. Take precautions to avoid injury.

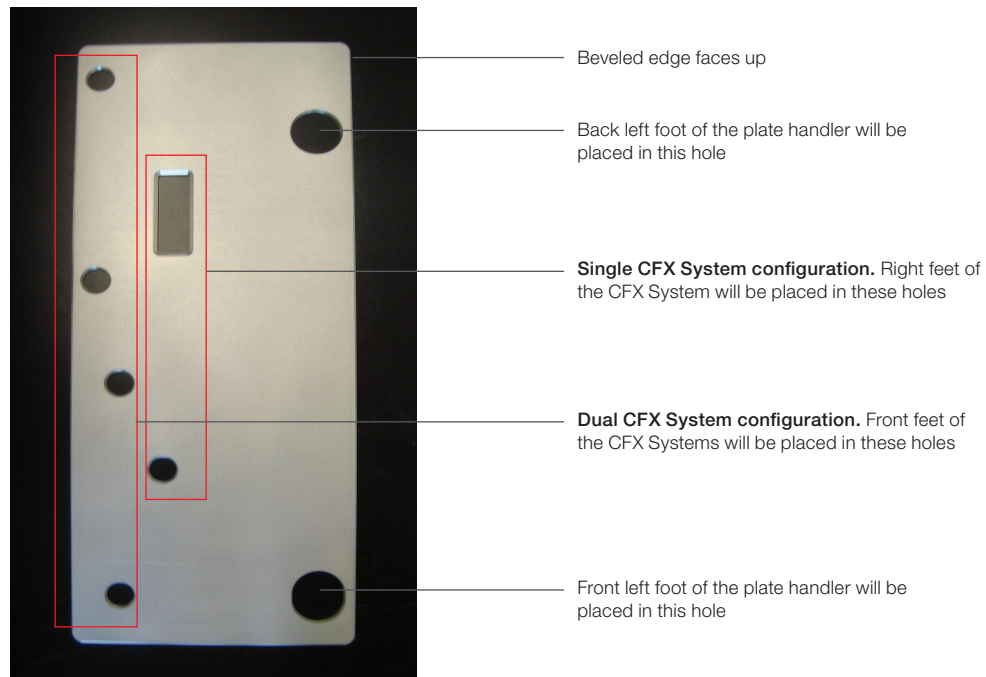


Fig. 3. Mounting plate.

Carefully cut the tie-wrap with the red sticker from the counterbalance rail and remove the tie-wrap and the black split tubing (Figure 4).



Fig. 4. Remove tie-wrap and black split tubing.

Install the CFX System(s)

1. Install the CFX System(s) in the desired positions.
 - **Single CFX System.** Align the right side feet of the CFX System in the mounting plate such that the CFX System front panel is facing forward (Figure 2)
 - **Dual CFX Systems.** Align the front feet of the CFX Systems in the mounting plate such that the CFX Systems' front panels are facing the plate handler (Figure 2)
2. Connect CFX System(s) power cord(s) and communication cable(s). For detailed instructions on installing the CFX Systems, refer to the CFX Systems instruction manual (bulletin #10021337).
3. Install the plate lifter (Figure 5) in all 384-well CFX Systems configured with the plate handler. The plate lifter aids in the removal of 384-well plates by gently lifting the plate slightly out of the reaction block when the heated lid is opened.

Note: The plate lifter is not required for 96-well CFX Systems. Save unused plate lifters for potential future use with 384-well CFX Systems.

 - Place the plate lifter around the outside of the 384-well block, with the lifters facing up (Figure 5)
 - Gently press down on the long edges of the plate lifter until the four notches on the short side of the plate lifter push against the 384-well block
 - Examine the plate lifter to ensure that it is properly installed

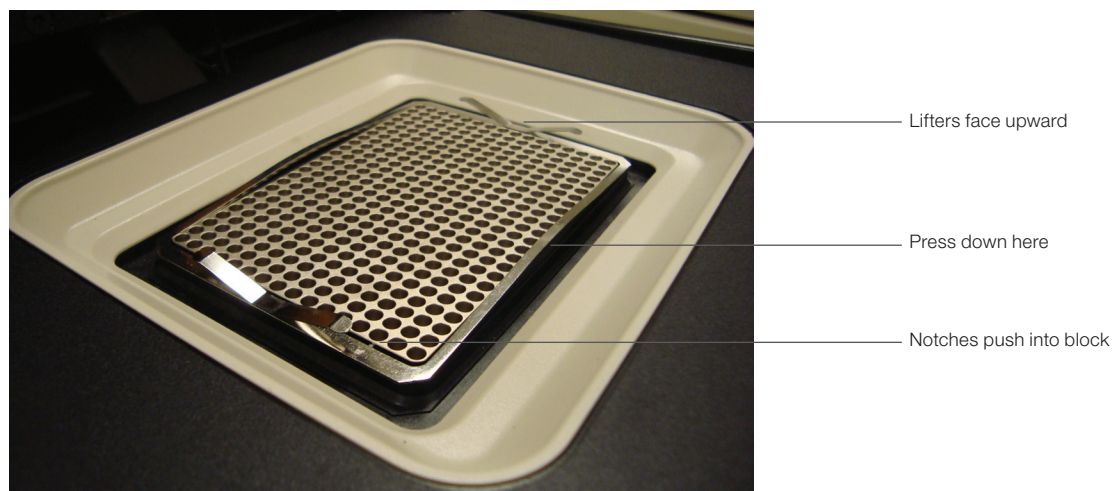


Fig. 5. Plate lifter for 384-well CFX Systems.

Level the Plate Handler

WARNING! This step requires two people. The plate handler weighs 110 lb (55 kg). When lifting, grasp only the bottom of the plate handler. Do not lift the system by the arm.

Note: The bench top must be able to support the weight of the computer, the plate handler and the CFX System(s) without sagging. An uneven surface will result in the misalignment of the plate handler.



Fig. 6. Bubble level in CFX System block.

1. Place bubble level in the center of the CFX System(s) block (Figure 6). Note where the bubble is within the level.
2. Lift the plate handler arm up high enough to access the tower opening. Place the level inside the center of the plate handler tower (Figure 7). Compare the position of the bubble to its position when placed on the CFX System block. Because the CFX Systems do not have leveling feet, the most important thing is to level the plate handler relative to the CFX System(s).
 - If the bubble position differs significantly in the plate handler tower and CFX System(s), proceed to step 3
 - If the bubble position does not differ significantly when placed in the plate handler tower and CFX System(s), proceed to step 6



Fig. 7. Bubble level in tower.

3. Turn the securing nut down toward the bench until it rests against the adjusting nut (Figure 8). Repeat on all four foot assemblies.

Tip: Have one person slightly lift the corner of the instrument while another person turns the securing nut.

WARNING! The plate handler arm may swing when the instrument is lifted. Take precautions to avoid injury.

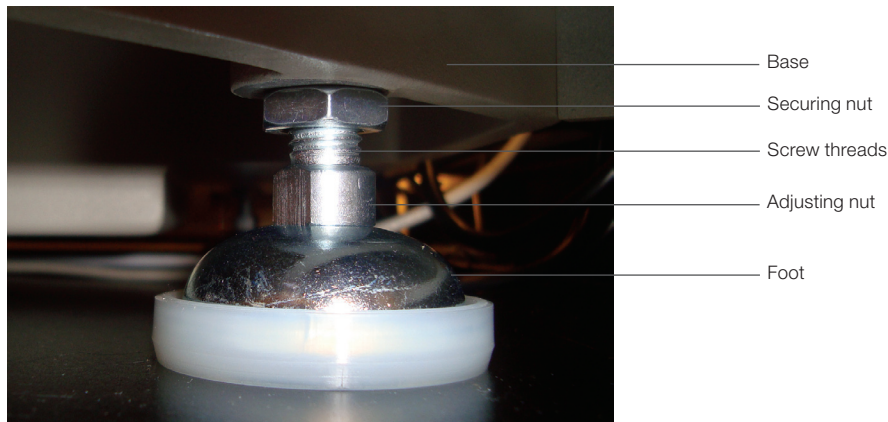


Fig. 8. Foot assembly.

4. Turn the adjusting nut until approximately two screw threads are visible between the plate handler base and the securing nut. This will allow for adequate travel in either direction during the leveling process. Repeat on all four foot assemblies.
5. Begin leveling the plate handler by turning the adjusting nut as needed until the bubble matches the position when the level is placed on the CFX System(s). You may need to raise one foot assembly and lower another during the leveling process.
Note: Rotating the foot itself will not change the height of the foot assembly. To level the plate handler, you must rotate the adjusting nut.
6. Push down on all four corners of the plate handler base to ensure the system is evenly seated on all four feet. All four feet **must** touch the bench for the instrument to be secure. Although the bubble in the level may appear centered, if any of the feet are not on the bench, the instrument is not secure.
7. When the plate handler is level, use an adjustable wrench to turn each securing nut upward until it is flush against the system base. Hold the foot and adjusting nut in place while turning the securing nut to ensure the plate handler remains level during this step. This step locks the plate handler into the desired level position.

Install the Racks

1. Lift a rack by the two side handles.
2. Hold the rack over the designated position with the two side handles facing toward you. The racks and rack positions are labeled and must be paired accordingly.
3. Lean the top of the rack toward you slightly.

4. Place the rack locator notch under the lip of the rack position (Figure 9).
5. Maintain the placement of the rack under the lip while you **lean the rack backward and snap it into place** against the locator pin.

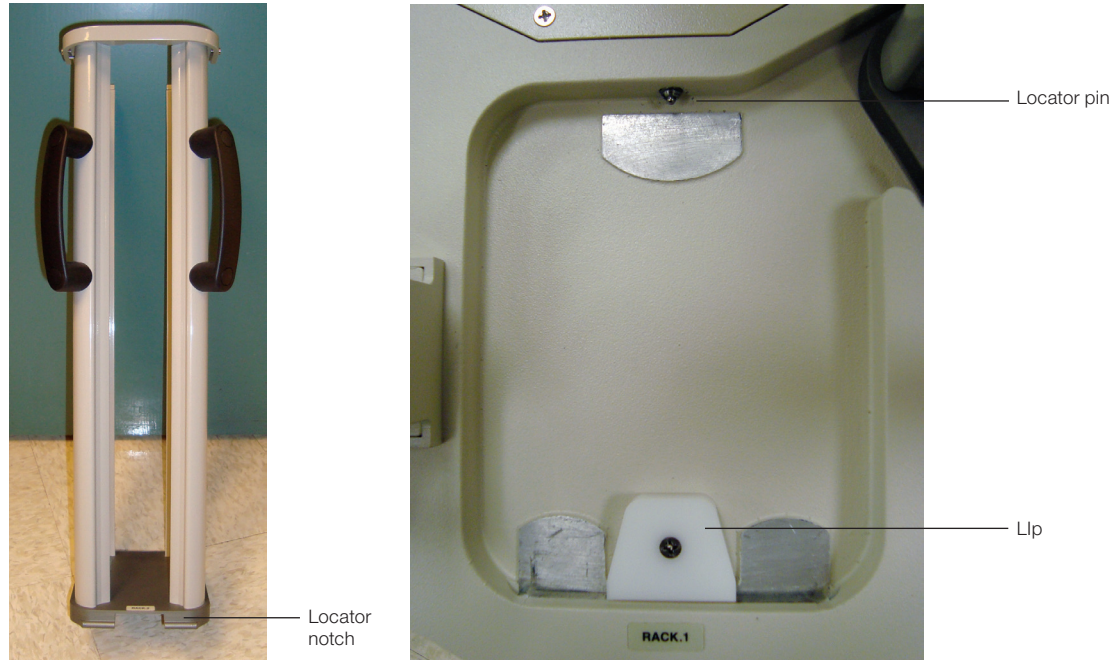


Fig. 9. Rack securing position.

6. Before releasing the rack, make sure it is firmly secured under the lip by gently pulling it toward you. Release gently in order to maintain the proper position.

Note: If the rack is not correctly placed under the lip, the rack will not be level. This will misalign the racks and the plate handler will not function properly.

7. Verify the region of the plate handler that holds the racks is level relative to the CFX System(s). Place the bubble level at the bottom of each empty rack. Compare the position of the bubble when the level is placed in the racks, in the tower, and on the CFX System(s) block(s). If the racks are not level, adjust the plate handler foot assemblies so that all regions of the plate handler are as level as possible, relative to the CFX System(s) (see Level the Plate Handler).

To remove a rack, reverse the steps above.

Connect the Power Cord and Communications Cable

WARNING! Before proceeding, verify the plate handler power switch is OFF and the computer power cord is unplugged.

1. Connect one end of the USB cable to the USB connector on the back of the plate handler (Figure 10).
2. Connect the other end of the USB cable to an available USB port on the computer.

3. Connect the power cord to the receptacle on the back of the plate handler (Figure 10).
4. Plug the plate handler AC power cord into a grounded 100 V, 120 V, or 240 V outlet.
5. Plug the computer AC power cord and the computer monitor AC power cord into appropriate power outlet.

WARNING! Plug the power cord into a properly grounded outlet only. Use only a standard IEC 60320-style power cord appropriate for your country. Equipment is Class 1 and must be connected to an outlet that has proper grounding to ensure safety. The power inlet is a basic disconnect device and should be positioned for easy access.

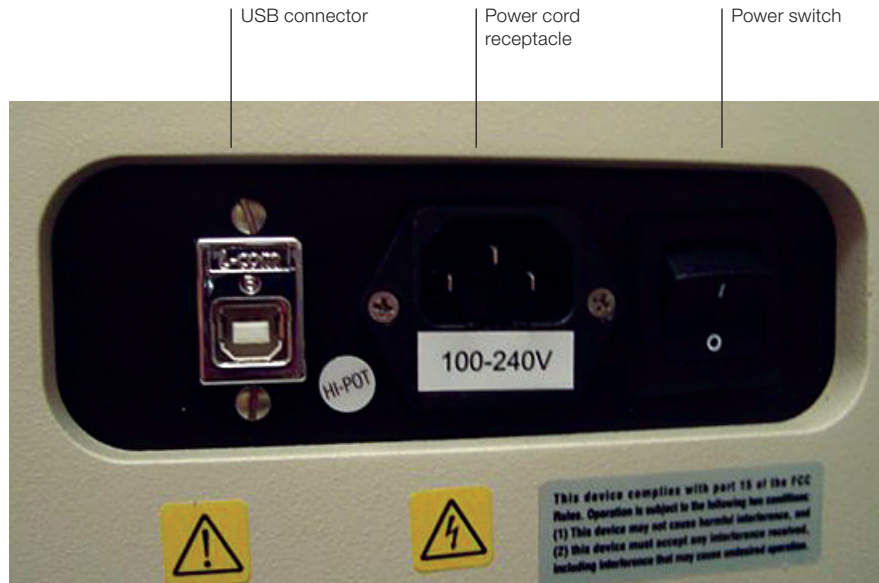


Fig. 10. Rear panel of the CFX Automation System II.

Software Installation

CFX Manager Software 3.1.1620 or higher must be installed first to run the CFX Automation System II. Refer to the CFX System instruction manual (bulletin #10021337) for detailed instructions on CFX Manager Software installation.

The CFX Automation Control Software must be installed on the computer by a user with administrative privileges. To install CFX Automation Control Software 2.1 or higher:

1. Place the CFX Automation Control Software CD in the computer CD drive.
2. Double click **setup.exe** to launch the software installation.
3. Click box for **Accept license agreement**. Click Install.
4. Click **Extract** for FTDI Chip CDM Drivers.
5. Click **Next** on the software installation screen.
6. Click **Finish** to exit device driver installation wizard.

7. Click **Next** for the CP210X USB to UART Bridge Driver Installer.
8. Select radio button **I accept this agreement**. Click **Next**.
9. When the software installation is complete, click **OK** to exit the installation wizard.
10. When completed, the CFX Automation Control Software icon appears on the desktop.

Note: To uninstall CFX Automation Control Software from your computer, use the Windows Add/Remove Programs function.

Enable Computer to Continuously Communicate with Barcode Scanner

Default power management settings for the barcode scanner must be modified to enable the system to function properly. To modify the power management settings:

1. Find the computer device manager by typing **device manager** into the computer's search field.
2. Expand the **Ports (COM & LPT)** option by clicking its arrow (Figure 11A).
3. Double click **Silicon Labs CP210x USB to UART Bridge**.
4. Select the **Power Management** tab (Figure 11B).
5. Clear the checkbox next to **Allow the computer to turn off the device to save power**.

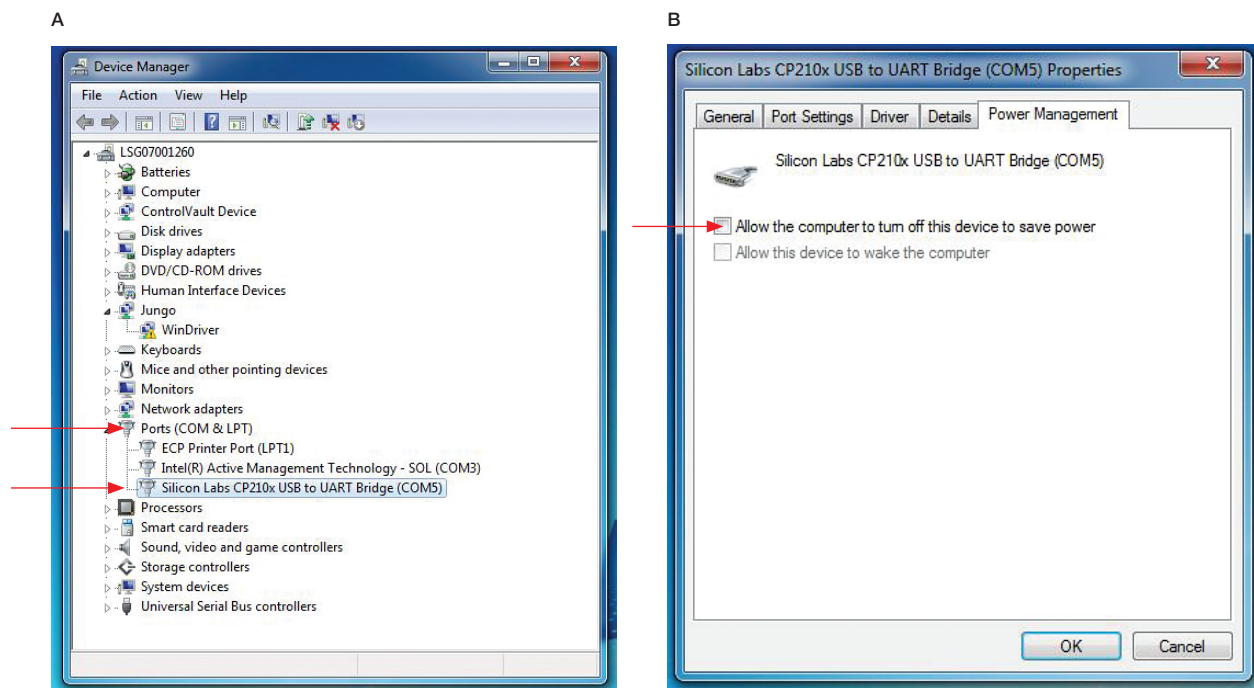


Fig. 11. A, device manager folder. B, modify the power management options for the barcode scanner.

Turn Off Windows Automatic Update Feature

When the Windows automatic updating feature is turned on, updates will be automatically installed and the computer will automatically restart. If these Windows automatic updates occur when an automation run is in progress, the run will be stopped and the application will close. No error messages will be displayed. To prevent this from occurring, turn off the Windows automatic updating feature and manually install Windows updates as needed.

CFX Automation System II Configuration and Calibration

After the CFX Automation System II, CFX System(s), CFX Manager Software, and CFX Automation Control Software are installed, follow these steps to complete instrument setup:

- Configure the Automation System
- Calibrate the Automation System
- Test the Calibration
- Complete a Test Automation Run

Configure the Automation System

System configuration must be set during system installation, when CFX Systems are added or removed and when optical modules are swapped on C1000™ Thermal Cycler bases.

1. Turn on the CFX System(s) and the plate handler using the power switches on the back of the instruments.
2. Open the CFX Automation Control Software.
3. In the menu bar, select **Tools > Configuration**. The platform configuration window will appear (Figure 12).
4. Select **Single CFX System** or **Dual CFX Systems** according to your setup.
5. Under Platform Configuration:
 - Use the dropdown menu to select the CFX System base serial number corresponding to the configured CFX System. The base serial number can be found on the back of the instrument base, and on the home screen display on systems with touch screens (Figure 13). If only a single CFX System is configured, select the serial number for that system next to the “front” CFX System. If two CFX Systems are configured, select the appropriate CFX System base serial number for the front and rear CFX Systems (Figure 1). Note that all CFX Systems and 1000-series thermal cyclers connected to this computer will be displayed in the dropdown menu
 - If you are switching just the optical modules and the thermal cycler base will remain the same, first select NOT USED from the dropdown menu. Then select the appropriate serial number again. This process will enable the software to recognize the new optical head
 - Select the desired waste rack
6. Select **OK** to save configuration
 - Each time the system configuration window is modified, the software will automatically restart

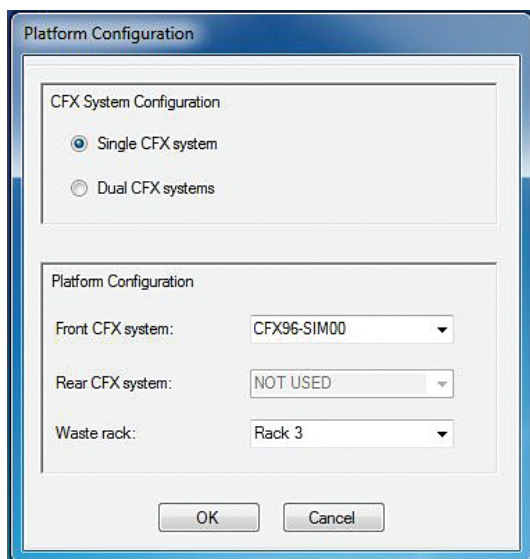
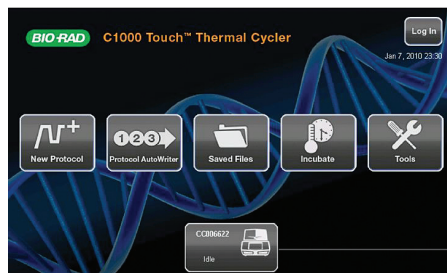


Fig. 12. Platform configuration window.



Serial number located on the base of the instrument.

Home screen on CFX System touch screens. Base serial number is located on this screen.

Fig. 13. Base serial number locations.

Calibrate the Automation System

The CFX Automation System II must be properly calibrated during installation. Recalibrate any time the system is moved or CFX Systems are added or removed.

Default calibrations for your CFX System configuration are automatically loaded during the system configuration step. The automation software includes a calibration wizard that aids in making the fine adjustments required for proper calibration. To calibrate the system:

- Select **Tools > Calibration**
- Select the positions to calibrate

- Select **Calibrate**
- The calibration wizard will walk you through the steps to calibrate, modify, and accept each calibration position. At each step, carefully read the instructions presented and perform the required actions. If calibration modification is required, *manually* adjust the plate handler by moving the arm to the desired location
- Select **Next**. Instructions for the next calibration step will automatically appear

This manual provides additional details to supplement the information displayed in the calibration wizard.

During calibration, refer to the following sections:

- Begin Calibration
- Calibrate the Racks
- Calibrate the Barcode Scanner
- Calibrate the CFX System(s)

After calibration is complete, test the calibration using the calibration wizard.

Lastly, confirm calibration by completing a test automation run.

Begin Calibration

During installation, factory calibration values are loaded. These values are starting points for calibration and must be adjusted as needed. If the system requires calibration at any of the positions, *manually* adjust the plate handler by moving it to the correct calibration position. When instructed by the software, the robot arm can be moved along the vertical axis and horizontal axis and extended in and out from the tower (Figure 14). The wrist can be rotated to help obtain ideal calibration.

WARNING! Adjust the plate handler only when instructed. Manually adjusting the plate handler at other times may damage the instrument.

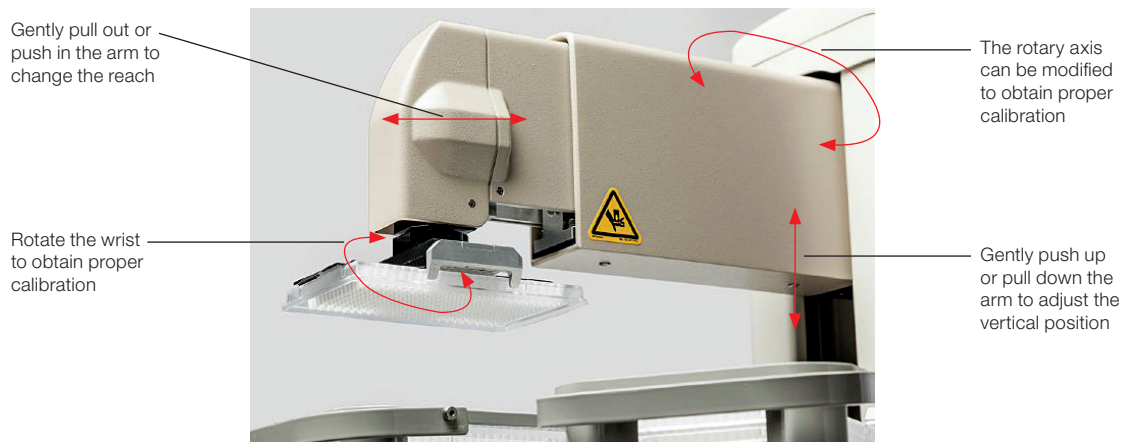


Fig. 14. Manually changing positions during calibration.

When calibrating the plate handler, always use the same brand and model of PCR plates that will be used in experiments. See Table 7 for a list of plates compatible with the automation system. All plates should be sealed. If both CFX96 and CFX384 Systems are being used, the calibration instructions will indicate which positions should use 96-well and 384-well plates.

WARNING! Stand clear of the plate handler arm throughout the calibration process.

To begin calibration:

1. In the menu bar, select **Tools > Calibration**.
2. The main calibration screen is displayed (Figure 15).
3. Select the positions to calibrate.
 - All positions should be calibrated during installation. After installation, specific positions may be recalibrated
 - If you will always or occasionally use barcoded plates, calibrate the barcode scanner during the initial installation. This will ensure a smooth automation run when the barcode software options are selected
4. Select **Calibrate**.
5. Carefully follow the instructions that appear in the calibration window and then select **Next** to continue through calibration. The system will execute the appropriate calibration steps and then display the next set of instructions.

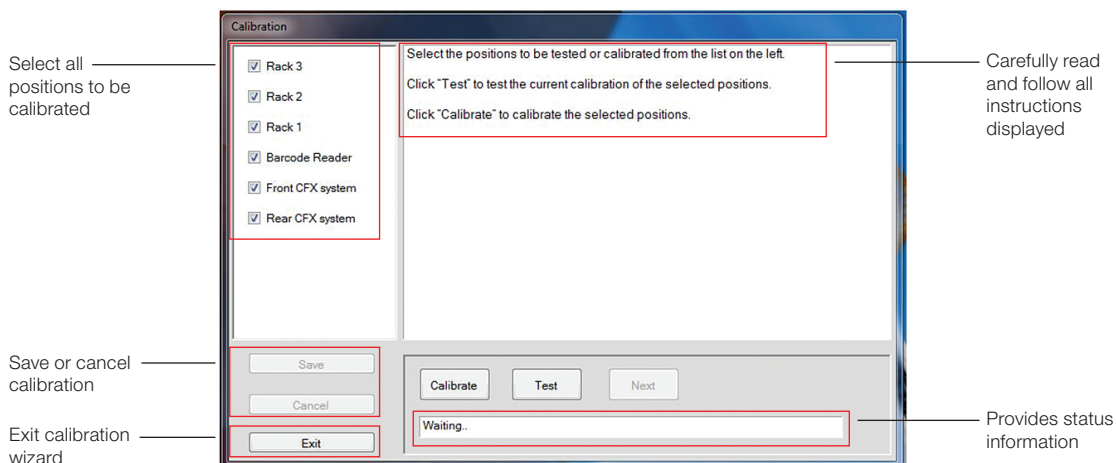


Fig. 15. Main calibration and test window.

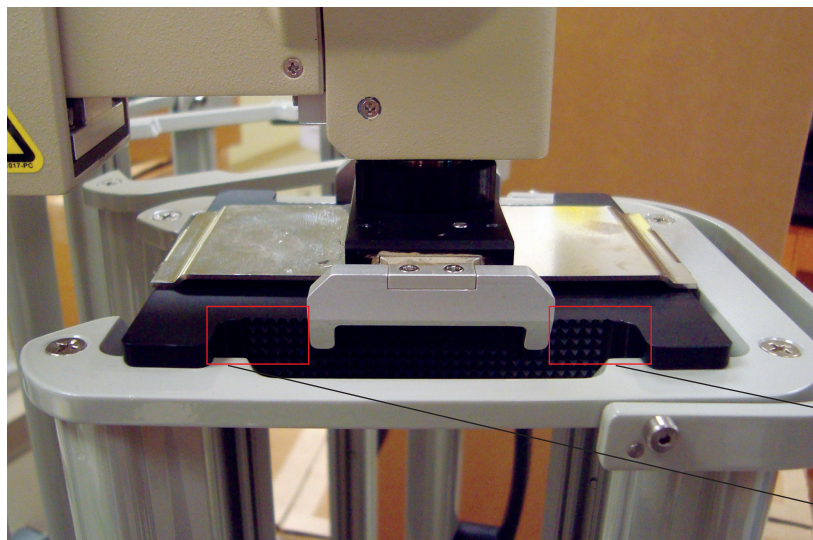
Calibrate the Racks

The instructions on the calibration screen will guide you through the calibration of the racks.

1. Place a single sealed PCR plate at the bottom of each rack. Well A1 should face out toward the exterior of the plate handler.

Note: Use the same brand and model of the plates that will be used in actual automation runs. If both 96-well and 384-well CFX Systems are connected to the plate handler, use a 384-well plate to calibrate the bottoms of all three racks.

2. When instructed by the software, place the calibration block on top of the rack to be calibrated (Figure 16). The calibration block is larger than a PCR plate and is designed to sit on top of the rack and aid in this calibration position.
3. The top of the rack is properly calibrated when the gripper fingers are perfectly centered on the calibration block (Figure 16).
4. If the calibration needs to be adjusted, manually adjust the plate handler only when instructed by the software.
5. If needed, adjust the calibration by manually separating the gripper fingers from the calibration block. Extend or retract the plate handler arm the appropriate amount so that the gripper fingers will be centered on the calibration block. Release the gripper fingers and inspect their location on the calibration block. Repeat as needed.
6. Follow the calibration wizard instructions to complete rack calibration.

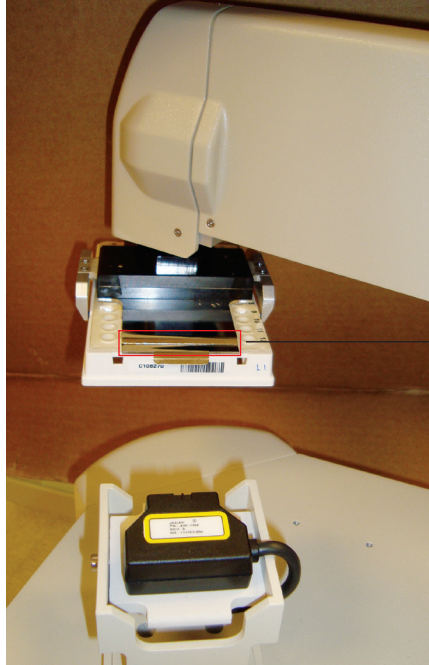


Properly calibrate the top of the rack by making sure the gripper fingers grasp the calibration block with an equal number of black pyramids on each side.

Fig. 16. Calibrating the racks.

Calibrate the Barcode Scanner

1. Place a sealed plate in rack 1.
Note: If both 96-well and 384-well CFX Systems are configured, use a 384-well plate for this step.
2. The plate handler will move the plate from rack 1 to the barcode scanner. Confirm that the barcode on the short side of the plate is facing the barcode scanner.
3. To be properly calibrated, the LED light from the barcode scanner should illuminate the region immediately above the plate barcode or at the very bottom of the gripper assembly (Figure 17). Manually adjust the plate handler arm and gripper assembly if not properly positioned. Ensure the plate handler arm remains fully extended.
Note: For the software to properly calibrate the barcode scanner, the LED beam must illuminate the region above the top of the barcode sticker.
4. Select **Next**. The software will now calibrate the barcode scanner.



Position the plate handler arm so the beam illuminates the region slightly **above** the top of the barcode sticker. It should be illuminating the very bottom of the gripper assembly.

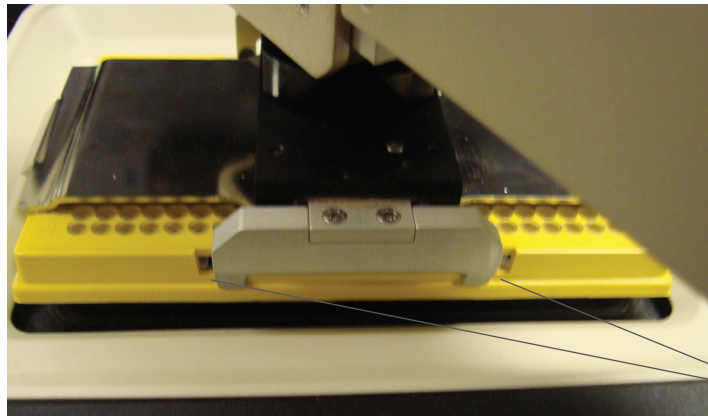
Fig. 17. Calibrating the barcode scanner.

Calibrate the CFX System(s)

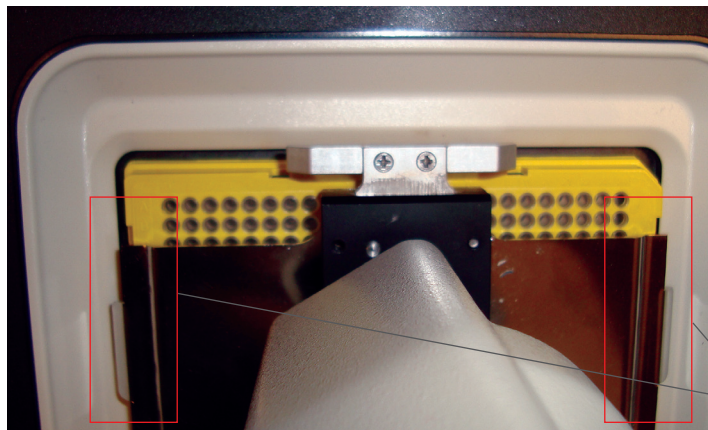
1. Place a sealed plate in the CFX System(s).
2. Keep the **CFX System(s) lid(s) open**.
3. The gripper assembly will move to the CFX System and stop approximately one inch above the plate. At this point, confirm that the gripper assembly is approximately centered above the plate.
 - This step confirms the general location of the gripper assembly. Do not lower the plate handler arm down toward the plate at this step
 - If the gripper assembly is misaligned by a large amount, you may make manual adjustments at this point. Fine adjustments to the calibration will be made in the next step
4. Select **Next**. The gripper assembly will move down and grip the plate. Confirm that the gripper assembly is centered on the plate (Figure 18).
 - Confirm the gripper fingers are centered, touching the plate with equal distance from the notches on the plate
 - Confirm that the top of the gripper assembly is squared on the plate, overhanging the plate by equal amounts
 - If changes need to be made, carefully spread the gripper fingers, releasing them from the plate. Continue to hold the gripper fingers open. Move the gripper assembly as needed so that it is centered on the plate. Gently release the gripper fingers and examine if the gripper assembly is centered on the plate (Figure 18). Repeat until properly centered
5. Select **Next**.

6. The plate handler will pick up the plate, place it in rack 1 and then return the plate to the CFX System. Confirm that the plate transitions smoothly between all positions.

Once all positions are calibrated, select **Save**. The application will automatically restart and load the saved calibration. Select **Cancel** to cancel any modifications that were made to the calibration and restore the previously set calibration values.



Gripper fingers are equal distance from each of the notches on the plate.



Gripper assembly overhangs the plate by equal amounts on both sides.

Fig. 18. Calibrate the CFX Systems.

Test the Calibration

You must test all calibration positions to verify calibration is correct.

1. Select **Tools > Calibration**.
2. Select all positions that will be used during the automation run.
3. Select **Test**. The automation system will proceed through a series of steps ensuring that all calibration settings work together.

4. Carefully observe the entire test process. Confirm the gripper assembly smoothly picks up and releases plates, the plate is perfectly placed into the CFX System(s) and plates never scrape against the racks.
5. If any of the calibration positions fail, a message will alert you to the failed position. You can instruct the system to continue testing the other positions.
6. When testing is complete, recalibrate the failed positions. After calibration is complete, test these positions.

Complete a Test Automation Run

After calibration and testing is complete, set up a plate list and run several empty plates through an automation run before actual experimental plates are used. Plates can remain empty but must be sealed. Use short cycling protocols in CFX Manager Software to reduce the amount of time required for this final recommended test.

Carefully observe the entire test automation run. Confirm the gripper assembly smoothly picks up and releases plates, the plate is perfectly placed into the CFX System(s), and plates never scrape against the racks. If the entire test automation run completes correctly, the automation system has been correctly installed and calibrated and is ready for use.

2 Using the CFX Automation System II

Read this chapter for information about using the CFX Automation System II.

- Introduction
- Starting an Automation Run
- Adding Plates after Starting an Automation Run
- Canceling an Automation Run
- Pausing or Canceling a Single Plate Run in a CFX System
- Emptying the Waste Rack
- LIMS Information
- PrimePCR™ Information
- Create the Plate List: Additional Features
- Barcode Controls: Advanced Features
- Modify Settings
- Status Tab
- History Tab

Introduction

CFX Automation Control Software and CFX Manager™ Software are used together to automate CFX System(s). The automation software controls the plate handler and is the main interface for controlling all automation processes. CFX Manager Software is used to create plate setup files and cycling protocols, control the CFX System thermal cycling processes, and analyze data. Refer to the CFX System instruction manual (bulletin #10021337) for detailed information about CFX Manager Software. **To use CFX Manager Software and the automation software simultaneously, CFX Manager Software must be opened prior to the automation software.**

Open the CFX Automation Control Software by double clicking the automation system icon. The main software tabs in the CFX Automation Control Software include:

- **Status tab.** Illustrates the status of the plate lists, the configured CFX System(s), and the waste rack
- **Plate list tabs.** Named according to the rack on which the source plates are loaded
- **History tab.** Provides a log of plates run using the CFX Automation System II

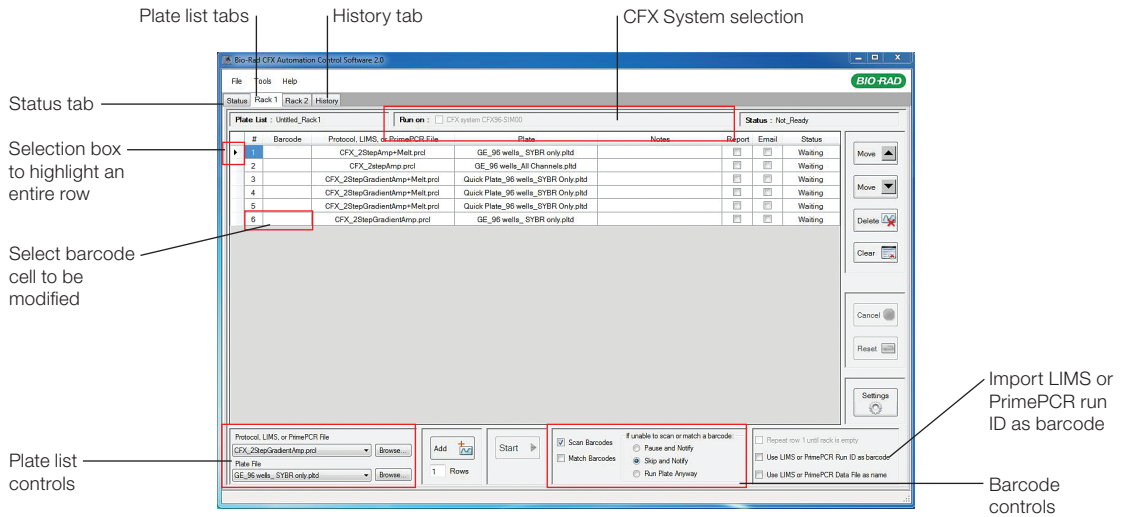


Fig. 19. Plate list tab.

Starting an Automation Run

The plate list is the table that contains the cycling instructions for all plates loaded into a specific source rack (Figure 19). The plate list tabs are named according to the rack in which the source plates are loaded (Rack 1, Rack 2, etc). View each of the plate lists by selecting either of the plate list tabs on the main tool bar. All controls for creating, editing, saving, and running plate lists are found on the plate list window.

Basic automation runs can be started by following these five steps:

1. Create the plate list.
2. Select the CFX System(s).
3. Modify the barcode controls.
4. Load the plates.
5. Select Start.

Step 1: Create the Plate List

Use the plate list controls (Figure 19) to add plates to a plate list:

- **Select protocol, LIMS, or PrimePCR file** — use the dropdown menu or browse function to select the desired protocol, Laboratory Information Management Systems (LIMS) file, or PrimePCR file. Protocols must be created and saved using CFX Manager Software. Because LIMS and PrimePCR files contain both protocol and plate information, when one of these files is selected, the plate file dropdown box will be disabled. For additional information on LIMS, see LIMS Information. For additional information on PrimePCR, see PrimePCR Information
- **Select plate file** — use the dropdown menu or browse function to select the desired plate file. Plate files must be created and saved using CFX Manager Software
- **Select Add** — a new entry with the selected files will be added to the plate list. If no rows on the plate list are selected, the new entry will be added to the bottom of the plate list. If a row in the plate list is selected, the new row will be inserted directly below the selected row

Tip: See Create the Plate List: Additional Features for tips to quickly add files to a plate list and information on editing and saving plate lists.

Step 2: Select the CFX System(s)

If a single CFX System is configured, all plates will automatically go to that CFX System and this step can be skipped.

If two CFX Systems are connected, designate the CFX System(s) on which the plates should be run. Select **Front CFX System** and/or **Rear CFX System** on the desired plate list (Figure 19). If both 96-well and 384-well CFX Systems are configured, each CFX System must be controlled by an individual plate list and the source rack must contain only 96-well or 384-well plates.

Note: If two separate plate lists have the same CFX System(s) selected, the software will alternate running plates from each plate list until the automation run is complete.

Step 3: Modify the Barcode Controls

Select or deselect the **Scan Barcodes** option in the barcode controls section of the plate list tab (Figure 19).

Select the **Match Barcodes** option to match scanned barcodes to plate list barcode information and pair the cycling and plate protocols accordingly.

For more information on barcode options, see Barcode Settings: Advanced Features.

Step 4: Load the Plates

If using Bio-Rad's Microseal® 'B' optical seals, peel off the seal end tabs after sealing the plates. Place the plates in the source rack. The source rack can be identified by the tab name on the plate list page, for example Rack 1. Well A1 should face out toward the exterior of the plate handler (Figure 20).

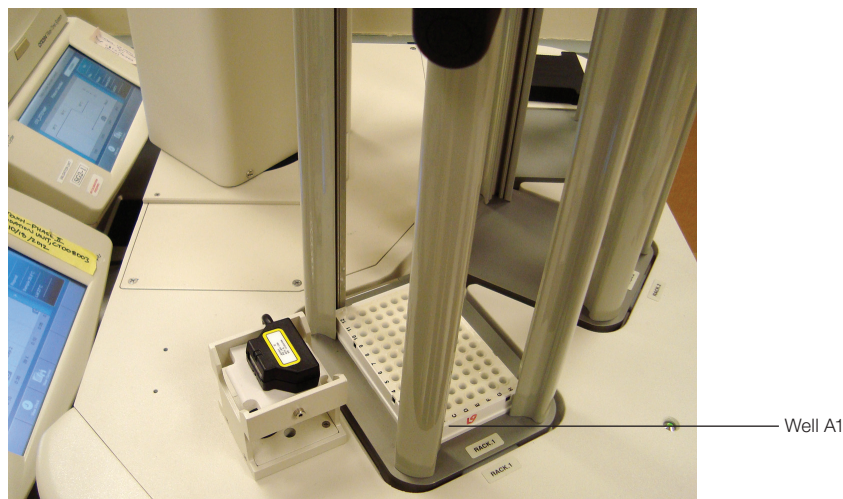


Fig. 20. Plate well A1 faces outward.

Step 5: Begin the Automation Run

Before beginning, confirm:

- Plates are placed in the input rack defined in the plate list window (Figure 19)
- Plates are placed with well A1 facing outward, away from the plate handler tower (Figure 20)
- If two CFX Systems are configured with the plate handler, the desired CFX System(s) is/are selected (Figure 19)
- Confirm **Match Barcodes** is selected if scanned barcodes should be matched with associated cycling protocols
- If configured CFX System(s) are also used in manual mode, confirm plates from former experiments have been removed from the CFX System block

Select **Start** on the plate list tab. The automation run will begin.

Adding Plates after Starting an Automation Run

You may add additional plates after an automation run has begun. To do this:

- Select the plate list window to which plates will be added
- Highlight the row under which you would like to add additional plates
- Select the desired protocol and plate files (or LIMS or PrimePCR file) and select **Add**
- Add the plates to the appropriate place in the input rack

Note: If **Match Barcodes** is **not** selected, the location of the plate in the plate list **must** match the physical location of the plates in the rack. Failure to correctly match orientations will lead to the incorrect pairing of cycling protocols with the plate.

WARNING! When using this feature, the plate handler arm will move to exchange plates at the appropriate time. Take care to ensure that you do not obstruct the movement of the plate handler arm when adding plates.

Canceling an Automation Run

To cancel an entire automation run:

- Select the plate list window corresponding to the automation run to be canceled
- Select **Cancel**

Any plates being cycled in a CFX System originating from that plate list will be canceled. The plate handler will remove the plate(s) from the CFX System(s) and place them in the waste rack. The automation run will be completely stopped. All plates not thermal cycled will be labeled “Not Run” in the status column.

Note: If two plate lists are running simultaneously using different CFX Systems, each plate list must be canceled separately.

Pausing or Canceling a Single Plate Run in a CFX System

You may pause or stop a single plate either through the CFX System or CFX Manager Software. Remember, selecting **Cancel** in the CFX Automation Control Software cancels the entire automation run, not a particular plate. See Canceling an Automation Run (above) for more detail.

Note: CFX Manager Software must be opened before CFX Automation Control Software to use both applications simultaneously.

To stop a single plate run, select **Cancel** on the CFX System or **Stop** in CFX Manager Software. All end-of-run processing will occur using the incomplete data generated to that point and the plate handler will move the plate to the waste rack. The automation run will continue with the next plate in the plate list.

To pause a single plate run, select **Pause** on the CFX System or in CFX Manager Software. Resume the cycling protocol using the CFX System or CFX Manager Software. The automation software will wait until the run is resumed or canceled to continue using that CFX System for the automation run. If the plate list is feeding plates to two CFX Systems, the automation run will continue using the other CFX System.

Emptying the Waste Rack

The waste rack may be emptied any time the plate handler is not actively performing an operation.

The plate handler checks the waste rack capacity immediately before removing a plate from a CFX System and placing it in the waste rack. Plates should not be emptied from the waste rack during this time.

You can set up automatic email notifications to alert you when the waste rack is approaching full. See Emails and Notifications for more information.

LIMS Information

The CFX Automation System II can be integrated with Laboratory Information Management Systems (LIMS) to facilitate automation and information flow. All LIMS integration is managed through CFX Manager Software.

The CFX System instruction manual (bulletin #10021337) explains in detail the steps required to set up LIMS integration. These steps include:

- Setting up a LIMS folder and data export options
- Creating a LIMS file (*.pln) using the provided CFX96™ or CFX384™ LIMS Plate Import Template files. Detailed definition of the LIMS Plate Import Template file content is provided
- Exporting data as a LIMS file

To complete LIMS integration, CFX Manager Software requires plate setup information generated by the LIMS platform, a protocol file created using CFX Manager Software (*.prcl), a defined data export location, and a defined export format. The LIMS file created by your internal LIMS contains the plate setup details and the protocol file name. CFX Manager Software will use the LIMS file to create a plate file that will be used in conjunction with the named protocol file to start a run and generate data. Refer to the LIMS Integration Section in the CFX System instruction manual (bulletin #10021337) for more detail.

When LIMS files are created for use with the automation system, plate barcode information provided in column B, row 8 of the LIMS file (the Run ID field) can be directly imported into the automation software (see Entering Barcode Information into a Plate List). Information entered in column B, row 11 of the LIMS file (the Data File field) can be used to name data files, reports, and export files (see File Name Format).

Once LIMS integration is complete, LIMS files may be loaded into the automation software and LIMS data export files can be generated.

PrimePCR Information

Bio-Rad offers 96- and 384-well PrimePCR plates that contain primer pairs lyophilized in the plate wells. You may customize the genes on the plates or choose from a wide variety of predesigned disease- and pathway-specific panels. For more information, go to www.bio-rad.com/primepcr.

Bio-Rad provides run files containing gene layout and cycling protocol information for all PrimePCR plates. Run files for predesigned and custom plates can be downloaded from www.bio-rad.com/primepcr. Run files for custom plates are saved under **My PrimePCR** once configured and purchased. To obtain run files for predesigned panels, select **Run File** on the Review Plate webpage.

Once the run files are downloaded, easily load PrimePCR files into any automation plate list using the plate list controls.

Create the Plate List: Additional Features

Quickly Add Rows to the Plate List

- **Add multiple rows with the same protocol and plate files (or same LIMS or PrimePCR files).** Enter the desired number of plates in the Rows box before selecting **Add**
- **Apply identical protocol and plate files (or LIMS or PrimePCR files) to all plates in a rack.** Enter the protocol and plate file (or LIMS or PrimePCR file) into a single row and select **Repeat row 1 until rack is empty**. The protocol and plate files will be applied to all plates in the input rack. Each time a new plate is retrieved from the source rack, a new row will be automatically added to the plate list. This option is available only when a single row is defined in the plate list

- **Add multiple LIMS or PrimePCR files to a plate list at once.** Select **Browse**, select all desired LIMS or PrimePCR files, and select **Open**. Each LIMS or PrimePCR file will be automatically added as a unique row on the plate list
- **Add multiple rows with the same protocol file but different plate files.** Select the desired protocol file using the dropdown menu or browse button. Select **Browse** in the plate file field and open the folder that contains multiple plate files of interest. Select all desired plate files and select **Open**. Each plate file will be paired with the protocol file and automatically added to the plate list
- **Add multiple rows with the same plate file but different protocol files.** Select the desired plate file using the dropdown menu or browse button. Select **Browse** in the protocol file field and open the folder that contains multiple protocol files of interest. Select all desired protocol files and select **Open**. Each protocol file will be paired with the plate file and automatically added to the plate list

Note: The maximum number of rows that can be added to a plate list is 1,000.

Edit a Plate List

Select the row to be modified by clicking on the selection box for that row (Figure 19). Multiple rows may be selected by using the shift and control keys. After selecting the desired rows, you may:

- Modify the protocol, LIMS, PrimePCR, or plate file using the dropdown menu or browse options
- Modify the order of the selected row by selecting **Move up** or **Move down**
- Delete a row by selecting **Delete**
- Clear an entire plate list by selecting **Clear**

Enter in notes for any row by selecting the desired notes cell in the plate list. All notes typed in the automation software will be stored in the CFX Manager Software data file.

Save a Plate List

By default, new plate lists are named “Untitled_rackX”. Save a plate list by selecting **File > Save**. The default directory for saved plate lists is: C:\Users\Public\Documents\Bio-Rad\CFXAutomationSystem\UserData. The saved plate list file also stores the selected CFX System(s) and barcode selections. However, the information specified under the Settings selection is not saved with the file.

You may load a previously saved plate list file by selecting **File > Open** and choosing the desired plate list file. Modifications to the plate list file can be saved by selecting **File > Save**. Modifications can be saved as a new plate list by selecting **File > Save As** and giving the plate list file a unique name.

Note: When loading a saved plate list file, remember that although CFX System(s) and barcode selections are stored within the file, the information stored under **Settings** is not associated with the plate list file. Carefully review the **Settings** each time a plate list file is loaded.

Barcode Controls: Advanced Features

Define If the System Should Scan Barcodes and/or Match Barcodes

Each plate list tab contains a barcode controls section (Figure 19) that permits you to modify how the system applies barcode information. Table 10 provides an overview of system response for the various options selected.

Define How the System Should Respond When Unable to Scan Barcodes or Match a Barcodes

Table 11 provides an overview of options available for how the system should respond when unable to scan or match a barcode.

Table 10. Barcode controls and associated system response.

Barcode Controls	Plate Scanned/Barcode Information Required Prior to Starting Automation Run	System Response When Barcode is Scanned	System Response Options When Unable to Scan or Match Barcode (Table 11)
<input type="checkbox"/> Scan Barcodes <input type="checkbox"/> Match Barcodes	No/No	N/A	N/A
<input checked="" type="checkbox"/> Scan Barcodes <input type="checkbox"/> Match Barcodes	Yes/No	Barcode recorded in the next plate list row Protocol and plate file (or LIMS or PrimePCR file) in the next available row will be applied	Pause and Notify, Skip and Notify, Run Plate Anyway
<input checked="" type="checkbox"/> Scan Barcodes <input checked="" type="checkbox"/> Match Barcodes	Yes/Yes (see Entering Barcode Information into a Plate List)	Protocol and plate file (or LIMS or PrimePCR file) associated with that barcode will be applied to the plate placed in the CFX System The displayed order of the plate list will be modified so that the currently running plate is moved up	Pause and Notify, Skip and Notify

Table 11. System response when unable to scan or match a barcode.

Barcode Controls	Plate Handler Response	Plate List Response*	Email Notifications Sent**
If unable to scan or match a barcode <input checked="" type="radio"/> Pause and Notify <input type="radio"/> Skip and Notify <input type="radio"/> Run Plate Anyway	Plate placed in source rack	Pauses	Yes
If unable to scan or match a barcode <input type="radio"/> Pause and Notify <input checked="" type="radio"/> Skip and Notify <input type="radio"/> Run Plate Anyway	Plate placed in waste rack	Continues running with the next plate	Yes
If unable to scan or match a barcode <input type="radio"/> Pause and Notify <input type="radio"/> Skip and Notify <input checked="" type="radio"/> Run Plate Anyway	Plate placed in CFX System	Protocol and plate file (or LIMS or PrimePCR file) associated with next row on the plate list will be applied to the plate	No

* If another automation run is executing using a different plate list, that run will continue.

** Email addresses must be properly configured in CFX Manager Software in order for these emails to be received.

Entering Barcode Information into a Plate List

Barcode information can be entered into the software and applied in a variety of ways, described below.

- **Manual entry** — select the barcode cell that corresponds to the plate of interest (Figure 19). Type in barcode information and then press the Enter key. The barcode cell for the next row will be automatically highlighted
- **External barcode scanner** — connect an external barcode scanner to the computer. Select the barcode cell corresponding to the plate of interest. Scan the plate. The barcode information will be entered, and the barcode cell for the next row will be automatically highlighted
- **Import LIMS or PrimePCR Run ID as barcode** — CFX Manager Software LIMS and PrimePCR Import Template files have a cell, B8, called Run ID. When **Import LIMS or PrimePCR Run ID as barcode** is selected, barcode information in cell B8 of the LIMS or PrimePCR file will be automatically loaded into the plate list
 - Note:** This option **must** be selected **before** the LIMS or PrimePCR file is added to the plate list.
- **Scan barcodes** — no barcode information is loaded into the plate list prior to starting the automation run. When **Scan Barcodes** is selected, all plates are moved to the barcode scanner, scanned, and then placed in the CFX System. Barcode information is entered into the plate list

Modify Settings

Settings allow you to customize the way files are named, managed, and stored, and to customize the email notifications. **Each plate list tab is associated with a separate set of software settings.** These settings are saved when the software is shut down. The settings will be applied to all plate lists created and used with that particular source rack. To modify the settings, select **Settings**. A window displaying three tabs with modifiable settings is displayed (Figure 21):

- Plate List Details
- Reports
- Emails and Notifications

Note: When saving a plate list, modifications made in Settings are not saved with the plate list file.

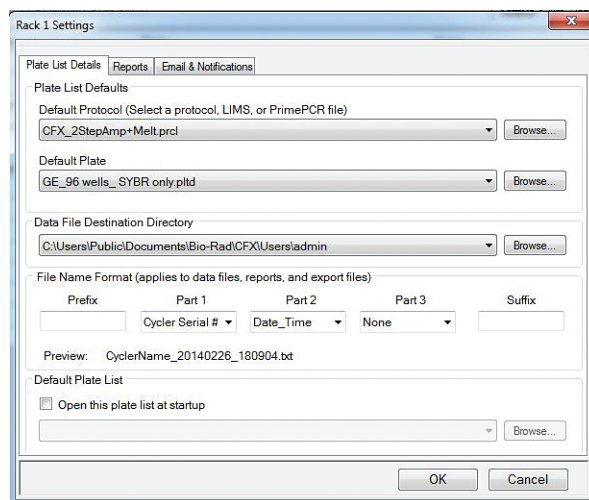


Fig. 21. Settings window.

Plate List Details

Plate List Defaults

Customize the protocol, LIMS, or PrimePCR file and plate files displayed in the dropdown menu when the application is opened. Because LIMS and PrimePCR files contain both protocol and plate information within the single file, when these files are selected, the Plate File dropdown box is disabled.

Data File Destination Directory

Specify the location for data files generated by CFX Manager Software. The data file directory information set in this window overrides directory settings set in CFX Manager Software.

File Name Format

Use the dropdown menus to define the file name format. Free form text can be entered in the prefix and suffix boxes. The time and date field is required in all file names. A preview of the sample name is displayed.

Alternatively, file names can be directly imported from a LIMS or PrimePCR file by selecting **Use LIMS or PrimePCR Data File as name** on the main plate list tab. The information entered in the Data File field in the LIMS import file will be used as the file name (see LIMS Information). Selecting this option will override any naming selection chosen in the dropdown menus.

Default Plate List

This allows you to have a particular plate list loaded each time the application is opened. By default, no plate list is displayed. To have a plate list always displayed at application startup, select **Open this Plate List at Startup** and choose a plate list you have previously saved.

Reports

Generate PDF Reports

By selecting this box, a PDF report will be automatically generated when a run is completed. There is also a Report column on the plate list screen. This column allows you to easily determine if a report will be generated. You may also create reports for individual plates by selecting or deselecting this column for individual plates.

Report File Destination Directory

This section allows you to specify the storage location for the reports.

Use CFX Manager Default Report Template

This section determines the template used for reports. When selected, the report template specified in CFX Manager Software will be used. To change the default report template in CFX Manager Software, go to **User > User preferences > Custom export** and select the export items you would like included.

Emails and Notifications

Run Completion Notification

When **Send Run Completion Notifications** is selected, an email containing the data file will be automatically sent at the completion of a run. Enter the desired email address in the text box. Multiple email addresses can be entered by separating each address with a comma.

Tip: To receive report files in addition to data files, ensure **Generate PDF Report** is selected in the Reports tab.

Other Notifications

This section enables the software to automatically email recipients regarding the status of the automation system. Options include:

- Notifications regarding the waste rack capacity. Enter in the percent capacity at which email notifications should be sent
- Notifications for when a plate list has completed
- Notifications when the automation system has encountered an error

Status Tab

The Status tab provides an overview of the status of both plate lists and the waste rack (Figure 22). When the automation software is in successful communication with the CFX System(s), CFX System status information is displayed. The Status tab also displays information on ongoing plate lists as well as waste rack capacity. Detailed plate list information can be viewed by selecting **Manage**.

Configured CFX System status

Type	SerialNo	Name	Block	Status	Repeat	Step	Remaining	Lid	Sample
THERMAL_CYCLER	CT001000	CTD01000	CFX384	Initializing	1 of 1	1 of 1	00:00:54	64.2 °C	28.8 °C
THERMAL_CYCLER	CT008003	CTD08003	CFX384	Idle	0 of 0	1 of 0	00:00:00	34.7 °C	27.1 °C

Plate list name

View plate list

Fig. 22. Status tab.

History Tab

The History tab contains details of all automation runs completed since the last time the application was opened (Figure 23). You may sort the history information by clicking on any column header. By default, the information is sorted by date.

Run history files for automation runs completed in the past can be located using the following file path: C:\Users\Public\Documents\Bio-Rad\CFXAutomationSystem\UserData.

Date	Time	Barcode	Protocol	Plate	Data File	Run On	Plate List	Outcome
2014/04/07	02:44:36	D074862	22C5seencolidheatplater...	Quick Plate_384 wells_AI...	2.0.450.0402_CT001000_2	CT001000	reallyfastcontinuous	Completed
2014/04/07	02:48:52	D082342	22C5seencolidheatplater...	Quick Plate_384 wells_AI...	2.0.450.0402_CT008003_2	CT008003	reallyfastcontinuous	Completed
2014/04/07	02:50:26	D075911	22C5seencolidheatplater...	Quick Plate_384 wells_AI...	2.0.450.0402_CT001000_2	CT001000	reallyfastcontinuous	Completed
2014/04/07	02:54:59	D075902	22C5seencolidheatplater...	Quick Plate_384 wells_AI...	2.0.450.0402_CT008003_2	CT008003	reallyfastcontinuous	Completed
2014/04/07	02:56:25	D082325	22C5seencolidheatplater...	Quick Plate_384 wells_AI...	2.0.450.0402_CT001000_2	CT001000	reallyfastcontinuous	Completed
2014/04/07	03:04:37	D074889	22C5seencolidheatplater...	Quick Plate_384 wells_AI...	2.0.450.0402_CT008003_2	CT008003	reallyfastcontinuous	Completed

Fig. 23. History tab.

3 Resources

Read this chapter for information about maintaining and troubleshooting the CFX Automation System II.

- Maintenance
- Power Outage
- Troubleshooting the CFX Automation System II
- Frequently Asked Questions

Maintenance

Cleaning the CFX Automation System II

Wipe up any spills immediately.

- Avoid direct contact with spilled liquid
- Wear protective gloves and safety glasses

The outside surfaces of the plate handler should be cleaned periodically. Clean only the exterior of the unit. Never remove any instrument covers to clean the inside of the instrument.

- Use a cloth or sponge dampened with water, alcohol, glass cleaner, or a mild soap solution diluted with water
- If using glass cleaner or mild soap, wipe with a cloth or sponge dampened with water after cleaning to remove any residue
- Do not use abrasive cleaners
- Do not spray cleaner onto the instrument
- Do not allow water or other fluids to drip inside the plate handler

Clean the gripper assembly and the racks with alcohol or other residue-free solvent. The surface beneath the plate handler racks must be clean at all times. Debris or dust under the racks will cause the plate handler and the racks to be out of calibration.

Changing the Fuses

WARNING! Electrical shock hazard. Disconnect the power cord before changing the fuses.

WARNING! For continued fire protection and correct system functioning, replace fuses only with exact part number.

To change the plate handler fuses:

1. Verify the plate handler power switch is OFF and the power cord is unplugged from the instrument.
2. Using a small flat-blade screwdriver at the top of the fuse housing, gently pry the fuse housing (Figure 24) out of the power entry port.
3. Remove the two 2.5 A fuses.
4. Replace both fuses with fuses with the same part number.
5. Confirm that the fuses are seated securely in the fuse housing.
6. Snap the fuse housing back into the power entry port.

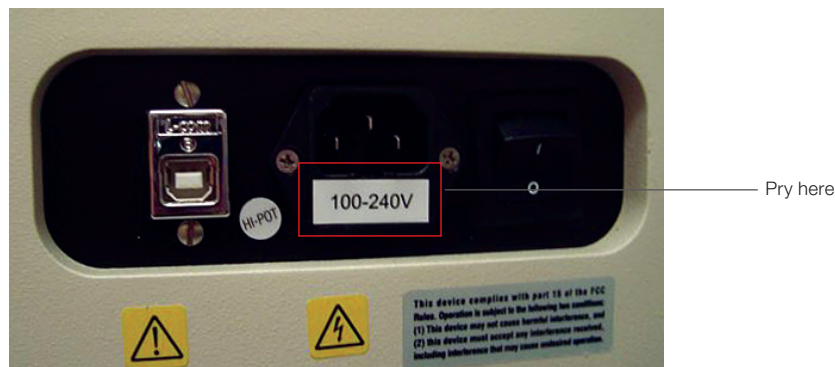


Fig. 24. CFX Automation System II power entry port.

Power Outage

If a power outage occurs during operation of the CFX Automation System II, the grippers will open and the plate will drop when the power is restored. If you routinely operate the CFX Automation System II overnight or with valuable samples, consider using a 900 W (or greater) uninterruptible power supply (UPS) to each connected instrument to provide a backup power source for the CFX Automation System II, the CFX System(s), and the computer.

Troubleshooting the CFX Automation System II

This section describes how to view automation system logs. It also includes a list of potential problems that may be encountered when using the system, along with their solutions. If you continue to experience problems after following the instructions below, contact Bio-Rad Laboratories technical support.

View Logs

The CFX Automation Control Software tracks information about the state of an instrument during an automation run. Use these logs to track events that occur on instruments and in the software, and for troubleshooting. To open the log, select **Tools > View Log**.

Logs are also stored in file folders. The file path to access these files is:
C:\ProgramData\Bio-Rad\CFXAutomationSystem\Logs.

Error Messages

Error messages inform the user of problems requiring immediate attention. If an error occurs during operation, the CFX Automation System II stops and an error message is displayed on the computer screen. Error messages along with the probable causes and possible solutions are listed in Table 12.

Table 12. Error messages, possible causes, and solutions.

Error Message	Possible Cause	Possible Solution
Another instance of CFX Manager™ Software is already running	The automation software was opened prior to opening CFX Manager Software	To use both CFX Manager Software and the automation software at the same time, open CFX Manager Software first
Plate list [xx] has paused. Unable to load plate in CFX System. Check for obstructions. Restart or cancel the plate list after correcting the issue	Incompatible plates may be being used	The CFX Automation System II is compatible with Hard-Shell® Low-Profile 96-Well and 384-Well Skirted PCR Plates. See Table 7 for detailed ordering information.
Plate list [xx] has paused. Unable to load plate in CFX System. Check for obstructions. Restart or cancel the plate list after correcting the issue	The CFX Automation System II is not properly calibrated	Test the calibration using the calibration wizard (see Test the Calibration). Recalibrate as required

Problems with Calibration

Inadequate calibration can result in the following observations:

- Plates are not smoothly picked up and/or released
- Plates are not perfectly placed into the CFX System
- Plates scrape against the racks

If any of the above situations are observed, first ensure the instrument is level relative to the CFX System(s). See Level the Plate Handler section for detailed leveling instructions. A properly leveled system is essential for system calibration.

After confirming the system is level, recalibrate any positions that are not properly calibrated. See Calibrate the Automation System for detailed instructions. Also, confirm the racks are properly seated and in their corresponding rack positions.

Additional Problems

If the CFX Automation System II does not start up or initialize properly when switched on, carefully review possible causes and solutions listed in Table 13.

Table 13. Causes and solutions for a CFX Automation System II not starting up.

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

Frequently Asked Questions

Q: Which way should I place my plates in the rack?

A: Plates should be placed with well A1 facing outward (Figure 20).

Q: I've set up my plate list and want to start the automation run. Why is **Start** disabled?

A: If you have two CFX Systems configured with the plate handler, you must select the desired CFX System(s) before starting the automation run. If a CFX System is not selected, the **Start** button is disabled.

The **Start** button will be disabled if the plate handler or selected CFX Systems are not connected. Confirm the CFX Systems and plate handler are powered on and cords are properly connected.

The **Start** button will be disabled if the selected CFX System is already in use.

The **Start** button will be disabled if CFX Manager Software is closed after opening the automation software.

Q: Why is **Repeat row 1 until rack is empty** disabled?

A: Only a single row can be defined in the plate list to use this feature. Additionally, **Match Barcodes** must not be selected.

Q: Why is **Run Plate Anyway** disabled?

A: When **Match Barcodes** is selected, the CFX System can run plates only after pairing them with the protocol and plate files (or LIMS or PrimePCR™ file) identified by that barcode in the plate list. When **Match Barcodes** is selected and the system is unable to scan or match a barcode, the only available options are **Pause and Notify** or **Skip and Notify** (see Table 10).

Q: I've already started an automation run. I'd like to rearrange plates in the rack. Can I do this?

A: Yes, plates in the rack can be rearranged once an automation run has begun. If barcoded plates are being used, and both **Scan Barcodes** and **Match Barcodes** are selected, you may rearrange the plates in the rack and do not have to modify the order of the plate list in the automation software. However, if **Match Barcodes** is not selected, you *must* rearrange the order the plates appear in the automation software to match the physical order of the plates in the rack. Failure to do so will result in the incorrect pairing of protocol and plate files (or LIMS or PrimePCR files) with the plates.

Ordering Information

Catalog #	Description
184-5075	CFX Automation System II , includes plate handler and barcode scanner, mounting plate, automation software, and manual
Real-Time PCR Detection Systems	
185-5485	CFX384 Touch Real-Time PCR Detection System , modular thermal cycler platform, includes C1000 Touch Thermal Cycler Chassis, CFX384 Optical Reaction Module, CFX Manager Software, qbase+ Software license, cables
185-5195	CFX96 Touch Real-Time PCR Detection System , modular thermal cycler platform, includes C1000 Touch Thermal Cycler Chassis, CFX96 Optical Reaction Module, CFX Manager Software, qbase+ Software license, cables
185-5201	CFX Connect Real-Time PCR Detection System , two-color real-time PCR detection system, includes CFX Connect Thermal Cycler Chassis, CFX Connect Optical Reaction Module, CFX Manager Software, qbase+ Software license, cables
PCR Seals	
181-4000	PX1 PCR Plate Sealer , heat sealing instrument, plate support block that holds 96-well and 384-well plates, sealing frame, power cord
181-4030	Optically Clear Heat Seal , pkg of 100, optically clear seals for PCR and real-time PCR applications, for use with PX1 PCR Plate Sealer
MSB-1001	Microseal 'B' Adhesive Seals , pkg of 100, optically clear seal for PCR plates used in PCR and real-time PCR reactions
PCR Plastic Consumables	
HSP-3805	Hard-Shell Thin-Wall 384-Well Skirted PCR Plates , pkg of 50, clear shell/white well PCR plate for higher fluorescent signals, rigid 2-component design
HSP-3905	Hard-Shell Thin-Wall 384-Well Skirted PCR Plates , pkg of 50, clear shell/white well PCR plate for higher fluorescent signals, barcoded, 7-digit sequential, Code 128, rigid 2-component design
HSP-9601	Hard-Shell Low-Profile Thin-Wall 96-Well Skirted PCR Plates , pkg of 50, white shell/clear well PCR plate, rigid 2-component design
HSP-9901	Hard-Shell Low-Profile Thin-Wall 96-Well Skirted PCR Plates , pkg of 50, white shell/clear well PCR plate, barcoded, 7-digit sequential, Code 128, rigid 2-component design
HSP-9655	Hard-Shell Low-Profile Thin-Wall 96-Well Skirted PCR Plates , pkg of 50, white shell/white well PCR plate for higher fluorescent signals, rigid 2-component design
HSP-9955	Hard-Shell Low-Profile Thin-Wall 96-Well Skirted PCR Plates , pkg of 50, white shell/white well PCR plate for higher fluorescent signals, barcoded, 7-digit sequential, Code 128, rigid 2-component design



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