

Applied Biosystems 9800 Fast Thermal Cyclers

With 96-Well Aluminum Sample Block Module

User Guide

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Preface

How to Use This Guide

Purpose of This Guide The *Applied Biosystems 9800 Fast Thermal Cycler with 96-Well Aluminum Sample Block Module User Guide* provides instructions for preparing and loading samples and cleaning the module. It also gives test and diagnostic procedures and the necessary information for interpreting test results.

Audience This guide is intended for novice and experienced 9800 instrument users.

Text Conventions This guide uses the following conventions:

- **Bold** indicates user action. For example:
Type **0**, then press **Enter** for each of the remaining fields.
- *Italic* text indicates new or important words and is also used for emphasis. For example:
Before analyzing, *always* prepare fresh matrix.
- A right arrow bracket (>) separates successive commands you select from a drop-down or shortcut menu. For example:
Select **File > Open > Spot Set**.
Right-click the sample row, then select **View Filter > View All Runs**.

User Attention Words Two user attention words appear in Applied Biosystems user documentation. Each word implies a particular level of observation or action as described below:

Note: Provides information that may be of interest or help but is not critical to the use of the product.

IMPORTANT! Provides information that is necessary for proper instrument operation, accurate chemistry kit use, or safe use of a chemical.

Examples of the user attention words appear below:

Note: The size of the column affects the run time.

Note: The Calibrate function is also available in the Control Console.

IMPORTANT! To verify your client connection to the database, you need a valid Oracle user ID and password.

IMPORTANT! You must create a separate Sample Entry Spreadsheet for each 96-well plate.

Safety Alert Words Safety alert words also appear in user documentation. For more information, see “Safety Alert Words” on page viii.

How to Obtain More Information

Related Documentation

The following related documents are shipped with the system:

- *Applied Biosystems 9800 Fast Thermal Cycler Base Module User Guide* – Describes the Applied Biosystems 9800 Fast Thermal Cycler Base Module hardware and software and provides information on preparing, maintaining, and troubleshooting the system.

Send Us Your Comments

Applied Biosystems welcomes your comments and suggestions for improving its user documents. You can e-mail your comments to:

techpubs@appliedbiosystems.com

How to Obtain Support

For the latest services and support information for all locations, go to **<http://www.appliedbiosystems.com>**, then click the link for **Support**.

At the Support page, you can:

- Search through frequently asked questions (FAQs)
- Submit a question directly to Technical Support
- Order Applied Biosystems user documents, MSDSs, certificates of analysis, and other related documents
- Download PDF documents
- Obtain information about customer training
- Download software updates and patches

In addition, the Support page provides access to worldwide telephone and fax numbers to contact Applied Biosystems Technical Support and Sales facilities.

Safety and EMC Compliance Information

This section includes the following topics:


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Safety Conventions Used in This Document


Safety Alert Words Four safety alert words appear in Applied Biosystems user documentation at points in the document where you need to be aware of relevant hazards. Each alert word—**IMPORTANT**, **CAUTION**, **WARNING**, **DANGER**—implies a particular level of observation or action, as defined below:

Definitions

IMPORTANT! – Indicates information that is necessary for proper instrument operation, accurate chemistry kit use, or safe use of a chemical.

 **CAUTION** – Indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

 **WARNING** – Indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.


 **DANGER** – Indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations.


Except for **IMPORTANT**s, each safety alert word in an Applied Biosystems document appears with an open triangle figure that contains a hazard symbol. *These hazard symbols are identical to the hazard icons that are affixed to Applied Biosystems instruments (see “Safety Symbols” on page ix).*


Examples

The following examples show the use of safety alert words:

IMPORTANT! You must create a separate a Sample Entry Spreadsheet for each 96-well plate.

 **CAUTION** The lamp is extremely hot. Do not touch the lamp until it has cooled to room temperature.








 **WARNING** **CHEMICAL HAZARD. Formamide.** Exposure causes eye, skin, and respiratory tract irritation. It is a possible developmental and birth defect hazard. Read the MSDS, and follow the handling instructions. Wear appropriate protective eyewear, clothing, and gloves.

 **DANGER** **ELECTRICAL HAZARD.** Failure to ground the instrument properly can lead to an electrical shock. Ground the instrument according to the provided instructions.

Symbols on Instruments




Electrical Symbols on Instruments



The following table describes the electrical symbols that may be displayed on Applied Biosystems instruments.

Symbol	Description
	Indicates the On position of the main power switch.
	Indicates the Off position of the main power switch.
	Indicates the On/Off position of a push-push main power switch.
	Indicates a terminal that may be connected to the signal ground reference of another instrument. This is not a protected ground terminal.
	Indicates a protective grounding terminal that must be connected to earth ground before any other electrical connections are made to the instrument.
	Indicates a terminal that can receive or supply alternating current or voltage.
	Indicates a terminal that can receive or supply alternating or direct current or voltage.

Safety Symbols

The following table describes the safety symbols that may be displayed on Applied Biosystems instruments. Each symbol may appear by itself or in combination with text that explains the relevant hazard (see “Safety Labels on Instruments” on page x). These safety symbols may also appear next to DANGERS, WARNINGS, and CAUTIONS that occur in the text of this and other product-support documents.

Symbol	Description
	Indicates that you should consult the manual for further information and to proceed with appropriate caution.
	Indicates the presence of an electrical shock hazard and to proceed with appropriate caution.
	Indicates the presence of a hot surface or other high-temperature hazard and to proceed with appropriate caution.

Symbol	Description
	Indicates the presence of a laser inside the instrument and to proceed with appropriate caution.
	Indicates the presence of moving parts and to proceed with appropriate caution.



Safety Labels on Instruments

The following CAUTION, WARNING, and DANGER statements may be displayed on Applied Biosystems instruments in combination with the safety symbols described in the preceding section.

English	Francais
CAUTION Hazardous chemicals. Read the Material Safety Data Sheets (MSDSs) before handling.	ATTENTION Produits chimiques dangereux. Lire les fiches techniques de sûreté de matériels avant la manipulation des produits.
CAUTION Hazardous waste. Read the waste profile (if any) in the site preparation guide for this instrument before handling or disposal.	ATTENTION Déchets dangereux. Lire les renseignements sur les déchets avant de les manipuler ou de les éliminer.
CAUTION Hazardous waste. Refer to MSDS(s) and local regulations for handling and disposal.	ATTENTION Déchets dangereux. Lire les fiches techniques de sûreté de matériels et la régulation locale associées à la manipulation et l'élimination des déchets.
CAUTION Hot surface.	ATTENTION Surface brûlante.
DANGER High voltage.	DANGER Haute tension.
WARNING To reduce the chance of electrical shock, do not remove covers that require tool access. No user-serviceable parts are inside. Refer servicing to Applied Biosystems qualified service personnel.	AVERTISSEMENT Pour éviter les risques d'électrocution, ne pas retirer les capots dont l'ouverture nécessite l'utilisation d'outils. L'instrument ne contient aucune pièce réparable par l'utilisateur. Toute intervention doit être effectuée par le personnel de service qualifié de Applied Biosystems.
CAUTION Moving parts.	ATTENTION Parties mobiles.


Instrument Warnings

Instrument Labels

	<p>WARNING ELECTRICAL HAZARD. Disconnect supply cord before opening. Grounding circuit continuity is vital for safe operation of equipment. Never operate equipment with grounding conductor disconnected.</p> <p><i>AVERTISSEMENT: Debrancher le cordon d'alimentation avant d'ouvrir la continuité des masses est essentielle.</i></p> <p><i>Pour un fonctionnement sans danger. Ne jamais utiliser l'équipement si le fil de terre n'est pas raccorde.</i></p>
	<p>This symbol indicates the danger of burns, if precautions are not followed, due to the presence of heat in this area of the instrument. There may also be hot surfaces that can be easily touched.</p> <p><i>Attention. Surface chaude.</i></p>

Electrical Safety Testing

Routine safety testing of analytical instruments (high potential voltage testing) may be required by various safety agencies.

	<p>Testing should only be carried out by qualified personnel after seeking advice from the Applied Biosystems Service Department.</p>
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Danger of Burns

WARNING BURN HAZARD. During instrument operation, the temperature of the heated cover can be as high as 108 °C, and the temperature of the sample block can be as high as 100 °C. Before performing the procedure, keep hands away until the heated cover and sample block reach room temperature.

AVERTISSEMENT: Surface chaude.




General Instrument Safety


Operating the Instrument

Ensure that anyone who operates the instrument has:

- Received instructions in both general safety practices for laboratories and specific safety practices for the instrument.
- Read and understood all applicable Material Safety Data Sheets (MSDSs). See “About MSDSs” on page xii.


 **WARNING PHYSICAL INJURY HAZARD.** Use this instrument as specified by Applied Biosystems. Using this instrument in a manner not specified by Applied Biosystems may result in personal injury or damage to the instrument.


Cleaning or Decontaminating the Instrument

 **CAUTION** Before using a cleaning or decontamination method other than those recommended by the manufacturer, verify with the manufacturer that the proposed method will not damage the equipment.

Chemical Safety

Chemical Hazard Warning

 **WARNING CHEMICAL HAZARD.** Before handling any chemicals, refer to the Material Safety Data Sheet (MSDS) provided by the manufacturer, and observe all relevant precautions.

 **WARNING CHEMICAL HAZARD.** All chemicals in the instrument, including liquid in the lines, are potentially hazardous. Always determine what chemicals have been used in the instrument before changing reagents or instrument components. Wear appropriate eyewear, protective clothing, and gloves when working on the instrument.

About MSDSs

Chemical manufacturers supply current Material Safety Data Sheets (MSDSs) with shipments of hazardous chemicals to *new* customers. They also provide MSDSs with the first shipment of a hazardous chemical to a customer after an MSDS has been updated. MSDSs provide the safety information you need to store, handle, transport, and dispose of the chemicals safely.

Each time you receive a new MSDS packaged with a hazardous chemical, be sure to replace the appropriate MSDS in your files.

Obtaining MSDSs

You can obtain from Applied Biosystems the MSDS for any chemical supplied by Applied Biosystems. This service is free and available 24 hours a day.

To obtain MSDSs:

1. Go to <https://docs.appliedbiosystems.com/msdssearch.html>
2. In the Search field, type in the chemical name, part number, or other information that appears in the MSDS of interest. Select the language of your choice, then click **Search**.
3. Find the document of interest, right-click the document title, then select any of the following:

- **Open** – To view the document
 - **Print Target** – To print the document
 - **Save Target As** – To download a PDF version of the document to a destination that you choose
4. To have a copy of a document sent by fax or e-mail, select **Fax** or **Email** to the left of the document title in the Search Results page, then click **RETRIEVE DOCUMENTS** at the end of the document list.
 5. After you enter the required information, click **View/Deliver Selected Documents Now**.

Chemical Safety Guidelines

To minimize the hazards of chemicals:

- Read and understand the Material Safety Data Sheets (MSDS) provided by the chemical manufacturer before you store, handle, or work with any chemicals or hazardous materials. (See “About MSDSs” on page xii.)
- Minimize contact with chemicals. Wear appropriate personal protective equipment when handling chemicals (for example, safety glasses, gloves, or protective clothing). For additional safety guidelines, consult the MSDS.
- Minimize the inhalation of chemicals. Do not leave chemical containers open. Use only with adequate ventilation (for example, fume hood). For additional safety guidelines, consult the MSDS.
- Check regularly for chemical leaks or spills. If a leak or spill occurs, follow the manufacturer’s cleanup procedures as recommended on the MSDS.
- Comply with all local, state/provincial, or national laws and regulations related to chemical storage, handling, and disposal.

Chemical Waste Safety

Chemical Waste Hazard



CAUTION HAZARDOUS WASTE. Refer to Material Safety Data Sheets and local regulations for handling and disposal.



WARNING CHEMICAL WASTE HAZARD. Wastes produced by Applied Biosystems instruments are potentially hazardous and can cause injury, illness, or death.



WARNING CHEMICAL STORAGE HAZARD. Never collect or store waste in a glass container because of the risk of breaking or shattering. Reagent and waste bottles can crack and leak. Each waste bottle should be secured in a low-density polyethylene safety container with the cover fastened and the handles locked in the upright position. Wear appropriate eyewear, clothing, and gloves when handling reagent and waste bottles.

Chemical Waste Safety Guidelines

To minimize the hazards of chemical waste:

- Read and understand the Material Safety Data Sheets (MSDSs) provided by the manufacturers of the chemicals in the waste container before you store, handle, or dispose of chemical waste.






- Provide primary and secondary waste containers. (A primary waste container holds the immediate waste. A secondary container contains spills or leaks from the primary container. Both containers must be compatible with the waste material and meet federal, state, and local requirements for container storage.)
- Minimize contact with chemicals. Wear appropriate personal protective equipment when handling chemicals (for example, safety glasses, gloves, or protective clothing). For additional safety guidelines, consult the MSDS.
- Minimize the inhalation of chemicals. Do not leave chemical containers open. Use only with adequate ventilation (for example, fume hood). For additional safety guidelines, consult the MSDS.
- Handle chemical wastes in a fume hood.
- After emptying the waste container, seal it with the cap provided.
- Dispose of the contents of the waste tray and waste bottle in accordance with good laboratory practices and local, state/provincial, or national environmental and health regulations.

Waste Disposal If potentially hazardous waste is generated when you operate the instrument, you must:

- Characterize (by analysis if necessary) the waste generated by the particular applications, reagents, and substrates used in your laboratory.
- Ensure the health and safety of all personnel in your laboratory.
- Ensure that the instrument waste is stored, transferred, transported, and disposed of according to all local, state/provincial, and/or national regulations.

IMPORTANT! Radioactive or biohazardous materials may require special handling, and disposal limitations may apply.

Electrical Safety

- Fuses**  **DANGER ELECTRICAL SHOCK HAZARD.** Improper fuses or high-voltage supply can damage the instrument wiring system and cause a fire. Before turning on the instrument, verify that the fuses are properly installed and that the instrument voltage matches the power supply in your laboratory.
-  **WARNING FIRE HAZARD.** For continued protection against the risk of fire, replace fuses only with fuses of the type and rating specified for the instrument.
- Power**  **DANGER ELECTRICAL HAZARD.** Grounding circuit continuity is vital for the safe operation of equipment. Never operate equipment with the grounding conductor disconnected.
-  **DANGER ELECTRICAL HAZARD.** Use properly configured and approved line cords for the voltage supply in your facility.
-  **DANGER ELECTRICAL HAZARD.** Plug the system into a properly grounded receptacle with adequate current capacity.

Overvoltage Rating The Applied Biosystems 9800 Fast 96-Well Aluminum Sample Block Module system has an installation (overvoltage) category of II, and is classified as portable equipment.

Biological Hazard Safety

General Biohazard



WARNING

BIOHAZARD. Biological samples such as tissues, body fluids, and blood of humans and other animals have the potential to transmit infectious diseases. Follow all applicable local, state/provincial, and/or national regulations. Wear appropriate protective eyewear, clothing, and gloves. Read and follow the guidelines in these publications:

- U.S. Department of Health and Human Services guidelines published in *Biosafety in Microbiological and Biomedical Laboratories* (stock no. 017-040-00547-4; <http://bmbi.od.nih.gov>)
- Occupational Safety and Health Standards, Bloodborne Pathogens (29 CFR§1910.1030; http://www.access.gpo.gov/nara/cfr/waisidx_01/29cfr1910a_01.html).

Additional information about biohazard guidelines is available at: <http://www.cdc.gov>

Safety and Electromagnetic Compatibility (EMC) Standards

This section provides information on:

- U.S. and Canadian Safety Standards
- Canadian EMC Standard
- European Safety and EMC Standards
- Australian EMC Standards

U.S. and Canadian Safety Standards

This instrument has been tested to and complies with standard UL 3101-1, “Safety Requirements for Electrical Equipment for Laboratory Use, Part 1: General Requirements.”



This instrument has been tested to and complies with standard CSA 1010.1, “Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use, Part 1: General Requirements.”

Canadian EMC Standard

This instrument has been tested to and complies with ICES-001, Issue 3: Industrial, Scientific, and Medical Radio Frequency Generators.

**European Safety
and EMC
Standards**



Safety

This instrument meets European requirements for safety (Low Voltage Directive 73/23/EEC). This instrument has been tested to and complies with standards EN 61010-1:2001, “Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use, Part 1: General Requirements” and EN 61010-2-010, “Particular Requirements for Laboratory Equipment for the Heating of Materials.”

EMC

This instrument meets European requirements for emission and immunity (EMC Directive 89/336/EEC). This instrument has been tested to and complies with standard EN 61326 (Group 1, Class B), “Electrical Equipment for Measurement, Control and Laboratory Use – EMC Requirements.”

**Australian EMC
Standards**



This instrument has been tested to and complies with standard AS/NZS 2064, “Limits and Methods Measurement of Electromagnetic Disturbance Characteristics of Industrial, Scientific, and Medical (ISM) Radio-frequency Equipment.”

Instrument Storage

The 9800 system must be stored at a temperature between $-20\text{ }^{\circ}\text{C}$ and $60\text{ }^{\circ}\text{C}$ ($-4\text{ }^{\circ}\text{F}$ and $140\text{ }^{\circ}\text{F}$) at altitudes ranging from 0 to 12,000 meters above sea level.

Sample Block Safe Operation

Operating Precautions

The following precautions should be taken whenever you operate the Applied Biosystems 9800 Fast 96-Well Aluminum Sample Block Module. Read this section before you install the instrument.



WARNING PHYSICAL INJURY HAZARD. To protect yourself against burns, do not open the heated cover or touch the sample block when the word Hot displays on the screen. This indicates a block temperature above $50\text{ }^{\circ}\text{C}$.

IMPORTANT! To protect your samples and to guarantee the best temperature uniformity, keep the heated cover closed at all times, except when loading or unloading samples.

Routine Maintenance

Maintain your instrument in good working order. In the event that the instrument has been subjected to adverse environmental conditions (such as fire, flood, earthquake, and so forth), a service inspection of the instrument should be made to insure safe operation.

Temperature, Humidity, and Environment

IMPORTANT! This instrument is designed for indoor use.

IMPORTANT! Do not operate in a Cold Room or a refrigerated area. The 9800 system will operate safely when the ambient temperature is $5\text{ }^{\circ}\text{C}$ to $40\text{ }^{\circ}\text{C}$ ($41\text{ }^{\circ}\text{F}$ to $104\text{ }^{\circ}\text{F}$) and will meet performance specifications when the ambient temperature is $15\text{ }^{\circ}\text{C}$ to $30\text{ }^{\circ}\text{C}$ and the ambient relative humidity is 20 to 80%. These specifications have been calculated for altitudes between 0 and 2,000 meters.



WARNING FIRE HAZARD. This instrument is not designed for operation in an explosive environment. Do not place the instrument close to potentially explosive materials or objects.

IMPORTANT! This instrument is not designed for operation with the heated cover retracted when running at 4°C . If the cover is retracted and the instrument runs at 4°C , water condensation may be excessive in the block area.

Pollution

The instrument has a pollution degree rating of 2 and may be installed in an environment that has nonconductive pollutants only.

Preparing, Loading, and Cleaning the 96-Well Sample Block Module

1

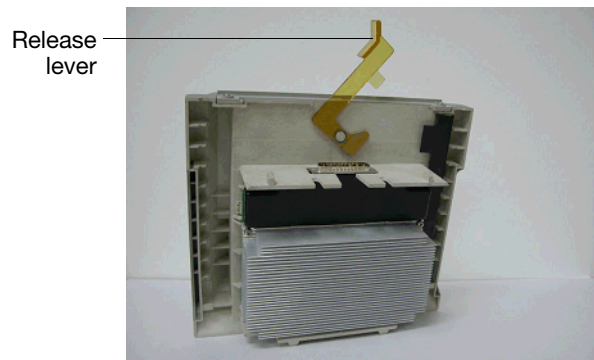
This chapter covers:

About the Sample Block Module	1-2
Loading Samples	1-5
Cleaning the Sample Block Module	1-6

About the Sample Block Module

Sample Block Diagram

The following are two diagrams of the top and bottom of a sample block module. A release lever at the rear of the interchangeable sample block releases the sample block module from the base unit.



The Sample Compartment

The sample compartment holds a 96-well microplate with low head space.



Placing the Sample Block

To place the sample block into the instrument base:

1.	Pull the release lever out from the block module.
2.	Place the block module onto the base.
3.	Pull the release lever left and into the instrument to secure the module.

Note: If the sample block module is not seated in place correctly, the power on/off switch does not function.

Heating and Cooling



WARNING BURN HAZARD. During instrument operation, the temperature of the heated cover can be as high as 108 °C, and the temperature of the sample block can be as high as 100 °C. Before performing the procedure, keep hands away until the heated cover and sample block reach room temperature.

The internal Peltier heating/cooling unit is housed in the sample block module.

Platinum sensors provide:

- Wide temperature range: 4 °C to 99.9 °C
- Accuracy: ± 0.25 °C from 35 °C to 100 °C
- Long term stability and high reliability

Electrical Requirements

IMPORTANT! You must be able to disconnect the main power supply to the instrument immediately if necessary.

The following table specifies the electrical operating range for the instrument in various parts of the world:

Location	Voltage (VAC)	Frequency	Amperage (A) Nominal
Japan	100 ±10%	50/60 Hz ±1%	6.3
USA/Canada	120 ±10%	50/60 Hz ±1%	5.2
EC	230 ±10%	50/60 Hz ±1%	4.0

Note: The Volt-Amp number for this instrument is 850 VA.

Part Numbers

You can order modules, accessories, and disposables for the 9800 Fast Thermal Cycler with 96-Well Aluminum Sample Block Module by part number.

Modules/Accessories/Disposables	Part Number
Applied Biosystems 9800 Fast 96-Well Aluminum Sample Block Module	4349440
Temperature Verification System	4351630
Splash-free Support Base	4312063
Adhesive Optical Cover	4311971
Adhesive Seal Applicator	4333183
Multi-Tool	4313950
96-Well Fast Thermal Cycling Plate	4346907

Loading Samples

The following procedures describe how to load samples for optical 96-well Fast thermal cycling for a sample volume range of 5 to 30 μL in Fast mode.

Note: Do not use mineral oil or glycerine in the sample block or as a vapor barrier over the PCR reaction mixture in the tubes. The MicroAmp[®] Reaction Tubes fit tightly in the wells and a heated cover exerts an even pressure on all tubes and eliminates condensation on the tubes.

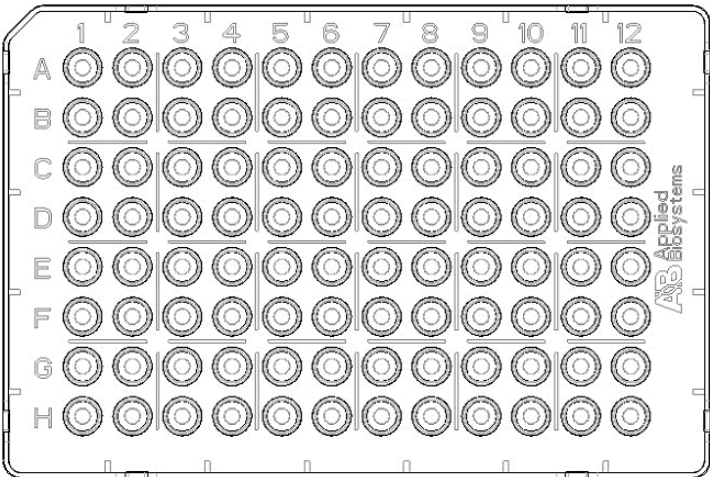
Loading the 96-Well Reaction Plate

To load the 96-well reaction plate:

1.	Place the reaction plate on the Splash-Free Support Base.
2.	Pipette the samples into the sample wells.
3.	Cap the tubes with the Adhesive Optical Cover. Note: See “Placing the Sample Plate Onto the Sample Block.”

Placing the Sample Plate Onto the Sample Block

To place the 96-well sample tray in the block:

1.	<p>Lift the 96-Well Sample Tray from the Splash-Free Support Base and place it in the sample block.</p> <p>Note: Place the Optical 96-Well Fast Thermal Cycling Plate onto the sample block so that the well numbered A1 is located at the upper left corner of the tray, orienting the tray for proper fit.</p>  <p>IMPORTANT! Do not place the base in the sample block.</p>
2.	<p>Slide the heated cover forward.</p> <p>Note: For a proper seal, make sure you pull the cover completely forward.</p>
3.	<p>Pull the lever down to engage the heated cover and the sample tray.</p>


Cleaning the Sample Block Module


To clean the sample block module, raise the front of the lid through the slots on each side of the module. The cleaning position is shown below.



Cleaning the Sample Wells

Before using any cleaning or decontamination method, except those recommended in the manual, check with Applied Biosystems to be sure the proposed method does not damage the equipment. Clean the sample wells once a month or more often as needed.

 **WARNING BURN HAZARD.** During instrument operation, the temperature of the heated cover can be as high as 108 °C, and the temperature of the sample block can be as high as 100 °C. Before performing the procedure, keep hands away until the heated cover and sample block reach room temperature.

 **WARNING CHEMICAL HAZARD.** **Isopropanol** is a flammable liquid and vapor. Exposure may cause eye, skin, and upper respiratory tract irritation. Prolonged or repeated contact may dry skin and cause irritation. Exposure may cause central nervous system effects such as drowsiness, dizziness, and headache. Read the MSDS, and follow the handling instructions. Wear appropriate protective eyewear, clothing, and gloves.

Sodium hypochlorite (bleach) is a liquid disinfectant that can be corrosive to the skin and can cause skin depigmentation. Read the MSDS, and follow the handling instructions. Wear appropriate protective eyewear, clothing, and gloves.

To clean the sample wells:

1.	If a method is running, press the Stop key twice.
2.	Turn off the instrument.
3.	Wait 1 minute for the block to cool.
4.	Remove the sample tray from the block and set it aside.
5.	Use a cotton swab soaked in undiluted isopropanol to thoroughly clean the sample wells.

To clean the sample wells: *(continued)*

6.	<p>Remove any remaining isopropanol from the cover before reloading the sample tray.</p> <p>Note: If the sample wells become contaminated from the samples, clean the wells thoroughly with a cotton swab soaked in bleach and then rinse them with water.</p>
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Cleaning the Heated Cover

Clean the heated cover once a month or more often as needed.

**WARNING**

BURN HAZARD. During instrument operation, the temperature of the heated cover can be as high as 108 °C, and the temperature of the sample block can be as high as 100 °C. Before performing the procedure, keep hands away until the heated cover and sample block reach room temperature.

**WARNING**

CHEMICAL HAZARD. **Isopropanol** is a flammable liquid and vapor. Exposure may cause eye, skin, and upper respiratory tract irritation. Prolonged or repeated contact may dry skin and cause irritation. Exposure may cause central nervous system effects such as drowsiness, dizziness, and headache. Read the MSDS, and follow the handling instructions. Wear appropriate protective eyewear, clothing, and gloves.

Sodium hypochlorite (bleach) is a liquid disinfectant that can be corrosive to the skin and can cause skin depigmentation. Read the MSDS, and follow the handling instructions. Wear appropriate protective eyewear, clothing, and gloves.

To clean the heated cover:

1.	If a method is running, press the Stop key twice.
2.	Turn off the instrument.
3.	Wait 20 to 30 minutes for the heated cover to cool down.
4.	Raise the heated cover release lever and slide the cover back almost, but not completely, to the back of its slide.
5.	<p>Line up the protrusions on the side of the heated cover so that the protrusions, which are closer to the front of the instrument, line up with the vertical channels.</p> <p>Note: The vertical channels in the cover rails are at about the midpoint of the rails.</p>
6.	Lift up the front of the heated cover until the protrusions travel up the vertical channels all the way to the top.

To clean the heated cover: (continued)

7.	Soak a cotton swab or piece of clean cloth with undiluted isopropanol and gently wipe the bottom of the cover.
8.	Remove any remaining isopropanol from the cover and return the cover to its normal position. If the cover becomes contaminated with amplified DNA, raise the heated cover to the cleaning position and wipe the cover with a cloth or cotton swab soaked in bleach, then rinse it with water.

Tests and Diagnostics

2

This chapter covers:


The Calibration Verification Test	2-2
Running the Temperature Non-Uniformity Test	2-9
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The Calibration Verification Test

This test is used to verify the temperature calibration of your Applied Biosystems 9800 Fast Thermal Cycler with 96-Well Aluminum Sample Block Module.

The Calibration Verification Test consists of several subprocedures, which you must perform in order:

- Setting up the probe assembly
- Configuring the 9800 instrument
- Running the test
- Evaluating the results
- Ending the test

 **WARNING BURN HAZARD.** Hot Surface. Use care when working around the heated cover and sample block to avoid being burned by hot components.

Required Materials

This test requires the Sample Block Module Temperature Verification Kit.

Your kit includes:

- Cotton swabs
- Light mineral oil
- 9800 Temperature Verification Frame
- Probe Assembly
- Digital thermometer Model 4500 with 9V battery installed

Threading the Probe Wire

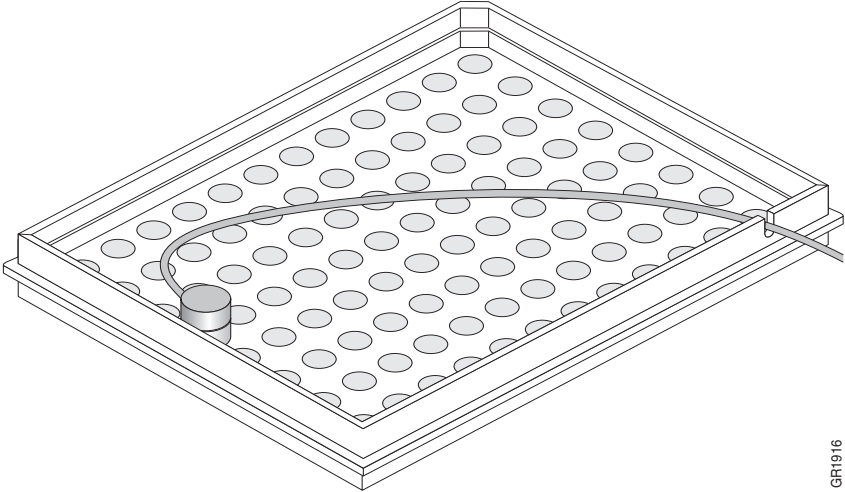
Use the equipment provided in your kit when you perform temperature verification tests on the 9800 instrument.

Setting Up the Probe Assembly

To set up the Probe Assembly

1.	If the heated cover is in the forward position, lift the release lever, then slide the heated cover back.
2.	Place the 9800 Temperature Verification Frame on the sample block.
3.	Using a cotton swab, coat well A6 with mineral oil.
4.	Place the Probe Assembly into well A6 .

To set up the Probe Assembly (continued)

5.	<p>Thread the probe wire through the channel in the 9800 Temperature Verification Frame.</p> <p>Note: Threading the probe wire through the channel, as shown below, prevents damage to the wire when the heated cover is closed.</p>  <p style="text-align: right; font-size: small;">GR1916</p>
6.	<p>Make sure the probe is connected to the digital thermometer.</p>
7.	<p>Slide the heated cover forward and pull the release lever down.</p> <p>IMPORTANT! You must properly seat the probe and carefully close the heated cover. If the probe wire is crushed when you close the heated cover, the probe may be damaged.</p>
8.	<p>Turn on the digital thermometer.</p> <p>Note: Refer to the instructions included with your Temperature Verification Kit for a detailed description of the operation of the Model 4500 digital thermometer.</p>

Configuring the 9800 System

To configure the 9800 instrument for the Calibration Verification Test:

1.	<p>Turn on the 9800 instrument.</p>
2.	<p>In the Main menu, press F4 (Util).</p>
3.	<p>In the Utilities screen, press F1 (Diag) to open the Diagnostics screen.</p> <div style="border: 1px solid black; padding: 10px; margin: 10px 0;"> <p style="text-align: center;">Diagnostics</p> <p>Hard - Hardware Diagnostics</p> <p>System - System Performance Tests</p> <p>TmpVer - Temperature Verification</p> <p>Upgrad - Firmware Upgrade</p> <p style="text-align: center;"> <input type="button" value="Hard"/> <input type="button" value="System"/> <input type="button" value="TmpVer"/> <input type="button" value="Upgrad"/> <input type="button" value="Exit"/> </p> <p style="text-align: center;"> F1 F2 F3 F4 F5 </p> </div>

To configure the 9800 instrument for the Calibration Verification Test: *(continued)*

4.	<p>In the Diagnostics screen, press F3 (TmpVer) to pen the Temperature Verification screen.</p> <div style="border: 1px solid black; padding: 10px; margin: 10px 0;"> <p style="text-align: center;">Temperature Verification</p> <p>Temp - Calibration Verification TNU - Temperature Non-Uniformity</p> <p style="text-align: center;"> <input type="button" value="Temp"/> <input type="button" value="TNU"/> <input type="button" value="Exit"/> </p> </div> <p style="text-align: center;">F1 F2 F3 F4 F5</p>
5.	<p>In the Temperature Verification screen, press F1 (Temp) to open the Calibration Verification screen.</p> <p>Note: Pressing F1 automatically configures the 9800 instrument for the Calibration Verification Test.</p> <div style="border: 1px solid black; padding: 10px; margin: 10px 0;"> <p style="text-align: center;">Calibration Verification</p> <p>Block temp = XX.X°C Cover temp = XXX°C</p> <p>Place probe in well A6 Press Run</p> <p style="text-align: center;"> <input type="button" value="Run"/> <input type="button" value="Cancel"/> </p> </div> <p style="text-align: center;">F1 F2 F3 F4 F5</p>

Running the Test

Use the digital thermometer to take temperature readings of the sample well connected to the Probe Assembly. You will take readings at two different setpoint temperatures.

Note: If necessary, press F5 (Cancel) to exit the test.

To run the Calibration Verification Test:

1.	<p>In the Calibration Verification screen, press F1 (Run) to start the Calibration Verification Test.</p> <p>The Calibration Verification screen now shows the setpoint value.</p> <div style="border: 1px solid black; padding: 10px; margin: 10px 0;"> <p style="text-align: center;">Calibration Verification</p> <p>Block temp = XX.X°C Cover temp = XXX°C</p> <p>Setpoint is 85°C Cover must be within 10°C of 85°C</p> <p style="text-align: right;"> <input type="button" value="Cancel"/> </p> </div> <p style="text-align: center;">F1 F2 F3 F4 F5</p> <p>Note: The cover must be within 10 °C of 85 °C. It may take several minutes for the 9800 instrument to ramp up.</p>
----	---

To run the Calibration Verification Test: (continued)

2. When the Stabilizing at setpoint value decrements to zero, read the digital thermometer.

Note: The Calibration Verification screen counts down the time until the setpoint is reached.

```

Calibration Verification
Block temp = XX.X°C Cover temp = XXX°C
Stabilizing at setpoint   X:XX
Cancel

```

F1 F2 F3 F4 F5

Note: Refer to your Temperature Verification Kit for digital thermometer (Model 4500) operating instructions.

3. Using the numeric keys, enter the value from the digital thermometer into the Enter actual block temperature field.

Note: The digital thermometer displays a four-digit value; round off this value to three digits before entering the value.

```

Calibration Verification
Block temp = XX.X°C Cover temp = XXX°C
Enter actual block temperature
Cancel

```

F1 F2 F3 F4 F5

Note: You can record this value on the Calibration Verification Test Data Sheet (see page 2-8) to keep a permanent record of the test.

4. Press **Enter**.

The 9800 instrument automatically begins the second reading at the 45 °C setpoint. The Calibration Verification screen shows the 45 °C setpoint value.

```

Calibration Verification
Block temp = XX.X°C Cover temp = XXX°C
Setpoint is 45°C
Cover must be within 30°C of 45°C
Cancel

```

F1 F2 F3 F4 F5

Note: The cover must be within 30 °C of 45 °C.

To run the Calibration Verification Test: *(continued)*

5.	<p>Repeat steps 2 and 3 for the second reading.</p> <p>The 9800 instrument software evaluates the calibration of the sample block temperature for the setpoint values you enter and displays the results. A summary screen opens at the conclusion of the test.</p> <div style="border: 1px solid black; padding: 10px; margin: 10px 0;"> <p style="text-align: center;">Calibration Verification</p> <p>Actual temperature at 85 °C <input type="text"/></p> <p>Actual temperature at 45 °C <input type="text"/></p> <p><input type="button" value="Accept"/> <input type="button" value="Cancel"/></p> </div> <p style="text-align: center;">F1 F2 F3 F4 F5</p> <p>Note: If you entered values on the Calibration Verification Test Data Sheet, compare those values with the actual test results.</p>
6.	<p>Press F1 (Accept).</p>

Evaluating the Results

When the 9800 instrument completes the Calibration Verification Test, one of two screens open. See the table below to evaluate the results.

Test Result	Message/Action
Pass	<div style="border: 1px solid black; padding: 10px; margin: 10px 0;"> <p style="text-align: center;">Calibration Verification</p> <p style="text-align: center;">Calibration is good</p> <p style="text-align: right;"><input type="button" value="Exit"/></p> </div> <p style="text-align: center;">F1 F2 F3 F4 F5</p>
Fail	<div style="border: 1px solid black; padding: 10px; margin: 10px 0;"> <p style="text-align: center;">Calibration Verification</p> <p style="text-align: center;">Instrument may require service. Contact Applied Biosystems Technical Support.</p> <p style="text-align: right;"><input type="button" value="Exit"/></p> </div> <p style="text-align: center;">F1 F2 F3 F4 F5</p> <p>Repeat the procedure to make sure you did not misread the digital thermometer or make a data entry error.</p> <p>If the test fails again, contact Applied Biosystems Technical Support.</p>

Ending the Test When you have completed all measurements, end the test.

To end the test:

1.	Press F5 (Exit).
2.	Remove the Probe Assembly from the sample block.
3.	Turn off the digital thermometer and clean off the oil.
4.	Wait for the sample block to reach room temperature (~25 °C), then remove the 9800 Temperature Verification Frame from the sample block.
5.	Clean the oil off the sample block.

Running the Temperature Non-Uniformity Test

This test is used to verify the temperature uniformity of the 9800 instrument with a 96-Well Sample Block Module.

The Temperature Non-Uniformity Test consists of several subprocedures, which you must perform in order.

- Setting up the Probe Assembly
- Configuring the 9800 instrument
- Running the test
- Evaluating the results
- Ending the test

Equipment Required

This test requires the Sample Block Module Temperature Verification Kit (PN 4351630).

Your kit includes:

- Cotton swabs
- Light mineral oil
- 9800 Temperature Verification Frame
- Probe Assembly
- Digital thermometer Model 4500 with 9V battery installed

Setting Up the Probe Assembly



WARNING

BURN HAZARD. Hot Surface. Use care when working around the heated cover and sample block to avoid being burned by hot components.

To set up the Probe Assembly:

1.	If the heated cover is in the forward position, lift the release lever, then slide the heated cover back.
2.	Place the 9800 Temperature Verification Frame on the sample block.
3.	Use a cotton swab to coat the following wells with mineral oil: <ul style="list-style-type: none"> • A1 • A12 • C4 • C9 • F4 • F9 • H1 • H12
4.	Place the Probe Assembly into well A1 . Note: As the test progresses, you will be moving the Probe Assembly to each of the test wells.

Running the Test The Temperature Non-Uniformity Test uses the Probe Assembly to test the temperature uniformity of eight different wells in the sample block.

Note: If necessary, press F5 (Cancel) to exit the test.

To run the Temperature Non-Uniformity Test:

1.	<p>Press F1 (Run) to start the test.</p> <p>The TNU Performance screen opens with the setpoint value displayed.</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <pre style="font-family: monospace; font-size: 0.9em;"> TNU Performance Sample temp = XX.X°C Cover temp = XXX°C Setpoint is 55°C Sample must be within 1.0°C of setpoint Cancel</pre> </div> <p style="text-align: center; margin: 0;">F1 F2 F3 F4 F5</p> <p>Note: The sample block must be within 1.0 °C of the setpoint. In addition, the cover must be within 1 °C of 55 °C. It may take several minutes for the 9800 instrument to stabilize at the setpoint temperature.</p>
2.	<p>When the Stabilizing at setpoint value decrements to zero, read the digital thermometer.</p> <p>The TNU Performance screen counts down the time until the setpoint is stabilized.</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <pre style="font-family: monospace; font-size: 0.9em;"> TNU Performance Sample temp = XX.X°C Cover temp = XXX°C Stabilizing at setpoint X:XX Cancel</pre> </div> <p style="text-align: center; margin: 0;">F1 F2 F3 F4 F5</p> <p>Note: Refer to the instructions included with your Temperature Verification Kit for a detailed description of the operation of the Model 4500 digital thermometer.</p>
3.	<p>Using the numeric keys, enter the value displayed on the digital thermometer into the Enter actual block temperature field.</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <pre style="font-family: monospace; font-size: 0.9em;"> TNU Performance Sample temp = XX.X°C Cover temp = XXX°C Enter actual block temperature <input style="width: 50px;" type="text"/> Cancel</pre> </div> <p style="text-align: center; margin: 0;">F1 F2 F3 F4 F5</p> <p>Note: The digital thermometer displays a four-digit value; round this value off to three digits before typing it in the TNU Performance screen.</p> <p>Note: You can record this value on the Temperature Non-Uniformity Test Data Sheet on page 2-15 to keep a permanent record of the test.</p>

To run the Temperature Non-Uniformity Test: *(continued)*

7. Slide the heated cover back and repeat steps 2 through 8 of “Setting Up the Probe Assembly” on page 2-9 and steps 2 through 6 of this procedure.

Complete these steps for all eight wells to be tested:

- A1
- A12
- C4
- C9
- F4
- F9
- H1
- H12

The 9800 instrument software evaluates the uniformity of the sample block temperature for the setpoint values you entered and displays the results. A summary screen opens at the conclusion of the test.

Well	95°C	55°C	Well	95°C	55°C
A1	XX.X	XX.X	F4	XX.X	XX.X
A12	XX.X	XX.X	F9	XX.X	XX.X
C4	XX.X	XX.X	H1	XX.X	XX.X
C9	XX.X	XX.X	H12	XX.X	XX.X

Accept Cancel

F1 F2 F3 F4 F5

Note: If you entered values on the Temperature Non-Uniformity Test Data Sheet, compare those values with the actual test results.

8. Press **F1** (Accept).

Evaluating the Results

When the 9800 instrument completes the Temperature Non-Uniformity Test, the TNU Performance screen opens. Use the table below to evaluate the results.

Test Result	Message/Action
Pass (≤ 0.50)	<div style="border: 1px solid black; padding: 10px; text-align: center;"> <p>TNU Performance</p> <p>TNU at 95°C is XX.XX - Pass</p> <p>TNU at 55°C is XX.XX - Pass</p> <p style="text-align: right;"><input type="button" value="Cancel"/></p> </div> <p style="text-align: center;">F1 F2 F3 F4 F5</p>
Fail (> 0.50)	<p>The setpoint temperature(s) for which the test failed are followed by the word "Fail."</p> <div style="border: 1px solid black; padding: 10px; text-align: center;"> <p>TNU Performance</p> <p>TNU at 95°C is XX.XX - Fail</p> <p>TNU at 55°C is XX.XX - Fail</p> <p style="text-align: right;"><input type="button" value="Cancel"/></p> </div> <p style="text-align: center;">F1 F2 F3 F4 F5</p> <p>Repeat the procedure to make sure you did not misread the digital thermometer or make a data entry error.</p> <p>If the test fails again, contact Applied Biosystems Technical Support.</p>

Ending the Test

When you have completed all measurements, end the test.

To end the test:

1.	Press F5 (Cancel).
2.	Remove the Probe Assembly from the sample block.
3.	Turn off the digital thermometer and clean off the oil.
4.	Wait for the sample block to reach room temperature (~25 °C), then remove the 9800 Temperature Verification Frame from the sample block.
5.	Clean the oil off the sample block.

**Temperature
Non-Uniformity
Test Data Sheet**

When running the Temperature Non-Uniformity Test, record the setpoint values for the wells listed on this data sheet. At the end of the Temperature Non-Uniformity Test, check the values displayed on the 9800 instrument against the values recorded here to help you maintain accurate test records.

Date		
Tested By		
Probe Serial No.		
Thermometer Serial No.		
Setpoint Value	95 °C	55 °C
A1		
A12		
C4		
C9		
F4		
F9		
H1		
H12		

System Performance Diagnostics

After you have configured the 9800 instrument, conduct system performance diagnostics to verify the integrity of the cooling and heating system.

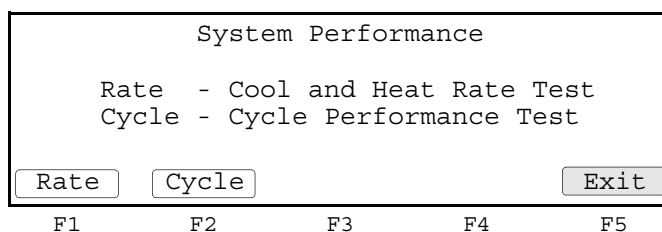
There are two system performance diagnostic tests:

- Rate Test
- Cycle Test

IMPORTANT! Before you begin these tests, make sure that you place an empty 96-well plate with full plate cover on the sample block. Slide the heated cover forward, and pull the release lever down.

Accessing the Tests

To access the tests, press **System** in the Diagnostics screen.



Running The Rate Test

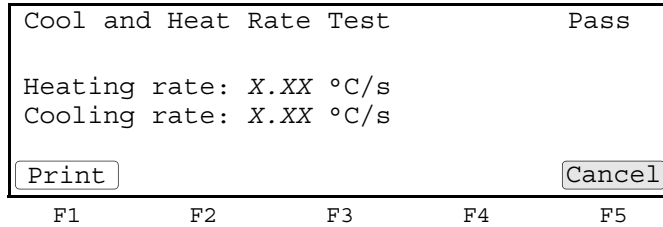
Use the Rate Test to verify that the Peltier units are operating correctly. The test takes approximately 5 minutes to run.

To run the Rate Test:

1.	<p>In the System Performance screen, press Rate.</p> <div style="border: 1px solid black; padding: 10px; margin: 10px 0;"> <p style="text-align: center;">WARNING!!!</p> <p style="text-align: center;">Install the appropriate empty Consumables into the Sample Block. Refer to System Performance Section of Block User Manual.</p> <p style="text-align: center;"> <input type="button" value="Cont"/> <input type="button" value="Cancel"/> </p> </div> <p style="text-align: center;">F1 F2 F3 F4 F5</p>
----	---

To run the Rate Test: *(continued)*

2. Install a plate and cover, then press **Cont.**
 The instrument runs through a series of tests where the sample block is stabilized at 35 °C, 95 °C, and 4 °C.
 At the end of the test, the Cool and Heat Test screen opens, giving the test results and the pass/fail status.



The passing ranges are:

Block Type	Heating Rate	Cooling Rate
Aluminum 96-well	3.5 to 5.5	3.5 to 5.5

Running the Cycle Test

Use the Cycle Test to verify that the PCR cycling function operates properly. This test takes approximately 15 minutes to run.

To run the Cycle Test:

1. In the System Performance screen, press **Cycle**.

WARNING!!!

Install the appropriate empty Consumables into the Sample Block. Refer to System Performance Section of Block User Manual.

F1 F2 F3 F4 F5

2. Install a plate cover, then press **Cont**.

The Cycle Test executes a standard PCR cycling reaction, and measures and reports the average cycle time and the cycle to cycle variation.

Note: Pressing Pause during the Cycle Test may generate false test results. Rerun the Cycle Test if Pause was pressed during the test.

At the end of the test, the Cycle Performance screen opens, giving the test results and the pass/fail status.

Cycle Performance Pass

Average Cycle Time: XXX.X sec
Cycle Time STD: X.X sec

F1 F2 F3 F4 F5

The passing ranges are:

Average Cycle Time	< 100 seconds
Cycle Time STD	≤ 1 second

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