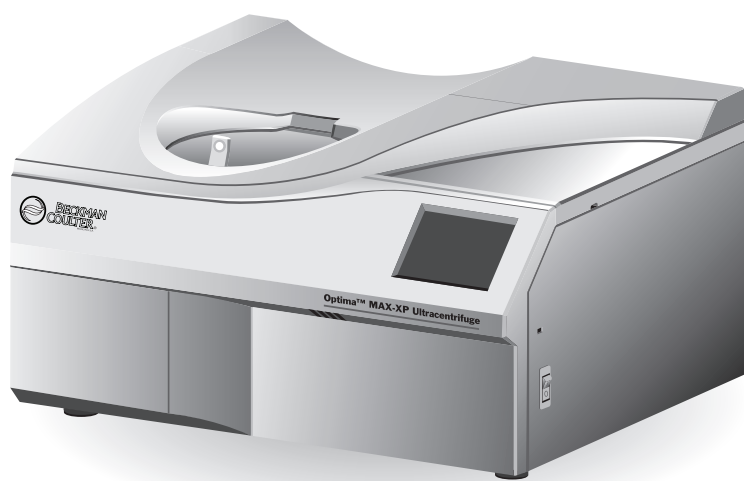




# Instructions For Use

## Optima MAX-XP

Ultracentrifuge



PN 393552AM  
December 2022



Beckman Coulter, Inc.  
250 S. Kraemer Blvd.  
Brea, CA 92821 U.S.A.



## **Optima MAX-XP**

### **Ultracentrifuge**

PN 393552AM (December 2022)

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*May be covered by one or more pat. - see [www.beckman.com/patents](http://www.beckman.com/patents)*

Original Instructions

# Revision History

Your Optima MAX-XP documentation can be found on our website. For updates, go to [www.beckman.com/techdocs](http://www.beckman.com/techdocs) and download the latest version of the manual or system help for your instrument.

**Revision AG, 04/2017**- Changes or additions were made to: Multiple Compliance.

**Revision AH, 08/2018**- Changes or additions were made to: CHAPTER 4, User Message Chart; CHAPTER 5, Supplies.

**Revision AJ, 06/2020**- Changes or additions were made to: CHAPTER 3, Installing the Rotor, CHAPTER 3, Manual Run.

**Revision AK, 08/2022**- Changes or additions were made to: CHAPTER 3, Operation, CHAPTER 5, Optional Accessories

**Revision AL, 09/2022**- Changes or additions were made to: Safety Notice, Multiple Compliance

**Revision AM, 12/2022**- Changes or additions were made to: [CHAPTER 1, Power Switch](#)

*Note: Changes that are part of the most recent revision are indicated in text by a bar in the margin of the amended page.*



# Safety Notice

Read all product manuals and consult with Beckman Coulter-trained personnel before attempting to operate the ultracentrifuge. Do not attempt to perform any procedure before carefully reading all instructions. Always follow product labeling and manufacturer's recommendations. If in doubt as to how to proceed in any situation, contact your Beckman Coulter representative.

## Alerts for Danger, Warning, Caution, and Note

---



**DANGER** indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.



**WARNING** indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



**CAUTION** indicates a potentially hazardous situation, which, if not avoided, may result in minor or moderate injury.

**NOTE** NOTE is used to call attention to notable information that should be followed during installation, use, or servicing of this equipment.

## Safety During Installation and/or Maintenance

---

This ultracentrifuge is designed to be installed by a Beckman Coulter Field Service representative. Installation by anyone other than authorized Beckman Coulter personnel invalidates any warranty covering the ultracentrifuge.

This ultracentrifuge weighs 105 kg (230 lb). Do not attempt to lift or move it without assistance.

Any servicing of this equipment that requires removal of any covers can expose parts which involve the risk of electric shock or personal injury. Make sure that the power switch is off and the ultracentrifuge is disconnected from the main power source, and refer such servicing to qualified personnel.

Do not replace any ultracentrifuge components with parts not specified for use on this ultracentrifuge.

## Electrical Safety

---

To reduce the risk of electrical shock, this equipment uses a three-wire electrical cord and plug to connect the ultracentrifuge to earth-ground. To preserve this safety feature:

- Make sure that the matching wall outlet receptacle is properly wired and earth-grounded. Check that the line voltage agrees with the voltage listed on the name-rating plate affixed to the ultracentrifuge.
- Never use a three-to-two wire plug adapter.
- Never use a two-wire extension cord or a two-wire non-grounding a type of multiple-outlet receptacle strip.
- Do not install the ultracentrifuge on a ground fault-protected power source.

Do not place containers holding liquid on or near the chamber door. If they spill, liquid may get into the ultracentrifuge and damage electrical or mechanical components.

## Safety Against Risk of Fire

---

Fuses protect certain electrical circuits within this ultracentrifuge against overcurrent conditions. For continued protection against the risk of fire, replace only with the same type and rating specified.

This ultracentrifuge is not designed for use with materials capable of developing flammable or explosive vapors. Do not ultracentrifuge such materials (such as chloroform or ethyl alcohol) in this ultracentrifuge nor handle or store them within the required 30-cm (1-ft) area surrounding the ultracentrifuge.

## Mechanical Safety

---

For safe operation of the equipment, observe the following:

- Use only the rotors and accessories designed for use in this ultracentrifuge.
- Do not exceed the maximum rated speed of the rotor in use.
- Do not lift or move the ultracentrifuge while the rotor is spinning.
- NEVER attempt to slow or stop the rotor by hand.
- NEVER attempt to override the door interlock system while the rotor is spinning.
- In the event of a power failure, do not attempt to retrieve the sample from the ultracentrifuge for at least 1 hour. Then follow the instructions for sample recovery in [CHAPTER 4, Troubleshooting](#).

## Chemical and Biological Safety

---

Normal operation may involve the use of solutions and test samples that are pathogenic, toxic, or radioactive. Such materials should not be used in this ultracentrifuge, however, unless *all necessary safety precautions are taken*.

- Observe all cautionary information printed on the original solution containers prior to their use.
- Handle body fluids with care because they can transmit disease. No known test offers complete assurance that they are free of micro-organisms. Some of the most virulent—Hepatitis (B and C) and HIV (I-V) viruses, atypical mycobacteria, and certain systemic fungi—further emphasize the need for aerosol protection. Handle other infectious samples according to good laboratory procedures and methods to prevent spread of disease. Because spills may generate aerosols, observe proper safety precautions for aerosol containment. Do not run toxic, pathogenic, or radioactive materials in this ultracentrifuge without taking appropriate safety precautions. Biosafe containment should be used when Risk Group II materials (as identified in the World Health Organization *Laboratory Biosafety Manual* are handled; materials of a higher group require more than one level of protection.
- Dispose of all waste solutions according to appropriate environmental health and safety guidelines.

**It is your responsibility to decontaminate the ultracentrifuge and accessories before requesting service by Beckman Coulter Field Service.**

## Summary of Instrument Labels

---

This section provides information for some labels and symbols appearing on the Optima MAX-XP instrument housing. These labels and symbols may be associated with user-serviceable procedures. Individual hazards associated with a specific procedure in this manual may use these labels and symbols, and are included in **Warnings** or **Cautions** within the procedures for that task.

### Caution Symbol



This symbol indicates a caution message and appears adjacent to an explanation or other symbols that define the caution.

## RoHS Caution



制造日期 / Mfg. Date

This label and materials declaration table (the Table of Hazardous Substance's Name and Concentration) are to meet People's Republic of China Electronic Industry Standard SJ/T11364-2006 “Marking for Control of Pollution Caused by Electronic Information Products” requirements.

This logo indicates that this electronic information product contains certain toxic or hazardous elements, and can be used safely during its environmental protection use period. The number in the middle of the logo indicates the environmental protection use period for the product. The outer circle indicates that the product can be recycled. The logo also signifies that the product should be recycled immediately after its environmental protection use period has expired. The date on the label indicates the date of manufacture.

## Recycling Label



This symbol is required in accordance with the Waste Electrical and Electronic Equipment (WEEE) Directive of the European Union. The presence of this marking on the product indicates:

- the device was put on the European Market after August 13, 2005 and
- the device is not to be disposed of via the municipal waste collection system of any member state of the European Union.

It is very important that customers understand and follow all laws regarding the proper decontamination and safe disposal of electrical equipment. For Beckman Coulter products bearing this label, please contact your dealer or local Beckman Coulter office for details on the take-back program that will facilitate the proper collection, treatment, recovery, recycling and safe disposal of the device.



## Multiple Compliance



- Recycling – Refer to the Recycling Label section in this document.
- **CE** – A “CE” mark indicates that a product has been assessed before being placed on the market, and has been found to meet European Union safety, health, and/or environmental protection requirements.
- **UK CA** – A “UKCA” mark indicates that a product has been assessed before being placed in the UK market, and has been found to meet UK safety, health, and/or environmental protection requirements.
- 169502 – This label indicates recognition by a Nationally Recognized Testing Laboratory (NRTL) that the instrument has met the relevant product safety standards.

**NOTE** 169502 is applicable to North American models only.

- The RCM mark is intended for use on products that comply with Australian Communications Media Authority (ACMA) EMC Requirements.

## CAUTION Static Sensitive Area



Indicates an area of the instrument which is sensitive to static electrostatic discharge (ESD). To prevent damage due to electrostatic discharge, always wear a properly earth-grounded wrist strap while operating this instrument. For details on proper grounding, see IEEE standard P1100.

## DANGER High Voltage



Operation, replacement or servicing of any components where contact with bare, live hazardous parts could occur, possibly resulting in electric shock, should only be performed by your Beckman Coulter representative.

## Protective Ground



This symbol is used to indicate a protective ground. This instrument must be properly grounded. Do not under any circumstances operate the instrument unless it is properly grounded.

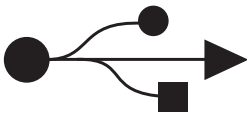
## WARNING Risk of Fire



**WARNING**  
RISK OF FIRE.  
REPLACE FUSE AS MARKED.

Before replacing fuses, shut off power and disconnect the power cord. Failure to do so can cause electric shock and/or equipment damage. Replace fuses only with approved type and rating replacement fuse.

## Universal Serial Bus (USB)



This symbol indicates the location of a universal serial bus (USB) connector.

## MAX-XP CAPACITY

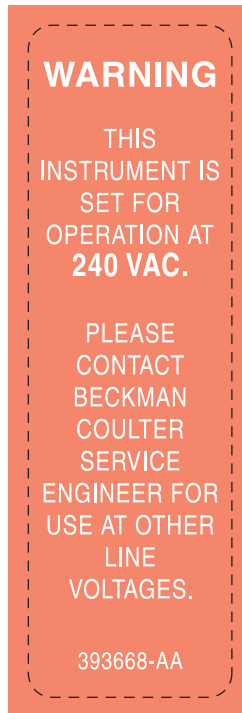
### **MAX-XP CAPACITY**

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DRIVE OIL:	110 cc
VACUUM PUMP OIL:	600 cc
DIFFUSION PUMP OIL:	30 cc

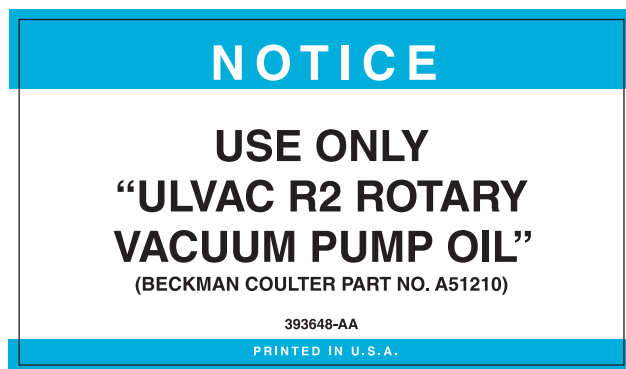
This label indicates oil capacities for the indicated subsystems.

## WARNING 240 VAC



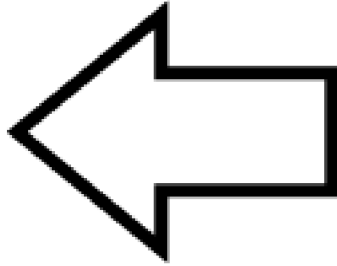
This symbol indicates that the instrument has been configured for operation at 240 VAC. Consult with a Beckman Coulter service engineer for use at other line voltages.

## NOTICE Regarding Vacuum Pump Oil



This label indicates to use only ULVAC R2 rotary vacuum pump oil (Beckman Coulter part number A51210).

## **Rotor Rotation**



This indicates the direction of instrument rotor rotation.

## **SER NO (Serial Number)**

**SER NO**

This label indicates the location of the instrument serial number.

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## Certification

---

To ensure full system quality, the Beckman Coulter Optima MAX-XP Ultracentrifuge has been manufactured in a registered ISO 9001 or 13485 facility. It has been designed and tested to be compliant (when used with Beckman Coulter rotors) with the laboratory equipment requirements of applicable regulatory agencies. Declarations of conformity and certificates of compliance are available at [www.beckman.com](http://www.beckman.com).

## Scope of Manual

---

This manual is designed to acquaint you with the Optima MAX-XP Ultracentrifuge, its functions, specifications, operation, and routine operator care and maintenance. We recommend that you read this entire manual, especially the *Safety Notice* and all safety-related information, before operating the ultracentrifuge or performing ultracentrifuge maintenance.

- **CHAPTER 1** contains system specifications and a brief physical and functional description of the ultracentrifuge, including the operating controls and indicators.
- **CHAPTER 2** describes the space and power requirements for installing and connecting the ultracentrifuge.
- **CHAPTER 3** describes the ultracentrifuge operating procedures.
- **CHAPTER 4** lists possible malfunctions with possible causes and suggested corrective actions.
- **CHAPTER 5** contains procedures for routine operator care and maintenance, as well as a brief list of supplies, replacement parts, and accessories.

### CAUTION

**If the ultracentrifuge is used in a manner other than that specified in this manual, the safety and performance of this equipment could be impaired. Further, the use of any equipment other than that recommended by Beckman Coulter has not been evaluated for safety. Use of any equipment not specifically recommended in this manual and/or the appropriate rotor manual is the sole responsibility of the user.**

## Typographic Conventions

---

Certain symbols are used in this manual to call out safety-related and other important information. These international symbols may also be displayed on the ultracentrifuge and are reproduced on the inside back cover of this manual.

Certain typographic conventions are used throughout this manual to distinguish names of user interface components, such as buttons and displays.

- Touchscreen buttons (for example, **START** or **VACUUM**) appear in boldface.
- Display names (for example, **SPEED RPM** or **TIME hr:mm**) appear in boldface.

## CFC-Free Centrifugation

---

To ensure minimal environmental impact, no CFCs are used in the manufacture or operation of the Optima MAX-XP Ultracentrifuge.

## Radio Interference

---

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of 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 this instruction manual, may cause interference to radio communications. Operation of this equipment in a residential area is likely to cause interference, in which case the user will be required to correct the interference at his own expense.

## Canadian Regulations

This equipment does not exceed the Class A limits for radio noise emissions from digital apparatus as set out in the radio interference regulations of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de Classe A prescrites dans le règlement sur le brouillage radioélectrique édicté par le Ministère des Communications du Canada.

## Description

---

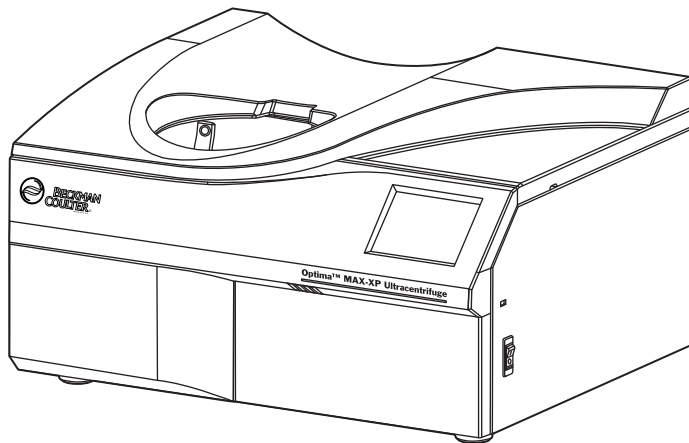
The Optima MAX-XP microprocessor-controlled tabletop ultracentrifuge (see [Figure 1.1](#)) generates high centrifugal forces for a variety of applications. The ultracentrifuge design features a variable-frequency induction drive, thermoelectric temperature control system, self-purging vacuum system, rotor overspeed identification system, user login feature, program memory that contains multiple five-step programs, and a choice of acceleration and deceleration rates.

Manual and programmed operations are available from the integrated touchscreen interface.

- In manual operation, you enter the individual run parameters before beginning each run.
- In programmed operation, you can duplicate runs quickly and accurately by selecting previously entered programs and running them again.

Additionally, a pulse feature allows you to manually accelerate the rotor for sample preparation.

**Figure 1.1** The Optima MAX-XP Ultracentrifuge



## Intended Use

Use the Optima MAX-XP Ultracentrifuge for applications requiring high force fields that are capable of separating and isolating small particles (virus, bacteria, and subcellular components like mitochondria) and large molecules (peptides, DNA, proteins). These samples are derived from a variety of natural and synthesized components.

## Rotor Chamber

The steel chamber is coated with a chemical-resistant finish to resist corrosion. The rotor drive hub and speed sensors are visible in the bottom of the chamber.

## Vacuum System

A diffusion pump, in series with a mechanical vacuum pump, reduces chamber pressure to below 10 microns (1.34 Pa). The vacuum system turns on when you press the **VACUUM** button on the touchscreen, or when you start a run. When the vacuum system is turned on, a self-purging system continuously removes moisture from the vacuum system.

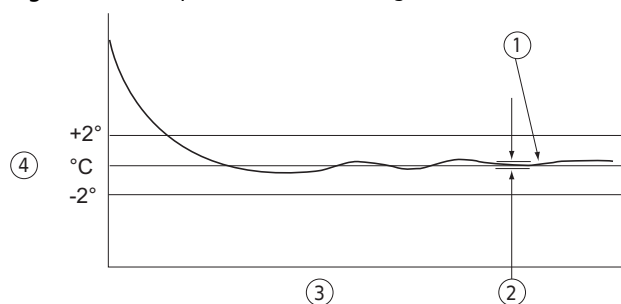
There are two ways to start the vacuum system (there must be power to the ultracentrifuge):

- 1 To start pumping air out of the chamber manually, press the **VACUUM** button.
  - The chamber door locks and the vacuum system starts.
- 2 To start the vacuum system for a run, place the rotor in the chamber, close the door, and press the **START** button.
  - The door locks, the rotor starts spinning, and the vacuum system starts.
  - The **VACUUM** button on the touchscreen interface turns green when the vacuum system is activated.
    - The button displays the vacuum level in microns.
- 3 To release the vacuum system, press the **VACUUM** button after the rotor has come to a complete stop.
  - This unlocks the door and turns off the vacuum system, including the mechanical and diffusion pumps.

## Temperature Sensing and Control

The solid-state thermoelectric temperature control system uses only forced air—no coolant is required. With the power on, the temperature control system is activated when the door is closed, and the vacuum system is turned on. Run temperature can be set between 0 and 40°C.

A sensor in the rotor chamber continuously monitors chamber temperature. The microprocessor calculates the required chamber temperature to maintain the selected rotor temperature. Peak-to-peak fluctuations of rotor temperature (after reaching thermoequilibrium) will be within 0.1°C (see [Figure 1.2](#)).

**Figure 1.2** Temperature Control Diagram

- |                                    |                    |
|------------------------------------|--------------------|
| 1. Actual rotor temperature        | 3. Time            |
| 2. 0.1° (peak-to-peak fluctuation) | 4. Set Temperature |

## Drive

---

The air-cooled, direct-drive induction motor is frequency controlled, with no gears or brushes. In addition, the drive does not require an oil vacuum seal or external oil reservoir. It is externally cooled by forced air and internally cooled by oil. The drive delivers ultra-smooth, quiet performance.

## Controls and Indicators

---

### Power Switch

The power switch, located on the right-hand side of the ultracentrifuge, controls electrical power to the ultracentrifuge. When the instrument is first turned on, a splash screen (or welcome screen) will initially be displayed until the user interface is launched. The power switch is also a circuit breaker that will trip to cut off power in the event of a power overload. The power switch must be turned on before the chamber door can be opened. In the event of a power failure, you can retrieve your sample manually. For more information, see [Retrieving Your Sample in Case of Power Failure](#) in [CHAPTER 4, Troubleshooting](#).

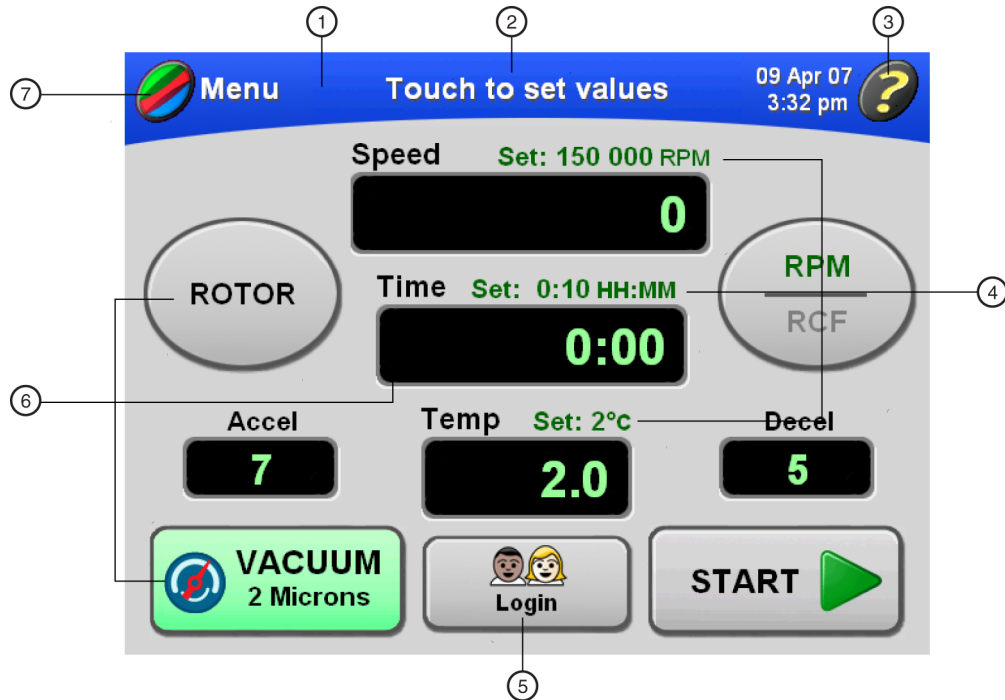
### Touchscreen Interface

The operation of the ultracentrifuge is controlled via the touchscreen interface display, which comprises touch-sensitive display fields and buttons for entering and displaying run parameters and program information. When you press a button, additional screens may appear to allow you to enter or select more information. [Figure 1.3](#) points out the elements of the touchscreen interface.

Use your fingertip to press the buttons on the touchscreen. A short beep sounds each time you press a button.

During operation (Run mode), the **Speed**, **Time**, and **Temp** display fields provide real-time status.

Figure 1.3 Touchscreen Interface



- |                        |                               |
|------------------------|-------------------------------|
| 1. Windshield          | 5. Login Button               |
| 2. Screen Instructions | 6. Buttons and Display Fields |
| 3. Help Button         | 7. Menu Button                |
| 4. Set Values          |                               |

The buttons and display fields on the Main screen are described briefly below. For complete information and instructions on using the touchscreen interface, see [CHAPTER 3, Operation](#).

### Color-Coded Windshield

The windshield changes color to indicate the current state of the ultracentrifuge:

- Blue indicates Set-up mode.
- Green indicates that a run (or a delayed run) is in progress (Run mode).
- Red indicates a diagnostic or user alert. A message is displayed to provide information and allow you to take the appropriate action.

The center of the windshield displays instructions for entering parameters and other commands in each screen.

### MENU BACK

Press the **MENU** button in the upper left-hand corner of the screen to open the menu. When you are working in other screens, the **MENU** button changes to the **BACK** button to allow you to navigate back to the previous screen.

The menu options are:

- **History** — Displays a list of previous runs.
- **Accel/Decel** — Displays a screen in which to select the acceleration and deceleration rates.



- **Program** — Displays a list of programmed runs and provides an interface from which to set up new programs.
- **Admin** — Opens the **Administrator Options** screen. If no user with Administrator privileges is logged in, opens the **User Login** screen.
- **My Options** — If no users are logged in, opens the **User Login** screen. If a user is logged in, displays the **Choose Button Type** screen.
- **Pulse** — Activates pulse mode.

### HELP

Press the **HELP** button in the upper right-hand corner of the screen to display an online help window. The help text that appears applies to the information in the current screen.

### ROTOR

Press the **ROTOR** button to select a rotor. The currently selected rotor appears on the button.

### RPM/RCF

Press the **RPM/RCF** button to toggle between RPM and RCF.

RPM indicates rotor speed in revolutions per minute. RCF (relative centrifugal field) represents the ratio of the centrifugal acceleration at a specified radius and speed to the standard acceleration of gravity.

The currently selected mode appears in green above the horizontal line on the button.

### SPEED

Press the **SPEED** button to select the speed. The set speed appears above this button, which doubles as a display field for the actual run speed. The set speed and actual speed can be displayed in RPM or RCF.

When the speed is increasing (rotor acceleration), animated arrows in the display field point upward. When the speed is decreasing (rotor deceleration), the animated arrows point downward.

### TIME

Press the **TIME** button to select the run duration in hours and minutes. This button doubles as a display field for the actual run time as follows:

- In a timed run, this display field indicates the remaining run time in hours and minutes. The time display begins counting down when you press the **START** button; it continues counting down to 0. Animated arrows will point downward. The run automatically ends when the set time reaches 0 and deceleration begins (a tone sounds when the rotor stops spinning). If a malfunction shuts down the ultracentrifuge during a run, the countdown stops and the time that remained when the run stopped stays in the display. By comparing this time with the original set time, you can determine when the run ended.
- In a hold run, the time display indicates the time elapsed since you pressed the **START** button. Animated arrows will point upward. After 99 hours and 59 minutes, the timer resets to 0 and continues counting elapsed time. The word "**HOLD**" displays as the set time.
- In a delayed run, when you press the **START** button after setting the start date and/or time, the time display first reflects the remaining delay time. When the delay concludes and the run starts, the time display indicates the remaining run time.
- In a pulse (momentary) run, the time display is blank.

### **TEMP**

Press the **TEMP** button to select the rotor temperature in degrees C at thermoequilibrium. The set temperature appears above this button, which doubles as a display field for the actual run temperature.

### **VACUUM**

Press the **VACUUM** button to start or stop the vacuum system.

### **LOGIN**

Press the **LOGIN** button to go to the **User Login** screen. The name of the currently logged-in user appears on this button.

The touchscreen interface includes a user timeout function. The currently logged-in user will be logged out automatically after 5 minutes of inactivity: 1) while setting up parameters for a run, 2) if Pulse mode is selected but the Pulse run is not started, and 3) after the user's run has been completed.

### **START STOP**

Press the **START** button to start a run. To stop a run, press the **STOP** button.

## Safety Features

---

The Optima MAX-XP ultracentrifuge has been designed and tested to operate safely indoors at altitudes up to 2000 m (6562 ft). Ultracentrifuge safety features are described below.

### **Door**

The steel chamber door has an electromechanical door-locking mechanism to prevent operator contact with a spinning rotor. To lock and unlock the door, press the **VACUUM** button on the touchscreen.

When there is a power failure, the door lock can be tripped manually for sample recovery. See [CHAPTER 4, Troubleshooting](#).

### **Barrier Ring**

A structural steel armor ring acts as the primary barrier, surrounded by a steel secondary barrier ring to provide full protection for the operator.

### **Imbalance Detector**

An imbalance detector monitors the rotor during the run, causing automatic shutdown if rotor loads are severely out of balance. At low speeds, an incorrectly loaded rotor can cause an imbalance. Rotor instability can also occur if the ultracentrifuge is moved, or if it is not resting level on the work surface. See [CHAPTER 4, Troubleshooting](#).

## Overspeed and Rotor Identification System

The overspeed system, which includes magnetic speed sensors in the rotor chamber and magnets on the bottom of each rotor, continuously monitors the rotor during centrifugation. At 1000 RPM, the system identifies the maximum permitted speed.

## Name Rating Plate

---

A name rating plate is affixed to the rear of the ultracentrifuge. When contacting Beckman Coulter regarding your ultracentrifuge, always mention the serial number and model number. You can also view the serial number and other information by pressing the **HELP** button, then pressing the **ABOUT** button in the Help screen.

## Specifications

---

*Only values with tolerances or limits are guaranteed data. Values without tolerances are informative data, without guarantee.*

## Control Features

Specifications	Description
<b>Speed</b>	<ul style="list-style-type: none"><li>• Set speed:<ul style="list-style-type: none"><li>— 5000 to 150,000 RPM in 1000-RPM increments</li></ul></li><li>• Speed display:<ul style="list-style-type: none"><li>— actual rotor speed in 100-RPM increments above 5000 RPM and 10-RPM increments at speeds below 5000 RPM</li></ul></li><li>• Speed control:<ul style="list-style-type: none"><li>— actual rotor speed, <math>\pm 50</math> RPM of set speed</li></ul></li></ul>
<b>Time</b>	<ul style="list-style-type: none"><li>• Set time:<ul style="list-style-type: none"><li>— to 99 hours 59 minutes</li></ul></li><li>• Time display:<ul style="list-style-type: none"><li>— Timed run: indicates run time remaining</li><li>— Hold mode: indicates actual run time</li><li>— Programmed operation: indicates time remaining in step</li></ul></li></ul>

Specifications	Description
<b>Temperature</b>	<ul style="list-style-type: none"> <li>• Set temperature:               <ul style="list-style-type: none"> <li>— 0 to 40°C in 1° increments</li> </ul> </li> <li>• Temperature control (after equilibration):               <ul style="list-style-type: none"> <li>— <math>\pm 2^\circ\text{C}</math> of set temperature</li> </ul> </li> <li>• Temperature display:               <ul style="list-style-type: none"> <li>— actual rotor temperature in 0.1° increments</li> </ul> </li> <li>• Ambient temperature range:               <ul style="list-style-type: none"> <li>— 15 to 35°C</li> </ul> </li> </ul>
<b>Acceleration</b>	10 acceleration profiles <ul style="list-style-type: none"> <li>• 9 slow rates from 0 to 5000 RPM followed by full acceleration to set speed; or maximum acceleration</li> </ul>
<b>Deceleration</b>	11 deceleration profiles <ul style="list-style-type: none"> <li>• 10 slow rates from 5000 to 0 RPM, including coasting to a stop without brake; or full dynamic braking from set speed</li> </ul>

## Physical Data

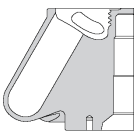
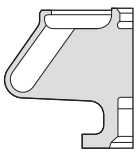
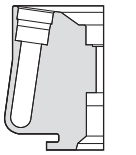
Specification	Description
<b>Width</b>	73.9 cm (29.1 in.)
<b>Depth</b>	61.7 cm (24.3 in.)
<b>Height</b>	<ul style="list-style-type: none"> <li>• Front left: 34.5 cm (13.6 in.)</li> <li>• Rear right: 39.4 cm (15.5 in.)</li> </ul>
<b>Weight</b>	105 kg (230 lb)
<b>Ventilation Clearances (sides and rear)</b>	7.6 cm (3.0 in.)
<b>Finishes</b>	<ul style="list-style-type: none"> <li>• Touchscreen panel:               <ul style="list-style-type: none"> <li>— coated polycarbonate</li> </ul> </li> <li>• Top surface:               <ul style="list-style-type: none"> <li>— acrylic baking enamel</li> </ul> </li> <li>• Other surfaces:               <ul style="list-style-type: none"> <li>— general purpose paint</li> </ul> </li> </ul>
<b>Electrical Supply</b>	Class 1
<b>Vacuum</b>	below 10 microns (1.34 Pa)
<b>Electrical Requirements</b>	<ul style="list-style-type: none"> <li>• 220/240 VAC~, 6 A, 50 Hz</li> <li>• 120 VAC~, 12 A, 50/60 Hz</li> <li>• 100 VAC~, 12 A, 50/60 Hz</li> </ul>

Specification	Description
Humidity Restrictions	<75% (noncondensing)
Maximum Heat Dissipation into Room Under Steady-State Conditions	2400 Btu/hr (0.7 kW)
Noise Level 1 m in front of ultracentrifuge	<47 dB(A)
Installation (overvoltage) Category	II
Pollution Degree	2 <sup>a</sup>

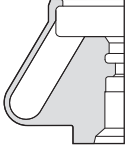
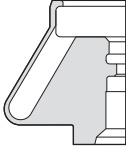
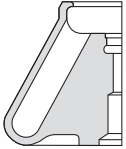
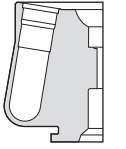
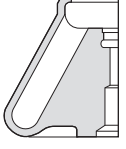
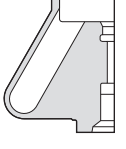
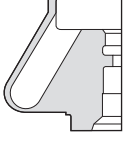
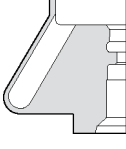
a. Normally, only nonconductive pollution occurs; occasionally, however, a temporary conductivity caused by condensation must be expected.

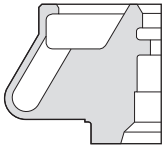
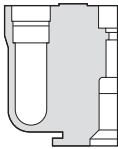
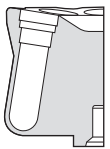


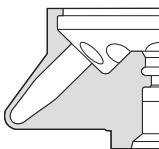
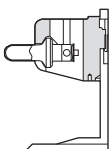
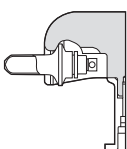
## Available Rotors


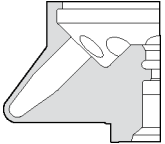
All Beckman Coulter ML- and TL-series rotors can be used in the Optima MAX-XP ultracentrifuge. The rotors are described in individual manuals that accompany each rotor. Information on rotors and accessories is also available in *Rotors and Tubes for Tabletop Preparative Ultracentrifuges (TLR-IM)* and in the Beckman Coulter *Ultracentrifuge Rotors, Tubes & Accessories* catalog (publication BR-8101).

Rotor Profile	Description	Max RPM/ <i>k</i> factor <sup>a</sup>	Max RCF <sup>b</sup> ( $\times g$ ) at $r_{\max}$	Number of Tubes $\times$ Nominal Capacity	Rotor Manual Number
	MLA-150 Fixed Angle 30° Angle	150,000 10.4	1,003,000	8 $\times$ 2.0 mL	393554
	MLA-130 Fixed Angle 28° Angle	130,000 8.7	1,019,000	10 $\times$ 2.0 mL	TL-TB-021
	TLN-120 Near Vertical Tube 8° Angle	120,000 7	585,000	8 $\times$ 1.2 mL	TL-TB-017

**Description**  
Available Rotors

Rotor Profile	Description	Max RPM/ k factor <sup>a</sup>	Max RCF <sup>b</sup> ( $\times g$ ) at $r_{max}$	Number of Tubes $\times$ Nominal Capacity	Rotor Manual Number
	TLA-120.2 Fixed Angle 30° Angle	120,000 8	627,000	10 $\times$ 2.0 mL	TL-TB-016
	TLA-120.1 Fixed Angle 30° Angle	120,000 8	627,000	14 $\times$ 0.5 mL	TL-TB-015
	TLA-110 Fixed Angle 28° Angle	110,000 20	657,000	8 $\times$ 5.1 mL	TL-TB-019
	TLN-100 Near Vertical Tube 9° Angle	100,000 14	450,000	8 $\times$ 3.9 mL	TL-TB-013
	TLA-100.4 <sup>c</sup> Fixed Angle 28° Angle	100,000 16	543,000	8 $\times$ 5.1 mL	TL-TB-014
	TLA-100.3 Fixed Angle 30° Angle	100,000 14	543,000	6 $\times$ 3.5 mL	TL-TB-011
	TLA-100.2 <sup>c</sup> Fixed Angle 30° Angle	100,000 12	436,000	10 $\times$ 2.0 mL	TL-TB-005
	TLA-100.1 <sup>c</sup> Fixed Angle 30° Angle	100,000 12	436,000	12 $\times$ 0.5 mL	TL-TB-004

Rotor Profile	Description	Max RPM/ k factor <sup>a</sup>	Max RCF <sup>b</sup> ( $\times g$ ) at $r_{\max}$	Number of Tubes $\times$ Nominal Capacity	Rotor Manual Number
	TLA-100 Fixed Angle 30° Angle	100,000 7	436,000	20 $\times$ 0.2 mL	TL-TB-003
	TLV-100 Vertical Tube 0° Angle	100,000 9	400,000	8 $\times$ 2.0 mL	TL-TB-007
	MLN-80 Near Vertical Tube 9° Angle	80,000 20	390,000	8 $\times$ 8.0 mL	TL-TB-022
	MLA-80 Fixed Angle 26° Angle	80,000 29	444,000	8 $\times$ 8.0 mL	TL-TB-024
	MLA-55 Fixed Angle 35° Angle	55,000 53	287,000	8 $\times$ 13.5 mL	TL-TB-026
	TLA-55 Fixed Angle 45° Angle	55,000 66	186,000	12 $\times$ 1.5 mL	TL-TB-020
	TLS-55 Swinging Bucket 90° Angle <sup>d</sup>	55,000 50	259,000	4 $\times$ 2.2 mL	TL-TB-006
	MLS-50 Swinging Bucket 90° Angle <sup>d</sup>	50,000 71	268,000	4 $\times$ 5.0 mL	TL-TB-023

Rotor Profile	Description	Max RPM/ <i>k</i> factor <sup>a</sup>	Max RCF <sup>b</sup> ( $\times g$ ) at $r_{\max}$	Number of Tubes $\times$ Nominal Capacity	Rotor Manual Number
	MLA-50 <sup>e</sup> Fixed Angle 30° Angle	50,000 92	233,000	6 $\times$ 32.4 mL	B03896
	TLA-45 <sup>c</sup> Fixed Angle 45° Angle	45,000 99	125,000	12 $\times$ 1.5 mL	TL-TB-012

- Maximum speeds are based on a solution density of 1.7 g/mL for all rotors, except the MLS-50, MLA-50, MLA-55, and MLA-80; solution density for these rotors is 1.2 g/mL. The *k* factors are listed for all Beckman Coulter rotors (using the largest-volume tube) as a measure of the rotor's relative pelleting efficiency.
- Relative Centrifugal Field (RCF) is the ratio of the centrifugal acceleration at a specified radius and speed ( $rw^2$ ) to the standard acceleration of gravity ( $g$ ) according to the following formula:  $RCF = r\omega^2/g$  — where  $r$  is the radius in millimeters,  $\omega$  is the angular velocity in radians per second ( $2\pi \text{ RPM}/60$ ), and  $g$  is the standard acceleration of gravity ( $9807 \text{ mm/s}^2$ ).  
After substitution:  $RCF = 1.12r (\text{RPM}/1000)^2$
- No longer manufactured.
- At speed.
- Temperature control at set temperature is 0 to 35°.



# Preinstallation Requirements

## Introduction

---

*Preinstallation requirements have been provided for your Optima MAX-XP ultracentrifuge. The following information is included in case the ultracentrifuge must be relocated.*

**NOTE** This ultracentrifuge is designed to be installed by Beckman Coulter Field Service. Installation by anyone other than authorized Beckman Coulter personnel invalidates any warranty covering the ultracentrifuge.

## Space Requirements

---

 **WARNING**

**Do not place the ultracentrifuge near areas containing flammable reagents or combustible fluids. Vapors from these materials could enter the ultracentrifuge air system and be ignited by the motor. Maintain a 30-cm (1-ft) clearance envelope around the ultracentrifuge while it is running. No persons or any hazardous materials should be within this clearance boundary while the ultracentrifuge is operating, except to change operating controls, if required.**

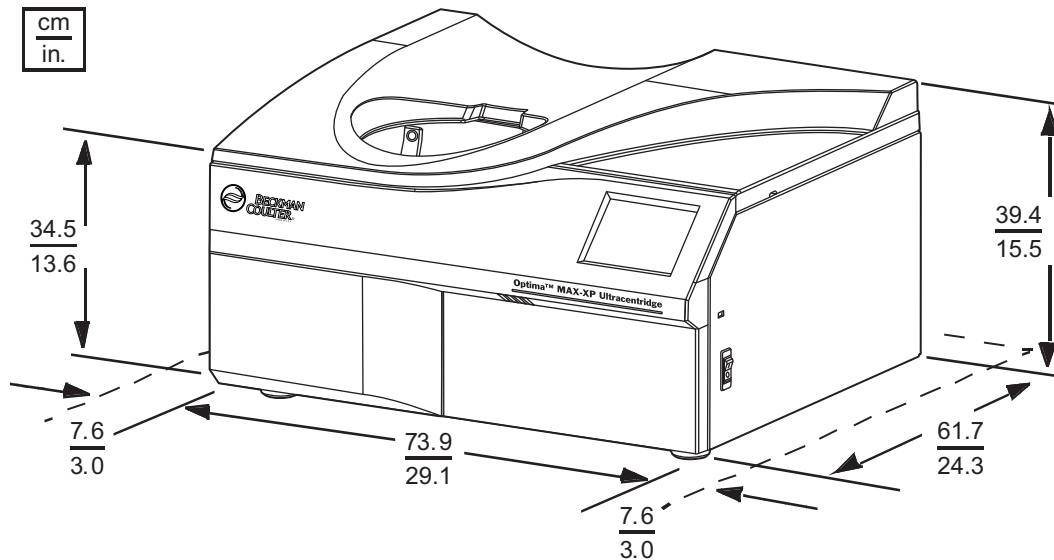
If it is necessary to move the ultracentrifuge, maintain the following conditions:

- 1** Select a location away from heat-producing laboratory equipment, with sufficient ventilation to allow heat dissipation.
- 2** Position the ultracentrifuge on a level surface, such as a sturdy table or laboratory bench that can support the weight of the ultracentrifuge 105 kg (230 lb) and resist vibration.
  - a.** Place the ultracentrifuge at least 5.1 cm (2 in.) from the front edge of the laboratory bench.
- 3** In addition to space for the ultracentrifuge itself (see [Figure 2.1](#) for dimensions), allow 7.6 cm (3-in.) clearances at the sides and back to ensure sufficient air circulation.

The ultracentrifuge must have adequate air ventilation to ensure compliance to local requirements for vapors produced during operation.

Relative humidity should not exceed 75% (noncondensing).

Figure 2.1 Dimensions of the Optima MAX-XP Ultracentrifuge



## Electrical Requirements

Voltage ranges	220/240 VAC~, 6 A, 50 Hz
	120 VAC~, 12 A, 50/60 Hz
	100 VAC~, 12 A, 50/60 Hz

To reduce the risk of electrical shock, this ultracentrifuge uses a 1.83-m (6-ft) three-wire electrical cord to be attached to the IEC 320/CEE-20 AC power connector at the rear of the ultracentrifuge and a plug to connect to earth-ground. (A plug that meets your local electrical and safety requirements was supplied with the ultracentrifuge. Contact your local Beckman Coulter office for specific information regarding local requirements.) To preserve this safety feature:

- Make sure that the matching wall outlet receptacle is properly wired and earth-grounded. Verify that the line voltage agrees with the voltage listed on the name rating plate affixed to the ultracentrifuge. Then plug in both ends of the ultracentrifuge power cord.
- Never use a three-to-two wire plug adapter.
- Never use a two-wire extension cord or a two-wire non-grounding type of multiple-outlet receptacle strip.
- If there is any question about voltage, have a qualified service person measure it under load while the drive is operating.

To ensure optimal safety, the ultracentrifuge should be wired to a remote emergency switch (preferably outside the room where the ultracentrifuge is housed, or adjacent to the exit from that room). In case of a malfunction, the ultracentrifuge can be disconnected from the main power source.

## Introduction

---

*This section contains manual and programmed operating procedures. A summary is provided at the start of this section for experienced users.*

 **WARNING**

Normal operation may involve the use of solutions and test samples that are pathogenic, toxic, or radioactive. Handle body fluids with care because they can transmit disease. No known test offers complete assurance that they are free of micro-organisms. Some of the most virulent—Hepatitis (B and C) and HIV (I-V) viruses, atypical mycobacteria, and certain systemic fungi—further emphasize the need for aerosol protection. Handle other infectious samples according to good laboratory procedures and methods to prevent spread of disease. Because spills may generate aerosols, observe proper safety precautions for aerosol containment. Do not run toxic, pathogenic, or radioactive materials in this ultracentrifuge without taking appropriate safety precautions. Biosafe containment should be used when Risk Group II materials (as identified in the World Health Organization *Laboratory Biosafety Manual*) are handled; materials of a higher group require more than one level of protection.

 **WARNING**

Do not use the ultracentrifuge in the vicinity of flammable liquids or vapors, and do not run such materials in the ultracentrifuge. Do not lean on the ultracentrifuge or place items on it while it is operating.

## Touchscreen Interface

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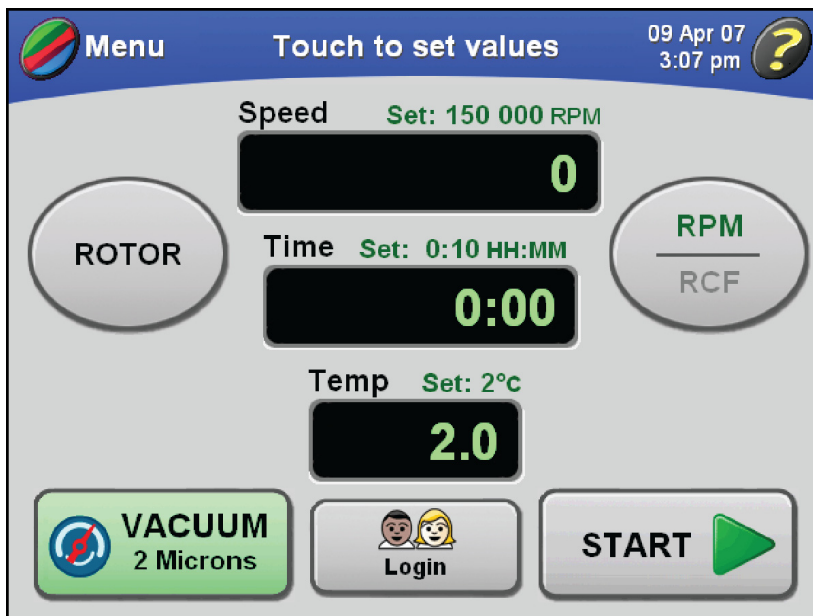
The touchscreen interface (see [Figure 3.1](#)) comprises menu options and touch-sensitive display fields and buttons for entering and displaying run parameters and program information. When you press a button or select a menu option, additional screens appear to allow you to enter or select more information.

You may configure the ultracentrifuge touchscreen for user interaction with different languages. See [Set Interface Language](#).

Use your fingertip to press the buttons on the touchscreen.

A short beep sounds each time you press a button on the touchscreen (unless the audio volume has been muted by your administrator).

Figure 3.1 Touchscreen Interface Main Screen



## Modes of Operation

### Setup Mode

During Setup mode, the ultracentrifuge is available for setting a run. The windshield is blue.

The touchscreen interface includes a user timeout function. The current logged-in user will be logged out automatically after 5 minutes of inactivity:

1. while setting up parameters for a run,
2. if Pulse mode is selected but the Pulse run is not started,
3. after the user's run has been completed.

### Run Mode

During Run mode, the windshield is green to indicate that a run is in progress. These parameters can be changed during Run mode: speed, time, temperature, and Accel/Decel; however, if the run is above 5000 RPM, the new Accel value will be ignored and the new Decel value will be used.

Some Administrator functions can be performed in Run mode. For more information, see [Administrator Operations](#).

### Diagnostics/User Messages

When a condition arises that requires operator attention, the windshield turns red. Press the windshield to open a dialog showing the diagnostic message. User messages communicate information about the ultracentrifuge or alert you to an abnormal condition. For more information, see [CHAPTER 4, Troubleshooting](#).

## Summary of Optima MAX-XP Run Procedures

---

This section provides a quick view of the steps for running the ultracentrifuge both manually and via a program. This is provided as a reference after you become familiar with using the ultracentrifuge and the touchscreen interface. For detailed procedures that include images of the interface screens, see [Manual Operation](#), [Programmed Operation](#), and [Pulse Run Operation](#).

*For runs at other than room temperature, refrigerate or warm the rotor beforehand for fast equilibration. For non-room temperature runs, prepare the system as described under [Ultracentrifuge Pre-Run Cooling or Warming](#).*

### Ultracentrifuge and Rotor Preparation

Prepare the rotor for centrifugation as described in the applicable rotor manual.

**NOTE** To achieve optimum ultracentrifuge performance, follow these instructions between runs: Leave the ultracentrifuge powered on, the door closed, and the vacuum turned on. You do not need to leave a rotor inside the chamber.

#### Installing the Rotor

The power must always be turned on before you can unlock and open the chamber door.

- 1 Turn the power on.
  - The touchscreen interface display turns on and is available.
  - a. To end a run for any reason, do not turn the power off.
  - b. Press the **STOP** button.

---

- 2 Try opening the door.
  - The ultracentrifuge will accept this command only when the rotor is at rest.
  - a. If the chamber is under vacuum and the door is locked, press the **VACUUM** button to vent the chamber and unlock the door.
    - You can hear a slight hissing sound when the chamber vents.
    - Do not attempt to open the chamber door for several minutes or until an audible bell chime is heard after pressing the **VACUUM** button. This ensures the vacuum chamber is completely vented so the door can be opened.

---

- 3 After the chamber has been vented, use the door handle to slide the door open.

---

- 4 Install the rotor according to the directions in the rotor manual.
  - a. Ensure that the rotor is seated on the drive hub.

- 
- 5 Close the chamber door.
    - a. To keep the chamber clean and dry, leave the door closed whenever possible.
- 

### Ultracentrifuge Pre-Run Cooling or Warming

Follow these steps to precool or warm the ultracentrifuge.

- 
- 1 Press the **TEMP** button on the Main screen.
    - The **Enter Run Temperature** screen appears.
- 
- 2 Enter the temperature, and press the **OK** button to accept.
    - The entered temperature becomes the set temperature that appears above the **TEMP** button on the Main screen.
- 

- 3 Close the door.
- 

- 4 Press the **VACUUM** button to turn the vacuum system on.
  - Note that it is not necessary to use the **START** button.
  - Pre-run cooling or warming begins.

**NOTE** In addition to precooling or warming the ultracentrifuge, cool or warm the rotor outside the ultracentrifuge to the required temperature before the run for fast temperature equilibration.

---

## Manual Run

This section is provided as a quick reference for executing a manual run. For detailed procedures of each step accompanied by screen shots of the touchscreen interface, see [Manual Operation](#).

- 
- 1 Turn the power on.
- 
- 2 Install the rotor according to the applicable rotor manual, then close the chamber door.
    - Turn the vacuum system on 30 minutes prior to starting a centrifuge cycle with samples. This allows the vacuum system to warm up and eliminate any moisture condensation within the system.

- 
- 3** Press the **ROTOR** button, then choose the rotor (listed by type and serial number) from the rotor list.
    - This step is optional.
    - a.** If you don't want to select a rotor, go to Step 4.
- 
- 4** Press the **SPEED** button, then enter the run speed (5000 to 150,000 RPM).
- 
- 5** Press the **TIME** button, then enter the run time (up to 99 hours, 59 minutes).
- 
- 6** Press the **TEMPERATURE** button, then enter the required run temperature (0 to 40°C).
- 
- 7** To accept the default Accel/Decel rates of Max (maximum), go to Step 8.
    - This step is optional.
    - a.** Select the **Accel/Decel** menu option, and select the acceleration rate number, from Max (fastest) to 9 (slowest).
    - b.** Select the deceleration rate number, from Max (fastest) to 0 (coast).
      - You can skip this step and accept the default rates of Max (maximum).
- 
- 8** Press the **START** button to start the run.
    - The instrument may take up to 20 minutes to reach the 5 micron vacuum level.
- 

## Programmed Run

This section is provided as a quick reference for executing a programmed run. This procedure assumes that programmed runs have been created and saved. For detailed procedures of each step accompanied by screen shots of the touchscreen interface, see [Programmed Operation](#).

- 
- 1** Turn the **POWER** switch to **ON**.
- 
- 2** Install the rotor according to the applicable rotor manual, then close the chamber door.
- 
- 3** Select the **Program** menu option, then select a program from the list.
- 
- 4** Press the **OK** button to load the program parameters.

- 5 Press the **START** button to start the run.

## Manual Operation

This section includes detailed procedures for entering run parameters for manual operation.

### Preparing the Ultracentrifuge

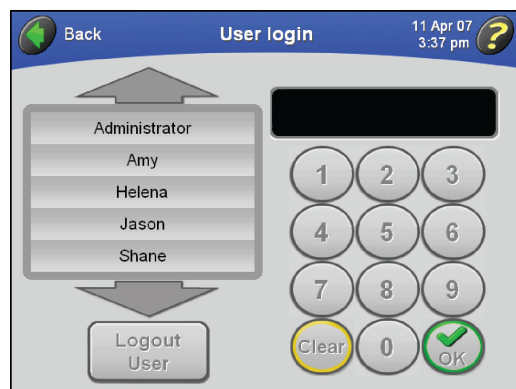
In the first step of a manual run, install the rotor and perform any precooling or prewarming procedures that may be required. For more information and detailed steps, see [Ultracentrifuge and Rotor Preparation](#).

### Logging In

Depending on your particular setup, you may need to log in with your user name. If your Administrator enables **User Login** is turned on by your Administrator, you will be required to log in prior to the start of a run.

Each user name in the system is accompanied by a PIN. To obtain your PIN, check with your Administrator.

- 1 To log in prior to performing any other actions, press the **LOGIN** button on the Main screen.
  - The **User Login** screen appears.



- a. If you have just pressed the **START** button to start a run and the **User Login** screen appears automatically, go to Step 2.
- 2 Select your user name, enter your PIN on the keypad, and press **OK** to accept.
    - The Main screen returns to view.



- If you were required to log in, the run starts.

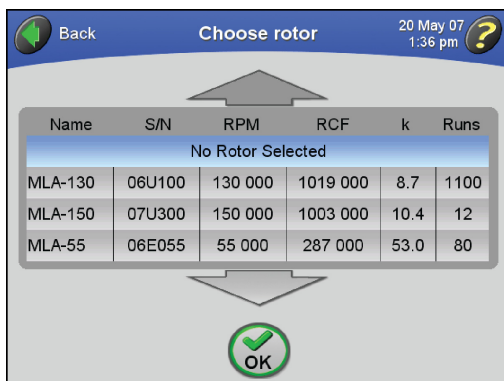
## Selecting a Rotor

There are two reasons for selecting a rotor:

- To track rotor usage (rotor logging). If your Administrator has turned **Rotor Logging** on, you must select a rotor prior to performing a run.
- To convert RPM to RCF. The ultracentrifuge needs to know the  $r_{\max}$  of the rotor on which to perform its calculations.

1 On the Main screen, press the **ROTOR** button.

- The **Choose Rotor** screen appears.

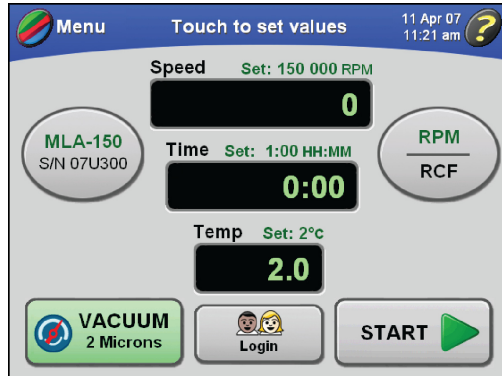


- a. If necessary, use the large arrows to bring additional rotor names into view.

**NOTE** If you are starting a run without selecting a rotor and a message appears asking you to select a rotor, press **OK** in the message box, then press the **ROTOR** button.

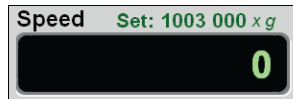
**NOTE** If **No Rotor Selected** is highlighted in this list, it means that no rotor is currently selected. If a rotor is selected and you want to remove it from your run parameters, select **No Rotor Selected**, or select another rotor.

- 2 Select the desired rotor, and press the **OK** button to accept.
  - The Main screen returns to view, and the selected rotor name and serial number appear on the **ROTOR** button.



- a. If you were about to start a run and were required to select a rotor, the run starts automatically when the Main screen returns to view.

- 3 To convert RPM to RCF for the selected rotor, press the **RPM/RCF** button.
  - The conversion is calculated automatically, and the set RCF value appears above the **Speed** display.
    - “RCF” displays in green above the horizontal line on the **RPM/RCF** button.



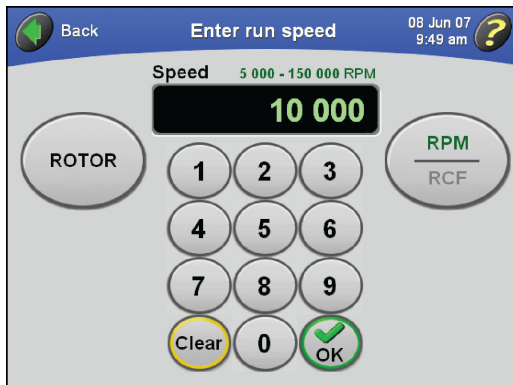
## Entering Run Speed

Run speed ranges from 5000 to 150,000 RPM. If no new speed is entered, the ultracentrifuge automatically selects the last entered speed. The last three digits of the run speed are fixed as zeros and cannot be changed. For example, to enter a run speed of 100,000 RPM, type 100 on the keypad display.

**NOTE** To enter or view an RCF value, you must select the rotor first. For information on selecting a rotor, see [Selecting a Rotor](#).

1 On the Main screen, press the **SPEED** button.

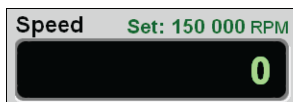
- The **Enter Run Speed** screen appears.



- The acceptable values for speed are shown above the display field: from 5000 to 150,000 RPM.
- If a rotor is selected, the display will show the speed range for that rotor.
  - For example, 5000 to 80,000 is the acceptable speed range for the MLA-80.

2 Enter the speed on the keypad display, and press the **OK** button to accept.

- The Main screen returns to view, and the set speed appears above the **Speed** display.



**NOTE** If you enter an RPM value greater than 150,000 and no rotor is selected, the **OK** button will be grayed out. If you have selected a rotor, any value above the maximum speed for the rotor will cause the **OK** button to be grayed out

3 To change to the new allowable run speed for the selected rotor at any time during a manual run, repeat Steps 1 and 2.

- The rotor will accelerate or decelerate to the new speed if a run is in process.

## Entering Run Time

There are three different run time modes:

- In Timed mode, the time display begins counting down when the rotor begins to spin. The run time automatically terminates when the set time reaches zero.
- In Hold mode, the time display counts up until you stop the run.

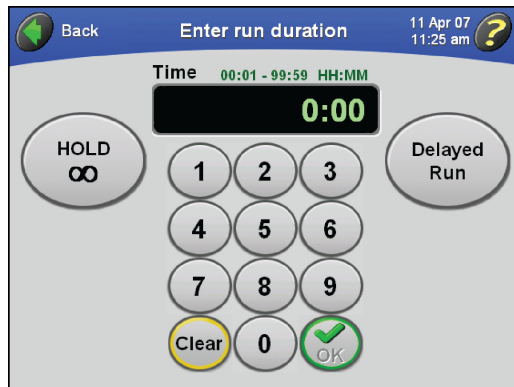
- In Delayed run mode, the time display first shows the remaining delay time. When the delay has concluded, the run starts and the time display counts down as in Timed mode.

## Timed Mode

Run time can be set for up to 99 hours and 59 minutes. If no new run time is entered, the ultracentrifuge automatically selects the last entered run time. The Time display begins counting down when the rotor starts to spin. The run automatically terminates and the rotor begins to decelerate when the set time reaches zero. A tone sounds when the rotor has stopped (unless the audio volume has been muted by your administrator).

1 On the Main screen, press the **TIME** button.

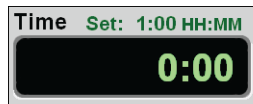
- The **Enter Run Duration** screen appears.



- The acceptable values for run duration are shown above the display field: from 00:01 to 99:59 HH:MM.

2 Enter the time on the keypad display, and press the **OK** button to accept.

- The Main screen returns to view, and the set time appears above the **Time** display.



- If you enter a number of minutes greater than 59, the ultracentrifuge automatically recalculates the time in hours and minutes.

3 To change the set time at any time during a manual run, repeat Steps 1 and 2.

- The ultracentrifuge will adjust to the new run duration.

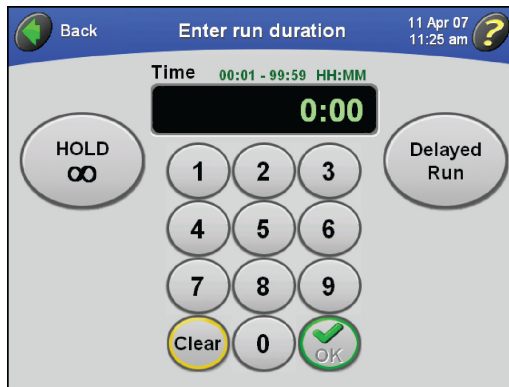
## Hold Mode

In Hold mode, the run continues until you stop the run by pressing the **STOP** button.

**NOTE** During Hold mode, the time display starts at zero and continues counting up until you stop the run. If the count reaches 99:59, it resets to 0.

1 On the Main screen, press the **TIME** button.

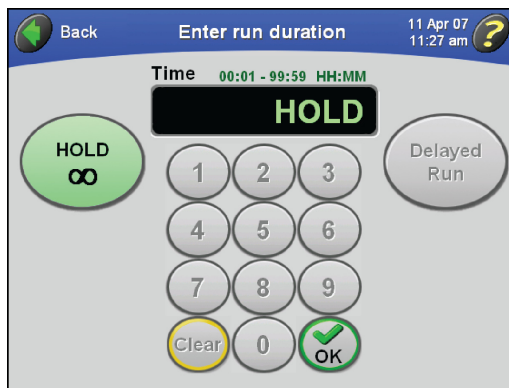
- The **Enter Run Duration** screen appears.



- The acceptable values for run duration are shown above the display field: from 00:01 to 99:59 HH:MM.

2 Press the **HOLD** button.

- The **HOLD** button turns green, and the word **HOLD** appears in the **Time** display field.



3 Press the **OK** button.

- The Main screen returns to view, and Hold mode is indicated above the **Time** display.

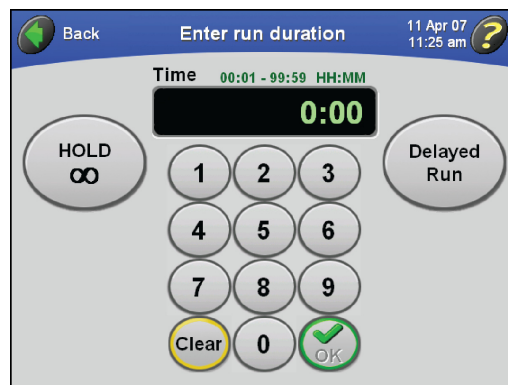


- 4 To cancel Hold mode, repeat steps 1-3.
  - The **HOLD** button turns gray in the **Enter Run Duration** screen.
    - **HOLD** disappears from above the **Time** Display on the Main screen.

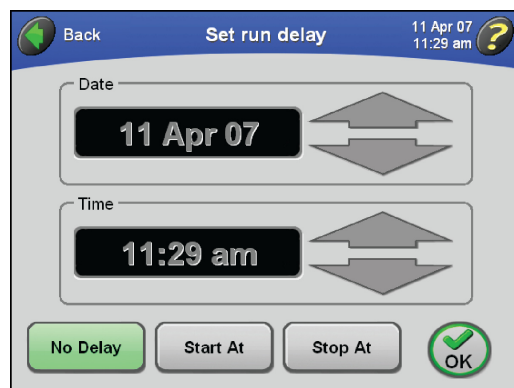
## Setting Up a Delayed Run

You can set up a run that starts or stops in the future.

- 1 On the Main screen, press the **TIME** button.
  - The **Enter Run Duration** screen appears.

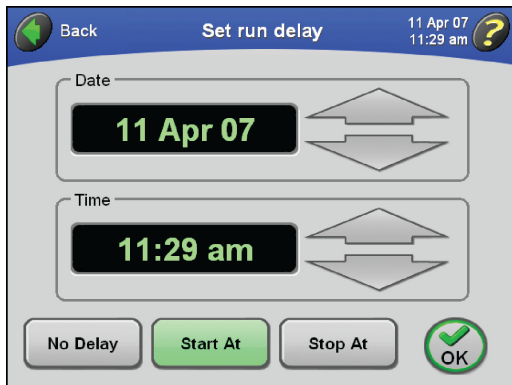


- 2 Enter the run duration, and press the **DELAYED RUN** button.
  - The **Set Run Delay** screen appears.



- The current date and time display in the fields.

- 3 To set a delayed run to start on a particular date and/or time, press the **START AT** button.
  - The **Date** and **Time** fields become active so you can change them.

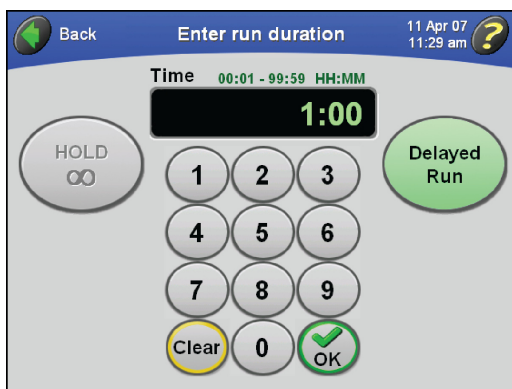


- a. To set a delayed run to stop on a particular date and/or time, press the **STOP AT** button.

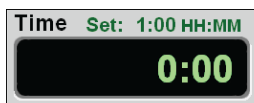
**NOTE** If you set up a run to stop at a particular time, the starting time will be calculated automatically by the ultracentrifuge.

- 4 Press the large arrows until you reach the desired date and time.
  - a. To change the date or time rapidly, hold down the corresponding arrow.

- 5 Press the **OK** button to accept.
  - The **Enter Run Duration** screen returns to view; the **DELAYED RUN** button is green.

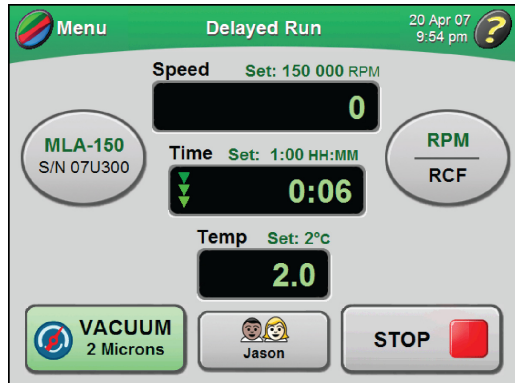


- 6 Press the **OK** button to accept.
  - The Main screen returns to view, and the set duration of the delayed run appears above the **Time** display.



**7** Press the **START** button.

- The Main screen indicates that a delayed run is in progress.

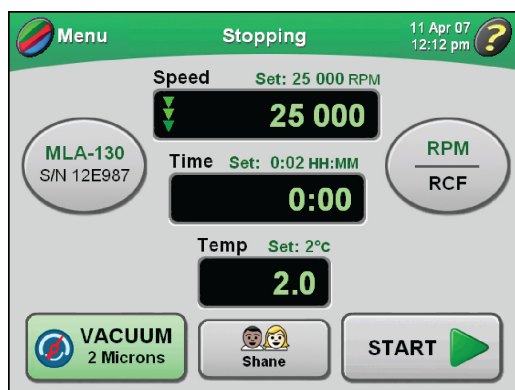


- The **time** display first reflects the remaining delay time (as shown in the example below).
  - When the delay concludes and the run starts, the **time** display indicates the remaining run time.
- a. If you are not logged in and **User Login** has been turned on by the Administrator, you are required to log in.
- For more information, see [Logging In](#).
- b. If you are starting a run without selecting a rotor and a message appears asking you to select a rotor, press **OK** in the message box.
- You will need to select a rotor.
  - For more information, see [Selecting a Rotor](#).

**NOTE** During a delayed run, you cannot change any parameters.

**8** To manually stop the delayed run at any time, press the **STOP** button.

- Any time a run is stopping, it is indicated on the Main screen.



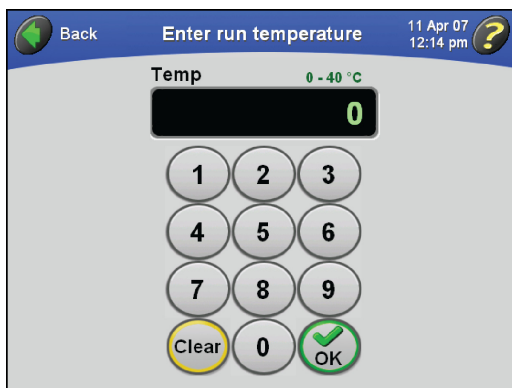


- 9 To cancel the delayed run:
  - a. Press the **TIME** button in the Main screen.
  - b. Press the **DELAYED RUN** button in the **Enter Run Duration** screen.
  - c. Press the **NO DELAY** button in the **Set Run Delay** screen, and press **OK**.
  - d. Press **OK** in the **Enter Run Duration** screen to return to the Main screen.

## Entering Run Temperature

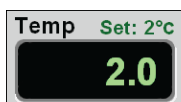
Run temperature can be set from 0 to 40°C. If no new value is entered, the ultracentrifuge automatically uses the last entered temperature. If you clear the previous entry, 25°C is used as the operating temperature.

- 1 On the Main screen, press the **TEMP** button.
  - The **Enter Run Temperature** screen appears.



- The acceptable values for run temperature are shown above the display field: from 0 to 40°C.

- 2 Enter the temperature on the keypad, and press the **OK** button to accept.
  - The Main screen returns to view, and the set run temperature appears above the **Temp** display.



**NOTE** If you enter a temperature value greater than 40, the **OK** button will be grayed out.

**3** To change the set temperature at any time during a manual run, repeat Steps 1 and 2.

- The ultracentrifuge accepts the new temperature immediately.

**NOTE** If the rotor temperature is not within 3°C above the set temperature for more than 40 minutes, a diagnostic message appears. If a run is in progress, the rotor will decelerate to a stop. See [CHAPTER 4, Troubleshooting](#).

## Entering Acceleration and Deceleration Rates

The ultracentrifuge provides ten acceleration rates and eleven deceleration rates to protect the gradient and sample-to-gradient interface. [Table 3.1](#) lists these rates by their corresponding numbers on the touchscreen interface. Acceleration time is the time it takes a rotor to reach 5000 RPM from rest. At 5000 RPM, maximum acceleration takes over until the rotor reaches set speed. Deceleration time is the time it takes a rotor to decelerate from 5000 to rest. From set speed to 5000, the rotor decelerates with full dynamic braking.

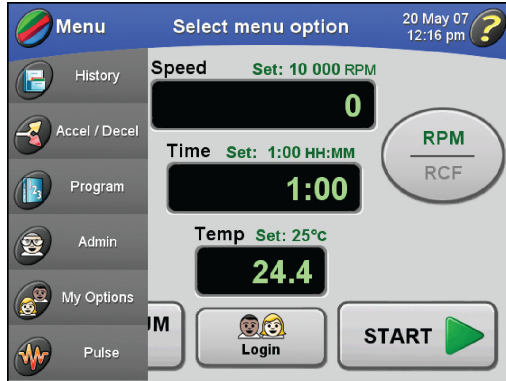
**Table 3.1** Acceleration and Deceleration Rates

Touchscreen Number	ACCEL Time from 0 to 5000 RPM (MM:SS)	DECEL Time from 5000 to 0 RPM (MM:SS)
Max	0:15 <sup>a</sup>	0:15 <sup>a</sup>
1	0:30	1:00
2	1:00	1:30
3	1:30	2:00
4	2:00	2:30
5	2:30	3:00
6	3:00	4:00
7	3:30	6:00
8	4:00	8:00
9	5:00	10:00
0	N/A	Coasting stop from set speed without braking

a. Maximum rate. If no touchscreen number is selected, the rotor will accelerate and/or decelerate at the maximum rates.

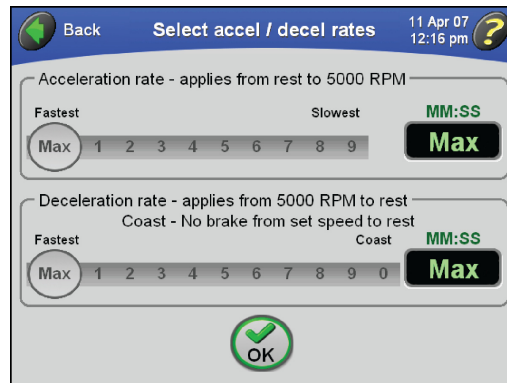
If you use the default rates of maximum, the ultracentrifuge automatically accelerates and decelerates at maximum rate. When you change either the acceleration or deceleration rate, **Accel** and **Decel** buttons display appear on the Main screen showing the selected rates. You can then change the rates using these buttons as an alternative to using the **Accel/Decel** menu option.

- 1 On the Main screen, press the **MENU** button in the upper left-hand corner.
  - The list of menu options appears.



- 2 Select **Accel/Decel**.

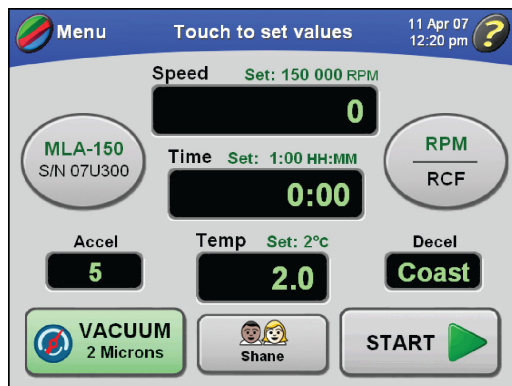
- The **Select Accel/Decel Rates** screen appears.
  - The default value for both is Max (maximum speed).



- 3 Press the desired rate(s) by pressing the appropriate number on the sliders.
  - The time duration for the rate you select is displayed in the fields on the right.
    - If you select a deceleration rate of Coast, “Coast” appears, as shown in this example.



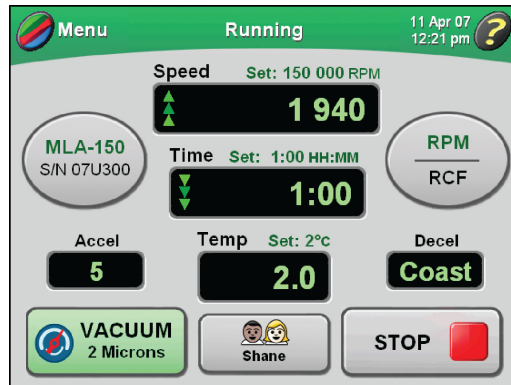
- 4 Press the **OK** button to accept.
  - If either rate is set to anything other than Max, **ACCEL** and **DECEL** buttons appear on the Main screen showing the selected rates.



## Starting a Run

- 1 On the Main screen, press the **START** button.
  - The rotor starts spinning.
  - The vacuum system turns on unless it was previously turned on.
    - The **VACUUM** button turns green and the vacuum level is displayed.
  - The touchscreen windshield turns green.
  - Animated arrows in the **Speed**, **Time**, and **Temp** display fields represent the ultracentrifuge’s progress until the set values are reached.

- The **START** button changes to the **STOP** button.



- The run will end automatically when the **Time** display counts down to zero, and a tone will sound.
- If you are not logged in and **User Login** has been turned on by the Administrator, you are required to log in.
    - For more information, see [Logging In](#).
  - If you start a run without selecting a rotor and a message appears asking you to select a rotor, press **OK** in the message box.
    - You'll need to select a rotor.
    - For more information, see [Selecting a Rotor](#).

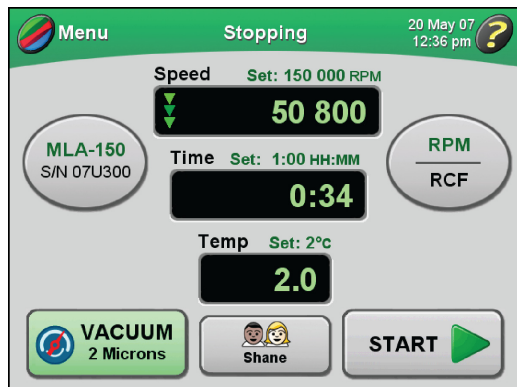
**NOTE** Some features are not accessible during a run.

- After the run has concluded, you can repeat the run using the same parameters. To do this, press the **START** button.
  - The set parameters will be used for the next run.

**NOTE** Keep the chamber door closed between runs.

## Stopping a Run

- 1 If you want to stop a run manually, press the **STOP** button on the Main screen.
  - Any time a run is stopping, it is indicated on the Main screen.

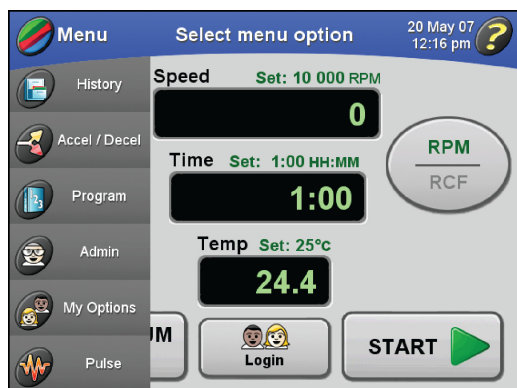


- 2 When the run stops and the time reaches 0, you can press the **VACUUM** button to turn off the vacuum system and vent the vacuum.
  - The chamber door unlocks so you can open it and remove your sample.

## Viewing a Previous Run

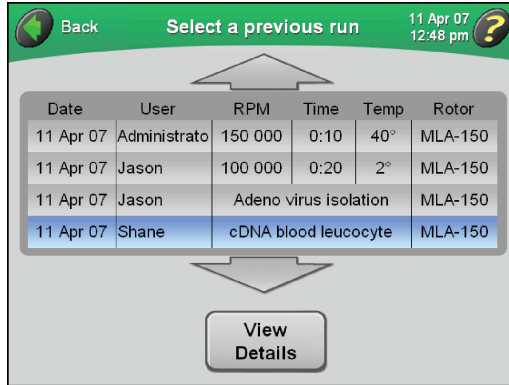
Viewing a previous run allows access to previous set and actual run information.

- 1 On the Main screen, press the **MENU** button.
  - The list of menu options appears.



**2** Select **History**.

- A list of previous runs is displayed.

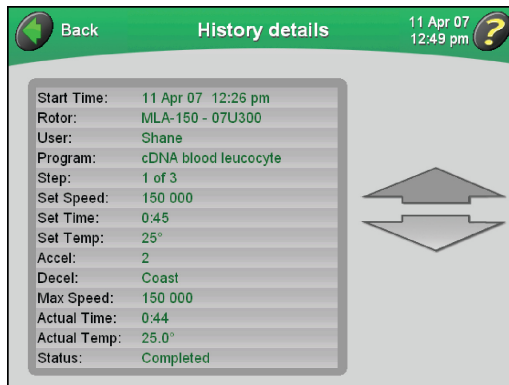


**3** If necessary, use the arrows to bring additional runs into view.

- a. Select the desired run from the list.

**4** To view the details of the selected run, press the **VIEW DETAILS** button.

- The **History Details** screen appears and displays complete information on the run.



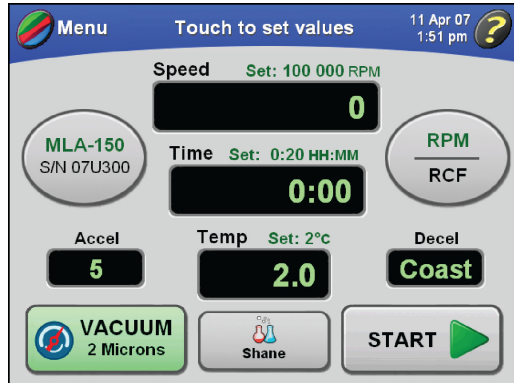
- a. Use the large arrows to bring more details into view.
- If you are viewing a programmed run that contains more than one step, the details for each step appear on a separate screen.

**5** Press the **BACK** button to return to the list of previous runs.

## Changing the Login Button Design

The name of the current logged-in user is displayed on the **LOGIN** button on the Main screen. You can customize the appearance of this button. Twelve designs are available for selection.

- 1 Verify that you are logged in.
  - The **LOGIN** button shows your user name and the currently selected button design.

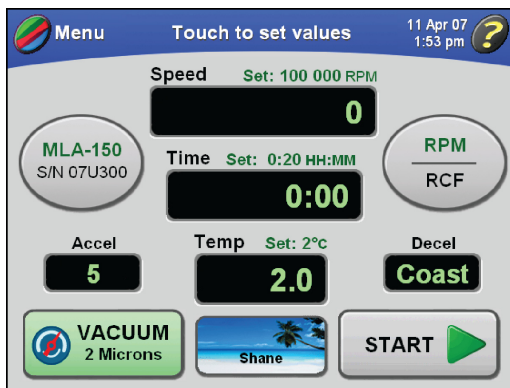


- 2 On the Main screen, press the **MENU** button, and select **My Options**.
  - The **Choose Button Type** screen appears.





- 3 Press the button design that corresponds to the design you want, and press the **OK** button to accept.
  - The Main screen returns to view, and the new button design is displayed until you log out.



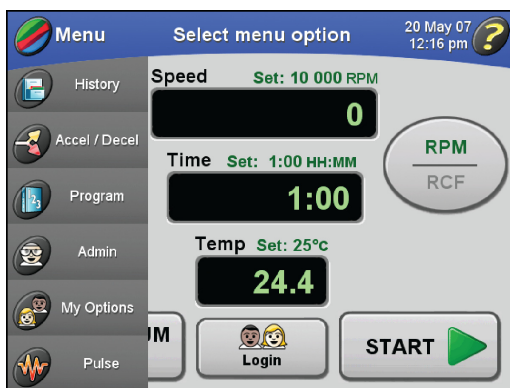
- The selection is saved and displayed the next time you log in.

## Programmed Operation

You can store programs in ultracentrifuge memory. Each program can contain up to five steps (a step contains a set of run parameters). Programs are retained in memory even after powering down the ultracentrifuge.

### Creating a New Program

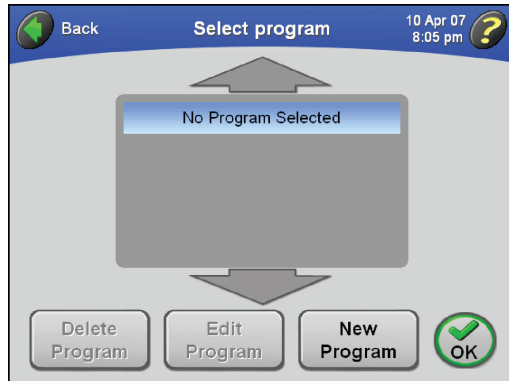
- 1 In the Main screen, press the **MENU** button.
  - The list of menu options appears.



---

**2** Select **Program**.

- The **Select Program** screen appears.

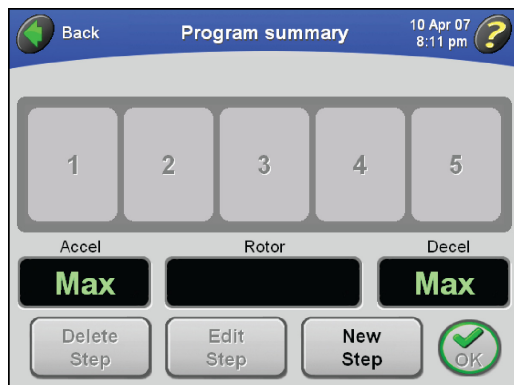


- If no programs have been created and saved, the screen will be blank.

---

**3** Press the **NEW PROGRAM** button.

- The **Program Summary** screen appears.

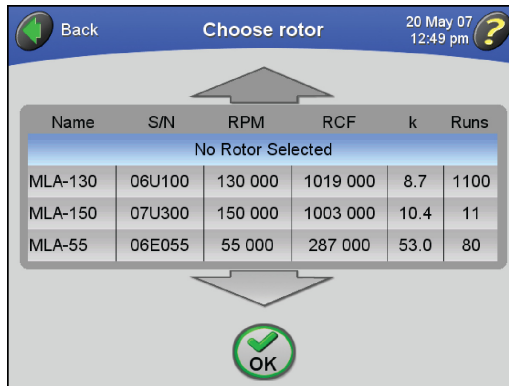


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**4** Select a rotor first.

- The rotor you select will determine the available speed settings.

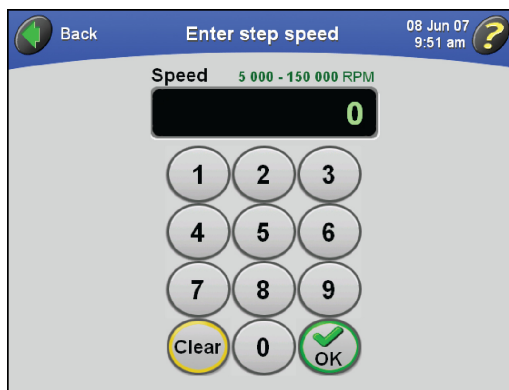
- a. Press the **ROTOR** button.
- The **Choose Rotor** screen appears.



- 5 Select the desired rotor, and press the **OK** button to accept.
- The name of the selected rotor displays on the **Program Summary** screen.



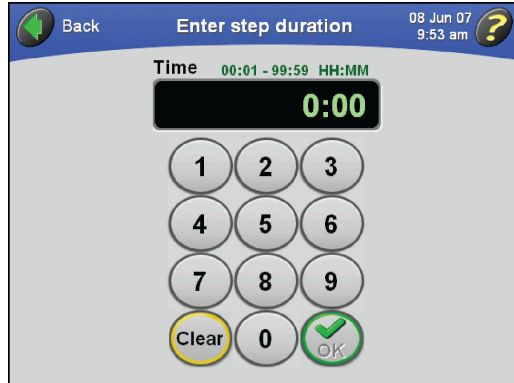
- 6 Press the **NEW STEP** button.
- The **Enter Step Speed** screen appears.



- The acceptable values for run speed are shown above the display field: from 5000 to 150,000 RPM, depending on the selected rotor.

7 Enter the speed on the keypad display, and press the **OK** button to accept.

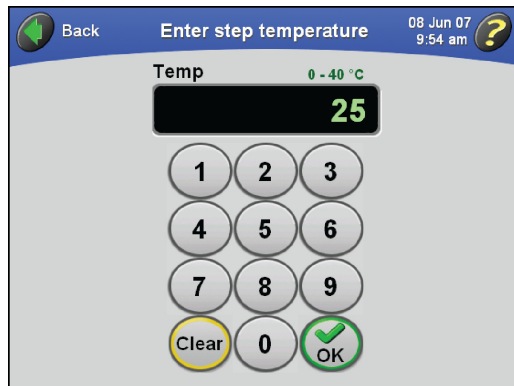
- The **Enter Step Duration** screen appears.



- The acceptable values for run duration are shown above the display field: from 00:01 to 99:59 HH:MM.

8 Enter the run time on the keypad display, and press the **OK** button to accept.

- The **Enter Step Temperature** screen appears.



- If you enter a number of minutes greater than 59, the ultracentrifuge automatically recalculates the time in hours and minutes.
- The acceptable values for run temperature are shown above the display field: from 0 to 40°C.

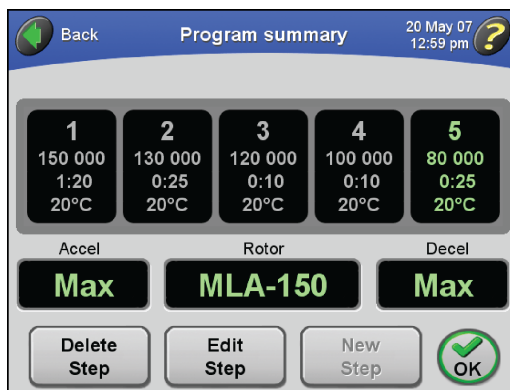
- 9 Enter the temperature on the keypad display, and press the **OK** button to accept.
- The **Program Summary** screen appears and displays the parameters for the first step.



- If you enter a number greater than 40, the **OK** button will be grayed out.

- 10 Repeat Steps 6–9 to enter the parameters for up to five steps for a complete run.

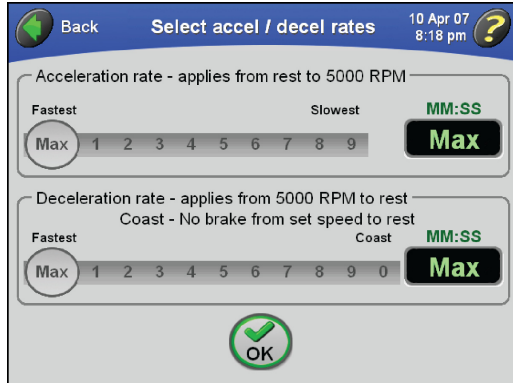
- The **Program Summary** screen displays the parameters of the steps you've entered.
  - The Accel value is for the first step in the program, and the Decel value is for the last step in the program.



- After you enter five steps, the **NEW STEP** button is grayed out.

**11** To change the acceleration/deceleration rates, press either the **ACCEL** or **DECEL** button.

- The **Select Accel/Decel Rates** screen appears.



- To use the maximum values for both rates, go to Step 12.
- Note that the default rates of “**Max**” (maximum) appear in the **Time** fields.

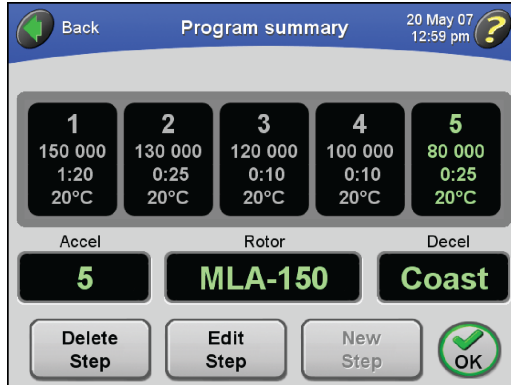
**12** Select the desired rates by touching the corresponding numbers.

- The approximate time duration for the rate you select is displayed on the right.
  - If you select a deceleration rate of coast, “**COAST**” appears in the **Time** field.



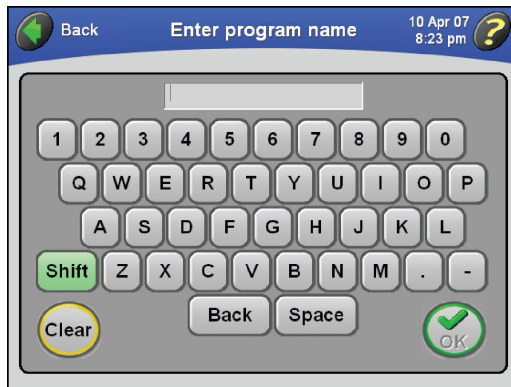
13 Press the **OK** button to accept.

- The rates you select display on the **Program Summary** screen.



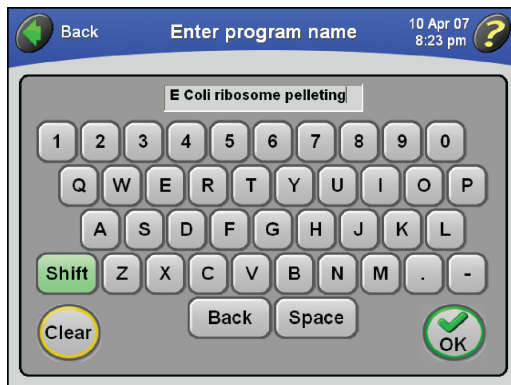
14 Press the **OK** button to accept.

- The **Enter Program Name** screen appears.



15 Type the name of the program using the keypad just as you would a keyboard.

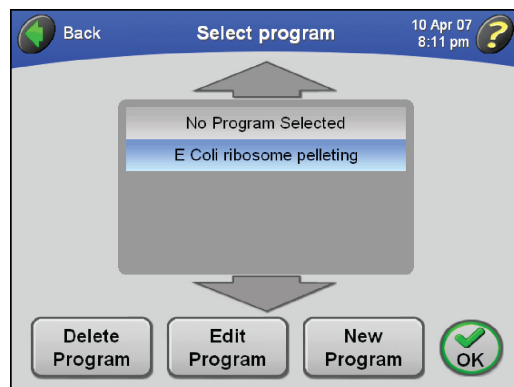
- The name of the program appears at the top of the screen.



- a. Note that the **SHIFT** key is green to indicate that uppercase letters are the default.
  - To enter lowercase letters, press the **SHIFT** key.
- b. Press **BACKSPACE** to erase entered characters one at a time.
- c. To clear the entire entry, press **CLEAR**.

**16** Press the **OK** button to accept.

- The name of the program appears in the list of programs.
  - You now have a new, saved program in memory.

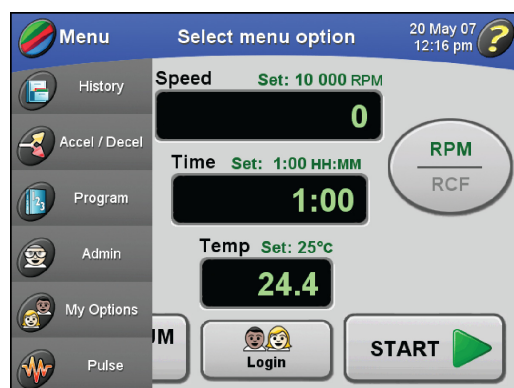


**NOTE** Pressing the **OK** button with a program name selected in this screen loads the program into the ultracentrifuge.

**17** Repeat this procedure to add and save additional programs.

## Starting a Programmed Run

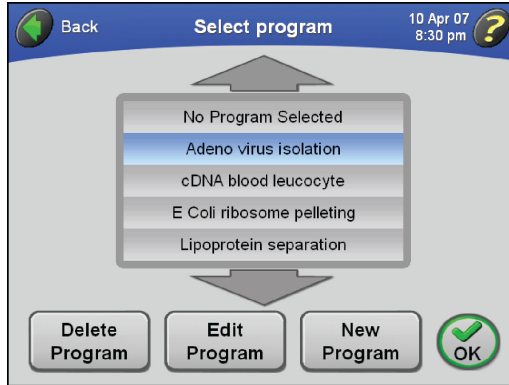
- 1** In the Main screen, press the **MENU** button.
  - The list of menu options appears.





**2** Select Program.

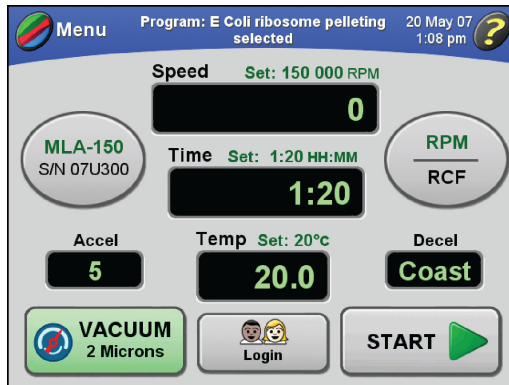
- The **Select Program** screen appears.



**NOTE** **No Program Selected** is highlighted in this list, it means that no saved program is currently selected.

**3** Select the name of the program you want to run, and press the **OK** button.

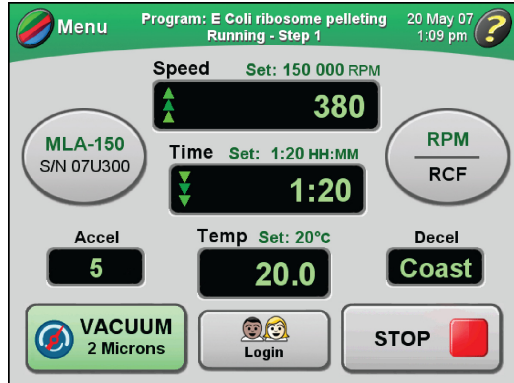
- The Main screen returns to view, and the name of the selected program appears in the windshield.



- The run parameters for the first step appear above the display fields in the Main screen.

4 Press the **START** button.

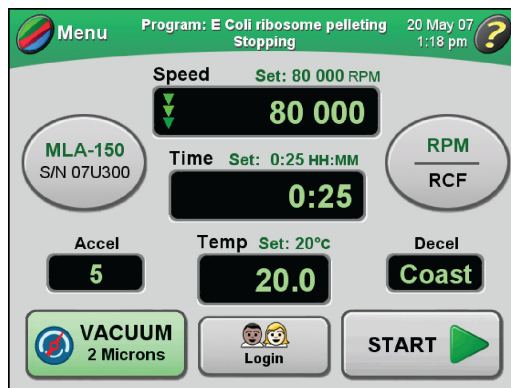
- The Main screen reflects the start of the run.



- This screen updates continuously to reflect the progress of each step in the program.
- a. If you are not logged in and **User Login** has been turned on by the Administrator, you are required to log in.
  - For more information, see [Logging In](#).
- b. If you are starting a run without selecting a rotor and a message appears asking you to select a rotor, press **OK** in the message box.
  - You'll need to select a rotor.
  - For more information, see [Selecting a Rotor](#).

5 To terminate a run for any reason, press the **STOP** button.

- The run will end automatically when the **Time** display counts down to zero for the last step in the program.
  - When the rotor comes to a complete stop, a tone will sound.



6 To exit from program mode:

- a. Press the **MENU** button in the Main screen.

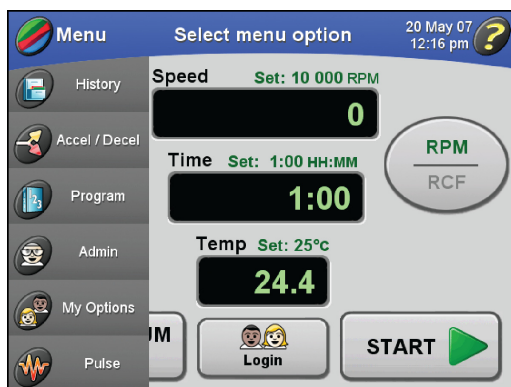
- b. In the **Select Program** screen, select **No Program Selected**.
- c. Press **OK**.
  - The Main screen returns to view so that you can enter parameters manually.
- d. Alternatively, you can try changing a parameter such as speed, time, or temperature.
  - A message appears asking you to confirm that you want to exit from program mode.

## Making Changes to a Program

You can modify any part of a program: the steps, the Accel/Decel rates, and the rotor.

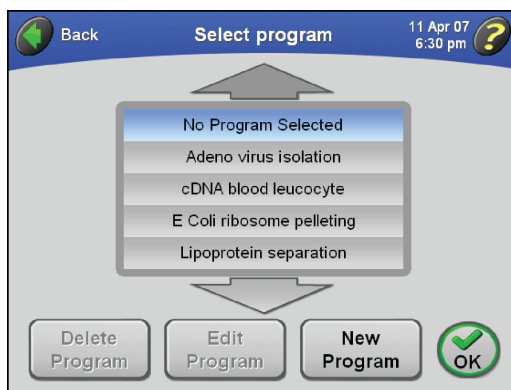
- 1 In the Main screen, press the **MENU** button.

- The list of menu options appears.



- 2 Select **Program**.

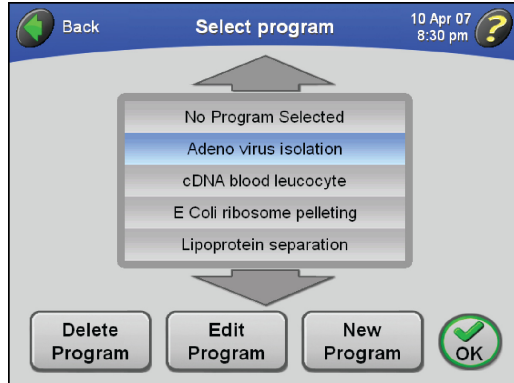
- The **Select Program** screen appears.



- a. If necessary, use the arrows to bring additional program names into view.

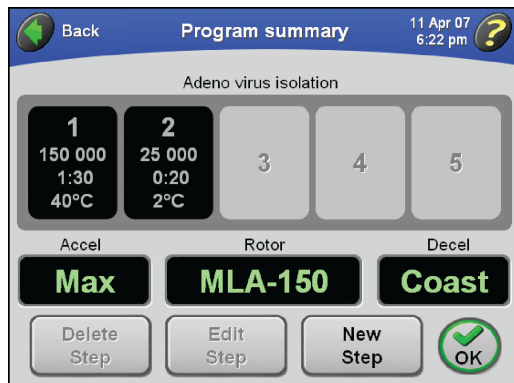
3 Select the name of the program you want to modify.

- The name of the program is highlighted, and the **EDIT PROGRAM** button becomes available.



4 Press the **EDIT PROGRAM** button.

- The **Program Summary** screen displays the steps and other parameters of the selected program.



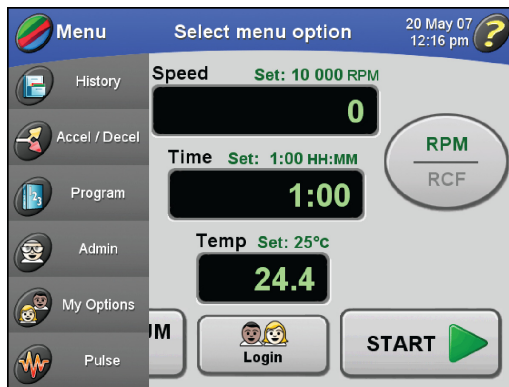
5 You can do any of the following:

- To delete a step, select the desired step and press the **DELETE STEP** button.
- To edit a step, selected the desired step and press the **EDIT STEP** button.
  - For more information, see [Creating a New Program](#).
- To add a step (if there are fewer than five steps in the program), press the **NEW STEP** button.
  - For more information, see [Creating a New Program](#).
- Change the Accel/Decel rate.
  - For more information, see [Creating a New Program](#).

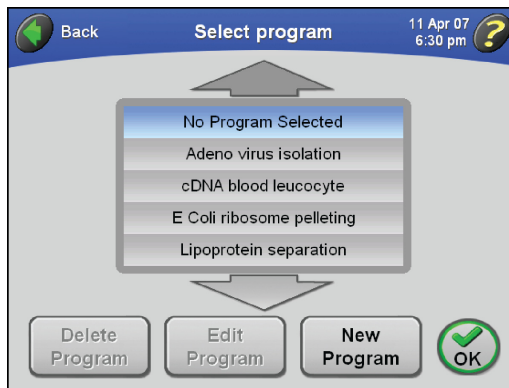
- e. Select a different rotor.
  - For more information, see [Creating a New Program](#).

## Deleting a Program

- 1 In the Main screen, press the **MENU** button.
  - The list of menu options appears.

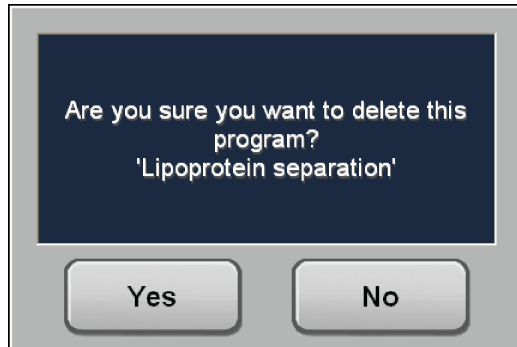


- 2 Select **Program**.
  - The **Select Program** screen appears.



- 3 Select the name of the program you want to delete.
  - a. If necessary, use the arrows to bring additional program names into view.
    - The name of the program is highlighted, and the **DELETE PROGRAM** button becomes available.

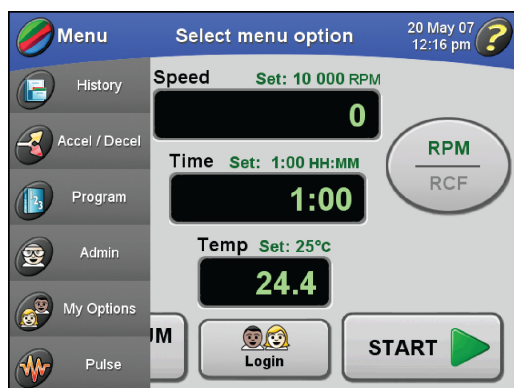
- To delete the program, press the **DELETE PROGRAM** button.
  - A confirmation message appears.



- Press the **YES** button.
  - The program is deleted and removed from the list of saved programs.

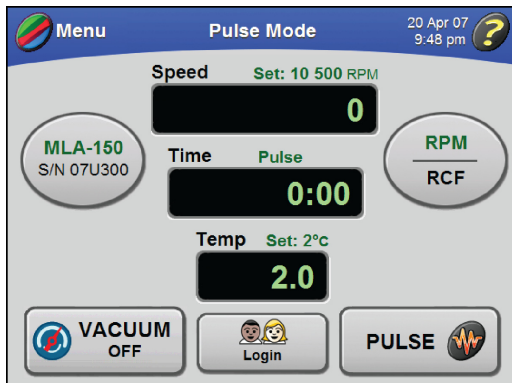
## Pulse Run Operation

- Set up the ultracentrifuge as described in [Preparing the Ultracentrifuge](#).
- In the Main screen, press the **MENU** button.
  - The list of menu options appears.



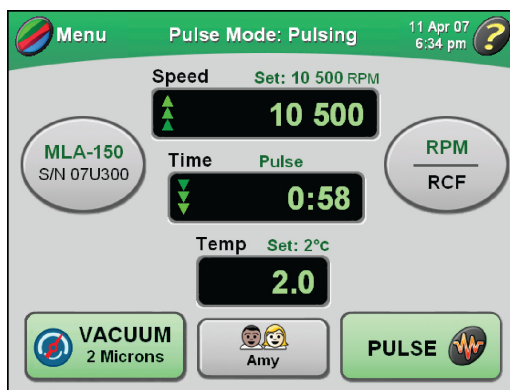
**3** Select **Pulse**.

- The **PULSE** button becomes available on the Main screen.



**4** To start the run, press and hold down the **PULSE** button.

- The Pulse run starts.
  - The windshield in the Main screen turns green and reads **Pulsing**.



- If you are not logged in and **User Login** has been turned on by the Administrator, you are required to log in.
  - For more information, see [Logging In](#).

**NOTE** The vacuum system will turn on automatically when you press and hold down the **PULSE** button.

**5** To stop the run, release the **PULSE** button.

- The vacuum system will turn off and vent after you release the **PULSE** button and the rotor stops spinning.
- The Main screen redisplay the settings in use prior to Pulse mode operation.

## Administrator Operations

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This section describes the procedures performed by the Administrator. The Administrator performs system level operations, such as setting the date and time, adding and deleting users, turning **User Login** on and off, and turning **Rotor Logging** on and off. Any user with Administrator privileges has access to Administrator functions.

### Accessing Administrator Options

**NOTE** You must have Administrator privileges to access these features. To find out if you have Administrator privileges, check with your system administrator.

- 1 Verify that you have Administrator privileges.
- 2 Log in (if you are not logged in already).
- 3 On the Main screen, press the **MENU** button, and select **Admin**.
  - The **Administrator Options** screen appears.



- 4 You can do the following from this screen:
  - Set the audio volume.
    - See [Setting Audio Volume](#).
  - Set the interface language.
    - See [Set Interface Language](#).
  - Set the date and time.
    - See [Setting the Date and Time](#).
  - Add and delete users, and set Administrator privileges.
    - See [Adding and Managing Users](#).



- Export data.
  - See [Exporting Data](#).
- Turn on User Login to require users to log in prior to starting a run.
  - See [Setting User Login](#).
- Turn on Rotor Logging.
  - See [Setting Rotor Logging](#).

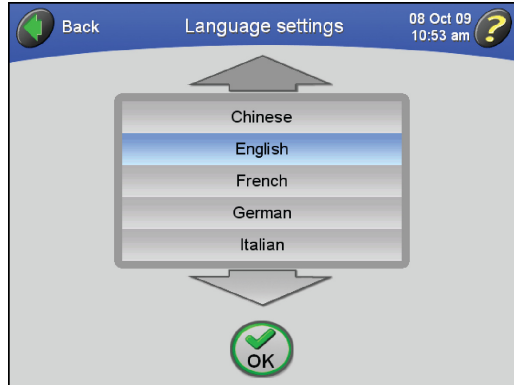
## Set Interface Language

You may configure the ultracentrifuge touchscreen for user interaction with different languages. Follow the steps below to configure language settings.

- 1 Verify that you have Administrator privileges.
- 
- 2 Log in (if you are not logged in already).
- 
- 3 On the Main screen, press the **MENU** button, and select **Admin**.
    - The **Administrator Options** screen appears.



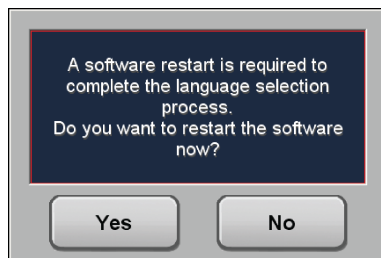
- 4 Press the **LANGUAGE** button.
  - The **Language Settings** screen appears.



- 5 Press a language from the language options list.

**NOTE** Select either the Up or Down arrow keys to view the full list of available languages.

- 6 Press **OK**.
  - A screen appears and prompts you to restart the system.

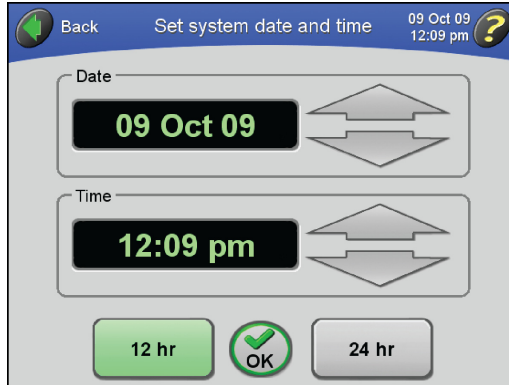


- 7 Press **YES**.
  - The system restarts and displays the selected language.

## Setting the Date and Time

- 1 Go to the Administrator Options screen as described in [Accessing Administrator Options](#).

- 2 Press the **SET TIME** button.
  - The **Set System Date and Time** screen appears.



- 3 Press the large arrows to set the desired date and time.
  - The time and date are set.
    - a. To change the date or time rapidly, hold down the corresponding arrow.
- 4 Press either **12 hr** or **24 hr** to configure the system to display time in either 12- or 24-hour format.
  - a. Press the **OK** button to accept.
    - Time and date configurations are set, and the **Administrator Options** screen returns to view.

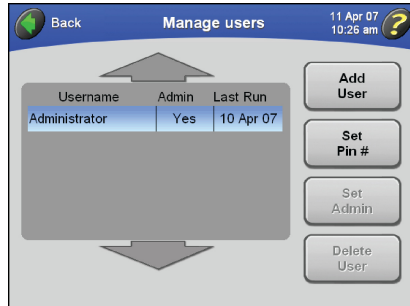
## Adding and Managing Users

### Adding a User

- 1 Go to the **Administrator Options** screen as described in [Accessing Administrator Options](#).

2 Press the **MANAGE USERS** button.

- The **Manage Users** screen appears.



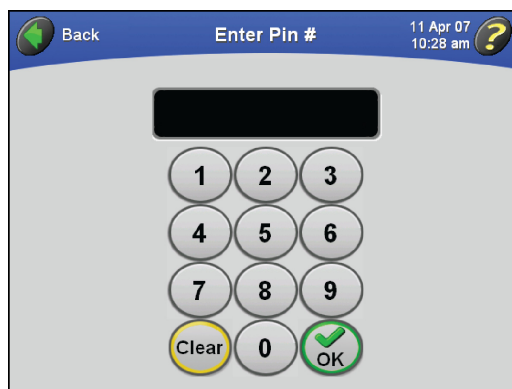
3 Press the **ADD USER** button.

- The **Enter User Name** screen appears.



4 Enter a user name on the keypad.

- When finished, press the **OK** button to accept.
- The **Enter PIN #** screen appears.

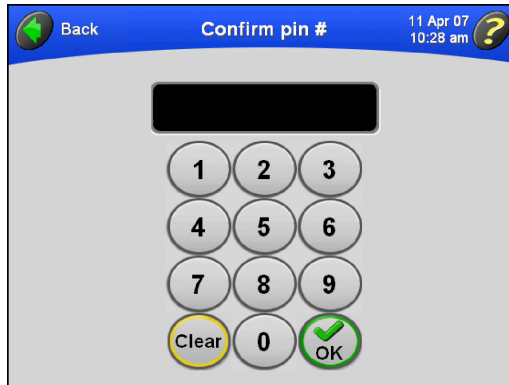


Note that the **SHIFT** key is green to indicate that uppercase letters are the default.

- a. To enter lowercase letters, press the **SHIFT** key.
- b. Press **BACKSPACE** to erase entered characters one at a time.
- c. To clear the entire entry, press **CLEAR**.

5 Enter a PIN number, and press the **OK** button to accept.

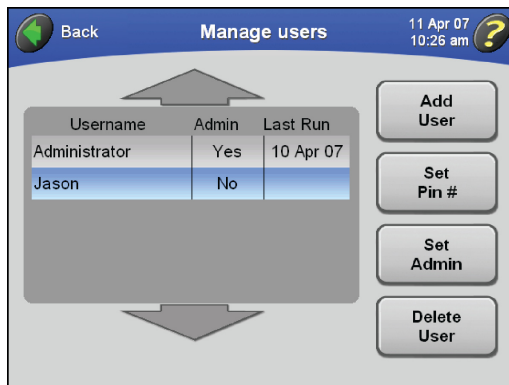
- The **Confirm PIN #** screen appears.



**NOTE** PINs can be from one to six numbers long. The PIN number is masked as you enter it.

6 Enter the PIN number again, and press the **OK** button to accept.

- The **Manage Users** screen returns to view, and the new user name is added to the list.



7 To grant this user Administrator privileges, see [Setting Administrator Privileges](#).

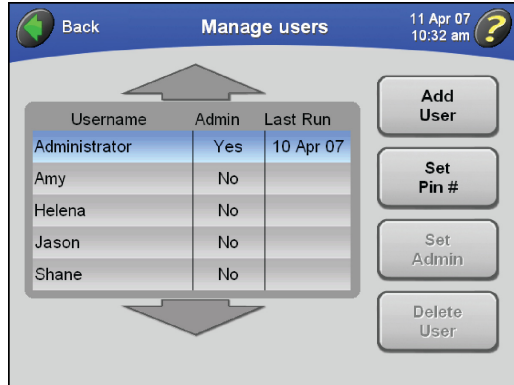
- a. To add another user, repeat Steps 2–6.

## Deleting a User

1 Go to the **Administrator Options** screen as described in [Accessing Administrator Options](#).

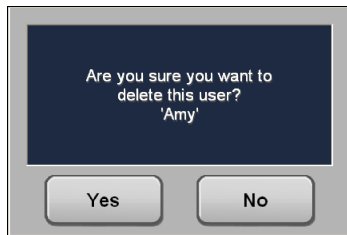
2 Press the **MANAGE USERS** button.

- The **Manage Users** screen appears.



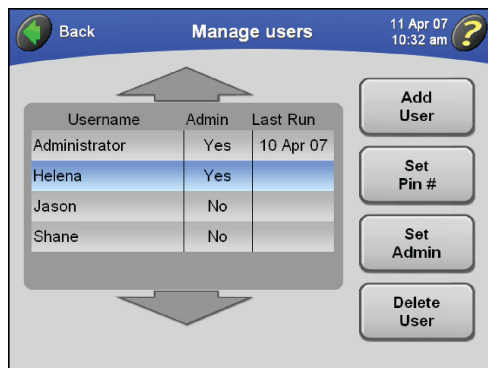
3 Select the desired user name in the list, and press the **DELETE USER** button.

- A message appears to allow you to confirm your action.



4 Press the **YES** button to confirm.

- The **Manage Users** screen returns to view, and the user name is deleted from the list.



## Setting Administrator Privileges

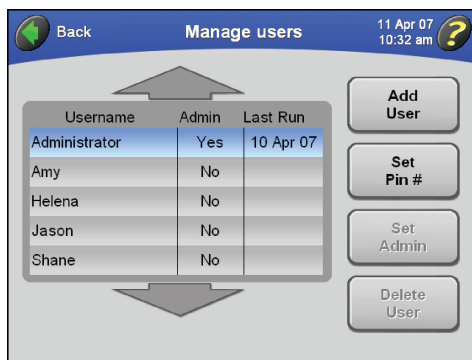
In this procedure, you give other users Administrator privileges.

**NOTE** You must have Administrator privileges to perform this procedure.

1 Go to the Administrator Options screen as described in [Accessing Administrator Options](#).

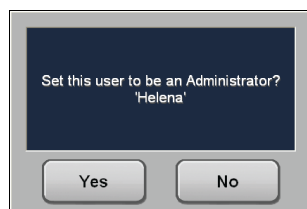
2 Press the **MANAGE USERS** button.

- The **Manage Users** screen appears.

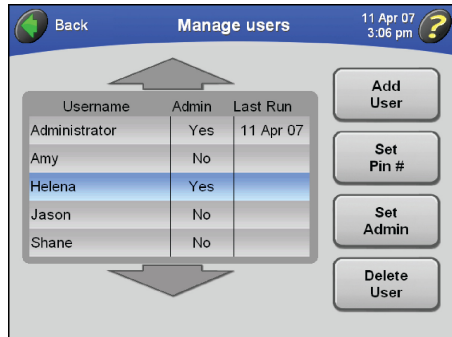


3 Select the desired user name from the list, and press the **SET ADMIN** button.

- A message appears to allow you to confirm your action.



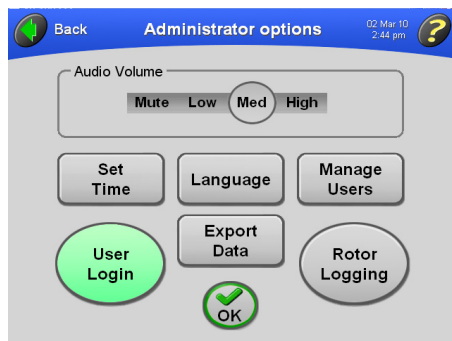
- 4 Press the **YES** button confirm.
  - The user with this login name can now perform Administrator operations.



## Setting User Login

You can require users to log in prior to starting a run. This builds a users' run log for the ultracentrifuge.

- 1 Go to the **Administrator Options** screen as described in [Accessing Administrator Options](#).
- 2 Press the **USER LOGIN** button.
  - The **USER LOGIN** button turns green to indicate that **User Login** has been turned on.



- 3 Press the **OK** button to accept.
  - When a user presses the **START** button to start a run, the user will be required to log in.

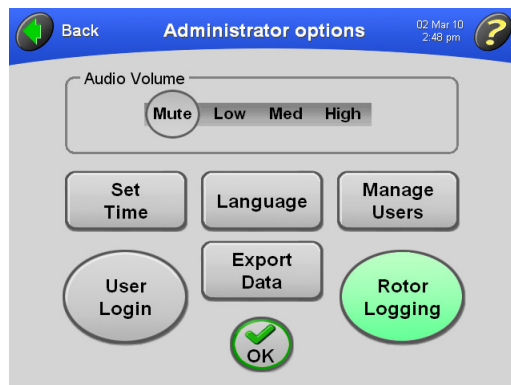


- This feature is a toggle. To turn off **User Login**, repeat this procedure.
  - The **USER LOGIN** button turns gray in the **Administrator Options** screen to indicate that **User Login** is now off.

## Setting Rotor Logging

When **Rotor Logging** is turned on, the user must select a rotor before starting a run. If a rotor is not selected, the user will be prompted to select the rotor in use.

- Go to the **Administrator Options** screen as described in [Accessing Administrator Options](#).
- Press the **ROTOR LOGGING** button.
  - The **ROTOR LOGGING** button turns green to indicate that **Rotor Logging** has been turned on.



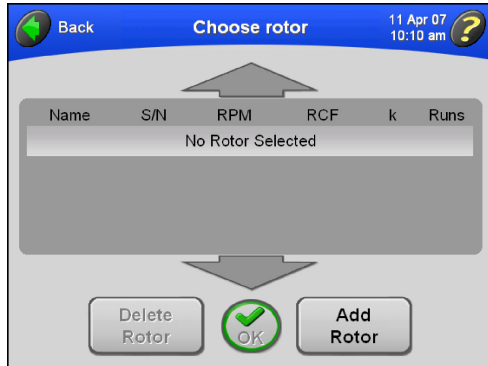
- Press the **OK** button to accept.
  - The ultracentrifuge will keep track of rotor usage.
  - Users will be required to select a rotor prior to starting a run (if no rotor is selected).
- This feature is a toggle. To turn off **Rotor Logging**, repeat this procedure.
  - This toggles the **ROTOR LOGGING** button back to gray to indicate that **Rotor Logging** is now off.

## Populating the Rotor Library

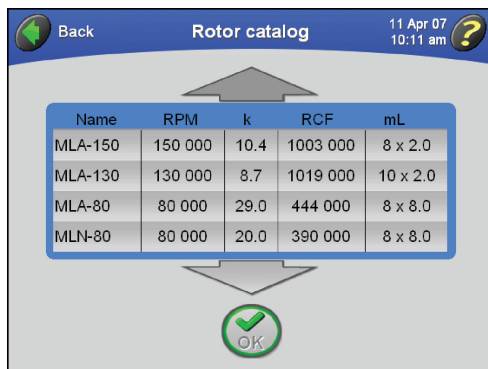
In this procedure, you develop a list of rotors that are available to users at your site.

**NOTE** You must have Administrator privileges to add rotors to and delete rotors from the rotor library.

- 1 On the Main screen, press the **ROTOR** button.
  - The **Choose Rotor** screen appears.

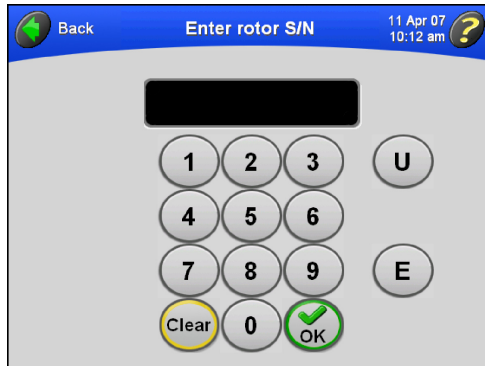


- 2 Press the **ADD ROTOR** button.
  - The **Rotor Catalog** screen appears.

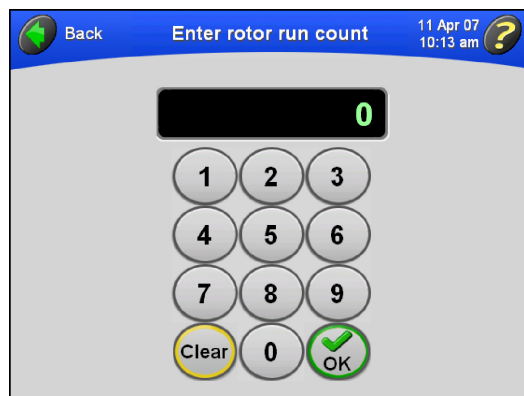


- The rotor catalog lists all rotors that can be used with the Optima MAX-XP.
- a. Select rotor names from the rotor catalog to develop the library of rotors available at your site.
  - b. If necessary, use the arrows to bring additional rotors into view.

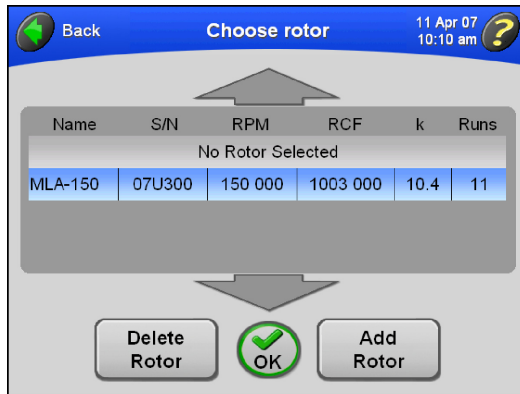
- 3 Select the desired rotor, and press **OK** to accept.
  - The **Enter Rotor Serial Number** screen appears.



- 4 Enter the serial number for the selected rotor, and press **OK** to accept.
  - The **Enter Rotor Run Count** screen appears.

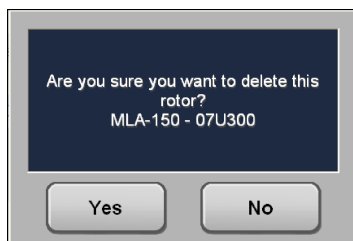


- 5 Enter the rotor run count, and press **OK** to accept.
  - The **Choose Rotor** screen returns to view, and the newly added rotor is listed in the rotor library.



**NOTE** The rotor run count is the number of runs a rotor has already accumulated.

- 6 To add another rotor, repeat Steps 2–5.
  - The list of available rotors is available for selection by users of the ultracentrifuge.
- 7 To delete a rotor from the rotor library, select the rotor entry from the list, and press the **DELETE ROTOR** button.
  - A message appears to allow you to confirm your action.



- 8 Press the **YES** button to confirm.
  - The rotor is deleted from the rotor library.

**NOTE** This action does not delete the rotor from the rotor catalog.

- 9 Press **BACK** to return to the Main screen.

## Setting Audio Volume

- 1 Go to the **Administrator Options** screen as described in [Accessing Administrator Options](#).
- 2 Select the desired audio volume.
  - The audio levels are: Mute, Low, Med, High.



- 3 Press the **OK** button to accept.
  - The audio level adjusts to the new volume level, and the Main screen returns to view.

## Exporting Data

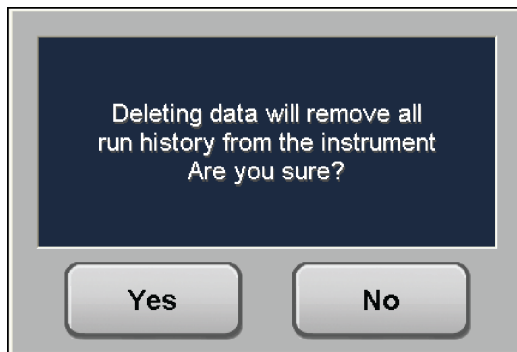
The ultracentrifuge automatically saves data associated with each run. You can export this run data for use in a spreadsheet program such as Microsoft Excel. The data, which consists of the set and actual parameters, user information, and rotor type and serial number, is saved in .csv format. To optimize instrument performance, we recommend exporting the data and then deleting data files from the system periodically.

- 1 Go to the **Administrator Options** screen as described in [Accessing Administrator Options](#).
- 2 Press the **EXPORT DATA** button.
  - You are prompted to insert a memory storage device into the USB slot on the right-hand side of the ultracentrifuge.



- 
- 3** Insert the memory storage device into the USB port, and press the **EXPORT DATA** button.
- When the data is exported successfully, a confirmation message is displayed.

- 
- 4** To delete the data files you just exported, press the **DELETE DATA** button.
- A message appears stating that all run history will be removed, and it asks you to confirm the operation.



- 
- 5** Press the **YES** button.
- When the data is deleted, a confirmation message is displayed.
-

## Introduction

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*This section lists possible malfunctions, together with probable causes and corrective actions. Maintenance procedures are described in [CHAPTER 5, Troubleshooting](#).*

For any problems not covered here, contact Beckman Coulter Field Service (1-800-742-2345 in the United States; world-wide offices are listed on the outside back cover of this manual) for assistance.

**NOTE** It is your responsibility to decontaminate the ultracentrifuge, as well as any rotors and/or accessories, before requesting service by Beckman Coulter Field Service.

## User Messages

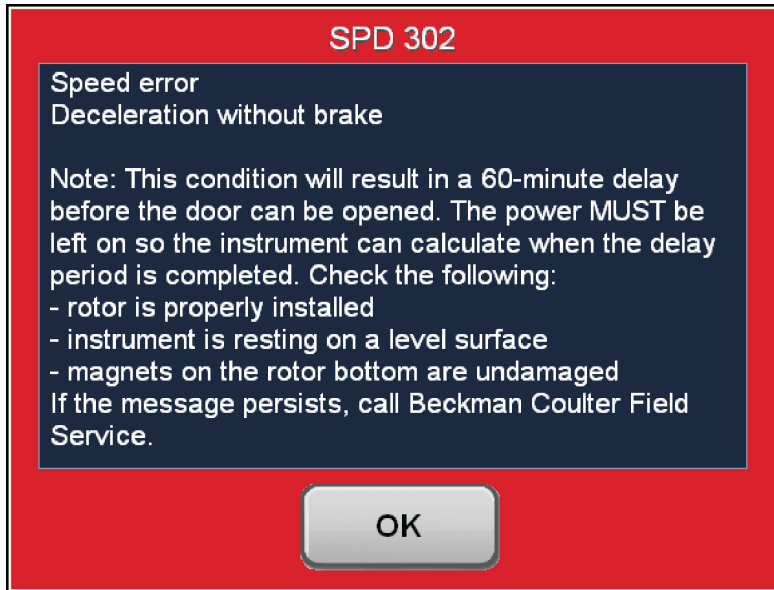
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Messages pop up on the touchscreen interface to communicate information about the ultracentrifuge or to alert you to conditions that require your attention. Dialog boxes with diagnostic messages contain a red border, as shown in the example in [Figure 4.1](#). The possible diagnostic types are:

- CPU
- Power
- Speed
- Vacuum
- Temperature
- Drive
- Imbalance
- Door

**NOTE** The user should wait 10 seconds between turning instrument power off and then turning power on to clear an error condition.

**Figure 4.1** Example User Message on Touchscreen Interface



**Table 4.1** User Message Chart

Message	Definition/Result	Possible Cause and Recommended Action
<b>CPU Errors 101 through 113</b>	Microprocessor malfunction or loss of program memory/Deceleration without brake	<ul style="list-style-type: none"> <li>• If the microprocessor malfunction was caused by power failure, the error can be cleared by turning power off and back on; otherwise, no user action. (In case of program memory loss, the ultracentrifuge is still functional for manual operation.)</li> <li>• Call Beckman Coulter Field Service.</li> </ul>
<b>Power Errors 201 and 202</b>	Loss of power during centrifugation	A power outage has occurred during the run. If power is restored while the rotor is spinning, the run will resume. If the rotor came to a stop, however, restart the run.
<b>Power Error 203</b>	Loss of power during centrifugation/Deceleration without brake	<p>A power outage has occurred during the run. Power was restored, but the run could not continue.</p> <ol style="list-style-type: none"> <li>1. Turn the ultracentrifuge power off and back on.</li> <li>2. If the problem persists, call Beckman Coulter Field Service.</li> </ol>
<b>Power Errors 204 through 207</b>	Power supply error/Deceleration without brake	No user actions are recommended. Call Beckman Coulter Field Service.
<b>Speed Error 301</b>	No rotor installed/Deceleration with brake	<ol style="list-style-type: none"> <li>1. Verify that the rotor is installed properly.</li> <li>2. If the problem persists, call Beckman Coulter Field Service.</li> </ol>



**Table 4.1** User Message Chart (Continued)

Message	Definition/Result	Possible Cause and Recommended Action
<b>Speed Errors 302 and 303</b>	Speed error/Deceleration without brake	<p><b>NOTE</b> This condition will result in a 166-minute delay before the diagnostic message can be cleared and the door opened. The power <i>MUST</i> be left on so the ultracentrifuge can calculate when the delay period is completed. If power to the ultracentrifuge is lost or turned off, the remaining delay period is preserved, and the door will remain locked when power is restored until the delay period is completed.</p> <ol style="list-style-type: none"> <li>1. Verify that the rotor is installed properly.</li> <li>2. Verify that the ultracentrifuge is resting on a level surface.</li> <li>3. Verify that the set speed is correct for the rotor in use.</li> <li>4. Verify that the rotor load is within the limits specified in the rotor manual.</li> <li>5. Verify that the magnets on the bottom of the rotor are undamaged.</li> <li>6. If the message persists, call Beckman Coulter Field Service.</li> </ol>
<b>Speed Error 304</b>	Speed error/Deceleration without brake	<p>This message indicates an overspeed condition.</p> <ol style="list-style-type: none"> <li>1. Verify that the rotor is installed properly.</li> <li>2. Verify that the ultracentrifuge is resting on a level surface.</li> <li>3. Verify that the magnets on the bottom of the rotor are undamaged.</li> <li>4. If the message persists, call Beckman Coulter Field Service.</li> </ol>
<b>Speed Error 305</b>	Speed error/Deceleration with brake	<p>This message indicates a speed signal problem.</p> <ol style="list-style-type: none"> <li>1. Verify that the rotor is installed properly.</li> <li>2. Verify that the ultracentrifuge is resting on a level surface.</li> <li>3. Verify that the magnets on the bottom of the rotor are undamaged.</li> <li>4. If the message persists, call Beckman Coulter Field Service.</li> </ol>
<b>Speed Errors 306 and 307</b>	Speed error/Deceleration with brake	No user actions are recommended. Call Beckman Coulter Field Service.

**Table 4.1** User Message Chart (Continued)

Message	Definition/Result	Possible Cause and Recommended Action
<b>Speed Error 308</b>	Set speed is above the maximum speed of the installed rotor/set speed is reset to the rotor maximum and the run continues	No user action is required.
<b>Speed Errors 309 and 310</b>	Speed error/Deceleration with brake	No user actions are recommended. Call Beckman Coulter Field Service.
<b>Vacuum Error 401</b>	Chamber pressure is above 500 microns/Deceleration with brake	<ol style="list-style-type: none"> <li>1. Make sure that the door O-ring is clean, undamaged, and properly lubricated.</li> <li>2. Check for sample leakage. Clean and dry the rotor chamber if needed.</li> <li>3. If the problem persists, call Beckman Coulter Field Service.</li> </ol>
<b>Vacuum Error 402</b>	Chamber pressure is above 31.5 microns for longer than 5 minutes/ If ultracentrifuge is running, it decelerates with brake	<ol style="list-style-type: none"> <li>1. Make sure that the door O-ring is clean, undamaged, and properly lubricated.</li> <li>2. Check for sample leakage. Clean and dry the rotor chamber if needed.</li> <li>3. If the problem persists, call Beckman Coulter Field Service.</li> </ol>
<b>Vacuum Error 403</b>	Chamber pressure didn't reach 31.5 microns within 45 minutes/If ultracentrifuge is running, it decelerates with brake	<ol style="list-style-type: none"> <li>1. Make sure that the door O-ring is clean, undamaged, and properly lubricated.</li> <li>2. Check for sample leakage. Clean and dry the rotor chamber if needed.</li> <li>3. If the problem persists, call Beckman Coulter Field Service.</li> </ol>
<b>Vacuum Error 404</b>	Vacuum level error/Deceleration with brake	<ol style="list-style-type: none"> <li>1. Make sure that the door O-ring is clean, undamaged, and properly lubricated.</li> <li>2. Check for sample leakage. Clean and dry the rotor chamber if needed.</li> <li>3. If the problem persists, call Beckman Coulter Field Service.</li> </ol>
<b>Vacuum Error 405</b>	Vacuum not venting properly/Deceleration with brake	No user action. Call Beckman Coulter Field Service.
<b>Vacuum Error 406</b>	Vacuum offset error/Deceleration with brake	No user action. Call Beckman Coulter Field Service.

**Table 4.1** User Message Chart (Continued)

Message	Definition/Result	Possible Cause and Recommended Action
<b>Temperature Errors 501 through 504</b>	Excessive or uncontrolled rotor temperature/Deceleration with brake	No user action. Call Beckman Coulter Field Service.
<b>Drive Error 601</b>	Drive error/Deceleration without brake	No user action. Call Beckman Coulter Field Service.
<b>Drive Error 602</b>	Drive overheated/Deceleration without brake	No user action. Call Beckman Coulter Field Service.
<b>Drive Errors 603 through 605</b>	Drive error/Deceleration without brake	<b>NOTE</b> This condition will result in a 166-minute delay before the door can be opened. The power <b>MUST</b> be left on so the instrument can calculate when the delay period is completed.  No operator action. Call Beckman Coulter Field Service.
<b>Drive Error 606</b>	Drive error/Deceleration without brake	<b>NOTE</b> This condition will result in a 166-minute delay before the door can be opened. The power <b>MUST</b> be left on so the instrument can calculate when the delay period is completed.  <ol style="list-style-type: none"> <li>1. Check that the rotor is properly installed.</li> <li>2. Check that the ultracentrifuge is resting on a level surface.</li> <li>3. Check that the magnets on the rotor bottom are undamaged.</li> <li>4. If the message persists, call Beckman Coulter Field Service.</li> </ol>
<b>Drive Error 607</b>	Drive error/Deceleration without brake	<ol style="list-style-type: none"> <li>1. Press OK to clear the error.</li> <li>2. If the error message is still displayed, turn instrument power off and back on.</li> <li>3. If the problem persists, call Beckman Coulter Field Service.</li> </ol>
<b>Drive Error 608</b>	Drive error/Deceleration without brake	<ol style="list-style-type: none"> <li>1. Wait for the rotor to decelerate to 0 rpm.</li> <li>2. Press OK to clear the error.</li> <li>3. If the error message is still displayed, turn instrument power off and back on.</li> <li>4. If the problem persists, call Beckman Coulter Field Service.</li> </ol>

**Table 4.1** User Message Chart (Continued)

Message	Definition/Result	Possible Cause and Recommended Action
<b>Drive Error 609</b>	Drive error/Deceleration without brake	<ol style="list-style-type: none"> <li>1. Press OK to clear the error.</li> <li>2. If the error message is still displayed, turn instrument power off and back on.</li> <li>3. If the problem persists, call Beckman Coulter Field Service.</li> </ol>
<b>Imbalance Error 701</b>	Rotor imbalance detected/Deceleration with brake	<ol style="list-style-type: none"> <li>1. Verify that the rotor is secured to the drive hub.</li> <li>2. Check for proper balance and placement of tubes and/or buckets.</li> <li>3. Restart the run.</li> <li>4. If the problem persists, call Beckman Coulter Field Service.</li> </ol>
<b>Door Errors 801 through 803</b>	Door open or unlocked/Deceleration with brake	<ol style="list-style-type: none"> <li>1. Close the door properly and restart the run.</li> <li>2. If the problem persists, call Beckman Coulter Field Service.</li> </ol>

## Retrieving Your Sample in Case of Power Failure

If facility power fails only momentarily, the ultracentrifuge will resume operation (where it left off) when power is restored and the rotor will return to set speed. However, if the rotor came to a complete stop, you will need to restart the run when the power is restored. In either case, the **POWER** message will appear on the touchscreen interface to indicate that a power outage has occurred.

 **WARNING**

**Any maintenance procedure requiring removal of a panel exposes the operator to the possibility of electrical shock and/or mechanical injury. Therefore, turn the power OFF and disconnect the ultracentrifuge from the main power source, and refer such maintenance to service personnel.**

In the event of an extended power failure, it may be necessary to trip the door-locking mechanism manually to remove the rotor and retrieve your sample.

 **WARNING**

**The following procedure should be implemented only when absolutely necessary and only by qualified service personnel.**

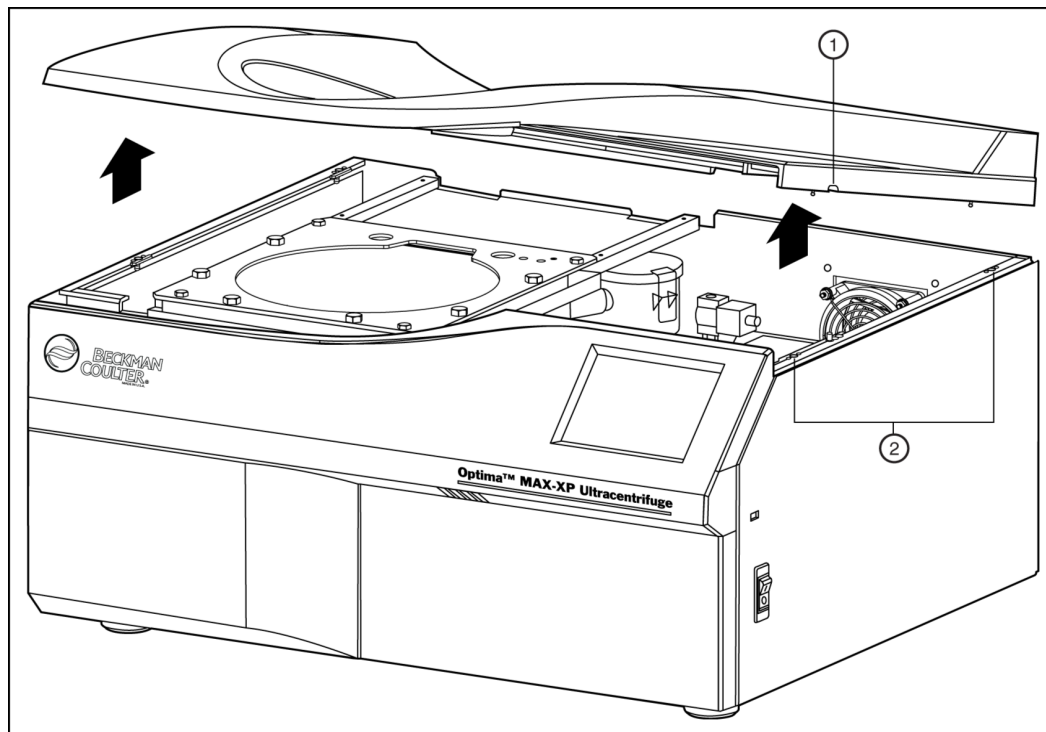
- 1 Turn the power off and disconnect the power cord from the main power source.

- 2 The underside of the top cover is fitted with tabs that snap inside clips in the side panels (see [Figure 4.2](#)). By inserting the blade of a flat-head screwdriver into the release slot on either side of the ultracentrifuge, you can pop off the top cover of the ultracentrifuge.

**CAUTION**

**LISTEN CAREFULLY! Do not proceed if any sound or vibration is coming from the drive.**

**Figure 4.2** Removing the Top Cover of the Ultracentrifuge



1. Release slot (located on right and left sides)    2. Clips for securing cover

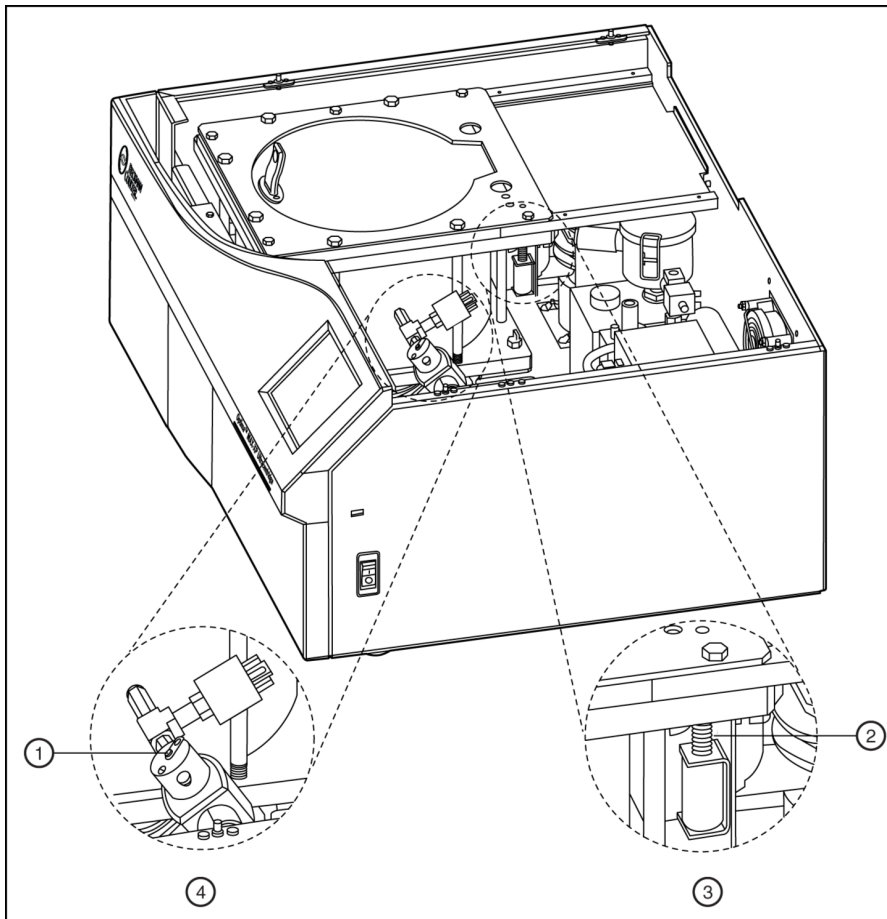
- 3 Remove the top cover and set it aside.
- 4 Locate the vacuum solenoid valve (see [Figure 4.3](#)), and turn the screw clockwise until you hear air rush into the chamber.
  - The chamber vacuum is released.
  - a. If you hear a whining noise, the rotor is still spinning. Close the valve and wait until the noise stops.
    - When the sound of rushing air stops, the vacuum is vented.
- 5 Turn the screw counterclockwise to its closed position.

- 6 Locate the door lock system (see [Figure 4.3](#)), and push the spring-loaded pin down to unlock the door.
  - a. If the rotor is still spinning, close the door and wait.
    - The drive is very quiet and may emit no audible sounds below 10,000 RPM.



**NEVER try to slow or stop the rotor by hand.**

**Figure 4.3** Door Lock System



- |                      |                     |
|----------------------|---------------------|
| 1. Screw             | 3. Door Lock System |
| 2. Spring Loaded Pin | 4. Vacuum Solenoid  |

- 7 Open the door and remove your sample.
- 
- 8 To replace the top cover of the ultracentrifuge, line up the tabs with the openings on the side panels, and press down firmly until all sides and corners of the cover snap securely into place.

## Circuit Breaker

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If the circuit breaker/power switch on the ultracentrifuge trips repeatedly, call Beckman Coulter Field Service. The circuit breaker/power switch is on the right-hand side of the ultracentrifuge.





*This section contains care and maintenance procedures that should be performed regularly. For maintenance not covered in this manual, contact Beckman Coulter Field Service (1-800-742-2345 in the United States; worldwide offices are listed on the outside back cover of this manual) for assistance.*

*User messages and recommended actions are discussed in CHAPTER 4, [Troubleshooting](#). Refer to the applicable rotor manual and Rotors and Tubes for instructions on the care of rotors and their accessories.*

## Ultracentrifuge Care

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**NOTE** It is your responsibility to decontaminate the ultracentrifuge, as well as any rotors and/or accessories, before requesting service by Beckman Coulter Field Service.



**Any maintenance procedure requiring removal of a panel exposes the operator to the possibility of electrical shock and/or mechanical injury. Therefore, turn the power OFF (O) and disconnect the ultracentrifuge from the main power source, and refer such maintenance to service personnel.**

## Vacuum System

For optimum performance of the vacuum system, keep the chamber O-ring (A31988) and area around the O-ring clean. (Ultracentrifuge O-rings have not been designed as bioseals for aerosol containment.) Wipe the area with a cloth dampened with a mild detergent such as Beckman Solution 555 (339555), diluted 10 to 1 with water.

### Chamber O-Ring

Clean the O-ring every three or four months with alcohol and a lint-free cloth or tissue and coat it lightly, but evenly, with silicone vacuum grease (335148).

### Purging Moisture from the Vacuum Pump Oil

If a chamber pressure of 500 microns cannot be reached in about 3 minutes, there may be moisture in the vacuum pump oil. To purge this moisture:

- 1 Leave the ultracentrifuge turned on with the door closed and the vacuum pump turned on for about 3 hours or, if convenient, overnight.

- 
- 2 Call Beckman Coulter Field Service to change the vacuum oil if it remains contaminated.
    - (The ultracentrifuge will continue to display a **VACUUM** message after following the instruction in Step 1.)
- 

## Drive Hub

Check the drive hub and regularly wipe it clean as needed.

## Air-Intake and Exhaust Louvers

Regularly verify that the air-intake and exhaust louvers are clean and unblocked. Use a vacuum cleaner or damp cloth to clean them.

## Cleaning

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**NOTE** Before using any cleaning or decontamination methods, except those recommended by the manufacturer, users should check with the manufacturer that the proposed method will not damage this equipment.

## Ultracentrifuge Surfaces

Keep ultracentrifuge surfaces clean by wiping them with a cloth dampened with a mild detergent such as Beckman Solution 555 (diluted 10 to 1 with water). If salts or other corrosive materials are used, however, or if spillage occurs, wash all affected areas immediately. Do not allow corrosive materials to dry on the ultracentrifuge. (Be careful not to spill liquid on the ultracentrifuge where electrical or mechanical components could get damaged.)

## Touchscreen Display

To clean the touchscreen, use any standard glass cleaner (non-ammonia based). Do not spray cleaner or pour liquid on the screen. Always spray or apply the cleaner on an antistatic cloth first, then gently wipe the touchscreen.

## Decontamination

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If the ultracentrifuge and/or accessories are contaminated with radioactive or pathogenic solutions, follow appropriate decontamination procedures as determined by your laboratory safety officer. Refer to the chemical resistances list in Appendix A of *Rotors and Tubes*, or contact Beckman Coulter Field Service to ensure that the decontamination method does not damage any part of the ultracentrifuge (or accessories).

## Sterilization and Disinfection

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The top working surface is finished with acrylic baking enamel; the sides are finished with general purpose paint. Ethanol (70%)\* may be used on both these surfaces. See Appendix A of *Rotors and Tubes* for more information on chemical resistance of ultracentrifuge and accessory materials.

While Beckman Coulter has tested these methods and found that they do not damage the ultracentrifuge, no guarantee of sterility or disinfection is expressed or implied. When sterilization or disinfection is a concern, consult your laboratory safety officer regarding proper methods to use.

## Storage and Transportation

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To ensure that the ultracentrifuge does not get damaged, contact Beckman Coulter Field Service for specific instructions and/or assistance in preparing the equipment for transport or long-term storage. Temperature and humidity requirements for storage should meet the environmental requirements described under *Specifications* in *CHAPTER 1, Description*.

## Supply List

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Contact Beckman Coulter Sales (1-800-742-2345 in the United States; worldwide offices are listed on the back cover of this manual) for information on ordering parts and supplies. A partial list of supplies is given below for your convenience. See the Beckman Coulter *Ultracentrifuge Rotors, Tubes & Accessories* catalog (BR-8101, available at [www.beckman.com/techdocs](http://www.beckman.com/techdocs)) for detailed information on ordering rotors, tubes, and accessories. Publications referenced in this manual can be obtained by calling 1-800-742-2345 in the United States or by contacting your local Beckman Coulter office.

### Supplies

Silicone vacuum grease (1 oz)	335148
Beckman Solution 555 (1 qt)	339555

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\* Flammability hazard. Do not use in or near operating ultracentrifuges.

## Optional Accessories

HEPA filter kit

350799

# Warranty for the Optima MAX-XP Ultracentrifuge

Subject to the exceptions and upon the conditions specified below, Beckman Coulter agrees to correct, either by repair, or at its election by replacement, any defects of material or workmanship which develop within one (1) year after delivery of the Optima MAX-XP Ultracentrifuge (the product), to the original Buyer by Beckman Coulter or by an authorized representative provided that investigation and factory inspection by Beckman Coulter discloses that such defect developed under normal and proper use.

Some components and accessories by their nature are not intended to and will not function for as long as one (1) year. A complete list of such components or accessories is maintained at the factory and at each Beckman Coulter District Sales Office. The lists applicable to the products sold hereunder shall be deemed to be part of this warranty. If any such component or accessory fails to give reasonable service for a reasonable period of time, Beckman Coulter will repair or, at its election, replace such component or accessory. What constitutes either reasonable service and a reasonable period of time shall be determined solely by Beckman Coulter.

## **Replacement**

Any product claimed to be defective must, if requested by Beckman Coulter, be returned to the factory, transportation charges prepaid, and will be returned to Buyer with the transportation charges collect unless the product is found to be defective, in which case Beckman Coulter will pay all transportation charges.

## **Conditions**

Beckman Coulter makes no warranty concerning products or accessories not manufactured by it. In the event of failure of any such product or accessory, Beckman Coulter will give reasonable assistance to the Buyer in obtaining from the respective manufacturer whatever adjustment is reasonable in light of the manufacturer's own warranty.

See the warranty that accompanies each rotor for ultracentrifuge rotor warranty information. Beckman Coulter shall be released from all obligations under all warranties, either expressed or implied, if the product(s) covered hereby are repaired or modified by persons other than its own authorized service personnel, unless such repair by others is made with the written consent of Beckman Coulter, or unless such repair in the sole opinion of Beckman Coulter is minor, or unless such modification is merely the installation of a new Beckman Coulter plug-in component for such product(s).

## **Special Drive Warranty**

During the instrument warranty period (one year), there will be no charge for drive replacement if the drive unit is installed, serviced, and operated in accordance with the conditions listed below. During the second through tenth year of use the drive replacement costs, excluding labor and travel, will be covered by warranty if the drive unit is installed, serviced, and operated in accordance with the conditions listed below. This applies to units not under service contract.\*

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\* For details of drive coverage with a service contract, contact your local Beckman Coulter service representative.

**Conditions**

1. The drive has been operated only within its rated speed and temperature ranges.
2. The drive unit has not been subjected to unequal loading, improper rotor installation, corrosion from material spilled onto the hub or accumulated in the chamber of the instrument.
3. The drive unit has not been disassembled, modified, or repaired, except by Beckman Coulter personnel.
4. The drive unit was installed by a Beckman Coulter Field Service representative.
5. The instrument in which the drive unit has been used and operated, and its associated rotors, were manufactured by Beckman Coulter and serviced only by Beckman Coulter Field Service representatives.

**Disclaimer**

IT IS EXPRESSLY AGREED THAT THE ABOVE WARRANTY SHALL BE IN LIEU OF ALL WARRANTIES OF FITNESS AND OF THE WARRANTY OF MERCHANTABILITY AND THAT BECKMAN COULTER, INC. SHALL HAVE NO LIABILITY FOR SPECIAL OR CONSEQUENTIAL DAMAGES OF ANY KIND WHATSOEVER ARISING OUT OF THE MANUFACTURE, USE, SALE, HANDLING, REPAIR, MAINTENANCE, OR REPLACEMENT OF THE PRODUCT.



# Related Documents

## **Rotors and Tubes for Tabletop Preparative Ultracentrifuges (TLR-IM)**

- Rotors
- Tubes and Accessories
- Using Tube and Accessories
- Using Rotors
- Care and Maintenance
- Chemical Resistances for Beckman Coulter Centrifugation Products
- The Use of Cesium Chloride Curves
- Gradient Materials
- Glossary of Terms
- References

## **Additional References**

- Chemical Resistances for Beckman Coulter Centrifugation Products (IN-175)
- Beckman Coulter Ultracentrifuge Rotors, Tubes & Accessories catalog (BR-8101)

