

User Guide

Optima XE Series

Preparative Ultracentrifuges
For *non-In Vitro* Diagnostic Use



CE

PN B07711AA
May 2011



Beckman Coulter, Inc.
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 **BECKMAN
COULTER**

Optima XE
Ultracentrifuge
User Guide
PN B07711AA (May 2011)

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Safety and Notices

This chapter presents the important notices that apply to the instrument and describes the conventions used in the document.

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

**DANGER**

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

**WARNING**

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury. May be used to indicate the possibility of erroneous data that could result in an incorrect diagnosis (does not apply to all products).

**CAUTION**

CAUTION indicates a potentially hazardous situation, which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices. May be used to indicate the possibility of erroneous data that could result in an incorrect diagnosis (does not apply to all products).

IMPORTANT IMPORTANT is used for comments that add value to the step or procedure being performed. Following the advice in the Important adds benefit to the performance of a piece of equipment or to a process.

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

Safety Notices

Before installing, using, or maintaining the instrument, be certain that you know all the following precautions.

Information

 **CAUTION**

Read all product manuals and consult with Beckman Coulter-trained personnel before attempting to operate instrument. 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.

Installation

 **CAUTION**

This instrument 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 instrument. Also, should the instrument need to be moved, a Beckman Coulter Field Service representative must reinstall and re-level the instrument in its new location.

 **WARNING**

Do not place the ultracentrifuge near areas containing flammable or combustible fluids, or any other source of vapors that could enter the ultracentrifuge air system and be ignited by the motor.

 **WARNING**

Ultracentrifuge operations generate high energy levels that require precautions against sudden movements that could result from the rare event of a rotor failure. Maintain a 30-cm. (1-ft.) clearance envelope around and above the ultracentrifuge. Do not install any equipment or furniture in this envelope. While the ultracentrifuge is running, keep the envelope clear of any persons or objects and do not reach into the envelope except when required to change operating controls.

Replacement Parts

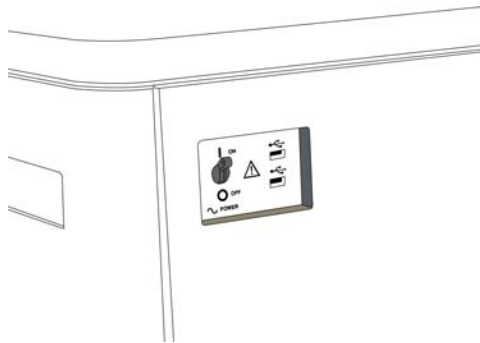
WARNING

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

Service

WARNING

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 turned off, and the instrument is disconnected from the main power source, by removing its power plug from the receptacle. Refer such servicing to qualified personnel.



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

Power Supply

DANGER

To reduce the risk of electrical shock, this instrument uses a three-wire electrical cord and plug to connect this equipment to earth-ground. Make sure that the matching wall outlet receptacle is properly wired and earth-grounded.

Fuse Replacement

WARNING

Fuses protect certain electrical circuits within this instrument against overcurrent conditions. The fuse is not customer replaceable. For continued protections, please contact Beckman Coulter Field Service.

Mechanical Safety



For safe operation of the equipment, observe the following:

- Use only the Beckman Coulter rotors and accessories designed for use in this instrument.
- Do not exceed the maximum rated speed of the rotor in use.
- NEVER attempt to slow or stop a rotor by hand.
- Do not move the centrifuge while the drive motor is spinning.
- In the event of a power failure, do not attempt to retrieve the sample from the instrument for at least one hour. Then follow the instructions for recovery of the sample in the [Maintenance and Troubleshooting](#) chapter.

Chemical and Biological Safety



Normal operation may involve the use of solutions and test samples that are pathogenic, toxic, or radioactive. Such materials require that you take all necessary safety precautions.

- Handle body fluids with care because they can transmit disease. No known test offers complete assurance that they are free of micro-organisms.
- Handle all 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.
- Some of the most virulent infectious agents—Hepatitis (B and C) and HIV (I-V) viruses, atypical mycobacteria, and certain systemic fungi—require additional emphasis on aerosol protection.
- Do not run toxic, pathogenic, or radioactive materials in a rotor without taking appropriate safety precautions.
- Risk Group II materials (as identified in the World Health Organization *Laboratory Biosafety Manual*) require biosafe containment. 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.

Precautions with Liquids



Do not place containers holding liquid on or near the chamber door. Liquid, if spilled, may get into the instrument and damage electrical or mechanical components.

Volatile Liquids



This instrument is not designed for use with materials capable of developing flammable or explosive vapors. Do not centrifuge such materials (for example, chloroform or ethyl alcohol) in this instrument nor handle or store them near the centrifuge.

Certification

To ensure full system quality, Beckman Coulter Optima XEs have been manufactured in a registered ISO 9001 or 13485 facility. They have 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.beckmancoulter.com.

Scope of Manual

This manual is designed to familiarize you with the Optima XE, its functions, specifications, operation, and routine operator care and maintenance. Read this entire manual, especially the safety notices and all safety-related information, before operating the instrument or performing maintenance.

NOTE If the instrument is used in a manner other than 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.

CFC-Free Centrifugation



To ensure minimal environmental impact, no CFCs are used in the manufacture or operation of the Optima XE ultracentrifuge.

Radio Interference

This instrument is certified with regard to radio frequency interference for both the United States and Canada.

United States FCC Certification

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 or her own expense.

Canadian Department of Communications Certification

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.

Industry Canada

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

Software Copyright

The software and other information incorporated into the Optima XE is protected by international copyright laws. Unauthorized copying, use, distribution, transfer, or sale is a violation of those laws that may result in civil or criminal penalties. This computer program is also subject to additional restrictions contained in the following Microsoft OEM Customer License Agreement for Embedded Systems:

“If you use the Device to access or utilize the services or functionality of Microsoft Windows XP Server (all editions), or use the Device to permit workstation or computing devices to access or utilize the services or functionality of Microsoft Windows XP Server, you may be required to obtain a Client Access License for the Device and/or each such workstation or computing device. Refer to the End-User License Agreement for Microsoft Windows XP Server for additional information.”

The End-User License Agreement is available on the Microsoft Embedded Systems website.

Summary of Instrument Labels

This section provides information for some labels and symbols appearing on the Optima XE 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.

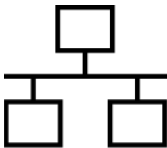
This logo indicates that this electronic information product contains certain toxic or hazardous elements, and can be used safely during its environmental protection use period. The number in the middle of the logo indicates the environmental protection use period for the product. The outer circle indicates 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.

Universal Serial Bus (USB)



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

Ethernet



This symbol indicates the location of an ethernet connector.

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

 This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.



This symbol indicates compliance with:

- certain US Federal Communications Commission Part 15 Rules as described on the label
- N395 – The C-Tick mark is intended for use on products that comply with Australian Communication Authority (ACA) EMC Requirements.
- 169502 – This label indicates recognition by a Nationally Recognized Testing Laboratory (NRTL) that the instrument has met the relevant product safety standards.
- CE – This label indicates conformance to various Directives set forth under European Union law.
- Recycling – Refer to the Recycling Label section in this document.

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



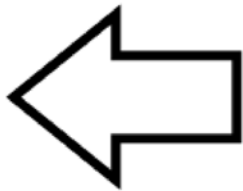
Operation, replacement or servicing of any components where contact with bare, live hazardous parts could occur, possibly resulting in electric shock, should only be performed by your Beckman Coulter representative.

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.

Rotor Rotation



This indicates the direction of instrument rotor rotation.

Symbols

Symbol Symbol Symbole Símbolo	Simbolo 記号 符号	Title / Titel / Titre / Titolo / Titolo / 名称 / 名称
		Dangerous voltage Gefährliche elektrische Spannung Courant haute tension Voltaje peligroso Pericolo: alta tensione 危険電圧 危険电压
		Attention, consult accompanying documents Achtung! Begleitpapiere beachten! Attention, consulter les documents joints Atención, consulte los documentos adjuntos Attenzione: consultare le informazioni allegate 注意、添付資料を参照のこと 注意，请参阅附带的文件
		On (power) Ein (Netzverbindung) Marche (mise sous tension) Encendido Acceso (sotto tensione) 入 (電源) 开 (电源)
		Off (power) Aus (Netzverbindung) Arrêt (mise hors tension) Apagado Spento (fuori tensione) 切 (電源) 关 (电源)
		Protective earth (ground) Schutzleiteranschluß Liaison à la terre Puesta a tierra de protección Collegamento di protezione a terra 保護アース (接地) 保护接地
		Earth (ground) Erde Terre Tierra Scarica a terra アース (接地) 接地

Description

The Optima XE generates centrifugal forces for the separation of particles. Classified S, it can be used with all currently manufactured Beckman Coulter preparative rotors.

This chapter describes the major components of the instrument.

For *non-In Vitro* Diagnostic Use

This Optima XE centrifuge is intended for use as a general purpose laboratory instrument for the separation of components through the use of relative centrifugal force. Applications may include the separation of blood, urine, and other bodily fluids, either alone or after the addition of reagents or other additives; chemicals; industrial or environmental samples.

This centrifuge should be operated by qualified professionals only.

Touch Screen

The touch screen is both the information display and the control input for the instrument. As they are needed, control buttons appear on the screen. When you select a button, you activate that control.

The touch screen position is adjustable (both swivel and tilt) to be made viewable from nearly anywhere in the lab. This is especially useful in environments where a single operator may oversee a number of instruments.

Each component of the touch screen interface is explained in the following chapters.

Name Rating Plate

A name rating plate is affixed to the rear of the instrument. Always mention the serial number and model number (available on the [About Page](#)) when contacting Beckman Coulter regarding your instrument.

Rotor Chamber

The rotor chamber is made of aluminum and coated with a chemical-resistant epoxy finish. The central feature is the rotor drive spindle, but several sensors and control systems are also contained in the rotor chamber.

Vacuum System

The Optima XE uses a diffusion pump in series with a mechanical vacuum pump to reduce chamber pressure to a very low level. The system starts automatically when you start a run, or manually when the chamber door is closed and you use the **Vacuum** Display/Button on the Footer Bar of the Home Page. When the vacuum system is on, the chamber pressure is displayed in microns in the **Vacuum** Display/Button.

At the end of a run, press the **Vacuum** Display/Button to vent the chamber vacuum before attempting to open the door. When the chamber vacuum is reduced to the point that you can open the door, the system sounds an audible tone. After you open the door, there is a five minute period where the chamber temperature remains as set (to allow back-to-back runs). Then the chamber returns to approximate room temperature to minimize condensation collecting in the chamber. To help keep the chamber dry and clean, keep the door closed whenever possible. If you wish to vent the chamber before the rotor has come to a complete stop, you can do so as soon as it slows below 3000 rpm.

In zonal or continuous flow operation, the door may remain open while the rotor is spinning up to the loading speed. The vacuum system is activated when the door is closed and the rotor speed is above 3000 rpm (after loading the rotor). Normally, you vent the chamber at the end of the run when the rotor has decelerated to the unloading speed, but you can vent the chamber when the rotor has decelerated below 3000 rpm if the unloading speed is slower than that.

Temperature Sensing and Control

A solid state thermopile in the bottom of the rotor chamber monitors rotor temperature.

The Optima XE uses a solid state thermoelectric refrigeration and heating system without coolant or water. Cooling is provided by forced air from the fans.

When the power is on, the temperature control system starts when the door is closed and the vacuum system is running.

Drive

The frequency-controlled, air-cooled, direct-drive induction motor requires no gears or brushes. In addition, the drive does not require an oil vacuum seal, external oil reservoir, or continuously operating damper. Externally cooled by forced air and internally cooled by oil, the drive delivers ultra-smooth, quiet performance, with high rotor-imbalance tolerance.

Safety Features

The Optima XE ultracentrifuge has been designed and tested to operate safely indoors at altitudes up to 2000 m (6562 ft.).

Door

The high-strength structural steel chamber door has a solenoid interlock to prevent operator contact with a spinning rotor. When the door is closed and a run begins, it locks automatically. It can be opened only when the power is on and the rotor is at rest with the chamber at atmospheric pressure. If there is a power failure, you can manually unlock the door as described in the **Maintenance and Troubleshooting** chapter.

Barrier Ring

A 41-mm (1.63-in.) steel alloy armor ring acts as the primary barrier, surrounded by a 13-mm (0.5-in.) vacuum chamber 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. Even at low speeds, an incorrectly loaded rotor can cause an imbalance.

Overspeed System

The overspeed system is a safety feature designed to ensure that the rotor does not exceed its maximum allowable speed. This system includes a photoelectric device in the rotor chamber next to the drive spindle and an overspeed disk on the bottom of the rotor. Individual rotor manuals provide information on the correct overspeed disks to be used with each rotor.

The overspeed disk has alternating light and dark sectors. As the rotor spins, the passage of reflecting and non-reflecting sectors over the photoelectric device generates a series of pulses detected by the electronic circuitry and software.

After the rotor reaches 600 rpm, the set speed is checked against the overspeed disk. If the set speed is greater than the maximum speed permitted by the disk, the speed setting is automatically lowered to the maximum speed of the disk, but the run continues without interruption. An error message appears to alert you to the change.

Dynamic Rotor Inertia Check (DRIC)

As the rotor accelerates between 15000 and 20000 rpm, the instrument checks the rotor inertia and calculates the rotor energy for the speed set by the user. If the calculated rotor energy is excessive, the instrument stops the run with braking to avoid possible damage and sends a diagnostic message to alert you to this condition.

Specifications

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

Control Features

Specifications	Description
Speed	<ul style="list-style-type: none"> • Set speed: <ul style="list-style-type: none"> — 1,000 to rated speed in 100-rpm increments • Speed display: <ul style="list-style-type: none"> — Actual measured rotor speed in 10-rpm increments below 1000 rpm and 100-rpm increments ≥ 1000 rpm • Speed control: <ul style="list-style-type: none"> — Actual measured rotor speed, ± 2 rpm at steady state (1,000 rpm to rated speed) • Acceleration: <ul style="list-style-type: none"> — 10 profiles • Deceleration: <ul style="list-style-type: none"> — 11 profiles, including coast • Braking: <ul style="list-style-type: none"> — Regenerative, power reclamation
Time	<ul style="list-style-type: none"> • Set time: <ul style="list-style-type: none"> — Up to 999 hours 59 minutes, including Hold runs — Up to 3.94780×10^{14} radians squared per second in ω^2t mode • Time display: <ul style="list-style-type: none"> — Indicates time remaining in timed runs, time elapsed in Hold runs, or estimated time remaining in ω^2t runs • Time accuracy: <ul style="list-style-type: none"> — ± 70 ppm (6 seconds/day) • Run modes: <ul style="list-style-type: none"> — Time, ω^2t, and RCF

Specifications	Description
Temperature	<ul style="list-style-type: none"> • Set temperature: <ul style="list-style-type: none"> — 0 to 40°C in 1°C increments • Rotor Temperature (after equilibration): <ul style="list-style-type: none"> — $\pm 0.5^{\circ}\text{C}$ over entire set temperature range for all rotors except SW-32 — $\pm 0.8^{\circ}\text{C}$ over entire set temperature range for SW-32 • Temperature display: <ul style="list-style-type: none"> — Actual rotor temperature in 0.1°C increments • Ambient temperature range: <ul style="list-style-type: none"> — 10 to 35°C • Humidity restrictions: <ul style="list-style-type: none"> — <80% at <35°C (non-condensing) • Condensation removal: <ul style="list-style-type: none"> — Automatic (begins five minutes after vacuum vent) • Vacuum: <ul style="list-style-type: none"> — Below 5 microns (0.7 Pa)
Ease of Use	<ul style="list-style-type: none"> • Languages: <ul style="list-style-type: none"> — Multi-language support • Help: <ul style="list-style-type: none"> — On-screen, context sensitive • Diagnostic messages: <ul style="list-style-type: none"> — 10,000 messages saved

Physical Data

Specification	Description
Dimensions	<ul style="list-style-type: none"> • Width : <ul style="list-style-type: none"> — 94.0 cm (37 in.) • Depth: <ul style="list-style-type: none"> — 68.1 cm (26.8 in.) • Height: <ul style="list-style-type: none"> — 125.7 cm (49.5 in.) • Weight <ul style="list-style-type: none"> — 485 kg (1068 lb)
Ventilation Clearances	<ul style="list-style-type: none"> • Sides <ul style="list-style-type: none"> — 5.1 cm (2.0 in.) • Rear <ul style="list-style-type: none"> — 15.2 cm (6.0 in.)

Specification	Description
Finishes	<ul style="list-style-type: none"> • Rotor pad: <ul style="list-style-type: none"> — Coated polycarbonate • Top and Front surfaces: <ul style="list-style-type: none"> — Polyurethane • Other surfaces: <ul style="list-style-type: none"> — Acrylic baking enamel
Electrical	<ul style="list-style-type: none"> • Power requirement: <ul style="list-style-type: none"> — 200–240 VAC, 30A branch circuit, 50/60 Hz — Automatic tap selection on every run • Electrical supply: <ul style="list-style-type: none"> — Class I • Power Consumption: <ul style="list-style-type: none"> — 60W in idle — 1.0 kW average running in steady state at 90K rpm • Installation (overvoltage) category: <ul style="list-style-type: none"> — II • LCD Monitor: <ul style="list-style-type: none"> — SAW technology touch screen — Wide tilt range, horizontal and vertical
Environmental	<ul style="list-style-type: none"> • RoHS compliant material: <ul style="list-style-type: none"> — 100% of content • Cooling system: <ul style="list-style-type: none"> — Thermoelectric (no CFC gases used) • Noise output (1m in front of instrument): <ul style="list-style-type: none"> — <51 dBA (Sound pressure level) — 7.0 sones (Zwicker Loudness) • Maximum heat dissipation into room under steady-state conditions: <ul style="list-style-type: none"> — 3400 Btu/hr (1.0 kW) • Pollution degree: <ul style="list-style-type: none"> — 2^a • HEPA filter: <ul style="list-style-type: none"> — Available

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

Audible Sounds

The Optima XE instrument will make an audible sound while displaying a corresponding visual prompt with the following events:

- Boot up

- Start of Run
- End of Run
- Diagnostics/Alert
- Vacuum low enough to open door
- Door open during Zonal or Continuous Flow mode

Available Rotors

All currently manufactured Beckman Coulter floor model ultracentrifuge rotors can be used in the Optima XE ultracentrifuge. The rotors are described in individual manuals that accompany each rotor. Information on rotors and accessories is available in the Rotor Catalog accessible from the touch screen. Additional information is available in *Rotors and Tubes for Preparative Ultracentrifuges* (LR-IM) and in the Beckman Coulter *Ultracentrifuge Rotors, Tubes & Accessories* catalog (publication BR-8101). The Beckman Coulter website, <http://www.beckmancoulter.com>, contains additional information about centrifugation processes and products.

Refer to specific rotor manuals for proper installation and removal of rotors from the instrument.

Description
Available Rotors

The Touch Screen Interface

This chapter describes the touch screen interface for the Optima XE. Except for the power switch, all the controls for the instrument are programmed controls that appear on the touch screen.

Figure 3.1 Home Page



Areas on the Screen

The items on the screen may change, depending on the state of the instrument. There are three areas where items appear on the screen:

- The Header Bar
- The Footer Bar
- The Page Display Area

Header Bar

Figure 3.2 Header Bar



The area across the top of the screen is called the Header Bar, containing four important items:

- **Home** Page Button
- **Menu** Button
- **Status** Display
- **Help** Button

The following sections explain these items.

Home Page Button

Figure 3.3 Home Page Button



The **Home Page** Button takes you to the [Home Page](#) from any other page. When you use Zonal Mode or Continuous Flow Mode, the **Zonal/Continuous Flow Operation** Page replaces the **Home** Page.

Menu Button

Figure 3.4 Menu Button



The **Menu** Button presents a list of menu items, allowing you to choose a particular function:

- Options
- References
- About
- Zonal Operation
- Continuous Flow Operation
- Service Mode

The menu options are explained in the following chapter.

Status Display

Figure 3.5 Ready Status



The Status Display is in the middle of the Header Bar and shows you the current instrument status. The background color of the header bar changes with the type of status:

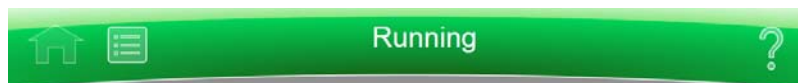
- Blue background: system ready (no run in progress).

Figure 3.6 Header Bar - Ready Status



- Green background: in operation (run in progress).

Figure 3.7 Header Bar - Running Status



- Green background: in operation (stop in progress).

Figure 3.8 Header Bar - Stopping Status



- Yellow background: warning message.

Figure 3.9 Header Bar - Warning Message



- Red background: fatal error message.

Figure 3.10 Header Bar - Fatal Error Message



Help Button

Figure 3.11 Help Button



The **Help** button gives you access to the built-in online help messages. Help messages are described at the end of this chapter.

Footer Bar

The bottom of the touch screen always shows the footer bar. The footer bar appears in two different ways, but it always has the **Start** Button at the left and the **Stop** Button at the right.

Start Button

Figure 3.12 Start Button



The **Start** Button begins a run with the current settings. Use it only after you have set the parameters for the run.

Stop Button

Figure 3.13 Stop Button



The **Stop** button stops the current run immediately. This is ordinarily only used for emergencies or if you mistakenly set too long a run time.

Footer Bar on the Home Page

On the **Home** Page, the middle of the Footer Bar shows three Items:

- The **Vacuum** Display/Button
- The System Name
- The **Accel** Display/**Decel** Display/Button

Figure 3.14 Footer Bar - Home Page



Each of these is explained below.

Footer Bar on Other Pages

When not on the Home Page, the three buttons for Speed, Time and Temperature appear in the Footer Bar for easy access. To set Acceleration or Deceleration profiles, or to use the **Vacuum** button, simply press **Home** button to return to the **Home** Page. The following items are described in detail within the **Home** Page section of the next chapter:

- The **Set Speed** Display/Button
- The **Set Time** Display/Button
- The **Set Temp** Display/Button

Figure 3.15 Footer Bar on Other Pages



Vacuum Display/Button

As a display, the Vacuum Display/Button shows the current chamber vacuum and the action that will be performed when the button is pressed. As a control, it serves two functions:

- Before a run, after mounting the rotor and closing the chamber door, press this control to evacuate the chamber and precondition the chamber to the set temperature.
- After a run, press this control to release the vacuum before opening the chamber door.

System Name

The system name is simply a display. You can set the system name as one of the options on the [System Options Page](#).

Accel and Decel Display/Buttons

These are two displays that, together, act as a single button.

As a display, each shows the selected acceleration or deceleration profile currently selected. If you select either one of them, it takes you to the [Set Acceleration/Deceleration Profiles Page](#), described in the next chapter.

Page Display Area

The Page Display Area is the main display area between the Header Bar and the Footer Bar. The pages and help messages all appear in this area. The pages are all described in [CHAPTER 5](#).

Help Messages

When you first select the **Help** Button, a number of new buttons appear on the screen, giving you three sets of options:

- Item Help
- Global Help
- Exit from Help.

Item Help

Item Help Buttons appear on-screen items where you can get an item help message. These are brief pop-up messages describing what the item does. Only one help message remains on the screen at a time.

Figure 3.16 Item Help Button



Global Help

The **Global Help** Button appears next to the **Help** Button. If you select the **Global Help** Button, the Page Display Area shows you a description of the current page and all the elements it contains.

Figure 3.17 Global Help Button attached to Help Button



While using Global Help, you also have some additional options:

- The **Global Help** page appears over a ghost image of the screen you were on when you selected global help.

Figure 3.18 Home Page Help with ghost image



If the ghost image makes it difficult for you to read the **Help** Page, select the **Transparency** Button in the upper right corner.

Figure 3.19 Transparency Button



The resulting opaque help page eliminates the image of the screen behind it.

Figure 3.20 Home Page Help with opaque screen



Select the **Transparency** Button again to return to the ghost screen image.

- If you need information about some other aspect of the instrument, you can select the Table of Contents link at the bottom of the page to see the outline of all the available help pages. You have access to all of the help pages from the Table of Contents.

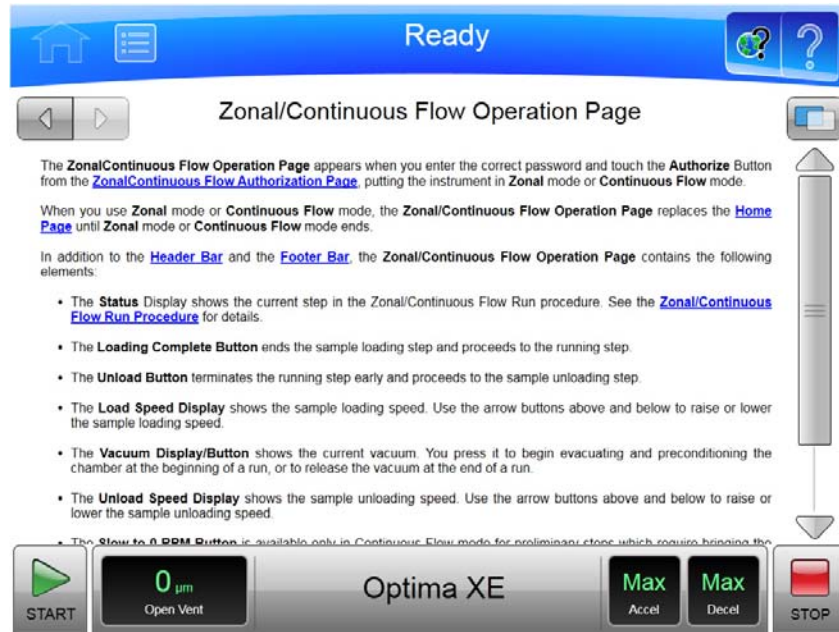
Figure 3.21 Help Navigation Buttons



- To navigate through your selected help pages, use the **Forward** and **Back** buttons in the upper left corner.

- If the global help page is too large to fit in the page display area, a Scroll Bar appears on the right side, allowing you to scroll up and down through the page.

Figure 3.22 Zonal/Continuous Flow Operation Help with scroll bar



Operations

The touch screen interface for the Optima XE makes operations about as simple as possible. Although there are many additional things you can do, this chapter outlines basic operations:

- Manual Operation
- Operations with Preconditioning
- Continuous Flow Operation
- Zonal Operation

Manual Operation

Manual operation is a simple procedure you can do from the **Home** Page.

Before you begin, there are four things you must know:

- What kind of rotor you are using for the run.
- What speed you want for the run.
- How long the run should be.
- What temperature you want for the run.

When you have this information, the procedure for the run is as follows:

1 Start on the **Home** Page.

2 Set the speed and rotor.

3 Set the time.

4 Set the temperature.

5 Start the run.

Step 1: Start on the Home Page

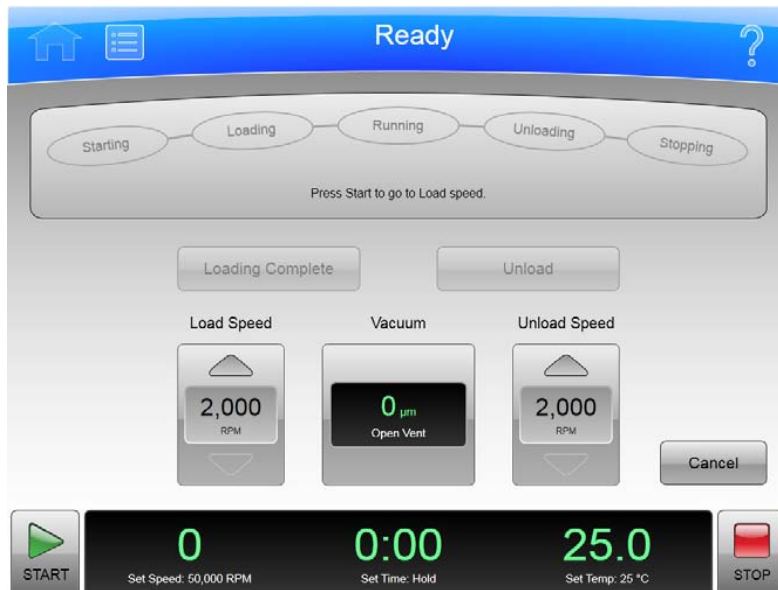
Start at the **Home** Page. If your screen shows any other page, press the **Home Page** Button in the upper left corner of the screen.

Figure 4.1 Home Page



NOTE If your system is in Zonal Mode or Continuous Flow Mode, you have to press the **Cancel** Button to go to the Home Page.

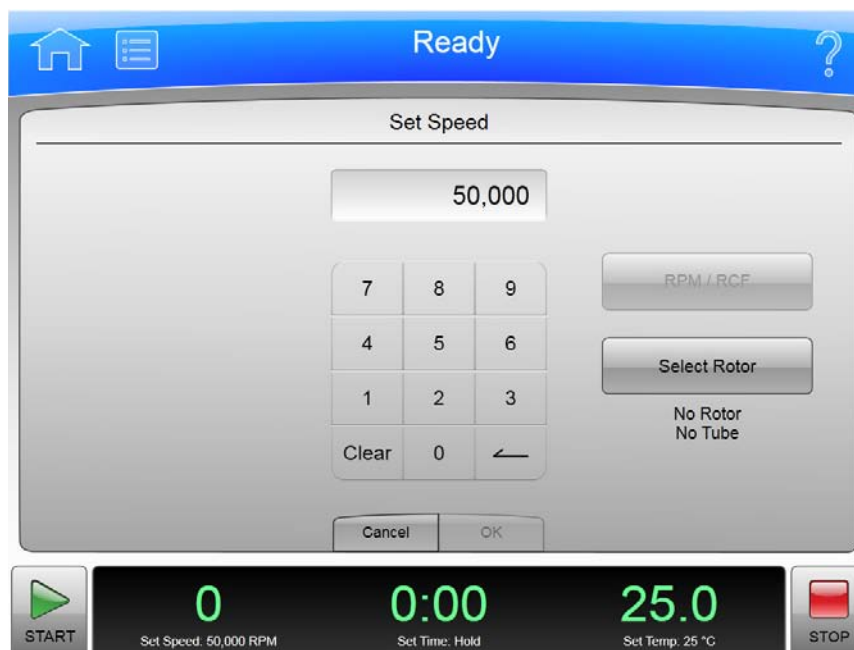
Figure 4.2 Zonal Operation Page with Cancel Button



Step 2: Set the Speed and Rotor

Press the **Set Speed Display/Button** on the **Home Page** to go to the **Set Speed Page**.

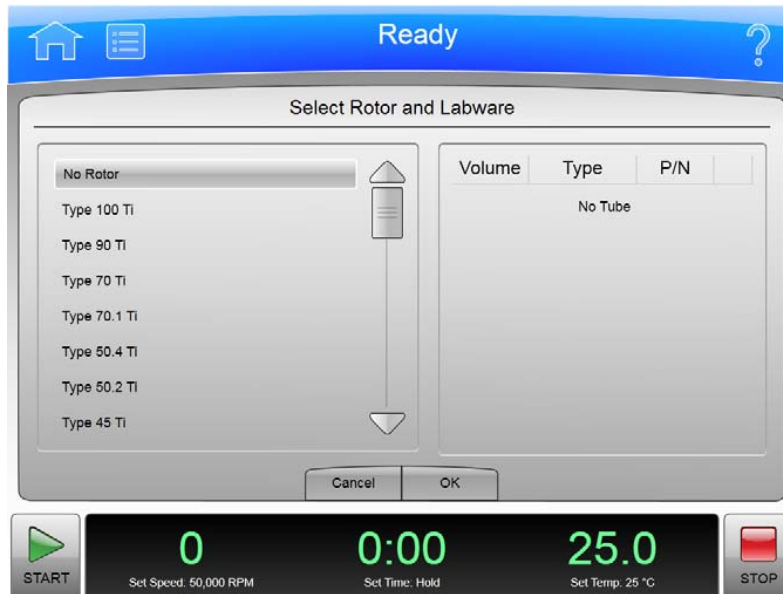
Figure 4.3 Set Speed Page



When the **Set Speed** Page appears, follow these steps:

- 1 Press the **Select Rotor** Button to go to the **Select Rotor and Labware** Page.

Figure 4.4 Select Rotor and Labware Page



- 2 Select the rotor and labware for the run from the list.
- 3 Select the **OK** Button to return to the **Set Speed** Page.
- 4 If you plan to set the speed in units of relative centrifugal field (RCF), select the **RPM/RCF** Button. Note that the RPM/RCF button is only enabled when you have selected a rotor.
- 5 Use the keypad to set the desired speed. Note that you actually enter hundreds, with two ending zeroes added to your number. You can also use the **Backspace** and **Clear** keys to make corrections.
- 6 Select the **OK** key to accept your entry and dismiss the page.

Step 3: Set the Time

Press the **Set Time** Display/Button to go to the **Set Time** Page.

Figure 4.5 Set Time Page



On the **Set Time** Page, follow two steps:

- 1 Use the keypad to set the desired time in hours and minutes. Use the **Backspace** and **Clear** keys to make corrections. You can also use the **Hold** key to set the time to a hold state with no countdown to an automatic end. When you use a **Hold** value, the run does not end until you select the **Stop** key (or until the maximum time of 999 hours and 59 minutes has been reached).
- 2 Select the **OK** key to accept your entry and dismiss the page.

Step 4: Set the Temperature

Press the **Set Temp** Display/Button to go to the **Set Temperature** Page.

Figure 4.6 Set Temperature Page



On the **Set Temperature** Page, follow two steps:

- 1 Use the keypad to set the desired temperature in degrees Celsius. Use the **Backspace** and **Clear** keys to make corrections.
- 2 Select the **OK** key to accept your entry and dismiss the page.

Step 5: Start the Run

Once the run values are set, start the run:

- 1 Prepare your samples and place them in the rotor following all proper procedures, including balanced weight distribution.
- 2 Preheat or precool the rotor and samples, if necessary.
- 3 Mount the rotor in the instrument following all the procedures in the rotor manual and observing all safety procedures and cautions.
- 4 Close and lock the chamber door. For preconditioning, press the Vacuum Display/Button and wait until the chamber reaches the set temperature.
- 5 Press the **Start** button.

Figure 4.7 Start Button



When the run begins, wait for the countdown timer to reach zero and the rotor to come to a stop. You can then remove your rotor and samples.

Zonal and Continuous Flow Operation

WARNING

In zonal and continuous flow operation, the operator is unavoidably exposed to rotating machinery. For safety, the operator must be properly instructed and qualified. Guard against accidentally dropping objects, such as pens, pencils, or hemostats into the chamber. Loose lab coats, neckties, scarves, and long necklaces should not be worn while operating in the zonal or continuous flow mode.

Use only zonal rotors in the zonal mode.

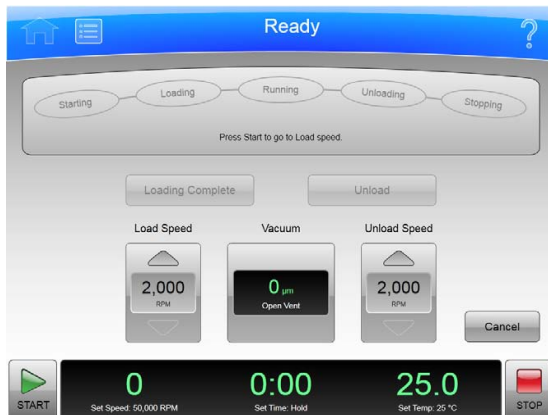
Use only continuous flow rotors in the continuous flow mode.

Zonal and continuous flow operations require special rotors and have some additional hazards in that samples are loaded and unloaded while the rotor is spinning. To prevent unauthorized users from attempting these operations, the instrument requires a password (which is 1793). When zonal

or continuous flow operations have been authorized, the **Zonal Operation** Page or the **Continuous Flow Operation** Page replaces the **Home** Page. The mode does not end until the run is complete or the user selects the **Cancel** Button to end the mode.

Zonal and Continuous Flow operations are very similar. The specific details vary according to the rotor you are using, but the summary below shows an outline of the procedure.

Figure 4.8 Zonal Page



There are seven phases to a Zonal or Continuous Flow run:

- Preparing
- Starting
- Loading
- Running
- Unloading
- Stopping
- Finishing

Each phase is outlined in a section below.

Preparing for the Run

The rotor manual details the preparations for a run, which may include cleaning, assembling, and lubricating the rotor, setting up pumps and tubing, and usually includes overnight cooling to precondition the rotor, sample and solutions used in the run. When you are ready to install the rotor, set the parameters for the run:

- Run Speed
- Run Time
- Temperature
- Load Speed
- Unload Speed

For Continuous Flow operation, you may have two different load speed settings. The initial setting is for alignment and adjustment checks, which you set in this phase.

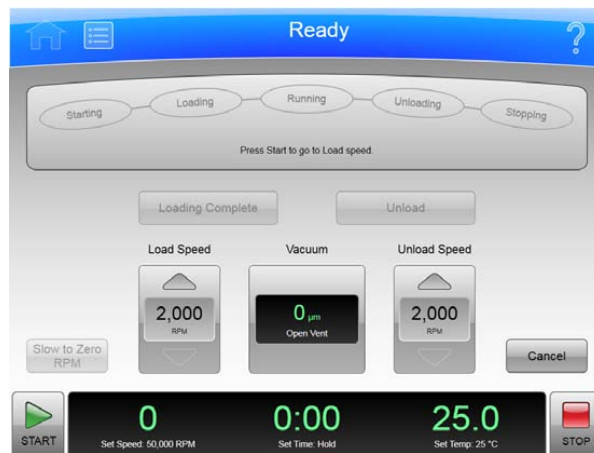
When everything else is ready, mount the rotor and select the **Vacuum** Display/Button to begin preconditioning the chamber. When the chamber reaches the set temperature, you are ready to start the run.

Starting the Run

To start the run, press the **Start** Button and wait for the rotor to reach loading speed. The status display at the top of the screen highlights Starting.

For a Continuous Flow run, you need to perform alignment and adjustment checks as detailed in the rotor manual. You may need to use the **Slow to Zero RPM** button to make adjustments and restart with the **Start** Button. Refer to Figure 4-9. When the rotor passes the alignment and adjustment checks, set the new loading speed (if it is different from the adjustment speed) and press the **Start** Button again.

Figure 4.9 Continuous Flow Page



When the rotor reaches the Loading speed, the status display highlights Loading, to show that you have moved into the next phase.

Loading the Sample

In the Loading phase, you inject the sample into the medium in the rotor. Again, the details depend on the rotor and the type of operation as detailed in the rotor manual. When you have finished all the specified loading steps, close the door, and select the **Loading Complete** button to go to the next phase.

Running the Sample

The instrument highlights Running on the Status Display, accelerates to the set run speed, and begins counting down the set run time. The run phase ends in one of three ways:

- When the timer countdown reaches zero, the instrument decelerates to the unloading speed and goes to the Unloading phase.
- If you select the **Unload** Button to terminate the run early, the instrument decelerates to the unloading speed and goes to the Unloading phase.
- If you select the **Stop** Button to abort the run, the instrument brings the rotor to a halt, skips the unloading phase, and exits Zonal or Continuous Flow mode entirely.

Unloading the Sample

While the rotor is running at unload speed, follow the instructions in the rotor manual to inject the displacement solution into the rotor and collect the resulting centrifugate sample.

Stopping the Run

When you have completed all the defined unloading steps, press the **Stop** Button to bring the rotor to a halt.

Finishing the Run

When the rotor comes to a halt, unmount it and perform all the cleanup and follow-up steps given in the rotor manual. The instrument exits Zonal or Continuous Flow mode when the rotor comes to a stop.

Functional Pages

This chapter describes the functional pages that you use to control the Optima XE Ultracentrifuge. They include all of the following:

- [Home Page](#)
- [Menu Page](#)
- [Set Speed Page](#)
- [Set Time Page](#)
- [Set Speed Time Page \(w²t Mode\)](#)
- [Set Temperature Page](#)
- [Set Acceleration/Deceleration Profiles Page](#)
- [Select Rotor and Labware](#)
- [References Page](#)
- [System Options Page](#)
- [Zonal Authorization Page](#)
- [Continuous Flow Authorization Page](#)
- [Service Login Page](#)
- [About Page](#)
- [Rotor Catalog Page](#)
- [Labware Catalog Page](#)
- [Export User Manual Page](#)
- [Set System Name Page](#)
- [Set Date and Time Page](#)
- [Set Sound Page](#)
- [Select Language Page](#)
- [Diagnostic History Page](#)
- [Compatible Tubes for Rotor Page](#)
- [Zonal Operation Page/Continuous Flow Operation Page](#)
- [Running Home Page](#)

Home Page

The **Home** Page is the first operational page to appear after the instrument startup. You return to it when you select the **Home** Page Button on the Header Bar. It is the basic page from which you begin most operations.

In addition to the Header Bar and the Footer Bar, the **Home** Page contains the following elements:

- The ω^2t Display.
- The **Set Speed** Display/Button.
- The **Set Time** Display/Button.
- The **Set Temp** Display/Button.

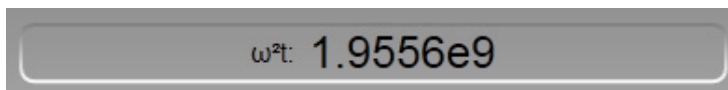
When you use Zonal Mode or Continuous Flow Mode, the **Zonal/Continuous Flow Operation** Page replaces the **Home** Page.

Figure 5.1 Home Page



ω^2t Display

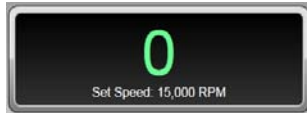
Figure 5.2 ω^2t Display



The ω^2t Display appears only when you have set the ω^2t mode on the [System Options Page](#). It shows the accumulated ω^2t value for the run in progress. See the **Set Speed Time** Page for details.

Set Speed Display/Button

Figure 5.3 Set Speed Display/Button



The **Set Speed** Display/Button shows the current rotor speed as a large number and also shows the current run speed setting in small characters across the bottom.

The **Set Speed** Display/Button takes you to the [Set Speed Page](#) (or to the [Set Speed Time Page \(w²t Mode\)](#) if the ω^2t mode is active)

When you are not on the **Home** page, the **Set Speed** Display/Button appears in the Footer Bar.

Set Time Display/Button

Figure 5.4 Set Time Display/Button



The **Set Time** Display/Button shows the current remaining run time as a large number and also shows the current run duration setting in small characters across the bottom. Before you begin a run, the numbers are the same. During a run, the large number counts down to zero.

When you select the **Set Time** Display/Button, it takes you to the [Set Time Page \(Set Speed Time Page \(w²t Mode\)](#) if the ω^2t mode is active).

When you are not on the **Home** page, the **Set Time** Display/Button appears in the Footer Bar.

Set Temp Display/Button

Figure 5.5 Set Temp Display/Button



The **Set Temp** Display/Button shows the current rotor temperature as a large number, and also shows the current temperature setting in small characters across the bottom.

When you select the **Set Temp** Display/Button, it takes you to the [Set Temperature Page](#).

When you are not on the **Home** page, the **Set Temp** Display/Button appears in the Footer Bar.

Menu Page

Figure 5.6 Menu Page



The **Menu** Page appears when you select the **Menu** Button in the Header Bar, allowing you access to the menu choices. Choosing an option dismisses the **Menu** page and goes to the selected page.

- The **Options** Button takes you to the [System Options Page](#).
- The **References** Button takes you to the [References Page](#).
- The **About** Button takes you to the [About Page](#).
- The **Zonal Operation** Button takes you to the [Zonal Operation Page](#).
- The **Continuous Flow Operation** Button takes you to the [Continuous Flow Authorization Page](#).
- The **Service Mode** Button is used by service personnel only. If you accidentally select this button and go to the **Service Login** Page, select the **Cancel** button to dismiss the page.

Each of these pages is described in a following section.

There is also a **Done** button at the bottom of the page that dismisses the page.

Set Speed Page

Figure 5.7 Set Speed Page (No Rotor Selected)

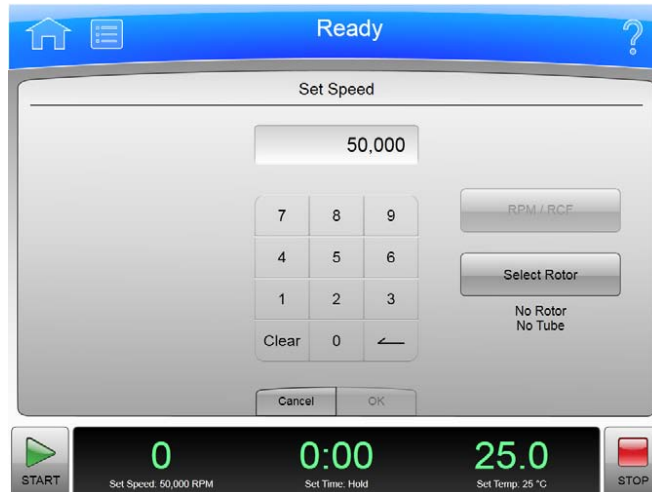


Figure 5.8 Set Speed Page (Rotor Selected)



The **Set Speed** Page appears when you select the **Set Speed** Display/Button on the **Home** Page or the Footer Bar, allowing you to set the speed for the next run. As an alternate, if you have already selected a rotor, you can set the units in RCF (Relative Centrifugal Field) instead of RPM.

If the instrument is in ω^2t mode, the **Set Speed Time** Page appears instead.

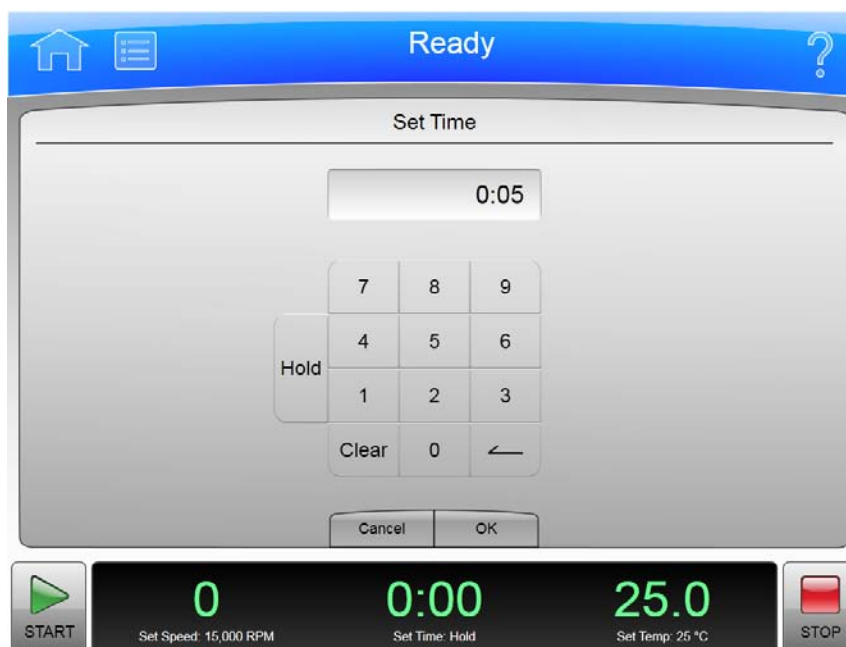
In addition to the Header Bar and the Footer Bar, the **Set Speed** Page contains the following elements:

- The Set Speed Display at the top of the page shows the current Set Speed in RPM or RCF. The last two digits are always zeroes when the speed is above 1000 RPM.
- The Keypad changes the speed setting. You can use the Clear and Backspace keys to make corrections.

- The **RPM/RCF** Button selects the type of speed units. This button is disabled until a rotor is selected.
- The **Select Rotor** Button takes you to the [Select Rotor and Labware](#) Page.
- The **Cancel** Button discards your changes and dismisses the page.
- The **OK** Button accepts your changes and dismisses the page.

Set Time Page

Figure 5.9 Set Time Page



The **Set Time** Page appears when you select the **Set Time** Display/Button on the **Home** Page or the Footer Bar, allowing you to set the duration for the next run.

If the instrument is in ω^2t mode, the **Set Speed Time** Page appears instead.

In addition to the Header Bar and the Footer Bar, the **Set Time** Page contains the following elements:

- The Set Time Display shows the current **Set Time** setting in hours and minutes.
- The Keypad changes the time setting. You can use the Clear and Backspace keys to make corrections.
- The **Cancel** Button discards your changes and dismisses the page without changing the current values.
- The **OK** Button accepts your changes and dismisses the page.

Set Speed Time Page (ω^2t Mode)

Figure 5.10 Set Speed Time Page (ω^2t Mode)



The **Set Speed Time** Page appears when the ω^2t mode is active and you select either the **Set Speed** Button or the **Set Time** Button on the **Home** Page or the Footer Bar. The ω^2t value is computed from the time and RPM (or RCF) values you enter. Having these all on the same page allows you to set the values for the next run that produce the desired ω^2t value.

Turn the ω^2t mode on and off with the ω^2t **Mode** Button on the [System Options Page](#).

In addition to the Header Bar and the Footer Bar, the **Set Speed Time** Page contains the following elements:

- The **Set Speed** Button/Display shows the current Speed in RPM or RCF. When you touch it, the keyboard becomes active to set a new speed value. The ω^2t value changes to reflect the new speed value.
- The ω^2t Button/Display shows the current ω^2t value. When you touch it, the keyboard becomes active to set a new ω^2t value. The time value changes to reflect the new ω^2t value.
- The **Set Time** Button/Display shows the current time setting in hours and minutes. When you touch it, the keyboard becomes active to set a new time value. The ω^2t value changes to reflect the new time value.
- The **RPM/RCF** Button selects the type of speed units. You must have a rotor selected to use RCF.
- The **Select Rotor** Button takes you to the [Select Rotor and Labware Page](#).
- The Keypad changes slightly depending on the value you are entering. For setting time, use the Hold key to set a hold value. For setting ω^2t , use the decimal and e keys to enter values in exponential notation.
- The **Cancel** Button discards your changes and dismisses the page.
- The **OK** Button accepts your changes and dismisses the page.

Set Temperature Page

Figure 5.11 Set Temperature Page



The **Set Temperature** Page appears when you select the **Set Temperature** Button on the **Home** Page or the Footer Bar, allowing you to set the temperature for the next run.

In addition to the Header Bar and the Footer Bar, the **Set Temperature** Page contains the following elements:

- The Set Temperature Display shows the current **Set Temperature** setting in degrees Celsius.
- The Keypad changes the temperature setting.
- The **Cancel** Button discards your changes and dismisses the page.
- The **OK** Button accepts your changes and dismisses the page.

To precondition the chamber to the selected temperature, use the **Vacuum** Button/Display on the Footer Bar of the **Home** Page.

Set Acceleration/Deceleration Profiles Page

Figure 5.12 Set Acceleration/Deceleration Profiles Page



The **Set Acceleration/Deceleration Profiles** Page appears when you select the **Accel/Decel** Button/Display in the Footer Bar, allowing you to choose profiles for acceleration and deceleration.

In addition to the Header Bar and the Footer Bar, the **Set Acceleration/Deceleration Profiles** Page contains the following elements:

- Acceleration lets you to choose an acceleration value by selecting a number.
- Deceleration lets you choose a deceleration value by selecting a number.
- The **Cancel** Button discards your changes and dismisses the page.
- The **OK** Button accepts your changes and dismisses the page.

The acceleration values are the degree of reduction from the maximum value. The acceleration value of zero is the maximum (no reduction). The acceleration value of 9 is the slowest (maximum reduction). The same applies to the deceleration values. The value 10 is an absolute reduction, eliminating all braking and allowing the rotor to coast to a stop.

Slower (numerically higher) acceleration and deceleration values minimize sample-to-gradient interface disturbance. Each acceleration profile has a designated time that it takes to reach a specified speed. After that, it uses maximum acceleration to reach run speed. For a deceleration profile, the instrument uses maximum deceleration until it reaches the specified speed, then takes the designated time to slow to a stop.

Example Acceleration and Deceleration Profiles

The values associated with each acceleration and deceleration profile are given in the tables below.

NOTE The values shown should be considered as approximations for time and rpm.

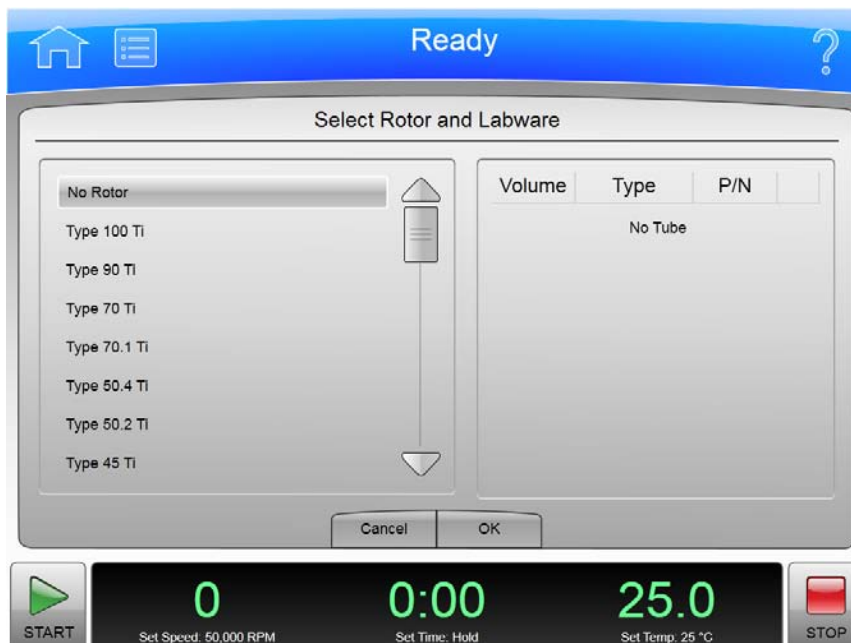
Acceleration			Deceleration		
Profile #	Time	RPM	Profile #	Time	RPM
0 (Max)	0:00	0	0 (Max)	0:00	0
1	2:00	170	1	2:00	170
2	2:40	350	2	2:40	350
3	3:00	500	3	3:00	500
4	3:00	170	4	3:00	170
5	4:00	350	5	4:00	350
6	4:30	500	6	4:30	500
7	4:00	170	7	4:00	170
8	5:20	350	8	5:20	350
9	6:00	500	9	6:00	500
			10	Coast	

For example, at an acceleration profile value of 5, the instrument takes four minutes to accelerate to 350 rpm, then proceeds to the run speed at maximum acceleration. For a deceleration profile of 3, the instrument uses maximum deceleration until it reaches 500 rpm, then takes three minutes to slow to a stop.

The exception is a deceleration profile of 10, for which no braking is applied at all. This is generally not used for high-speed runs because of the extremely long length of time it would take for the rotor to come to a stop.

Select Rotor and Labware

Figure 5.13 Select Rotor and Labware Page



The **Select Rotor and Labware** Page appears when you select the Button on either the **Set Speed** Page or the **Set Speed Time** Page, allowing you to select a rotor for the next run.

This is different from the **Rotor Catalog** Page, which shows rotor specifications, but does not select one for your next run.

In addition to the Header Bar and the Footer Bar, the **Select Rotor and Labware** Page contains the following elements:

- The Rotor Catalog List shows the available rotors for the instrument. You can select a rotor from this list. If the No Rotor value is selected, you cannot use RCF units on the **Set Speed** Page.
- The **Cancel** Button dismisses the page and any changes.
- The **OK** Button accepts the selection and dismisses the page.

For details about each rotor or labware, use the **Rotor Catalog** Page. This page only lists names for selection.

References Page

Figure 5.14 References Page



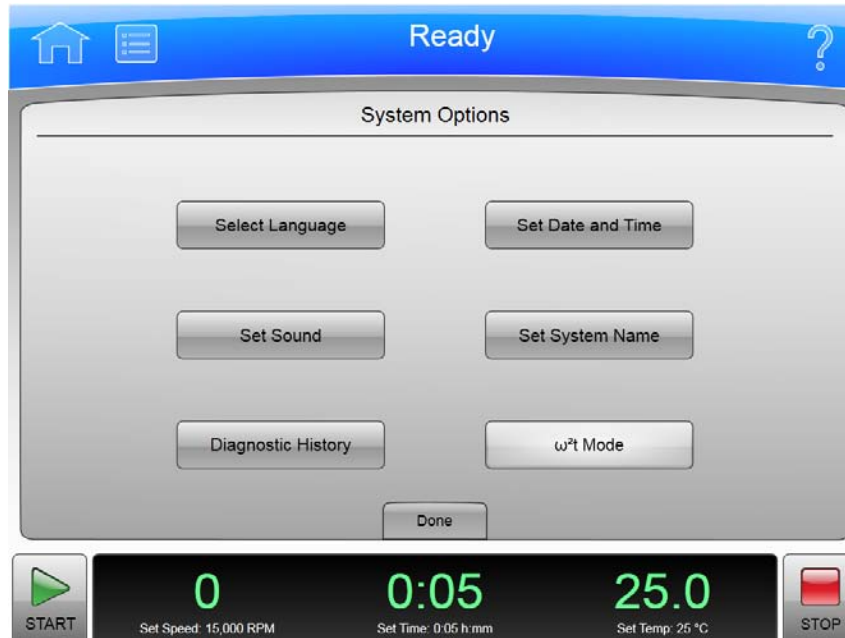
The **References** Page appears when you select the **References** Button in the **Menu** Page, allowing you to choose from the available reference materials to view.

In addition to the Header Bar and the Footer Bar, the **References** Page contains the following elements:

- The **Rotor Catalog** button takes you to the [Rotor Catalog Page](#).
- The **Labware Catalog** button takes you to the [Labware Catalog Page](#).
- The **Export User Manual** button takes you to the [Export User Manual Page](#).
- The **Done** Button dismisses the page.

System Options Page

Figure 5.15 System Options Page



The **System Options** Page appears when you select the **Options** Button in the **Menu** Page, allowing you to choose any of the available system option setting pages.

In addition to the Header Bar and the Footer Bar, the **System Options** Page contains the following elements:

- The **Select Language** Button takes you to the [Select Language Page](#).
- The **Set Sound** Button takes you to the [Set Sound Page](#).
- The **Diagnostic History** Button takes you to the [Diagnostic History Page](#).
- The **Set Date and Time** button takes you to the [Set Date and Time Page](#).
- The **Set System Name** Button takes you to the [Set System Name Page](#).
- The **ω²t Mode** Button toggles the ω²t mode off and on. The mode is on when the button is highlighted. See the **Set Speed Time** Page for details.
- The **Done** Button dismisses the page.

Zonal Authorization Page

Figure 5.16 Zonal Authorization Page



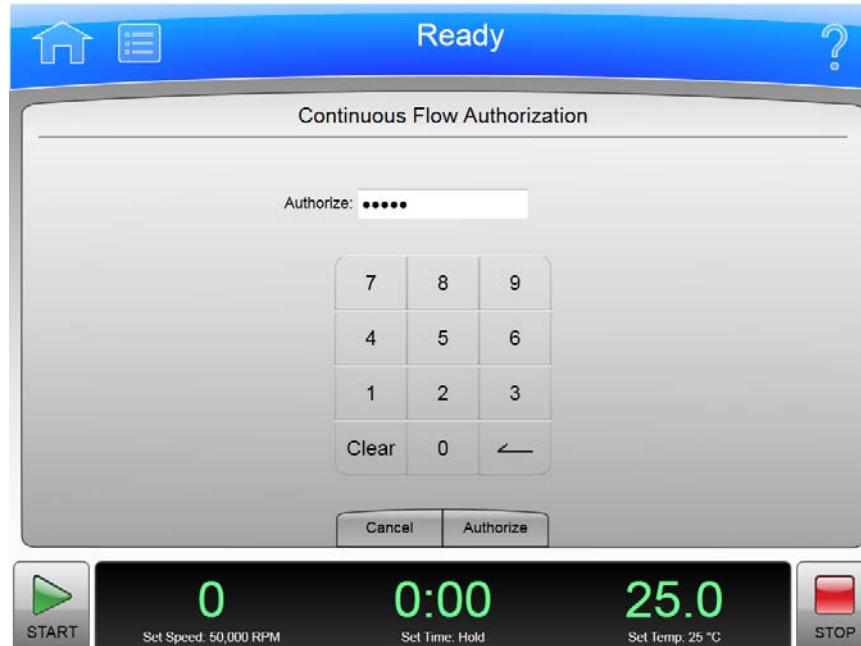
The **Zonal Authorization** Page appears when you select the **Zonal Operation** Button on the **Menu** Page, allowing you to use Zonal mode for the next run.

In addition to the Header Bar and the Footer Bar, the **Zonal Authorization** Page contains the following elements:

- The **Authorize** Display allows you to enter the authorization password (which is 1793). For security reasons, the display shows bullets in place of the numbers you enter.
- The Keypad for entering the password.
- The **Cancel** Button dismisses the page without entering Zonal mode.
- The **Authorize** Button accepts the password you have entered and (if the password is the correct one) takes you to the [Zonal Operation Page](#), which replaces the **Home** Page while you are using Zonal mode.

Continuous Flow Authorization Page

Figure 5.17 Continuous Flow Authorization Page



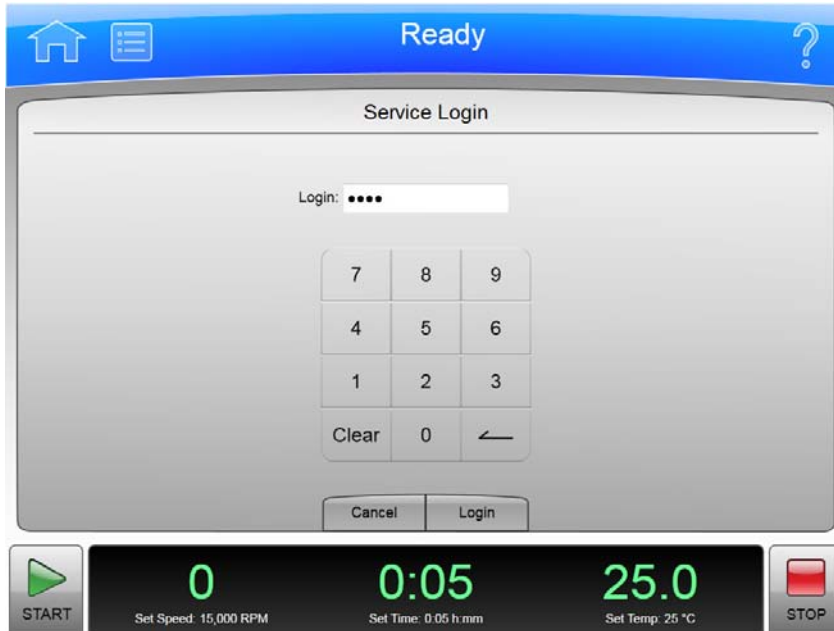
The **Continuous Flow Authorization** Page appears when you select the **Continuous Flow Operation** Button on the **Menu** Page, allowing you to use Continuous Flow mode for the next run.

In addition to the Header Bar and the Footer Bar, the **Continuous Flow Authorization** Page contains the following elements:

- The **Authorize** Display allows you to enter the authorization password (which is 1793). For security reasons, the display shows bullets in place of the numbers you enter.
- The Keypad for entering the password.
- The **Cancel** Button dismisses the page without entering Continuous Flow mode.
- The **Authorize** Button accepts the password you have entered and (if the password is the correct one) takes you to the [Continuous Flow Operation Page](#), which replaces the **Home** Page while you are using Continuous Flow mode.

Service Login Page

Figure 5.18 Service Login Page

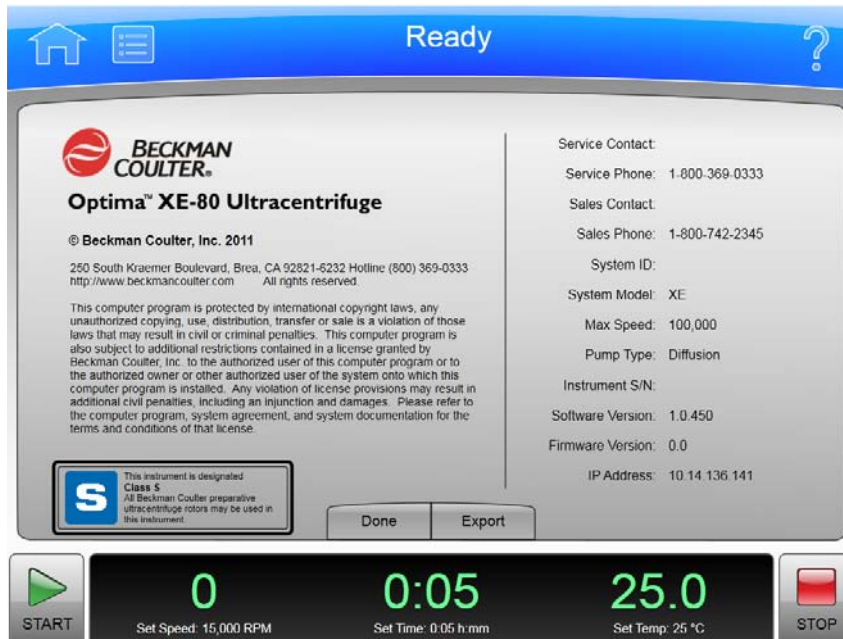


The **Service Login** Page appears when you select the **Service Mode** Button on the **Menu** Page.

This page is for service personnel only. If you accidentally find yourself on the **Service Login** Page, select the **Cancel** button to dismiss the page.

About Page

Figure 5.19 About Page



The **About** Page appears when you select the **About** Button on the **Menu** Page. This page presents system information about your instrument.

In addition to the Header Bar and the Footer Bar, the **About** Page contains the following operating elements:

- The **Done** button dismisses the page.
- The **Export** button takes you to the export **About** Page.

NOTE Do not remove the USB drive while a data transfer is in progress.

- The Available Drives list shows all the available USB drives. If the list is empty, the prompt “Insert USB Drive” appears below the list area. Select an available USB drive to receive the information.
- The **Export** Button transfers the information to the selected USB drive.

Rotor Catalog Page

Figure 5.20 Rotor Catalog Page



The **Rotor Catalog** Page appears when you select the **Rotor Catalog** Button on the **References** Page, allowing you to examine the detailed specifications for all the rotors available for your instrument.

This is different from the **Select Rotor and Labware** Page where you choose a rotor from the **Set Speed Page**.

In addition to the Header Bar and the Footer Bar, the **Rotor Catalog** Page contains the following elements:

- The List of Rotors on the left side of the screen shows all the available rotors for the instrument. You can scroll through this list and select a rotor to view the detailed information about it.
- The Rotor Details on the right side of the screen shows all the details for the selected rotor on the List of Rotors.
- The **Back** Button returns you to the **References** Page.
- The **Labware** Button takes you to the [Compatible Tubes for Rotor Page](#) to show you the labware for the selected rotor. Note that this is a small subset of all the labware shown on the **Labware Catalog** Page.

Labware Catalog Page

Figure 5.21 Labware Catalog Page



The **Labware Catalog** Page appears when you select the **Labware Catalog** Button on the **References** Page, allowing you to examine the detailed specifications for the labware available for the rotors your instrument can use.

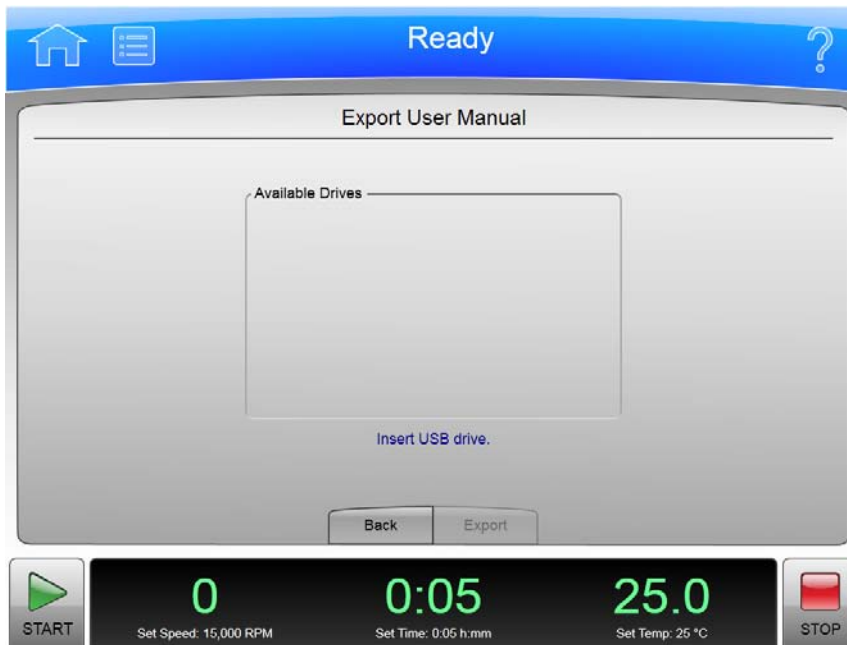
This is different from the **Compatible Tubes for Rotor** Page, which shows only the labware available for a particular rotor when you are on the **Rotor Catalog** Page.

In addition to the Header Bar and the Footer Bar, the **Labware Catalog** Page contains the following elements:

- The List of Labware on the left side of the screen shows the labware by volume, type, and part number. Scroll through this list and select a particular labware to view the detailed information about it.
- The Labware Details on the right side of the screen shows all the details for the selected labware on the List of Labware.
- The **Back** Button returns you to the **References** Page.

Export User Manual Page

Figure 5.22 Export User Manual Page



Selection of the **Export User Manual** Button allows you to copy the User Manual to a USB drive.

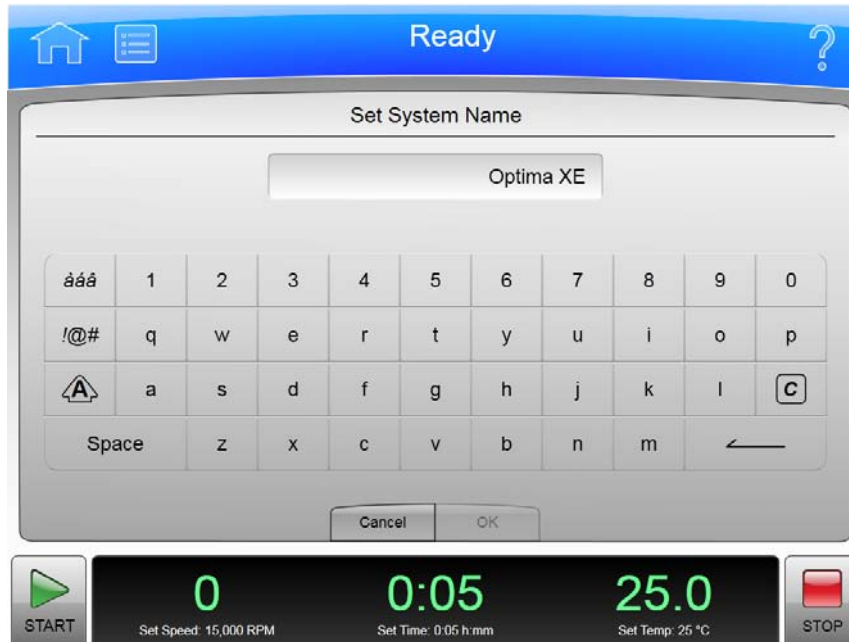
NOTE Do not remove the USB drive while a data transfer is in progress.

In addition to the Header Bar and the Footer Bar, the **Export User Manual** Page contains the following elements:

- The Available Drives list shows all the available USB drives. If the list is empty, the prompt “Insert USB Drive” appears below the list area. Select an available USB drive to receive the information.
- The **Back** Button returns you to the previous page.
- The **Export** Button transfers the information to the selected USB drive.

Set System Name Page

Figure 5.23 Set System Name Page



The **Set System Name** Page appears when you select the **Set System Name** Button on the [System Options Page](#), allowing you to set the System Name that appears in the Footer Bar on the **Home** Page.

In addition to the Header Bar and the Footer Bar, the **Set System Name** Page contains the following elements:

- The Set System Name Display shows the current System Name.
- The Keyboard for entering the name. It includes special keys for different character modes and corrections.
- The **Cancel** Button ignores any changes you have made and returns to the [System Options Page](#).
- The **OK** Button accepts your changes and returns to the [System Options Page](#).

The other keys work much like standard keyboard keys, except that the Shift and Special Character Set keys work as toggle (like a standard Caps Lock key). There are also Clear and Backspace keys with symbolic markings.

Set Date and Time Page

Figure 5.24 Set Date and Time Page



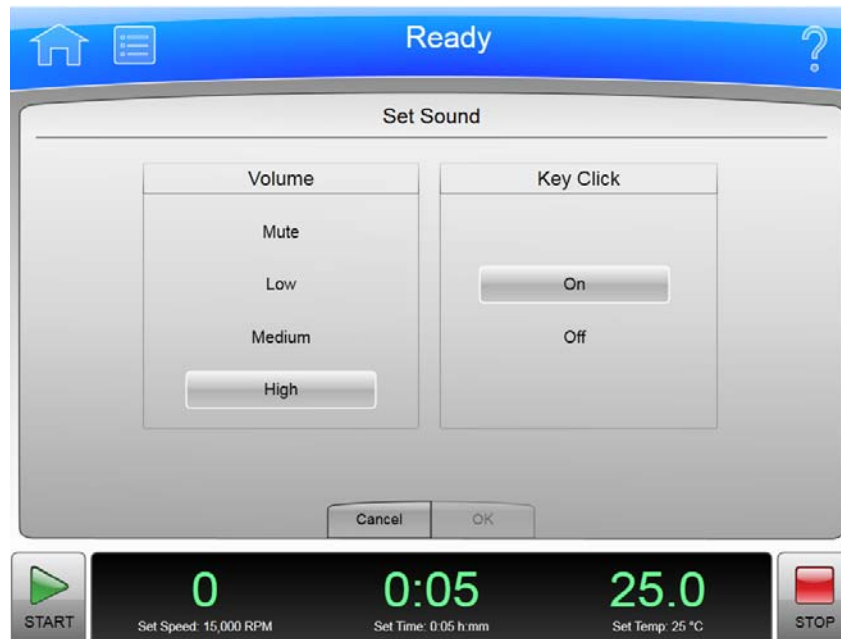
The **Set Date and Time** Page appears when you select the **Set Date and Time** Button on the [System Options Page](#), allowing you to set the instrument's internal time and date.

In addition to the Header Bar and the Footer Bar, the **Set Date and Time** Page contains the following elements:

- The Month-Day-Year controls let you set the date. Simply select the arrow button above one of the numbers to make it larger or select the button below to make it smaller.
- The Hour-Minute-AM/PM controls let you set the time. They work the same as the date controls except that the AM/PM value has only one arrow button to change the setting.
- The **Select Time Format** Buttons set the way time appears on the instrument. The 12 Hour format button selects a 12 hour display with AM and PM. The 24 Hour format button selects a 24 hour display without AM and PM notation. With some language selections, the 12 hour option may be unavailable.
- The **Cancel** Button discards any changes you made on this screen and returns to the [System Options Page](#).
- The **OK** Button accepts your changes and returns to the [System Options Page](#).

Set Sound Page

Figure 5.25 Set Sound Page



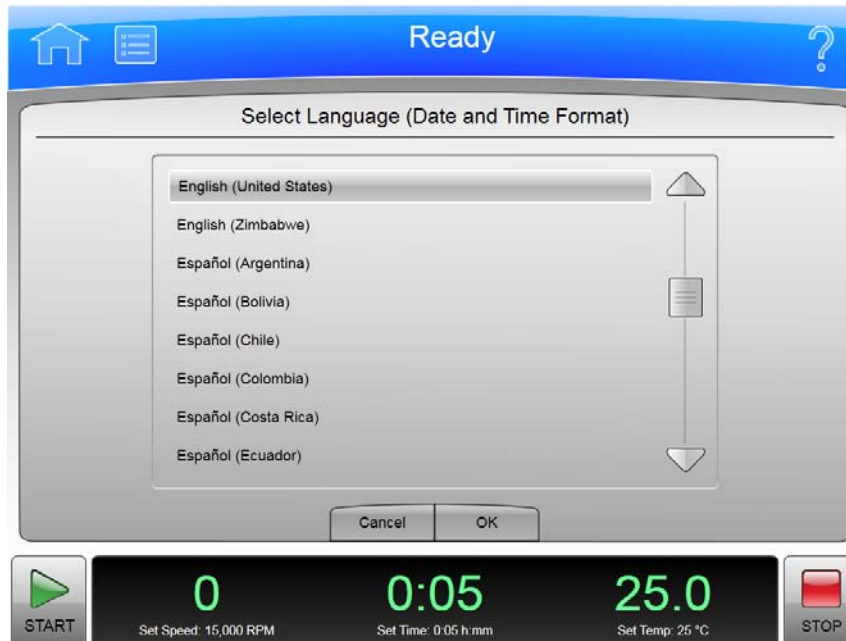
The **Set Sound** Page appears when you select the **Set Sound** Button on the [System Options Page](#), allowing you to set the sound volume and enable or disable the key click option.

In addition to the Header Bar and the Footer Bar, the **Set Sound** Page contains the following elements:

- The **Volume** buttons let you to choose one of the four system volumes: Mute (silent), Low, Medium, or High.
- The **Key Click** buttons let you choose if the key click is On or Off.
- The **Cancel** Button discards your changes and returns you to the [System Options Page](#) without changing the current volume and key click settings.
- The **OK** button accepts your changes and returns you to the [System Options Page](#).

Select Language Page

Figure 5.26 Select Language Page



The **Select Language** Page appears when you select the **Select Language** Button on the [System Options Page](#), allowing you to choose the language the instrument uses in operations.

In addition to the Header Bar and the Footer Bar, the **Select Language** Page contains the following elements:

- The List of Languages shows all the languages and countries available for the instrument. Scroll through this list and select a language and country.
- The **Cancel** Button ignores your selection and returns you to the [System Options Page](#).
- The **OK** Button accepts your selection and returns you to the [System Options Page](#) with the newly-selected language active on all pages.

NOTE Be careful that you do not select a language that you do not understand. You will find it difficult to return to this page and restore the language setting (unless you can remember Menu, upper left button for Options, and then upper left button for Select Language).

Diagnostic History Page

Figure 5.27 Diagnostic History Page



The **Diagnostic History** Page appears when you select the **Diagnostic History** Button on the [System Options Page](#), allowing you to examine and export the details of incidents that caused a diagnostic message on the instrument (warnings and error messages).

In addition to the Header Bar and the Footer Bar, the **Diagnostic History** Page contains the following elements:

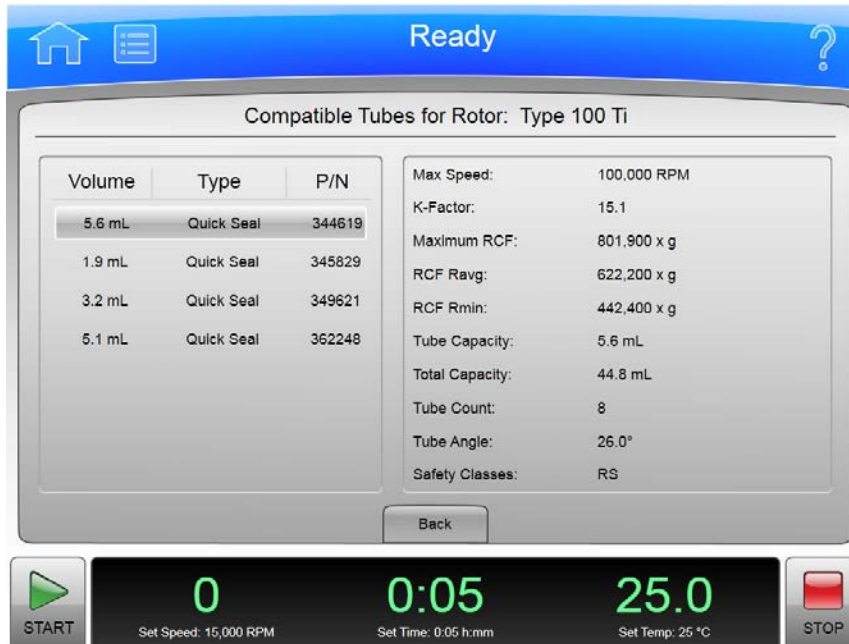
- The List of Events on the left side of the screen shows all the diagnostic events for the instrument. Scroll through this list and select an event to view the detailed information about it.
- The Event Details on the right side of the screen shows all the details for the selected event on the List of Events.
- The **Back** Button returns you to the [System Options Page](#).
- The **Export** Button takes you to the Export Diagnostic Page to let you copy the diagnostic history to a USB drive.

NOTE Do not remove the USB drive while a data transfer is in progress.

- The Available Drives list shows all the available USB drives. If the list is empty, the prompt "Insert USB Drive" appears below the list area. Select an available USB drive to receive the information.
- The **Export** Button transfers the information to the selected USB drive.

Compatible Tubes for Rotor Page

Figure 5.28 Compatible Tubes for Rotor Page



The **Compatible Tubes for Rotor** Page appears when you select the **Labware** Button on the **Rotor Catalog** Page, allowing you to examine the detailed specifications for the labware for the selected rotor.

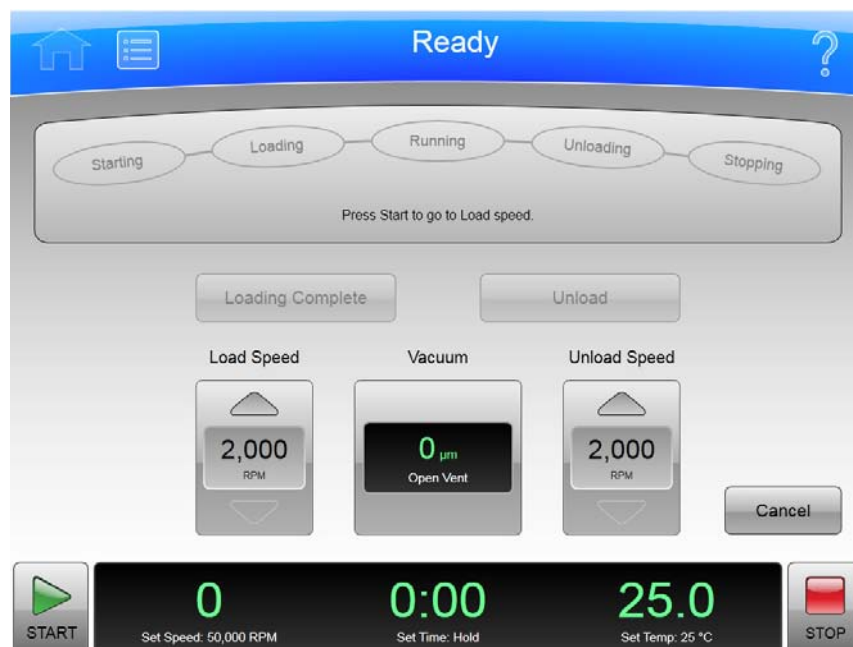
This is different from the **Labware Catalog** Page, which shows the labware for all rotors.

In addition to the Header Bar and the Footer Bar, the **Compatible Tubes for Rotor** Page contains the following elements:

- The List of Labware on the left side of the screen shows the labware for the selected rotor by volume, type, and part number. Scroll through this list and select a particular labware to view the detailed information about it.
- The Labware Details on the right side of the screen show all the details for the selected labware on the List of Labware.
- The **Back** Button returns you to the **Rotor Catalog** Page.

Zonal Operation Page

Figure 5.29 Zonal Operation Page



The **Zonal Operation** Page appears when you enter the correct password and select the **Authorize** Button from the **Zonal Authorization** Page, putting the instrument in Zonal mode.

When you use Zonal mode, the **Zonal Operation** Page replaces the **Home** Page until Zonal mode ends.

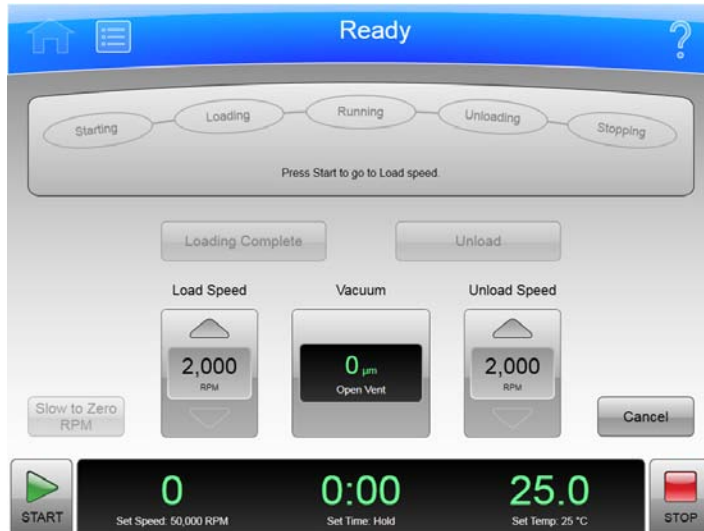
In addition to the Header Bar and the Footer Bar, the **Zonal Operation** Page contains the following elements:

- The Status Display shows the current step in the Zonal run procedure. See [Zonal and Continuous Flow Operation](#) in the [Operations](#) chapter for details.
- The **Loading Complete** Button ends the sample loading step and proceeds to the running step.
- The **Unload** Button terminates the running step early and proceeds to the sample unloading step.
- The Load Speed Display shows the sample loading speed. Use the **arrow** buttons above and below to increase or decrease the sample loading speed.
- The **Vacuum** Display/Button shows the current vacuum. You press it to begin evacuating and preconditioning the chamber at the beginning of a run, or to release the vacuum at the end of a run.
- The Unload Speed Display shows the sample unloading speed. Use the arrow buttons above and below to increase or decrease the sample unloading speed.
- The **Cancel** Button ends Zonal Mode before loading is complete and returns you to the **Home** Page.

Use the Footer Bar for setting the run speed, time, and temperature.

Continuous Flow Operation Page

Figure 5.30 Continuous Flow Operation Page



The **Continuous Flow Operation** Page appears when you enter the correct password and select the **Authorize** Button from the **Continuous Flow Authorization** Page, putting the instrument in Continuous Flow mode.

When you use Continuous Flow mode, the **Continuous Flow Operation** Page replaces the **Home** Page until Continuous Flow mode ends.

In addition to the Header Bar and the Footer Bar, the **Continuous Flow Operation** Page contains the following elements:

- The Status Display shows the current step in the Continuous Flow Run procedure. See [Zonal and Continuous Flow Operation](#) in the [Operations](#) chapter for details.
- The **Loading Complete** Button ends the sample loading step and proceeds to the running step.
- The **Unload** Button terminates the running step early and proceeds to the sample unloading step.
- The Load Speed Display shows the sample loading speed. Use the arrow buttons above and below to increase or decrease the sample loading speed.
- The **Vacuum** Display/Button shows the current vacuum. Press it to begin evacuating and preconditioning the chamber at the beginning of a run, or to release the vacuum at the end of a run.
- The Unload Speed Display shows the sample unloading speed. Use the arrow buttons above and below to increase or decrease the sample unloading speed.
- The **Slow to Zero rpm** Button is for preliminary steps which require bringing the rotor to a stop temporarily during the initial loading adjustments.
- The **Cancel** Button ends Continuous Flow Mode before loading is complete and returns you to the **Home** Page.

Use the Footer Bar for setting the run speed, time, and temperature.

Running Home Page

Figure 5.31 Running Home Page



The **Running Home** Page appears when there is an actual run in progress.

In addition to the Header Bar and the Footer Bar, the **Running Home** Page contains the following elements:

- The **Set Speed** Display shows the current Set Speed progress of the run in RPM or RCF. The last two digits are always zeroes when the speed is above 1000 RPM.
- The Set Time Display shows the current **Set Time** progress of the run in hours and minutes.
- The Set Temperature Display shows the current **Set Temperature** of the run in degrees Celsius.

The **Vacuum** Display/Button on the Footer Bar shows the current vacuum of the run that is in progress. The button toggles between evacuating and venting. Press it before starting a run (after the door is closed) to begin evacuating and pre-conditioning the chamber. Press it at the end of a run (assuming speed is less than 3000 rpm and decelerating) to release the vacuum (i.e., vent the chamber).

Press the **Accel** (acceleration) button on the Footer Bar to select a new profile for the acceleration of a run.

Press the **Decel** (deceleration) button on the Footer Bar to select a new profile for the deceleration of a run.

Maintenance and Troubleshooting

This chapter contains care and maintenance procedures to be performed regularly.

Field Service

For any maintenance not covered in this manual, contact Beckman Coulter Field Service for assistance. USA customers can call 1-800-742-2345. For international contacts, see the website at www.beckmancoulter.com or use the contact numbers on the inside front cover of this book.

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

Rotors and Labware

You also need to maintain rotors and labware. You can find the approved rotors and labware on the **Reference** Page as described in the previous chapter. Refer to the applicable rotor and labware documents for detailed instructions on their care.

Cleaning

The methods and materials used in the following procedures have been tested by Beckman Coulter and will not damage the instrument if used as instructed.

 **CAUTION**

Before using any other materials or methods, check with Beckman Coulter to verify that they will not damage the instrument.

Instrument Surfaces

Clean instrument surfaces using a cloth dampened with a mild detergent solution, such as Beckman Solution 555™.



Be careful not to spill liquid on the instrument where electrical or mechanical components could get damaged.

Rotor Chamber

The rotor chamber is coated with epoxy resin paint. To clean the chamber, wipe it with a cloth dampened with a mild detergent, such as Beckman Solution 555.

Chamber Door O-ring

The chamber door O-ring is Buna N rubber. Clean it with a tissue or soft cloth every 3 or 4 months.

If the O-ring becomes worn or damaged, replace it. Lightly coat the new O-ring with silicone vacuum grease (335148) to ensure an optimum vacuum seal.

NOTE Instrument O-rings have **not** been designed as bioseals for aerosol containment.

Decontamination

If the instrument and/or accessories are contaminated with radioactive or pathogenic solutions, follow appropriate decontamination procedures as determined by your laboratory safety officer. Refer to Chemical Resistances (publication IN-175), or contact Beckman Coulter Field Service to ensure that the decontamination method does not damage any part of the instrument (or accessories).

Sterilization and Disinfection



WARNING

While Beckman Coulter has tested these methods and found that they do not damage the instrument, 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.

The top working surface is finished with urethane paint. The sides are finished with general purpose paint. You can use Ethanol (70%) on both these surfaces.



WARNING

Ethanol is a volatile liquid that cannot be used on or near an operating instrument due to fire hazard.

Diagnostics/User Messages

When a condition arises that requires operator attention, the windshield turns yellow or red. A dialog will automatically open showing the diagnostic message. User messages communicate information about the ultracentrifuge or alert you to an abnormal condition. For a list of the possible malfunctions and their corrective actions, see [APPENDIX C, Diagnostics](#).

Retrieving Your Sample in Case of Power Failure

The instrument responds to a power failure during operations in two different ways:

- Power failed during a run and the rotor is still spinning when power is restored.
- Power failed during a run and the rotor has stopped when power is restored.

During a Run

If a power failure occurs during a run, the rotor begins to decelerate with the brake off. The corrected run time is determined when power is restored and, if the set run time has not elapsed, the run will resume as described. Note that a rotor decelerating without the brake may take hours to come to a complete stop.

Rotor Spinning at Restoration

If the rotor is still spinning when power is restored, the instrument takes the following steps:

- Return to the set speed.
- Resume incrementing the run timer.
- Set a diagnostic message to alert you that a power failure occurred during the run.

Rotor Stopped at Restoration

If the rotor has stopped spinning when power is restored, the instrument cancels the run and sends a diagnostic message to alert you to that the run was cancelled due to a power failure.

Getting Access to the Sample

If a power failure lasts for several hours, you may have to remove the sample from the rotor while there is no power to the instrument. The procedure requires removing the front panel, which should be done only by qualified service personnel.

WARNING

Any maintenance procedure requiring removal of a panel exposes the operator to the possibility of electrical shock and/or physical injury. If any such procedure becomes necessary, turn the power switch OFF, and then disconnect the instrument from the main power source by removing its power plug from the receptacle. Refer the maintenance to qualified service personnel.

To get access to the rotor, follow these steps:

- Disconnect the power by removing its power plug from the receptacle.
- Remove the front panel.
- Vent the chamber to release the vacuum.
- Release the door lock.
- Open the door.

WARNING

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

Check Power

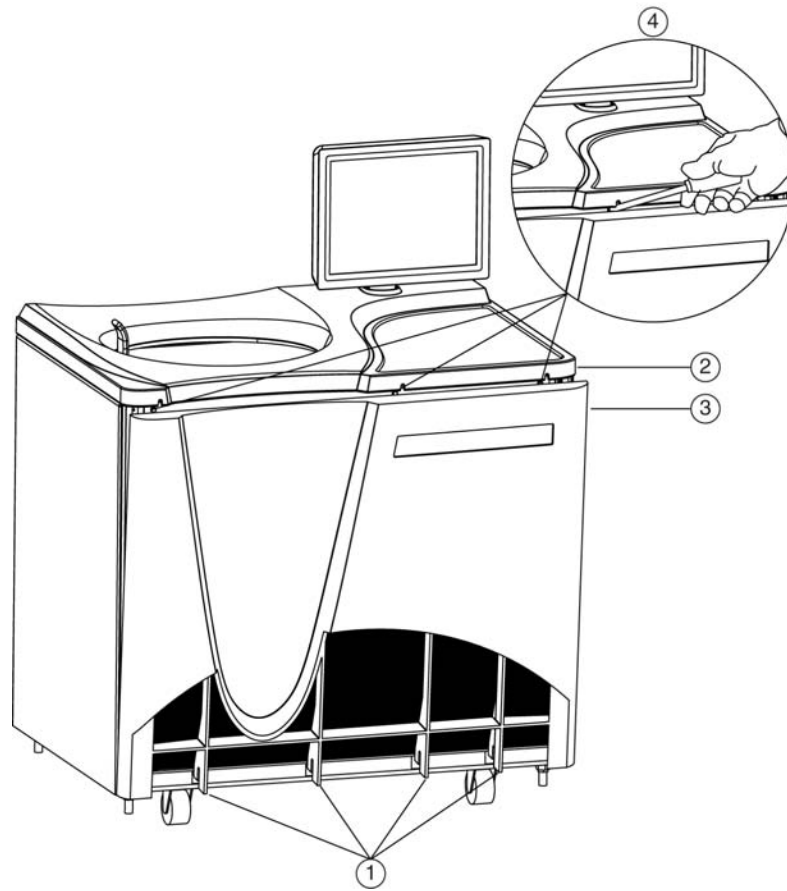
Check that the power switch is in the OFF position and the instrument is disconnected from the power (i.e., the power plug is removed from its receptacle).

Remove the Front Panel

To remove the front panel:

- 1 Locate the three front panel latch screws and use a small flat-head screwdriver to turn each latch screw counter-clockwise until each one is loose. Refer to [Figure 6.1](#).

Figure 6.1 Panel screws and Tabs



- | | |
|---------------|-----------------|
| 1. Panel Tabs | 3. Front Panel |
| 2. Top Panel | 4. Latch Screws |

2 When all three latch screws are loose, use your hand to lift the top panel until it pops loose.

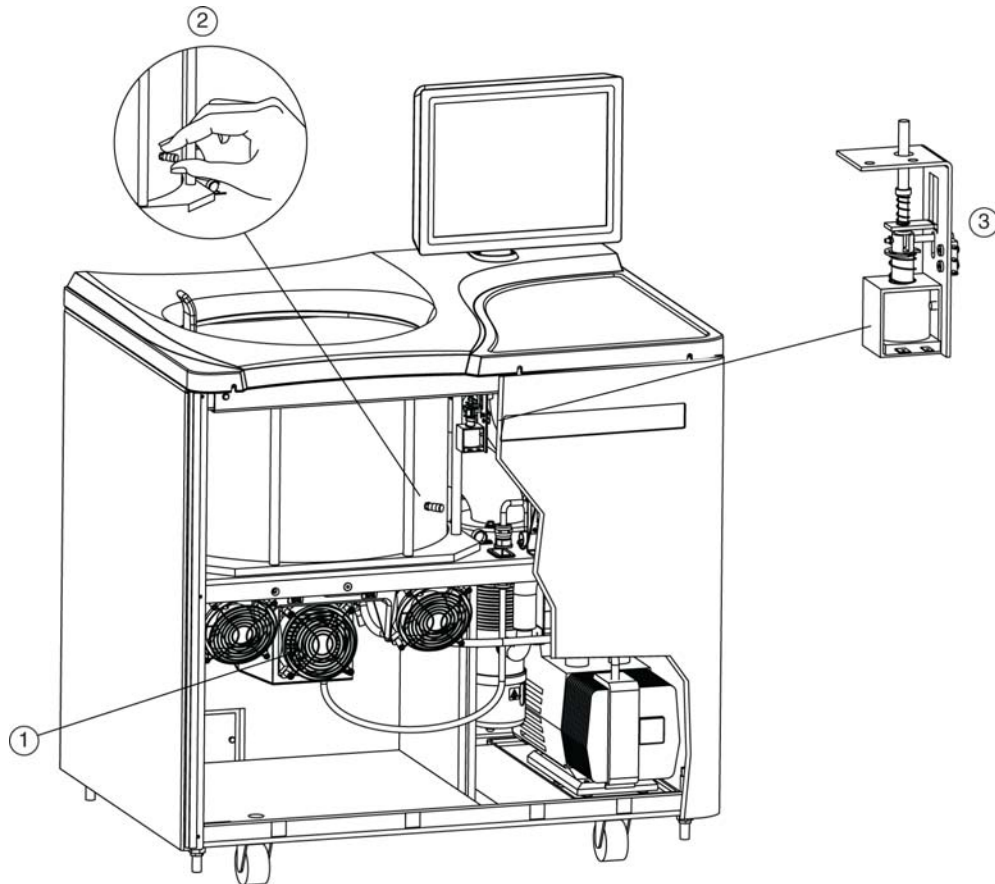
3 Lift the front panel until it is free and tilt the top edge towards you.

4 Lift the front panel off the tabs that secure it at the bottom and put it in a safe place.

⚠ WARNING

When working on the inside of the instrument, be careful not to touch any wires or circuitry.

Figure 6.2 Internal Parts



- 1. Fan Housing
- 2. Vacuum Vent Port Cap
- 3. Door Interlock Assembly

5 Listen carefully for any sounds coming from the drive and touch the fan housing to feel for vibrations. If you detect any sounds or vibrations, do not go further. The rotor is still spinning and you must wait for it to come to a stop.

Vent the Chamber

Although you checked for noise and vibration, there is still a possibility that the rotor is still spinning. If it is still spinning, you can hear a whining noise when you begin to vent the chamber. If you hear the whining noise when you begin to vent the chamber, you must close the port immediately and wait for the rotor to come to a stop. The following steps describe the procedure you must follow:

- 1 Locate the vacuum vent port cap on the side of the rotor chamber.
- 2 Turn the cap very slowly counter-clockwise until you can hear the hiss of air entering the chamber.
- 3 If you hear a whining noise, immediately turn the cap clockwise to close it and wait until the rotor has had time to come to a stop (at least an hour) before attempting to vent the chamber again.
- 4 When air flows into the chamber without a whining noise, remove the cap completely.

Release the Door Lock

Locate the door interlock assembly. Pull down on the interlock pin until it locks in the downward position.

Open the Door

Open the chamber door carefully. If the rotor is still spinning, even at a slow speed, close the door and wait.



NEVER attempt to slow or stop the rotor by hand.

With the door open and the rotor stopped, you can retrieve your sample.



Do not attempt to run the instrument before restoring it to a safe operating condition as described in the following section.

Restoring the Instrument to Operating Condition

After retrieving your sample, restore the instrument to operating condition as follows:

- 1 Close the chamber door.
- 2 Replace and tighten the vacuum vent port cap. It should be snug, but do not overtighten it.
- 3 Place the front panel in the tilted position with the top edge toward you, the sides aligned with the sides of the instrument, and the tabs at the bottom edge inserted into the lip at the base of the instrument.
- 4 Lift the front edge of the top panel a few inches and insert the upper edge of the front panel under it. Push back gently to engage the tabs, then push down.
- 5 For each of the three latch screws, use the small flat-head screwdriver to turn it clockwise until snug.
- 6 After the panels are all secure, reconnect the instrument to the power supply.

The instrument is again ready for use when power is restored.

Storage and Transportation

To ensure that the instrument 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 in **Appendix A: Preinstallation Requirements**.

Supply List

Contact Beckman Coulter Sales for assistance ordering parts and supplies. Customers in the United States call 1-800-742-2345. For international contacts, see the website at www.beckmancoulter.com or use the contact numbers on the inside front cover of this book. 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.beckmancoulter.com) for detailed information on ordering rotors, tubes, and accessories.

Replacement Parts

Description	Part Number
Chamber O-ring	801778

Supplies

Description	Part Number
Spinkote lubricant (1 oz)	306812
Silicone vacuum grease (2 oz)	335148
Beckman Solution 555 (1 qt)	339555
Logbook for preparative ultracentrifuges	330049
Master rotor logbook	339587

NOTE For MSDS information, go to the Beckman Coulter website at www.beckmancoulter.com

Preinstallation Requirements

Overview

NOTE Do not attempt to install or turn on the power to the Optima XE. Its purchase price includes installation by Beckman Coulter personnel. Installation by anyone other than authorized Beckman Coulter personnel invalidates the instrument warranty.

Preinstallation requirements have been sent prior to shipment of the instrument. Copies are also attached to the outside of the shipping container. The following information is provided in case the instrument must be relocated. Contact Beckman Coulter Field Service to adjust and level the instrument if it must be moved. The pads on each leveling leg are designed to prevent possible rotation of the instrument in the case of a rotor mishap.

Space Requirements

Space requirements include specifications for safety, ventilation, and temperature.

Safety

Locate the ultracentrifuge in a clean, safe, uncluttered environment free of volatile vapors that could be ignited by the operation of the centrifuge.

 **WARNING**

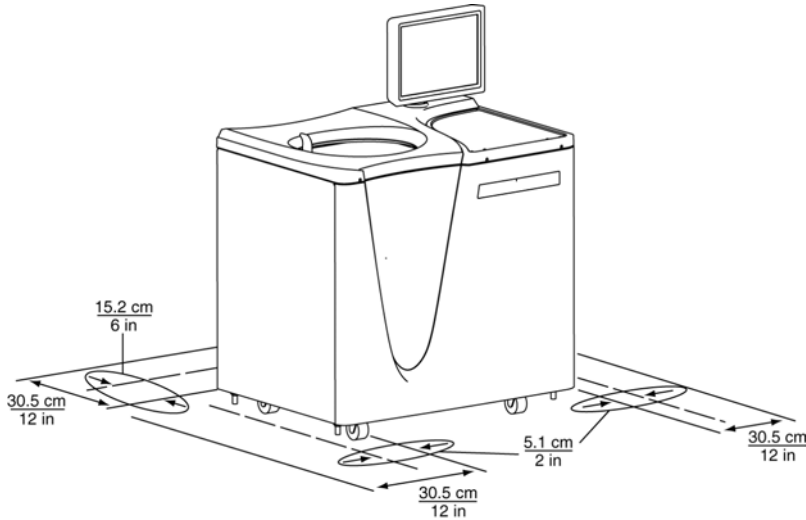
Do not place the ultracentrifuge near areas containing flammable reagents or combustible fluids. Vapors from these materials could enter the ultracentrifuge air system and be ignited by the motor.

Although the possibility of a rotor failure is remote, your planning should include a safety space around the instrument of 12 inches (30.5 cm.) to allow for the movement of the instrument in the event that a rotor failure occurs at high rotational speed. If you decide to install the instrument in an area where furniture, equipment, or a wall is within this safety space, you run the risk of damage to anything within this space in the event of a rotor failure.

⚠ WARNING

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.

Figure A.1 Safety and ventilation space



Ventilation

If you choose to install the instrument with less than the 12 in./30.5 cm. safety clearance, you must at least provide a required ventilation and service access clearance of 6 in. (15.2 cm.) behind the instrument and 2 in. (5.1 cm.) on each side. In addition, the ultracentrifuge must have adequate air ventilation to ensure compliance to local requirements for vapors produced during operation.

Temperature

The instrument operates within specifications in a laboratory with ambient temperatures ranging from 10 to 35°C.

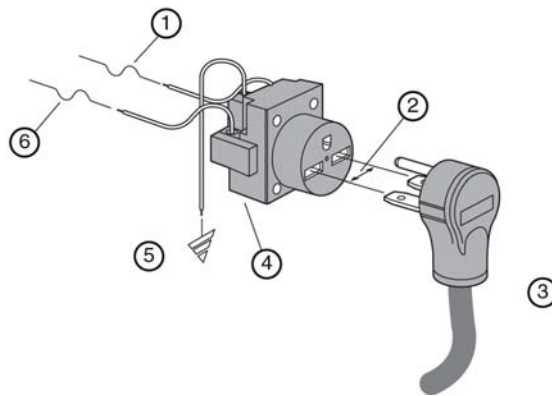
Electrical Requirements

- Instrument Rating: 220 to 240 VAC, 50 Hz, 20 A
200 to 240 VAC, 50/60 Hz, 20 A
- Power Line Range: 180 to 264 VAC, 60 or 50 Hz (single-phase), 30 A

To reduce risk of electrical shock, this equipment uses a three-wire electrical cord (3.05 m; 10 ft.) and plug (see [Figure A.2](#)) to connect the equipment to earth ground. In regions where the instrument is supplied with an unterminated cord, a plug that meets local electrical and safety requirements must be supplied. (Contact your local Beckman Coulter office for specific information regarding these requirements.) See [Table A.1](#) for the required wire connections. Make sure that the matching wall outlet is located near the centrifuge and is easily accessible, properly wired and earth-grounded.

NOTE The power plug serves as the Disconnecting Device and must remain easily accessible.

Figure A.2 Electrical Connection



1. 30-ampere Circuit Protector
2. Measured Line Voltage
3. North American Plug
4. Wall Outlet: NEMA 6-30 R
5. Earth Ground
6. 30-ampere Circuit Protector

To ensure safety, the instrument 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). Refer to [Table A.1](#).

Table A.1 Required Wire Connections

Wire Insulation Color	Terminal	Symbol	
		Harmonized	North American
Green/Yellow	Earth ground		
Light Blue	Neutral	N	L
Brown	Live or Line	L	L

Special Warranty for the Optima™ XE

Special Warranty

Subject to the exceptions and upon the conditions specified below, Beckman Coulter, Inc., 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 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. 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.

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.

Damage to the instrument while operating a rotor not of Beckman Coulter manufacture is not covered by warranty or service contract terms. Further, Beckman Coulter shall be released from all obligations under all warranties either expressed or implied, if the product covered hereby is repaired or modified by persons other than its own authorized service personnel, unless such repair is made by others who meet qualifications similar to those required of Beckman Coulter's service personnel, 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.

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 drive's second through tenth year of use there is a prorated drive replacement price based on years of use if the drive unit is installed, serviced, and operated in accordance with the conditions listed below.

Drive replacement price for units not under service contract = current drive exchange price
 $\times \left(\frac{\text{years of use}}{10} \right) + \text{labor and travel.}$

NOTE 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.

If the above conditions are not met, the full appropriate exchange price for the drive will be charged.

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.

Diagnostics

Overview

This section lists possible malfunctions and corrective actions. Maintenance procedures are described in [CHAPTER 6, Maintenance and Troubleshooting](#).

For any maintenance not covered in this manual, contact Beckman Coulter Field Service for assistance. USA customers can call 1-800-742-2345. For international contacts, see the website at www.beckmancoulter.com or use the contact numbers on the inside front cover of this book.

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.

Diagnostics/User Messages Chart

Refer to the chart below for a list of possible malfunctions and their corrective actions.

Table C.1 Diagnostics/User Messages Chart

Message	Definition/Result	Recommended Action
D100 - Turn off power immediately	Instrument cannot trip breaker	Call Beckman Coulter Field Service.
D101 - SBC Communications	Single board computer boot error	Call Beckman Coulter Field Service.
D102 - SCB Communications	Communications error	Call Beckman Coulter Field Service.
D103 - Inverter Communications	Inverter I ² C error	Call Beckman Coulter Field Service.
D104 - Inverter Communications	Inverter ADC I ² C error - U21	Call Beckman Coulter Field Service.
D105 - Inverter Communications	Inverter I ² C I/O Expander error	Call Beckman Coulter Field Service.

Table C.1 Diagnostics/User Messages Chart (Continued)

Message	Definition/Result	Recommended Action
D107 - Inverter Communications	TEM ADC I ² C error - U24	Call Beckman Coulter Field Service.
D108 - Network Communications	D108 - Network Communications	Be sure external devices are turned on.
D109 - Network Communications	Network error - ethernet disconnected	Be sure network cable is plugged in.
D110 - Network Communications	Network error - cannot renew IP address	Check to see if network is active.
D111 - System Data Error	Data error	Note: If recovery fails, this condition will result in a 200 minute delay before the diagnostic can be cleared and the door opened. The power must be left on, until the delay period is completed. Call Beckman Coulter Field Service.
D112 - USB Port	USB import/export error	USB device may be full or removed too quickly. Save again with another USB device..
D113 - Touch Screen Not Detected	Touch Screen USB cable not connected	Be sure USB touch screen cable is connected. If problem persists, call Beckman Coulter Field Service.
D114 - Code error	Bad checksum on code flash	Call Beckman Coulter Field Service.
D115 - Code error	Corrupted data flash	Note: This condition will result in a 200 minute delay before the diagnostic can be cleared and the door opened. The power must be left on, until the delay period is completed. Call Beckman Coulter Field Service.
A117 - Alert: Printer error	No printer or printer driver	Be sure printer is turned on and drivers are installed. If problem persists, call Beckman Coulter Field Service.
A118 - Alert: Hard drive error	Enhanced Write Filter disabled	Call Beckman Coulter Field Service.
D119 - SBC Communication	Unable to open serial port	Call Beckman Coulter Field Service.
A120 - Alert: Simulator	Simulator not found	Call Beckman Coulter Field Service.
D121 - Internal software error	Software error	Call Beckman Coulter Field Service.

Table C.1 Diagnostics/User Messages Chart (*Continued*)

Message	Definition/Result	Recommended Action
A122 - Alert: Firmware error	Firmware error caused reset	Call Beckman Coulter Field Service.
D123 - UI Communications	Communications error	Call Beckman Coulter Field Service.
A124 - Alert: Hard drive space low	Hard drive is 90% full	Backup files soon. Call Beckman Coulter Field Service.
D125 - SBC Communications	Communications parameters are not compatible	Call Beckman Coulter Field Service.
A200 - Alert: AC Power Loss - Run continued	AC Power Loss - Run continued	None
A201 - Alert: AC Power Loss - Run stopped	AC Power Loss - Run, Delayed Run, or Program stopped	None
D202 - Bus Current	Bus current measures zero (<0.1A)	Call Beckman Coulter Field Service.
D203 - Bus Voltage	Bus voltage too high (>220VDC) or Bus voltage too low (<180VDC)	Call Beckman Coulter Field Service.
D204 - Power Supply	Inverter +18V supply too high (>19.8VDC)	Call Beckman Coulter Field Service.
D205 - Power Supply	Inverter +18V supply too low (<16.2VDC)	Call Beckman Coulter Field Service.
D206 - Power Supply	Inverter +5V supply too high (>5.5VDC)	Call Beckman Coulter Field Service.
D207 - Power Supply	Inverter +5V supply too low (<4.5VDC)	Call Beckman Coulter Field Service.
D208 - Power Supply	Inverter -5V supply too high (>-4.5VDC)	Call Beckman Coulter Field Service.
D209 - Power Supply	Inverter -5V supply too low (<-5.5VDC)	Call Beckman Coulter Field Service.
D210 - Power Supply	SCB +12V supply too high (>13.2VDC) or SCB +12V supply too low (<10.8VDC)	Call Beckman Coulter Field Service.

Table C.1 Diagnostics/User Messages Chart (Continued)

Message	Definition/Result	Recommended Action
D211 - Power Supply	SCB +3.3V supply too high (>3.63VDC)	Call Beckman Coulter Field Service.
D212 - Power Supply	SCB analog +3.3V supply too high (>3.63VDC) or SCB analog +3.3V supply too low (<2.97VDC)	Call Beckman Coulter Field Service.
D213 - Power Supply	System +24V supply too high (>26.4VDC) or System +24V supply too low (<21.6VDC)	Call Beckman Coulter Field Service.
D214 - Power Supply	System +5V supply too high (>5.5VDC)	Call Beckman Coulter Field Service.
D216 - AC Power Out of Range	AC Power Out of Range	Check electrical power source.
A217 - Alert: AC Power Voltage Sag	AC Power Voltage Sag below 180Vac	None
D300 - Rotor Speed	Rotor speed exceeds maximum rated speed	Call Beckman Coulter Field Service.
A301 - Alert: Rotor Speed Adjusted	Rotor set speed adjusted	None
A302 - Alert: Inertia Calibration	Inertia calibration failure	Call Beckman Coulter Field Service.
D303 - Speed Signals	Overspeed timing signal is <9 counts/revolution or >47 counts/revolution, or overspeed timing signal is unstable	<ol style="list-style-type: none"> 1. Check the condition of the rotor overspeed disk. 2. Make sure the rotor is installed properly. 3. Verify the rotor load is within limits specified in the rotor manual.
D304 - Speed Signals	No tachometer signal	<p>NOTE This condition will result in a 20-minute/10K of RPM delay before the diagnostic can be cleared and the door opened. The power must be left on, until the delay period is completed.</p> <ol style="list-style-type: none"> 1. Make sure the rotor is installed properly. 2. Check the condition of the rotor overspeed disk. 3. Verify the rotor load is within limits specified in the rotor manual. 4. If the problem persists, call Beckman Coulter Field Service.

Table C.1 Diagnostics/User Messages Chart (*Continued*)

Message	Definition/Result	Recommended Action
D305 - Inertia	Inertia check failure	Be sure rotor is loaded properly.
A400 - Alert: Vacuum Calibration	Vacuum calibration failure	Call Beckman Coulter Field Service.
A401 - Alert: Slow Vacuum	Vacuum exceeds 750 microns after 4 minutes	<ol style="list-style-type: none"> 1. Make sure door o-ring is clean, undamaged, and properly lubricated. 2. Check for sample leakage. Clean and dry the rotor chamber if needed. 3. If the problem persists, call Beckman Coulter Field Service.
D402 - Slow Vacuum	Vacuum not <20 microns after 20 minutes	<ol style="list-style-type: none"> 1. Make sure door o-ring is clean, undamaged, and properly lubricated. 2. Check for sample leakage. Clean and dry the rotor chamber if needed. 3. If the problem persists, call Beckman Coulter Field Service.
D403 - Lost Vacuum	Vacuum >750 microns for 1 minute after being <750 microns	<ol style="list-style-type: none"> 1. Make sure door o-ring is clean, undamaged, and properly lubricated. 2. Check for sample leakage. Clean and dry the rotor chamber if needed. 3. If the problem persists, call Beckman Coulter Field Service.
D404 - Lost Vacuum	Vacuum >50 microns for 10 minutes after being <20 microns	<ol style="list-style-type: none"> 1. Make sure door o-ring is clean, undamaged, and properly lubricated. 2. Check for sample leakage. Clean and dry the rotor chamber if needed. 3. If the problem persists, call Beckman Coulter Field Service.
D407 - Vacuum Vent	Vacuum vent solenoid not connected	Call Beckman Coulter Field Service.
D408 - Vacuum Vent	Vacuum vent can not be opened	Call Beckman Coulter Field Service.
D500 - Temperature Control	Ambient thermistor open	Call Beckman Coulter Field Service.
D501 - Temperature Control	Ambient thermistor shorted	Call Beckman Coulter Field Service.
D502 - Temperature Control	Ambient temperature out of range (<10°C or >35°C)	Adjust room temperature before operating.

Table C.1 Diagnostics/User Messages Chart (Continued)

Message	Definition/Result	Recommended Action
D503 - Temperature Control	Can thermistor not connected	Call Beckman Coulter Field Service.
D504 - Temperature Control	Can thermistor shorted	Call Beckman Coulter Field Service.
D505 - Temperature Control	Can temperature out of limits (<-30°C or >70°C)	Call Beckman Coulter Field Service.
D506 - Temperature Control	TEM voltage too high	Call Beckman Coulter Field Service.
D507 - Temperature Control	TEM voltage too low	Call Beckman Coulter Field Service.
D508 - Temperature Control	TEM impedance too low	Call Beckman Coulter Field Service.
D509 - Temperature Control	TEM impedance too high	Call Beckman Coulter Field Service.
D510 - Temperature Control	Rotor temperature error rate of change is not decreasing and rotor temperature is greater than 10°C from set temperature after running for 15 minutes.	Call Beckman Coulter Field Service.
D512 - Temperature Communications	D512 - Temperature Communications	Call Beckman Coulter Field Service.
D513 - Temperature Communications	No communications - TEM I ² C	Call Beckman Coulter Field Service.
D514 - Temperature Communications	No communications - thermopile	Call Beckman Coulter Field Service.
D600 - DriveDrive fault	Drive fault	Call Beckman Coulter Field Service.
D601 - Drive	Bus current too high (>30A)	Call Beckman Coulter Field Service.
D602 - Drive Temperature	Drive temperature >69°C	Call Beckman Coulter Field Service.
D603 - Damper	Damper coil status error	Call Beckman Coulter Field Service.
D604 - CF-32 Rotor Oil Level	CF-32 oil level error	Make sure the rotor oil level switch is installed on the back panel for CF-32 operation. Add oil to CF-32 rotor.

Table C.1 Diagnostics/User Messages Chart (*Continued*)

Message	Definition/Result	Recommended Action
D605 - Drive Performance	Abnormal rate of change in speed	Call Beckman Coulter Field Service.
D606 - Drive Performance	Abnormal tachometer frequency	<p>NOTE This condition will result in a 20-minute/10K of RPM delay before the diagnostic can be cleared and the door opened. The power must be left on, until the delay period is completed.</p> <ol style="list-style-type: none"> 1. Make sure the rotor is installed properly. 2. Check the condition of the rotor overspeed disk. 3. Verify the rotor load is within limits specified in the rotor manual. 4. If the problem persists, call Beckman Coulter Field Service.
D607 - Drive Performance	Drive frequency error	Call Beckman Coulter Field Service.
D608 - Drive Performance	Tachometer frequency >103K rpm	Call Beckman Coulter Field Service.
A700 - Alert: Imbalance	Imbalance detector error	<ol style="list-style-type: none"> 1. Make sure the rotor is installed properly. 2. Verify the rotor load is within limits specified in the rotor manual. 3. If the problem persists, call Beckman Coulter Field Service.
A800 - Alert: Door Latch	Door latch will not engage	<ol style="list-style-type: none"> 1. Make sure the door is closed before pressing Start. 2. If the problem persists, call Beckman Coulter Field Service.
A802 - Alert: Door Latch	Door latch changed states	Call Beckman Coulter Field Service.
D803 - Door Latch	Door latch will not disengage	Call Beckman Coulter Field Service.

Diagnostics

Diagnostics/User Messages Chart

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