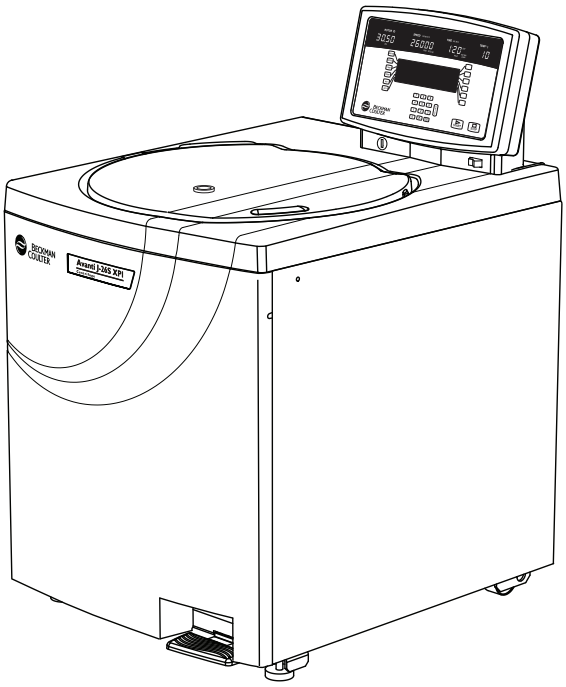
Instructions For Use

Avanti J-26S XPI

High-Performance Centrifuge



PN B10093AB
June 2012

Beckman Coulter, Inc.
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Brea, CA 92821

BECKMAN COULTER

Avanti J-26S XPI
High-Performance Centrifuge
PN B10093AB (June 2012)

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Safety Notice

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

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.

⚠ WARNING

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

⚠ 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.

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 During Installation and/or Maintenance

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, if the instrument needs to be moved, a Beckman Coulter Field Service representative must reinstall and relevel the instrument in its new location.

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 the Mains (power) plug from the outlet receptacle, and refer such servicing to qualified personnel.

Be sure to use the anchoring system to secure the centrifuge in place. The anchoring system is designed to reduce the possibility of injury or damage that could result from instrument movement in the event of a major rotor mishap.

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

Electrical Safety

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

- Make sure that the matching wall outlet receptacle is properly wired and earth-grounded. Check that the line voltage agrees with the voltage listed on the name-rating plate affixed to the centrifuge.
- Never use a three-to-two wire plug adapter.
- Never use a two-wire extension cord or a two-wire non-grounding type of multiple-outlet receptacle strip.

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

Safety Against Risk of Fire

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.

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 lift or move the centrifuge while a rotor is spinning.
- NEVER attempt to override the door interlock system while the rotor is spinning.
- Do not lean on the centrifuge or place items on it while it is operating.

Chemical and Biological Safety

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

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

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

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Beckman Coulter, Inc.
Avanti J Series Centrifuge Warranty

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Introduction

Certification

Beckman Coulter Avanti J-26S XPI centrifuges are manufactured in a facility that maintains certifications to both ISO 9001:2008 and ISO 13485:2003. 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 centrifuge users and site engineers with the Avanti J-26S XPI centrifuge, its functions, specifications, operation, and routine care and maintenance. Beckman Coulter recommends that you read this entire manual, especially the *Safety Notice* and all safety-related information, before operating the instrument or performing instrument maintenance.

- CHAPTER 1, *Description* contains an overall description of the centrifuge, including a description of system controls and indicators and system specifications.
- CHAPTER 2, *Operation* summarizes procedures for operating the centrifuge.
- CHAPTER 3, *Troubleshooting* lists system diagnostic messages, together with probable causes and user-performed corrective actions.
- CHAPTER 4, *Care and Maintenance* contains procedures for routine maintenance, as well as a brief list of supplies and replacement parts.
- APPENDIX A, *Preinstallation Requirements* contains instructions for preparing your site for centrifuge installation.
- APPENDIX B, *Temperature Calibration Procedure* contains a procedure to use when temperature control within ±1°C is required.

NOTE If the centrifuge 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 is the sole responsibility of the user.

Conventions

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

Typographic Conventions

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

- Control knob names (for example, **ROTOR** and **SPEED**) appear in bold type.
- Key names (for example, **START** and **STOP**) appear in bold type.
- Display field names (for example, **TEMP°C** or **SPEED**) appear in bold type.

CFC-Free Centrifugation

To ensure minimal environmental impact, no CFCs are used in the manufacture or operation of the Avanti J-26S XPI centrifuge.

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:

1. The device was put on the European market after August 13, 2005 and
2. The device is not to be disposed 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.

CHAPTER 1

Description

Introduction

This section describes the Avanti J-26S XPI centrifuge components and their functions. It also describes system safety features and centrifuge controls and displays. Refer to the applicable rotor manual for rotor descriptions.

Centrifuge Function and Safety Features

Centrifuge Function

The Avanti J-26S XPI is a refrigerated centrifuge that generates centrifugal forces required for a wide variety of applications. Together with the Beckman Coulter rotors designed for use in this centrifuge, applications include:

- Routine processing such as sample preparations, pelleting, extractions, purifications, concentrations, phase separations, and spin column and spin filter centrifugations.
- Rapid sedimentation of protein precipitates, large particles, and cell debris.
- Preparation of subcellular organelles such as mitochondria, nuclei, chloroplasts, and crude microsomes.
- Separation of blood cells and cellular components.
- Pelleting of prokaryotic and eukaryotic cells.
- Gradient separation, for example, Ficoll-Hypaque and Percoll.
- Nucleic acid precipitation.
- Virus isolation.
- Bacteriophase isolation.

The Avanti J-26S XPI centrifuge is microprocessor-controlled, providing interactive operation.* The instrument design features a brushless switched-reluctance drive motor,† an automatic rotor identification system, FRS (friction reduction system), vacuum control circuitry, temperature control system, and programmable acceleration and deceleration times.

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* Avanti J-26 XPI software and firmware ©2005–2012 Beckman Coulter, Brea, CA,92821.

† Manufactured under license from Switched Reluctance Drives Limited, Harrogate, U.K.

The user interface consists of a separate Actual Value Display and Setup Screen, a numerical keypad, and other system control and parameter entry touch keys. User messages on the Setup Screen alert the operator to conditions that may need attention.

Manual and programmed operation are available.

- In manual operation, you enter the individual run parameters before beginning each run.
- In programmed operation, you enter and save sets of run parameters. To perform a run, you recall and start a previously saved program, enabling quick and accurate run duplication. Up to 30 programs can be saved, each containing one or two steps.

User messages and/or audible signals are provided to alert you to conditions that may need attention.

The centrifuge can also be operated by the SpinTrace II system for centrifuge control and data collection. SpinTrace II software runs on a personal computer connected to up to thirty-two centrifuges. Contact your Beckman Coulter representative* for more information.

Safety Features

Avanti J-26S XPI centrifuges have been designed and tested to operate safely indoors at altitudes up to 2000 m (6562 ft).

Safety features include the following.

- An electromechanical door lock system prevents operator contact with spinning rotors and prevents run initiation unless the door is closed and locked. The door locks when **ENTER** and **START** are pressed, or when the POWER switch is turned off. The exception to this is **ZONAL** mode, in which open-door operation up to 3000 RPM is allowed.
- A steel casing surrounds the rotor chamber to provide operator protection in the unlikely event of a rotor mishap.
- *Dynamic Rotor Inertia Check (DRIC)*: As the rotor accelerates, rotor inertia is measured and the rotor energy is calculated for the speed set by the user. If the calculated rotor energy is determined to be excessive, the centrifuge recalculates a permitted set speed and uses this value to avoid possible rotor damage. A diagnostic message is displayed to indicate the change.
- An imbalance detector monitors the system during operation, causing automatic shutdown if rotor loads are severely out of balance.

Centrifuge Chassis

Housing and Door

The instrument control housing, door assembly, and cover panels are made from a highly-durable unfinished plastic. The control panel is covered by a protective overlay made of coated polycarbonate.

* In the United States, call 1-800-742-2345. Outside the U.S., contact your local Beckman Coulter office or visit us at www.beckmancoulter.com.

The door is opened by stepping on a foot pedal, which is located at the bottom right front of the instrument. The door is hinged at the back left to open at a 60-degree angle to the centrifuge side panels, providing clearance for loading and unloading of the centrifuge.

In the event of a power failure, the door can be manually unlocked for sample recovery (see CHAPTER 3, *Troubleshooting*).

Rotor Chamber

The rotor chamber is made of stainless steel to resist corrosion. A rubber gasket around the chamber opening ensures sealing. (Instrument gaskets have not been qualified as bioseals for aerosol containment.)

Drive

The drive spindle is directly driven by a brushless, high-torque, switched-reluctance motor. The instrument's resilient suspension minimizes disturbance of the sample during acceleration and deceleration, and reduces damage to the drive spindle if an imbalance occurs during centrifugation.

Friction Reduction System (FRS)

The friction reduction system (FRS) uses a mechanical rotary vane vacuum pump to reduce chamber pressure to approximately one-quarter atmosphere (190 mm Hg). The pump turns on after the run is started, before rotor friction reaches a high level. When the required vacuum level is reached, the pump turns off. Vacuum in the chamber is vented during rotor deceleration.

Temperature Sensing and Control

The temperature control system is cooled by circulation of a non-CFC-based refrigerant. The temperature control system is activated when the centrifuge power is on and when the door is closed.

A thermistor in the rotor chamber continuously monitors the chamber temperature. The system calculates the chamber temperature required to maintain the set rotor temperature, ±2°C.* Although the chamber temperature fluctuates during operation, the rotor's large mass keeps the sample temperature substantially constant. At the end of a run, the system continues controlling the temperature to prevent freezing or overheating of the sample.

Overtemp System

An overtemp (over temperature) system provides flexibility, sample protection, and safety for the user.

- The user sets the run temperature, then sets a maximum temperature or accepts the default maximum temperature which is 4°C over the set temperature.

* Refer to the applicable rotor manual for specific temperature information.

- The user specifies whether the run should shut down or continue if the overtemp setting is reached.
- The system will always shut down using maximum brake if the temperature goes above 50°C.

Name Rating Plate

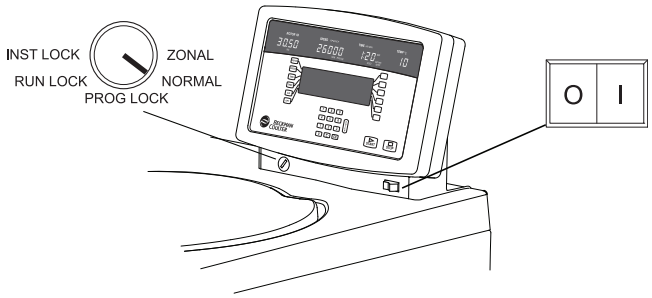
The name rating plate is affixed to the rear of the centrifuge. Check that the line voltage agrees with the voltage listed on this name rating plate before connecting the centrifuge. Always mention the model number and serial number when corresponding with Beckman Coulter regarding your centrifuge.

Controls and Indicators

Key and Power Switches

The key switch and the power switch are located below the control panel (see Figure 1.1).

Figure 1.1 The Power Switch



The power switch is a two-position rocker switch (**I**, on; **O**, off) which controls electrical power to the centrifuge.

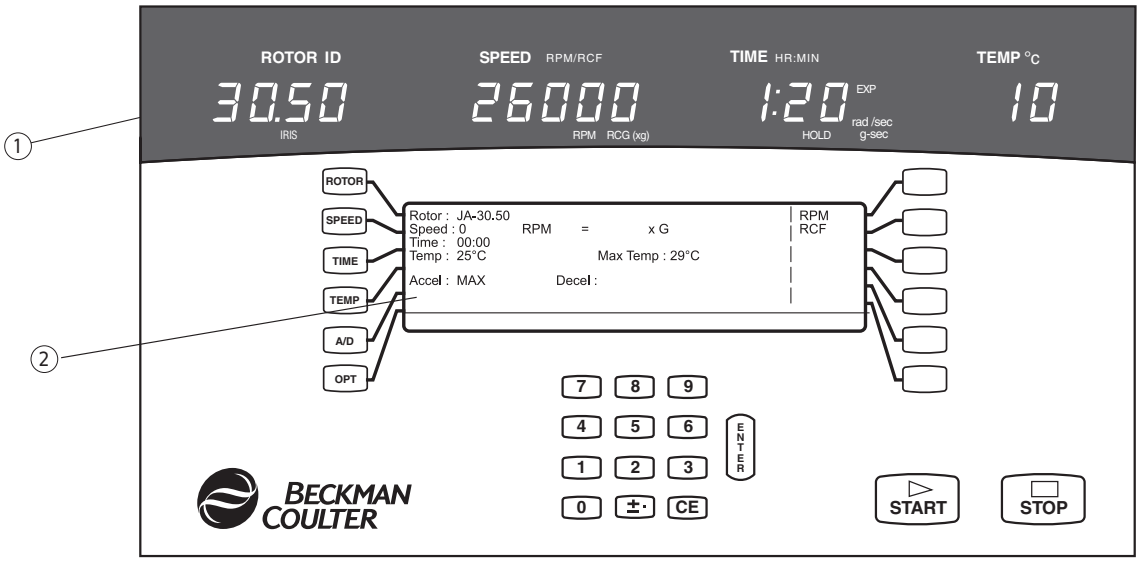
The key switch has five positions, indicating the five different operating modes.

- **NORMAL** mode is used for regular, closed-door centrifugation.
- **ZONAL** mode is used when the JCF-Z continuous flow/zonal rotor is installed. In **ZONAL** mode, the centrifuge can run up to 3000 RPM with the door open so that sample can be loaded and unloaded while the rotor is spinning.
- **PROG(RAM) LOCK** mode disables the function that saves parameters to stored programs, to prevent overwriting of previously stored programs.
- **RUN LOCK** mode disables all user inputs except **START** and **STOP** to ensure that current settings do not get changed.
- **INST(RUMENT) LOCK** mode disables all user inputs except **STOP**, to prevent use of the instrument after the current run is complete.

Control Panel

The control panel (Figure 1.2) is mounted at an angle on the centrifuge top rear for easy visibility and access. It contains a separate Actual Value Display and a Setup Screen, numerical keypad, and touch keys for parameter entry and system control.

Figure 1.2 The Control Panel



1. Actual Value Display
2. Setup Screen

Actual Value Display

The actual value display (Figure 1.3) indicates the actual centrifuge operating conditions.

Figure 1.3 The Actual Value Display

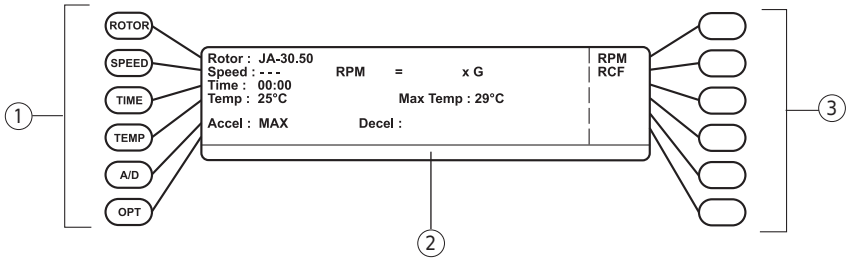
ROTOR ID	Indicates the installed rotor. At the start of a run, this field is blank. During acceleration, the centrifuge identifies the installed rotor and displays the rotor name.
SPEED	Indicates rotor speed in revolutions per minute (RPM), or in relative centrifugal field, a term describing the ratio of the centrifugal acceleration at a specified radius and speed to the standard acceleration of gravity (RCF $\times$ *g*).

TIME	• In time mode, indicates the remaining run time in hours and minutes. The **TIME** display begins counting down when **START** is pressed and continues counting down to 0, when deceleration begins. • In hold mode, indicates the time elapsed since **START** was pressed. After 99 hours and 59 minutes the timer will reset to 0 and continue counting elapsed time. • In $\omega^2 t$ mode, indicates the user-entered $\omega^2 t$ (accumulated centrifugal force on the sample) and the calculated time remaining until the $\omega^2 t$ setting is reached.
TEMP°C	Indicates rotor temperature in degrees C. The temperature is displayed to 1 degree and is within ±2 degrees of the set temperature (after temperature equilibrium is reached).

Setup Screen

The setup screen (Figure 1.4) contains editable fields for parameter entry. The six function keys to the left of the screen are for selecting parameter fields. The six soft keys to the right of the screen are used to select options based on which function key is pressed. Guidelines direct the eye from each function and soft key to the display line controlled by that key. A message line at the bottom of the screen shows help and diagnostic messages during setup and operation.

Figure 1.4 The Setup Screen



1. Function Keys **2.** Message Line **3.** Soft Keys

When the centrifuge power is turned on, the setup screen displays the parameters of the last run performed.

Function Keys

Pressing **ENTER** or another function key saves parameter entries.

ROTOR	Pressed to select the rotor in use. When **ROTOR** is pressed, the rotor type soft keys are displayed (**JA:** fixed angle rotors; **JS:** swinging bucket rotors; **JLA:** lightweight fixed angle rotors; **JV:** vertical tube rotors; **JE:** elutriator rotors; **JCF-Z:** continuous flow/zonal rotors). Pressing a rotor type soft key displays a list of the rotors of that type that can be used. (Abbreviated rotors names are displayed.)
SPEED	Pressed to enter a run speed, in RPM or RCF $\times g$. Use the **RPM** and **RCF** soft keys to toggle between RPM and RCF setting modes, then enter the speed setting using the keypad. If you enter a speed setting above the maximum RPM permitted for the installed rotor, an error message will prompt you to select a speed within the rotor's valid range, and will display the range (in RPM or RCF). If you do not specify a rotor and you enter a speed setting above the maximum permitted for the installed rotor, and you start a run, during acceleration the centrifuge will identify the rotor and reduce the speed setting to the maximum for the installed rotor.
TIME	Pressed to enter run time (using the keypad). When **TIME** is pressed, the three time mode soft keys are displayed: **HH:MM** (hour:minute), **W2T** ($\omega^2 t$, accumulated centrifugal effect), and **HOLD**. Pressing any of the soft keys causes the **TIME** display to flash, indicating that a time can be entered on the keypad. • Timed run (HH:MM) — Run time up to 99 hours and 59 minutes can be set. If more than 59 minutes are entered in the minutes field, the system automatically converts the entry to hours and minutes. Decelerating begins when the set time counts down to zero. The corresponding $\omega^2 t$ value can be displayed by pressing the **W2T** soft key. • $\omega^2 t$ run — An $\omega^2 t$ value can be entered and the system will calculate the run time required to reach that value. Valid $\omega^2 t$ settings are different for each rotor; a user message will appear if an invalid entry is made. Deceleration begins when the calculated run time counts down to zero, but $\omega^2 t$ continues accumulating until the rotor stops spinning. • Continuous run (hold) — For runs of unspecified lengths, hold mode is used. The display will show the accumulated run time. When 99 hours, 59 minutes is reached, the system resets to 0 and continues counting. The run will continue until the **STOP** key is pressed.
TEMP	Pressed to enter run temperature (using the keypad), from –10°C to +40°C. • The minimum allowable set temperature depends on the set speed and the rotor in use. If a temperature is entered that cannot be achieved by the rotor at the set speed, the **TEMP°C** field will flash. • The maximum achievable rotor temperature depends on the frictional heat generated inside the chamber during operation. At low run speeds or low ambient temperature, the centrifuge may not be able to achieve some higher temperatures. • If, during acceleration, the system identifies a rotor different from the rotor entered by the user, or if the set speed is changed during operation, the set temperature may no longer be achievable. If this happens, the **TEMP°C** field will flash indicating that a different temperature must be entered.

A/D	Pressed to enter acceleration and deceleration rates that will maintain optimum separation while protecting samples. When **A/D** is pressed, the **Accel:** field flashes, prompting you to enter an acceleration setting. Pressing **A/D** once more moves the cursor to the **Decel:** field. Available acceleration rates are maximum, slow, and timed (1 to 10 minutes from 0 to 500 RPM). Available deceleration rates are maximum, slow, timed (1 to 10 minutes from 500 to 0 RPM), and no brake (off).
OPT	Pressed to put the centrifuge into program mode, where you can enter run parameters into memory for later use. Up to 30-step programs can be stored.

Keypad

The keypad is used to enter numerical run parameters and to enter or recall a program number. In addition to keys 0 through 9, the keypad includes ±**.** (plus/minus/decimal) and **CE** (clear entry) keys.

The ±**.** key is used to enter a decimal point when typing in a rotor number (for example, 25.50) and enter a temperature setting below 0°C (for example, –2°C).

The **CE** (clear entry) key clears any parameter in the active field. Pressing **CE** will also clear some diagnostic messages. If a diagnostic message does not clear when **CE** is pressed, see CHAPTER 3, *Troubleshooting*.

System Keys

START	Pressing **ENTER**, then **START** begins the run. **START** must be pressed within 5 seconds of pressing **ENTER**.) This key combination can also be used to abort a deceleration process and restart the centrifuge.
STOP	Pressed to end a run according to the deceleration setting. The red light on the **STOP** key flashes while the rotor decelerates. An audible tone sounds when the rotor comes to a complete stop. Deceleration can be terminated and the run restarted by pressing **ENTER**, then **START**. During a zonal run, pressing **STOP** once will decelerate the rotor to 2000 RPM. Pressing **STOP** again will decelerate the rotor to 0 RPM.
ENTER	Pressed to save parameter inputs to system memory, and to start the centrifuge (**ENTER**, then **START** must be pressed to start the centrifuge).

Specifications

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

Control Features

Specifications	Description
Speed	• *Setting range*: — 100 to 26,000 RPM *or* equivalent RCF (in 100 × *g* increments) • *Elutriation speed setting range*: — 0 to 5000 RPM (in 10-RPM or 10 × g increments) • *Speed display*: — from 0 to 10,000 RPM, display indicates actual rotor speed ±10 RPM; from 10,000 to 26,000 RPM, indicates actual rotor speed ±0.1%, *or* equivalent RCF
Speed Control	• Low speed (2000 RPM) control = ±10 RPM • High speed (Max/Rotor) control = ±0.1 RPM
Time	• *Setting range*: — 1 min to 99 hr 59 min, $\omega^2 t$, or continuous (hold) • *Actual display*: — Indicates time remaining (timed run), $\omega^2 t$, or elapsed time (hold run) • $\omega^2 t$ *setting range*: — up to 9.99×10^{14} radians squared per second • $\omega^2 t$ *actual display*: — indicates accumulated centrifugal effect to 3 significant digits (in exponential notation)
Temperature	• *Setting range:* — –10 to +40°C (in 1°C increments) • *Accuracy*: — rotor temperature controlled to within ±2°C of set temperature (after equilibration)[a] • *Ambient temperature range*: — 16 to 38°C (60 to 100°F)[b] • *Cooling fluid*: — refrigerant 404A (HFC)
Acceleration	maximum, slow, or timed (1 to 10 min from 0 to 500 RPM)
Deceleration	maximum, slow, timed (1 to 10 min from 500 to 0 RPM), or off

a. During transient conditions, such as acceleration and deceleration, rotor temperature may be outside this range. Refer to applicable rotor manuals for specific rotor operating range information.

b. To reach temperatures above ambient, the centrifuge is dependent on the frictional heat generated inside the chamber during operation. At low run speeds or low ambient temperatures, the centrifuge may not be able to achieve some higher temperatures.

Operational Features

Specifications	Description
Door	6.1-cm (2.4-in.) thick plastic resin with steel plate
Rotor Chamber Diameter	51.3 cm (20 in.)
Friction Reduction System (FRS)	190 mm (7.5 in.) Hg

Physical Data

Specification	Description
Width	71 cm (28 in.)
Depth	• 86 cm (34 in.) • including air diverter extending from back panel — 102 cm (40.25 in.)
Height	• with door closed — 86 cm (34 in.) • to top of control head — 116 cm (45.5 in.) • to top of open door — 149 cm (58.5 in.)
Weight	290 kg (640 lb)
Clearances (for adequate ventilation)	• sides — 7.6 cm (3 in.) • back (place air diverter against the wall) — 16 cm (6.25 in.)
Surface Finish	polyester control panel with polycarbonate coating overlay; uncoated plastic on door and covers; acrylic baking enamel on metal surfaces
Electrical Requirements	• 200/208/240-V, single-phase instrument — 180–264 VAC, 30 A, 50/60 Hz • 230-V, single-phase instrument — 180–264 VAC, 30 A, 50 Hz • 220/380-V plus neutral, three-phase[a] instrument — 313–457 VAC plus neutral, 16 A, 50 Hz
Electrical Supply	Class I

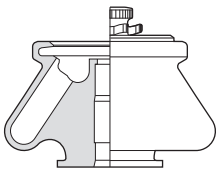
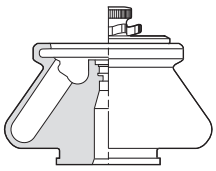
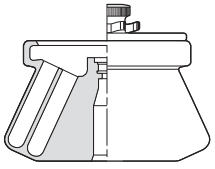
Specification	Description
Maximum Heat Dissipation into Room Under Steady-State Conditions	6900 BTu/h (2.0 kW)
Humidity restrictions	<95% (noncondensing)
Noise Level 0.91 m (3 ft) in front of instrument at 26,000 RPM	57 dBa
Installation (overvoltage) Category	II
Pollution Degree	2[b]

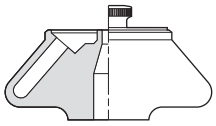
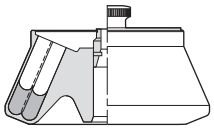
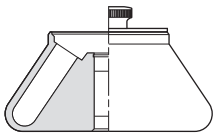
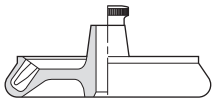
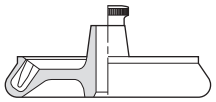
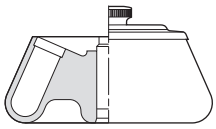
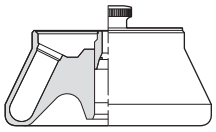
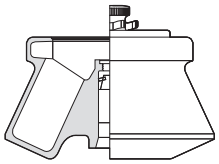
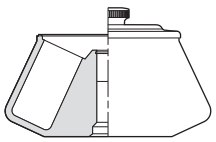
a. Unbalanced three-phase. Split for single-phase operation internally.

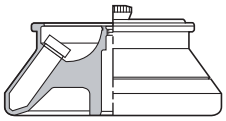
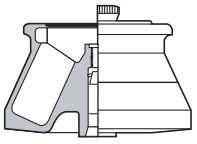
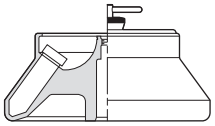
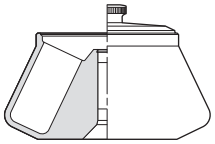
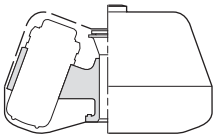
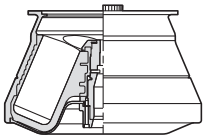
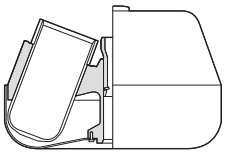
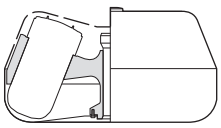
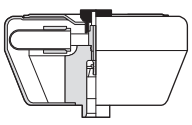
b. Normally, only nonconductive pollution occurs; occasionally, however, a temporary conductivity caused by condensation must be expected.

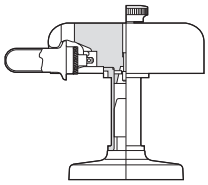
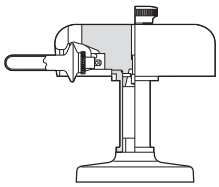
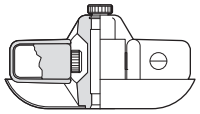
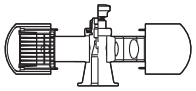
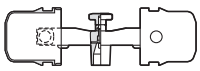
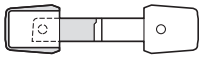
Available Rotors

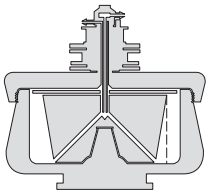
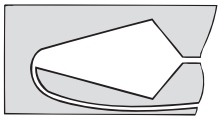
Refer to the applicable rotor manual for complete rotor descriptions.

Rotor Profile	Description	Rotor Code	Max RPM[a]	Max RCF ($\times g$)	Max Capacity	Rotor Manual Number
	JA-30.50 Ti [b] Fixed Angle, 34° (8 place) r_{max} = 108 mm	30.50	26,000[c]	81,800	8 × 50 mL	J-TB-070
	JA-25.50 Ti Fixed Angle, 34° (8 place)[d] r_{max} = 108 mm	25.50	25,000	75,600	8 × 50 mL	J-TB-056
	JA-25.15 Ti Fixed Angle, 25° (24 place)[d] r_{max} = 106 mm (outer row) r_{max} = 86 mm (inner row)	25.15	25,000	74,200 60,200	24 × 15 mL	J-TB-057

Rotor Profile	Description	Rotor Code	Max RPM[a]	Max RCF ($\times g$)	Max Capacity	Rotor Manual Number
	JA-21 Fixed Angle, 40° (18 place) r_{max} = 102 mm	21	21,000	50,400	18 × 10 mL	J-TB-002
	JA-20.1 Fixed Angle, 23° (32 Place) r_{max} = 115 mm (outer row) r_{max} = 98 mm (inner row)	20.1	20,000	51,500 43,900	32 × 15 mL	J-TB-022
	JA-20 Fixed Angle, 34° (8 place) r_{max} = 108 mm	20	20,000	48,400	8 × 50 mL	J-TB-003
 	JA-18.1 Fixed Angle (24 place) 45° adapter r_{max} = 116 mm 25° adapter r_{max} = 112 mm	18.1	18,000 17,000	42,100 36,300	24 × 1.8 mL 24 × 1.8 mL	J-TB-037
	JA-18 Fixed Angle, 23° (10 place) r_{max} = 132 mm	18	18,000	47,900	10 × 100 mL	J-TB-035
	JA-17 Fixed Angle, 25° (14 place) r_{max} = 132 mm	17	17,000	39,800	14 × 50 mL	J-TB-017
	JLA-16.250 Fixed Angle, 25° (6 place) r_{max} = 134 mm	16.250	16,000	38,400	6 × 250 mL	J-TB-072
	JA-14 Fixed Angle, 25° (6 place) r_{max} = 137 mm	14	14,000	30,100	6 × 250 mL	J-TB-004

Rotor Profile	Description	Rotor Code	Max RPM[a]	Max RCF ($\times g$)	Max Capacity	Rotor Manual Number
	F14BCI-14x50cy Fixed Angle, 34° (14 place) r_{max} = 153 mm	F50C	14,000	33,500	14 × 50 mL	—
	F14BCI-6x250y Fixed Angle, 23° (6 place) r_{max} = 134 mm	F250	14,000	30,000	6 × 250 mL	—
	JA-12 Fixed Angle, 35° (12 place) r_{max} = 144 mm	12	12,000	23,200	12 × 50 mL	J-TB-051
	JA-10 Fixed Angle, 25° (6 place) r_{max} = 158 mm	10	10,000	17,700	6 × 500 mL	J-TB-006
	JLA-10.500 Fixed Angle, 20° (6 place) r_{max} = 166 mm	10.500	10,000	18 600	6 × 500 mL	J-TB-048
	F10BCI-6x500y Fixed Angle, 23° (6 place) r_{max} = 158 mm	F500 (previously 10.1)	10,000	17,696	6 × 500 mL	—
	JLA-9.1000 Fixed Angle, 20° (4 place) r_{max} = 185 mm	9.1000	9,000	16,800	4 × 1000 mL	J-TB-073
	JLA-8.1000 Fixed Angle, 20° (6 place) r_{max} = 222.8 mm	8.1000	8,000	15,970	6 × 1000 mL	J-TB-073
	JS-13.1 Swinging Bucket (6 place) r_{max} = 140 mm	13.1	13,000	26,500	6 × 50 mL	J-TB-036

Rotor Profile	Description	Rotor Code	Max RPM[a]	Max RCF ($\times g$)	Max Capacity	Rotor Manual Number
	JS-24.38 Swinging Bucket (6 place) r_{max} = 161 mm	24.38	10,000[e]	18,000	6 × 38.5 mL	J-TB-058
	JS-24.15 Swinging Bucket (6 place) r_{max} = 171.3 mm	24.15	10,000[e]	19,200	6 × 15 mL	J-TB-058
	JS-7.5 S Swinging Bucket (4 place) r_{max} = 165 mm	7.5	7,500	10,400	4 × 250 mL	J-TB-007
	JS-5.3 Swinging Bucket (4 place) r_{max} = 194.8 mm	5.3	5,300	6,130	24 microplates 8 deep-well plates 4 square-well plates	J-TB-089
	JS-4.3 Swinging Bucket (4 place) r_{max} = 204 mm	4.3	4,300	4,220	4 × 750 mL	J-TB-050
	JS-4.0 Swinging Bucket (4 place) r_{max} = 226 mm	4.0	4,000	4,050	4 × 1 liter 4 blood bags 12 microplates 148 RIA tubes	J-6TB-006

Rotor Profile	Description	Rotor Code	Max RPM[a]	Max RCF (× *g*)	Max Capacity	Rotor Manual Number
	JCF-Z Continuous Flow/ Zonal Rotor[f]	JCFZ	20,000	39,900	660 mL (standard core) 1250 mL (large core) 240 mL (small core)	JCFZ-IM
	JE-5.0 Elutriation Rotor r_{max} large chamber = 168 mm standard chamber = 125 mm Sanderson chamber = 126 mm	5.0	5,000	 4,700 3,500 4,230	 40 mL 4.0 mL 5.5 mL	JE5-IM

a. Maximum speeds are based on a solution density of 1.2 g/mL with the following exceptions: the JA-18.1 rotor is rated for a density of 1.4 g/mL; the JCF-Z rotor is rated for a density of 1.45 g/mL; and the JE-5.0 rotor is rated for a density of 3 g/mL.

b. Temperature performance for the JA-30.50 Ti rotor in the Avanti J-26S XPI is as follows: 15°C minimum at 26,000 RPM (at 30°C ambient); 4°C minimum at 21,500 RPM (30°C ambient).

c. Maximum speed for the JA-30.50 Ti rotor is 26,000 RPM in the Avanti J-26 XPI centrifuge, and 30,000 RPM in the Avanti J-30I centrifuge.

d. Temperature performance for the JA-25.50 and JA-25.15 rotors in the Avanti J-26S XPI is as follows: 10°C minimum at 25,000 RPM (at 30°C ambient); 4°C minimum at 21,500 RPM (30°C ambient).

e. Maximum speed for the JS-24.38 and JS-24.15 rotor is 10,000 RPM in the Avanti J-26S XPI centrifuge, and 24,000 RPM in the Avanti J-30I centrifuge.

f. In the Avanti J-26S XPI the JCF-Z Continuous Flow/Zonal Rotor can be used in the continuous flow and reorienting gradient zonal configurations only.

CHAPTER 2

Operation

Introduction

This section contains detailed centrifuge operating procedures. A summary is provided on page 2-2*. If you are an experienced user of this centrifuge, you can turn to the summary for a quick review of operating steps.*

⚠ WARNING

Normal operation may involve the use of solutions and test samples that are pathogenic, toxic, or radioactive. Handle body fluids with care because they can transmit disease. No known test offers complete assurance that they are free of micro-organisms. Some of the most virulent—Hepatitis (B and C) and HIV (I–V) viruses, atypical mycobacteria, and certain systemic fungi—further emphasize the need for aerosol protection. Handle other infectious samples according to good laboratory procedures and methods to prevent spread of disease. Because spills may generate aerosols, observe proper precautions for aerosol containment.

Do not run toxic, pathogenic, or radioactive materials in this centrifuge without taking appropriate safety precautions. Biosafe containment should be used when Risk Group II materials (as identified in the World Health Organization *Laboratory Biosafety Manual*) are handled; materials of a higher group require more than one level of protection.

⚠ WARNING

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

Summary of Avanti J-26S XPI Run Procedures

For runs at temperatures other than ambient, precool or prewarm the rotor to the required temperature before the run.

Manual Run

1 Press the POWER switch to on (**I**).

2 Depress the foot pedal to open the chamber door.

3 Install the rotor according to instructions in the applicable rotor manual, then firmly close the chamber door.

4 Press **ROTOR,** press the soft key to select rotor type, press the soft key to select the rotor name.

5 Press **SPEED,** press the soft key to select **RPM** or **RCF** mode, then use the keypad to enter the run speed (0 to 26,000 RPM).

6 Press **TIME** press the soft key to select a time mode (**HH:MM**, **Hold** or $\omega^2 t$), then use the keypad to enter the run time or $\omega^2 t$ value.
(No entry is made in **Hold** mode.)

7 Press **TEMP** then use the keypad to enter the required run temperature.

8 Press **A/D** and press the **MAX**, **SLOW,** or **TIME** soft key. Or, skip this step and accept the default acceleration rate (**MAX**).

9 Press **A/D** and press the **MAX**, **SLOW, TIME**, or **OFF** soft key.

a. (Or, skip this step and accept the default deceleration rate (**MAX**).

10 Check that all parameters are correct and that the door is closed.

a. Press **ENTER,** then press **START.**

11 Wait for the set time to count down to zero, or end the run by pressing **STOP**.

12 When the rotor stops, depress the foot pedal to open the chamber door.

Programmed Run

1 Press the **POWER** switch to on (**I**).

2 Depress the foot pedal to open the chamber door.

3 Install the rotor according to instructions in the applicable rotor manual, then firmly close the chamber door.

4 Press **OPT** then use the keypad to enter the program number.

5 Check that all parameters are correct and that the door is closed.

   a. Press **ENTER** then press **START**.

6 Wait for program step 1 or 2 to end, or end the run by pressing **STOP**.

7 When the rotor stops, depress the foot pedal to open the chamber door.

Preparation

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

Installing the Rotor

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

1 Turn the power switch on (**I**).

Indicator lights on the control panel light up.

2 Step on the foot pedal to open the door.

The door opens.

3 Install the rotor according to the instructions in the rotor manual.

Make sure that the rotor is seated on the drive hub.

⚠ CAUTION

Do not drop the rotor onto the drive hub. The drive shaft can be bent if the rotor is forced sideways or dropped onto the spindle hub. Install the rotor by centering it over the hub and carefully lowering it straight down.

4 Securely attach the rotor lid knob, or tie-down knob in rotors without lids, to the drive shaft by turning it to the right (clockwise).

NOTE If the knob turns loosely and you do not feel threads engaging, the rotor drive hole pins may not be properly seated on the centrifuge hub. Lift the rotor up, rotate it slightly, and lower it onto the hub again. Tighten the knob.

5 Close the chamber door.

⚠ CAUTION

If you leave the rotor in the centrifuge between runs, make sure the rotor is seated on the drive hub and the tie-down knob is tight before each run.

Manual Operation

- When a function key (**ROTOR**, **SPEED**, **TIME**, **TEMP**, **A/D**, or **OPT**) is pressed, the corresponding setup screen field blinks to indicate that a parameter can be entered or changed. The field continues to blink until **ENTER** or another function key is pressed.
- To change an entry before you've pressed **ENTER** press **CE** and enter a different value. To change an entry after you've pressed **ENTER**, press the function key again.
- If an invalid setting is entered, the display blinks and the valid range for that parameter is displayed in the message line. A valid parameter must be entered and **ENTER** must be pressed before you can enter another parameter.

Selecting a Rotor

1 Press **ROTOR**.

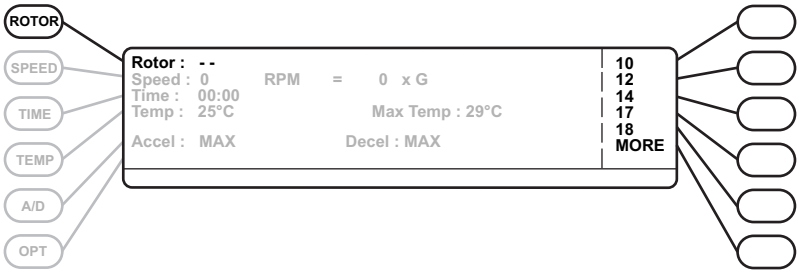
The **Rotor:** field flashes, and rotor type abbreviation soft keys (**JA:** fixed angle, **JS:** swinging bucket, **JLA:** lightweight fixed angle; **JSP:** special; **JV:** vertical tube; **JE:** elutriator; **JCF-Z:** continuous flow/zonal) appear.

2 Press the appropriate soft key to select the rotor type.

A list of rotor codes appears—fixed angle rotor codes are displayed below.

a. Press the **MORE** soft key to display additional fixed angle rotor codes.

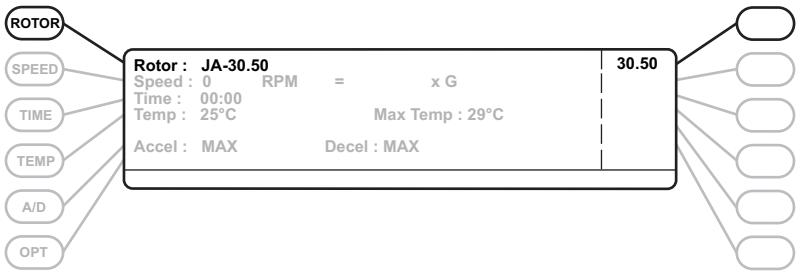
b. To select a different rotor type, press **ROTOR** again and then press another soft key.



3 Select the rotor name by pressing the appropriate soft key.

a. Press **ENTER.**

The selected rotor name appears in the **Rotor:** field.



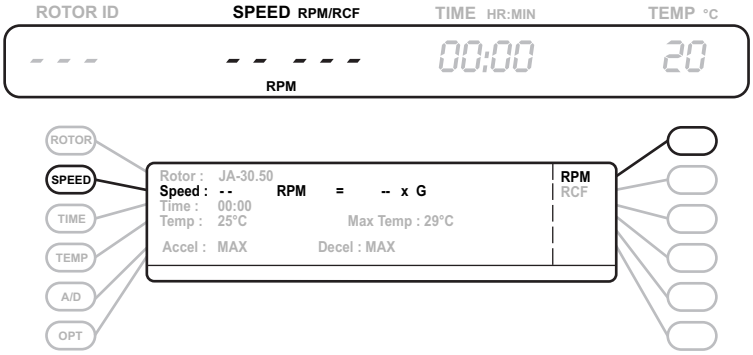
Entering Run Speed

Enter a run speed up to the maximum speed of the rotor in use (26,000 RPM maximum). Or, enter a relative centrifugal field (RCF) value up to the maximum achievable RCF of the rotor.

Entering RPM

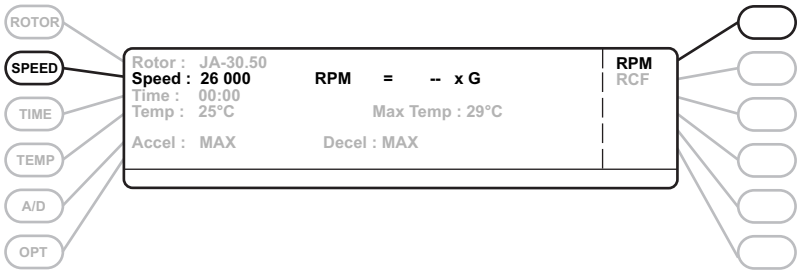
1 Press **SPEED**.

- The **Speed:** field flashes, and **RPM** and **RCF** soft keys appear.
- The **RPM** indicator illuminates in the actual value display.



2 Enter the required RPM on the keypad and press **ENTER.**

- The speed is displayed in the **Speed:** field.
- The system rounds off the last digit of the RPM entry, if necessary, and calculates and displays the *g*-force applied to the rotor at that speed.



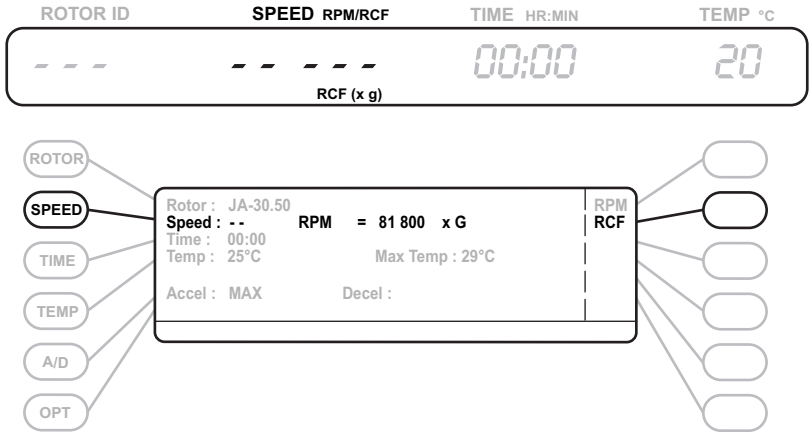
Entering RCF

1 Press **SPEED**

RPM and **RCF** soft keys appear.

2 Press the **RCF** soft key.

The **RPM = - - × G** field flashes.



3 Enter the required RCF on the keypad and press **ENTER**.

- The RCF and the corresponding RPM appear in the Speed: field.
- The RCF (× *g*) indicator illuminates on the actual value display, indicating that RCF (× *g*) is being displayed during the run.
- When **ENTER** and **START** are pressed, the centrifuge runs at the calculated RPM.
- If you enter an RCF value that is unachievable for the installed rotor, a message will appear telling you the rotor's achievable RCF.

Entering Run Time

Run time can be entered in hours and minutes or in $\omega^2 t$ (accumulated centrifugal effect). Hold mode is used for continuous operation.

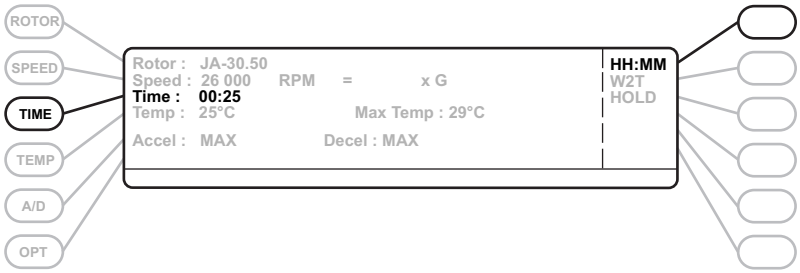
Entering a Timed Run

1 Press **TIME**.

HH:MM:, **W2T,** and **HOLD** soft keys appear.

2 Use they keypad to enter the required time (up to 99 hours, 59 minutes) and press **ENTER**.

Entered time appears in the **Time:** field.



3 Press the next function key or press **ENTER**, then **START**.

- The run begins, and the time remaining begins counting down to 0 in the **TIME** display.
- If you enter a number over 59 minutes, the centrifuge automatically recalculates the time in hours and minutes after **ENTER** or any function key is pressed.
- Deceleration begins when the **TIME** display has counted down to 0.
- During deceleration, "**End**" flashes in the **TIME** display and the red indicator light on the **STOP** key flashes.

Entering a $\omega^2 t$ Run

1 Press **TIME**.

HH:MM, **W2T,** and **HOLD** soft keys appear.

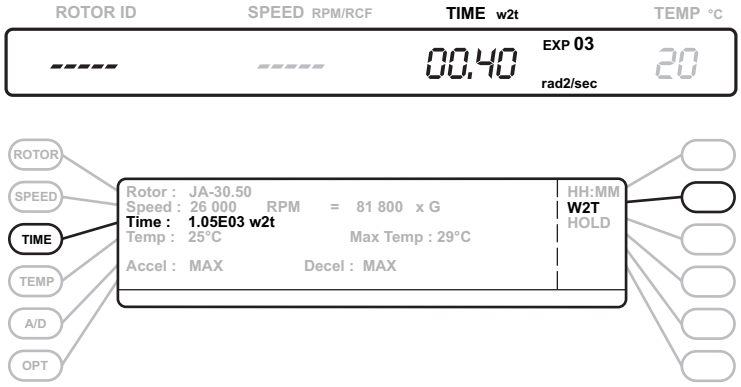
2 Press the **W2T** soft key to select the $\omega^2 t$ mode.

The **Time:** field flashes.

3 Use the keypad to enter an $\omega^2 t$ value.

- The entry appears in the **Time:** field.
- The decimal point and **E** appear automatically as you type.

- If you enter a value out of the achievable $\omega^2 t$ range for that rotor, a message prompts you to enter a different value.



4 Press the next function key or press **ENTER**, then **START**.

- The centrifuge begins calculating and displaying the accumulated centrifugal effect.
- Deceleration begins when the set $\omega^2 t$ value is reached. During deceleration, the red indicator light on the **STOP** key flashes.
- The $\omega^2 t$ continues to accumulate until the rotor stops spinning, so set and actual $\omega^2 t$ values may be different at the end of the run.

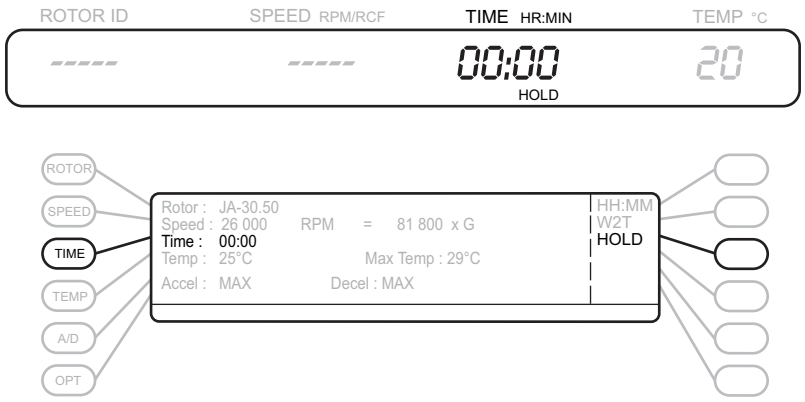
Entering a Continuous (HOLD) Run

1 Press **TIME**.

The **HH:MM**, **W2T**, and **HOLD** soft keys appear.

2 Press the **HOLD** soft key to select the hold mode.

HOLD appears in the **Time:** field.



3 Press the next function key or press **ENTER**, then **START**.

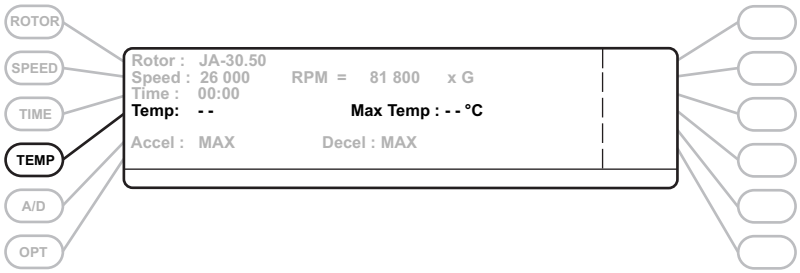
- After you start the run, the **HOLD** indicator illuminates in the **TIME** display.
- The elapsed run time is displayed.
- The run continues until **STOP** is pressed.

Entering Run Temperature

Run temperature can be set from –10 to +40°C. If no value is entered, the last-entered temperature is used.

1 Press **TEMP.**

The **Temp:** field flashes.



2 Use the keypad to enter the required temperature.

Entered temperature appears in the **Temp:** field.

3 Press the **TEMP** key again to move the cursor to the **Max Temp:** field.

- Entered temperature plus 4°C appears in the **Max Temp:** field, and **YES** and **NO** soft keys appear.
- The default maximum temperature is the set temperature plus 4°C.
- You can specify a different maximum temperature, from +2°C above the set temperature to 44°C.
- You can also specify whether or not you want the system to shut down if the maximum temperature is reached.
- The centrifuge will always shut down if the system temperature reaches 50°C.

4 Use the keypad to enter a different maximum temperature, or accept the default.

5 Choose **YES** to make the system shut down at maximum temperature, or **NO** to allow the system to run above maximum temperature.

Your selection (**YES** or **NO**) appears to the right of the **Max Temp:** field.

Entering Acceleration and Deceleration Rates

The centrifuge provides a choice of three acceleration rates and four deceleration rates to protect the gradient and sample-to-gradient interface. Table 2.1 describes these rates. If no rate is selected, the centrifuge accelerates and decelerates at maximum rates.

The default setting for both acceleration and deceleration is maximum (**MAX**) for all rotors except the JS-24.38 and the JS-24.15. Maximum acceleration and deceleration are not available for these rotors. **SLOW** is the default setting; **TIMED** settings can also be used.

Table 2.1 Acceleration and Deceleration Settings

Setting	Description
Maximum acceleration (not available with the JS-24.38 and JS-24.15 rotors)	Full torque is used from 0 RPM until set speed is reached.
Slow acceleration	Approximately 2 minutes from 0 to 500 pm. (Time depends on the mass of the rotor in use; larger rotors take longer.) Above 500 RPM, full torque is used until set speed is reached.
Timed acceleration	Acceleration time from 0 to 500 RPM can be set from 1 to 10 minutes. Above 500 RPM, full torque is used until set speed is reached.
Maximum deceleration	Full brake from set speed to near 0 RPM. Reduced brake is used during the last few RPM until 0 is reached to minimize sample disturbance.
Slow deceleration	Reduced torque from set speed to 500 RPM, then approximately 2 minutes from 500 to 0 RPM. Deceleration to 500 RPM takes about twice as long as with maximum deceleration. (The exact time depends on the mass of the rotor in use; larger rotors take longer.)
Timed deceleration	Full brake from set speed to 500 RPM. From 500 to 0 RPM, deceleration time can be set from 1 to 10 minutes.
Off	No brake is used. Rotor coasts from set speed to 0 RPM. Can take up to 1 hour, depending on the mass of the rotor in use and the set speed.

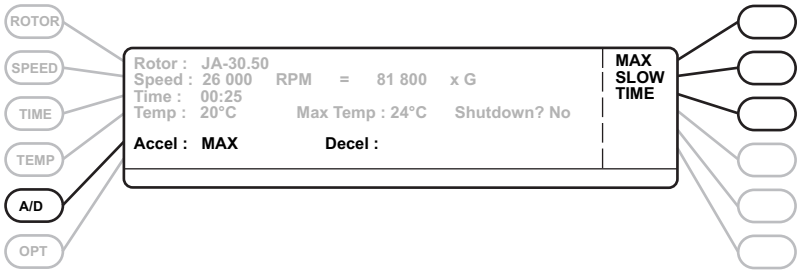
Acceleration

1 Press **A/D.**

The **Accel:** field flashes. **MAX**, **SLOW**, and **TIME** soft keys appear.

2 Press the appropriate soft key.

- If you choose **MAX** or **SLOW**, your selection appears in the **Accel:** field.
- If you choose **TIME**, enter an acceleration time from 1 to 10 minutes and press **A/D** again or accept the 10-minute default setting.



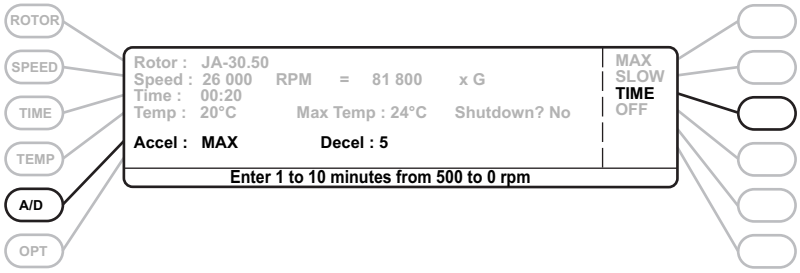
Deceleration

1 Press **A/D** twice (if the cursor is in the **Accel:** field, press **A/D** once).

The **Decel:** field flashes. **MAX**, **SLOW, TIME,** and **OFF** soft keys appear.

2 Press the appropriate soft key.

- If you choose **MAX**, **SLOW,** or **OFF**, your selection appears in the **Decel:** field.
- If you choose **TIME**, enter a deceleration time from 1 to 10 minutes and press **A/D** again or accept the 10-minute default setting.



Starting a Run

1 Press **ENTER**, then **START**.

- (You must press **START** within 5 seconds of pressing **ENTER**.)
- The green light on the **START** key flashes and the rotor begins to spin.

Changing Parameters During a Run

While a run is in progress, run parameters (speed, time, temperature, and acceleration and deceleration settings) can be changed without stopping the run by entering the new setting and pressing **ENTER**.

Ending a Run

To end a run in progress, press **STOP**. The red **STOP** indicator light flashes until the rotor comes to a complete stop.

In timed runs, deceleration begins automatically when the **TIME** display counts down to zero. In $\omega^2 t$ runs, deceleration begins when the set $\omega^2 t$ is achieved.

NOTE If a diagnostic condition causes the run to stop, a diagnostic message appears and the red **STOP** indicator light flashes until the rotor comes to a complete stop. See Table 3.1 for diagnostic code explanations and troubleshooting procedures.

Programmed Operation

The centrifuge internal memory can store up to 30 programs, each containing up to two steps (each step is a set of run parameters). Programs are retained in memory when the power is turned off.

Creating a New Program

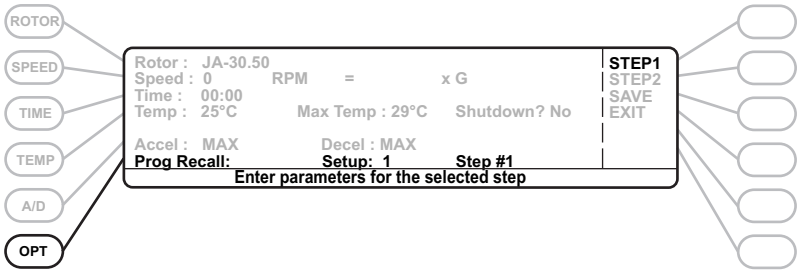
1 Press **OPT**.

The **Prog**(ram) **Recall:** field flashes, and the message line says "**Enter program number (1–30).**"

2 Press **OPT** again to move the cursor to the **setup:** field.

a. Use the keypad to enter a program number in this field, then press **ENTER**.

- A two-step program is created and is assigned the number you entered.
- If you enter a number that is already assigned to a program, you can either overwrite the program or select another program number.
- A message prompts you to enter parameters for step 1.



3 Enter run parameters (rotor, speed, time, temperature, acceleration/deceleration settings) for step 1.

a. Press **ENTER** when programming is complete.

The message "**Switch steps, save, or exit program mode**" appears.

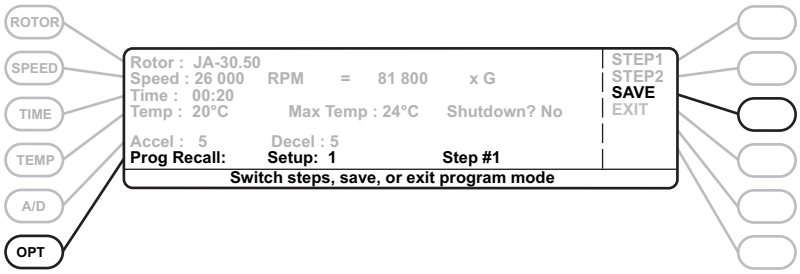
NOTE To program a delayed start, set the time in step 1 to the required delay length and set the speed in step 1 to 0 RPM. Enter run parameters in step 2, setting the step 2 time to any value greater than 00:00. The run will start when the step 1 set time has elapsed.

4 If you want to program one step only, press the **SAVE** soft key, then press the **EXIT** soft key to exit program mode.

The parameters are saved to step 1.

If you are overwriting a program that contains user-entered settings in step 2, those values are retained until you change them.

a. To check step 2 settings, press the **STEP2** soft key.



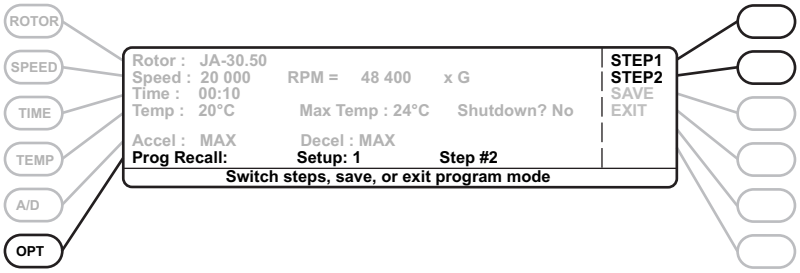
5 To add a second step to program 1, press the **STEP2** soft key.

6 Enter parameters for step 2.

a. Press **ENTER** when done.

All parameters for step 1 and 2 are saved under the selected program number.

b. To recheck the parameters in either step, press the **STEP1** or **STEP2** soft key to toggle to that step.



7 Press the **SAVE** soft key when programming is complete.

8 Press the **EXIT** soft key to exit program mode.

Modifying a Program

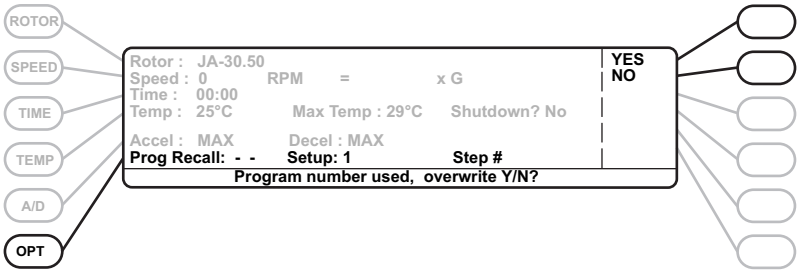
1 Press the **OPT** key.

The **Prog Recall:** field flashes, and the message "**Enter program number (1–30)**" appears.

2 Press **OPT** again to move the cursor to the **Setup:** field.

a. Enter the number of the program to be modified.

- The program number appears in the **Setup:** field.
- A message appears asking if you want to overwrite the program.
- **YES** and **NO** soft keys appear.



3 Press the **YES** soft key.

The step 1 parameters appear.

4 To see step 2 parameters, press the **STEP2** soft key.

The step 2 parameters appear.

5 Modify the parameters for either step.

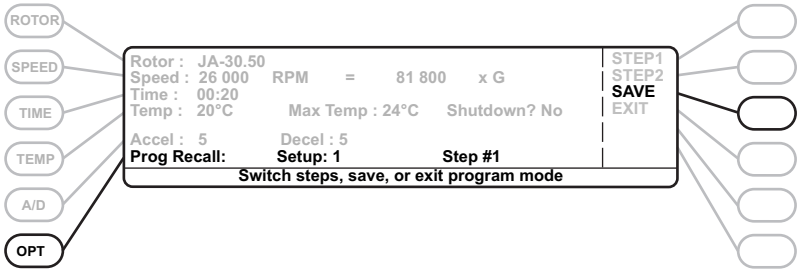
a. Press **ENTER** when done.

b. Repeat for the other step, if required.

The newly entered parameters appear.

6 Press the **SAVE** soft key to save both program steps.

Steps 1 and 2 are saved under the selected program number.

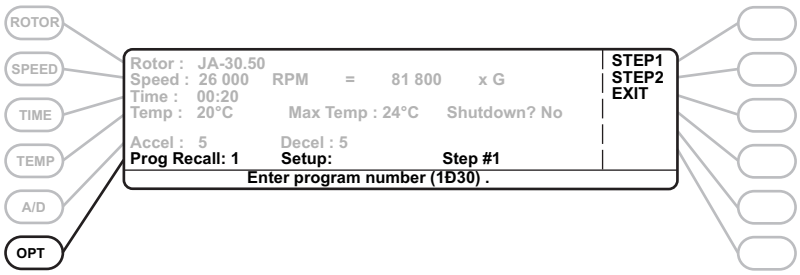


7 Press the **EXIT** soft key to exit program mode.

Running a Program

1 Press **OPT**.

The **Prog Recall:** field flashes.



2 Use the keypad to enter the program number in the **Prog Recall:** field.

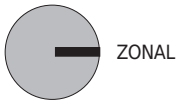
3 Press **ENTER**, then **START.**

Setting Up a Zonal Run

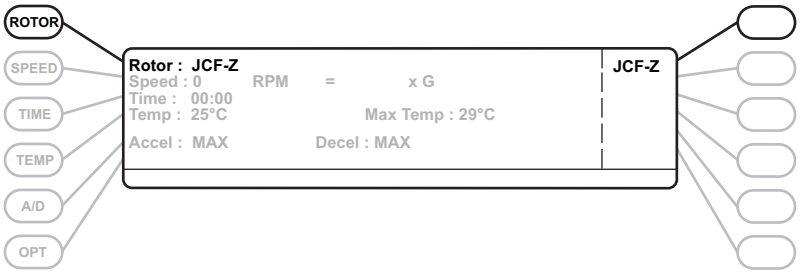
When the centrifuge is in the zonal mode (key switch is in the **ZONAL** position), open-door operation at speeds up to 3000 RPM is enabled to allow loading and unloading of the rotor while it is spinning.

The JCF-Z continuous flow/zonal rotor is the only rotor that can be used while the key switch is in the ZONAL position. See the JCF-Z rotor manual for complete rotor operating instructions.

1 Turn the key to the **ZONAL** position.



- Open-door operation up to 3000 RPM is enabled.
- JCF-Z appears in the **Rotor:** field.



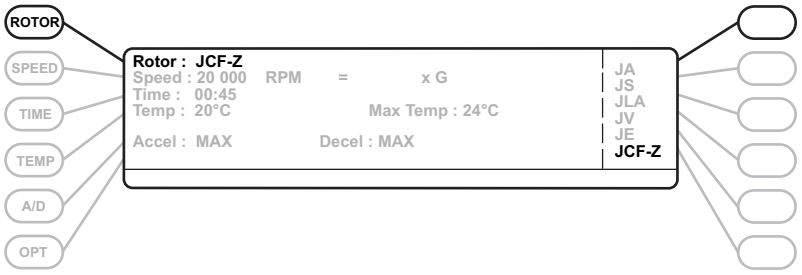
2 Install the rotor.

a. Leave the door open when installation is complete.

3 Press **ROTOR**.

a. Press the **JCF-Z** soft key.

b. Enter the remaining run parameters.



4 Press **ENTER,** then **START**.

- The rotor begins accelerating to 2000 RPM, which is the default loading speed.
- If an $\omega^2 t$ run is specified, $\omega^2 t$ starts accumulating.
- To select a different loading speed, enter a speed of 3000 RPM or less before or after the rotor starts to spin.

5 Load the rotor.

6 Close the door.

The rotor accelerates to the set speed.

a. *If you entered a loading speed other than 2000 RPM, re-enter the run speed after you close the door.*

7 End the run.

- When the run is complete (the run time has expired, the set $\omega^2 t$ value has been reached, or **STOP** has been pressed), the rotor decelerates to the default unloading speed of 2000 RPM.
- If desired, you may enter a different unloading speed of 3000 RPM or below after the rotor reaches 2000 RPM.

8 Open the door and unload the rotor.

⚠ DANGER

Never try to slow or stop the rotor by hand.

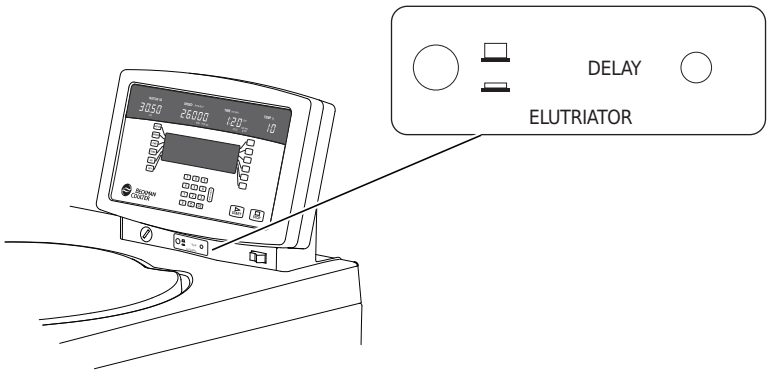
9 Press **STOP** to bring the rotor to a complete stop.

NOTE Before another zonal run can be started, you must press the **RESET** key.

Setting Up an Elutriation Run

Centrifuges equipped for elutriation have elutriation controls as shown in Figure 2.1 and an elutriation power box mounted on the back of the control panel. See the JE-5.0 elutriator rotor manual (JE5-IM) for complete rotor setup and operating instructions.

Figure 2.1 Elutriation Controls



1 Install the rotor.

2 Set up sample and buffer reservoirs and tubing lines as described in the rotor manual.

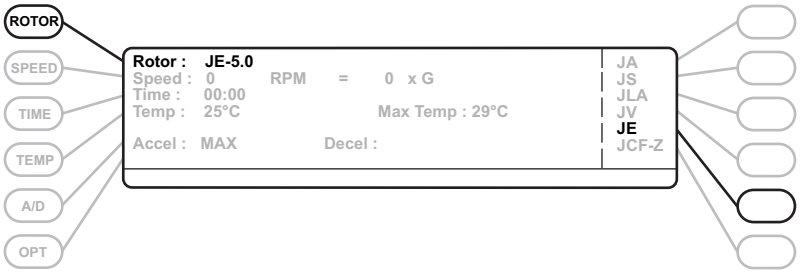
a. Route tubing lines through the elutriator port holes at the left side of the door seal.

b. Close the centrifuge door.

3 Press **ROTOR**.

a. Press the **JE** soft key.

JE-5.0 appears in the **Rotor:** field.



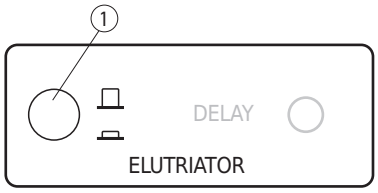
4 Enter the remaining run parameters.

5 Press **ENTER**, then **START**.

The rotor accelerates to set speed.

6 When the rotor reaches set speed, turn on the strobe controls by pressing the strobe control power switch.

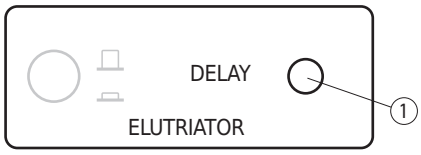
The power switch indicator lights.



1. Strobe Power Switch

7 When the rotor speed has stabilized, look through the port in the centrifuge door and turn the **DELAY** control knob until the elutriation chamber in the rotor is synchronized with the strobe.

- (The chamber will appear to be motionless).
- Sample can now be injected into the lines.
- See the elutriator rotor instruction manual for detailed instructions.



1. Delay Control Knob

NOTE At the end of the run, after disassembling the liquid and power lines, be sure to replace the black rubber stoppers in the ports at the left side of the centrifuge door. Failure to seal these openings will prevent proper operation of the FRS system, which will cause a diagnostic shut down during the next run.

CHAPTER 3

Troubleshooting

Introduction

This section lists possible malfunctions, along with probable causes and corrective actions. Maintenance procedures are given in CHAPTER 4, Care and Maintenance. For any problems not covered here, contact Beckman Coulter Field Service (1-800-742-2345 in the United States; outside the U.S. contact your local Beckman office or visit us at www.beckmancoulter.com) for assistance.

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

User Messages

User messages appear on the setup screen to communicate information about the instrument or to alert you to abnormal conditions that need attention.

- Help and informational messages caused by incorrect input or certain operating conditions can be cleared by pressing **CE** and following the instructions in the message.
- Diagnostic messages that result from abnormal operating conditions or equipment malfunction require troubleshooting. Refer to Table 3.1 to determine the nature of the condition and any recommended actions. If a problem persists after you have performed the recommended action, call your Beckman Coulter Field Service representative (in the United States, call 1-800-742-2345; outside the U.S., call your local Beckman Coulter office). To help the field service representative diagnose and correct the problem, try to gather as much information about the situation as you can, including:
  - the diagnostic number and message,
  - the operating situation when the diagnostic condition occurred (such as rotor in use, speed, or load type), and
  - any unusual environmental and/or operating conditions (such as ambient temperature or voltage fluctuations).

  NOTE The information provided in Table 3.1 is a user guide, and is not a comprehensive checklist.

Table 3.1 Diagnostic Message Chart

Diagnostic Message	Problem	Result	Recommendation
P1/ Power failure, run continued	Momentary power failure: rotor does not come to a complete stop	Run continues when power resumes	Press **CE** to clear message.
P2/ Power failure, run restarted	Power failure: rotor comes to a complete stop	Run will restart automatically when power resumes	Press **CE** to clear message.
L2/ Door not latched, reclose door **L5**/ Door not latched, call Beckman service	Door not closed firmly enough, or debris in latch area may be preventing latches from closing securely	L2 error message appears. If you reclose the door repeatedly and the problem continues, the message will change to say "**L5 Door not latched, Call Beckman Service**"[a]	Reclose the door firmly, placing your hand over the drawing of the hand on the door label. (As you close the door your hand should be half-way between the two latches, which is approximately 45° to the right of center front.) Gently clean the latch areas with a dry, lintless cloth. Be careful not to damage sensitive electronics in the area. If L2 continues to appear after cleaning, call Beckman Coulter Field Service.[a]
L3/ Door problem, refer to manual **L9**/ Door problem, refer to manual	Foot pedal was depressed before end of run	Latches are not operating properly	Press **CE** and try to restart the run. If this does not work, call Beckman Coulter Field Service.[a]
L4/ Door problem, refer to manual	Door stays locked after rotor stops spinning	Sample cannot be retrieved	Restart the centrifuge and perform a brief run. If door will still not open after decel, call Beckman Coulter Field Service.[a]
C2/ Rotor over temp, run stopped	Rotor temperature exceeds maximum temperature setting	Run shuts down with maximum brake	Call Beckman Coulter Field Service.[a]
C3/ No temp control, refer to manual	Refrigeration system malfunction	Run shuts down with maximum brake	• Check the air filter and replace if dirty (see CHAPTER 4, *Care and Maintenance*). • Call Beckman Coulter Field Service.[a]
D1 and **D9**	Erroneous signal from tachometer board to display board or drive system problem. Door lockout time may not be sufficient to prevent access to spinning rotor.	Erroneous display of 0 RPM immediately after failure, rotor still spinning.	Call Beckman Coulter Field Service.[a] Wait for 4 hours before trying to open the door.

Table 3.1 Diagnostic Message Chart *(Continued)*

Diagnostic Message	Problem	Result	Recommendation
D1–5/ Drive error, call Beckman Coulter Field Service	Drive system problem (for example, over current, over/under voltage, components over temperature)	Run stops, usually with no brake. Door may not unlock for up to an hour.	Call Beckman Coulter Field Service.[a] Before trying to open the door, listen carefully and make sure that no sound is coming from the chamber (indicating a spinning rotor). Follow the directions under *Accessing the Rotor in Case of Power Failure*, below.
F1, F4, **F5**/ FRS[b] failure, refer to manual	Required FRS level not reached	Run shuts down with maximum brake	• Check and clean door sealing area and door gasket. • Wipe any ice and excess moisture from chamber. • Check and clean door sealing area and door gasket.
F2/ FRS failure, refer to manual	FRS level too high	Run continues	Press **CE**. If F2 message reappears, perform same actions as for Fl error.
F3/ FRS failure, refer to manual	FRS level too high	Run shuts down with maximum brake	Call Beckman Coulter Field Service.[a]
S1/ System error	There is a problem with the system control software, EPROM, or RAM	System shuts down	Call Beckman Coulter Field Service.[a]
H4/ Speed error	• a run is in progress (at speed or accelerating) • the operator changes the speed to 0 RPM by pressing **SPEED, 0**, **ENTER** rather than by **STOP** key • the operator then tries to increase the speed by pressing **SPEED**, entering a new speed, and pressing **ENTER**.	The centrifuge does not accelerate, and the H4 diagnostic occurs. (Note that during a run, the speed can be changed from any speed other than 0 by pressing **SPEED**, entering the new speed, and pressing **ENTER**.)	Press **STOP** (green light on **START** key will turn off), then press **CE** to clear the diagnostic. Set the new run speed and then press **ENTER**, **START** to begin a new run.

Table 3.1 Diagnostic Message Chart *(Continued)*

Diagnostic Message	Problem	Result	Recommendation
I1/ Imbalance error	Rotor load is severely out of balance	Run shuts down with maximum brake	• Make sure that tubes or bottles are loaded symmetrically in the rotor. • With swinging bucket rotors, lubricate the buckets according to the rotor manual instructions. Unlubricated pivot pins can prevent the buckets from reaching horizontal position, which can cause imbalance.
—	During low-temperature runs (near –10°C), ice forms around the door opening	Door will not open at the end of a run	Press firmly in several locations around the door opening, then depress the foot pedal again. To minimize icing, wipe moisture from the chamber, the chamber gasket and the inner door surface before each run. Keep the door closed as much as possible.

a. In the U.S. call 1-800-742-2345. Outside the U.S., contact your local Beckman Coulter office or visit us at www.beckmancoulter.com.

b. Friction Reduction System.

Accessing the Rotor in Case of Power Failure

⚠ WARNING

Any maintenance procedure requiring removal of a panel exposes the operator to the possibility of electrical shock and/or mechanical injury. Therefore, turn the power off (O) and disconnect the instrument from the main power source by removing the Mains (power) plug from the outlet receptacle, and refer such maintenance to qualified service personnel.

⚠ WARNING

Before performing this procedure, verify that the rotor is not spinning by listening carefully for any noise coming from the chamber. Proceed only if the instrument is quiet. Never attempt to override the door interlock system while the rotor is spinning.

If the facility power fails only momentarily, the centrifuge will resume operation when the power is restored and the rotor will return to the set speed. In the event of an extended power failure, you may need to override the door-locking mechanism manually to remove the rotor and retrieve your sample.

To access the door-locking mechanism, you must remove the instrument front panel. Two latches secure the front panel in place; these latches are accessible through two holes at the upper right and left of the panel (see Figure 3.1).

Figure 3.1 Emergency Door Release Latch Access

1 Turn the power switch to off (**O**) and unplug the power cord from the main source by removing the Mains (power) plug from the outlet receptacle.

- The Mains (power) plug is the disconnect device and must remain easily accessible.
  - Position the centrifuge so that it is easy to remove the Mains (power) plug from the outlet receptacle.

2 Insert a 4-mm or $^{5}/_{32}$-in. Allen wrench straight through one of the holes (either one) and turn the wrench to the left (counterclockwise) until the latch disengages.

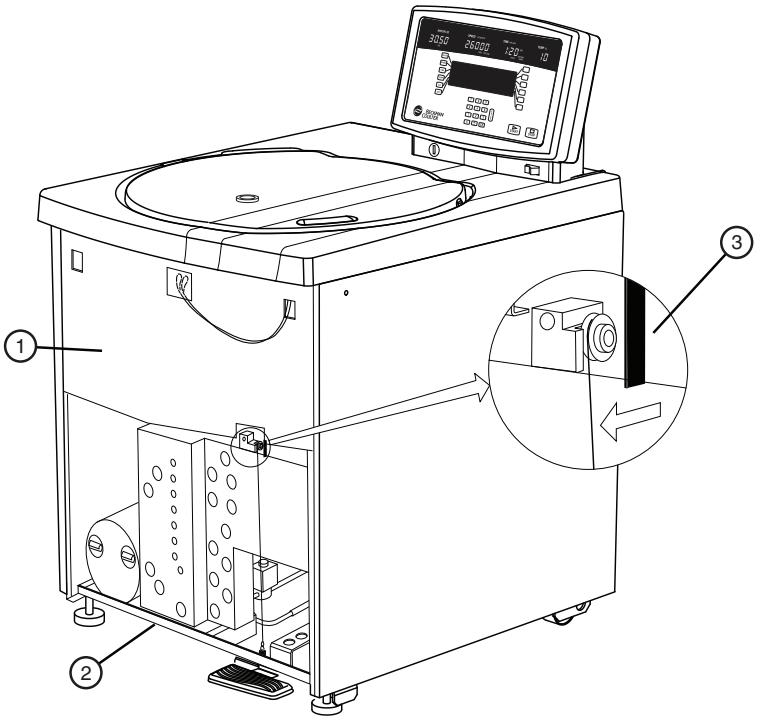
3 Repeat step 2, inserting the Allen wrench through the other hole.

- After the second latch disengages, the front panel will fall forward about an inch from the top.
- The bottom of the front panel is held in place by three grooved brackets, attached to the front panel, that seat over a metal retaining strip on the centrifuge bottom panel.

4 Lift the front panel up and off the centrifuge; set it aside.

- You will see an inner front panel that extends about halfway down from the centrifuge top (see Figure 3.2).
- Below this inner panel is a black manual door release interlock lever (see Figure 3.2).

Figure 3.2 Manual Door Release



1. Inner Front Panel
2. Retaining Strip
3. Manual Door Release Interlock Lever

5 Pull the interlock lever out and to the left (at about a 45-degree angle), and while holding it out, step on the foot pedal.

Depending on the level of vacuum in the chamber at the time of the power failure, the door may or may not open.

a. If it opens, go to step 6.

b. If it does not open, you will need to manually vent the vacuum. Go to step 7.

6 After the door opens, first release the foot pedal and then release the interlock lever.

Sample can be removed.

a. Go to step 10.

7 To vent the chamber vacuum, grasp the red rubber hose and pull it up until it comes off of the pump fitting (see Figure 3.3).

a. Use a back-and-forth motion as you pull; this takes quite a bit of force.

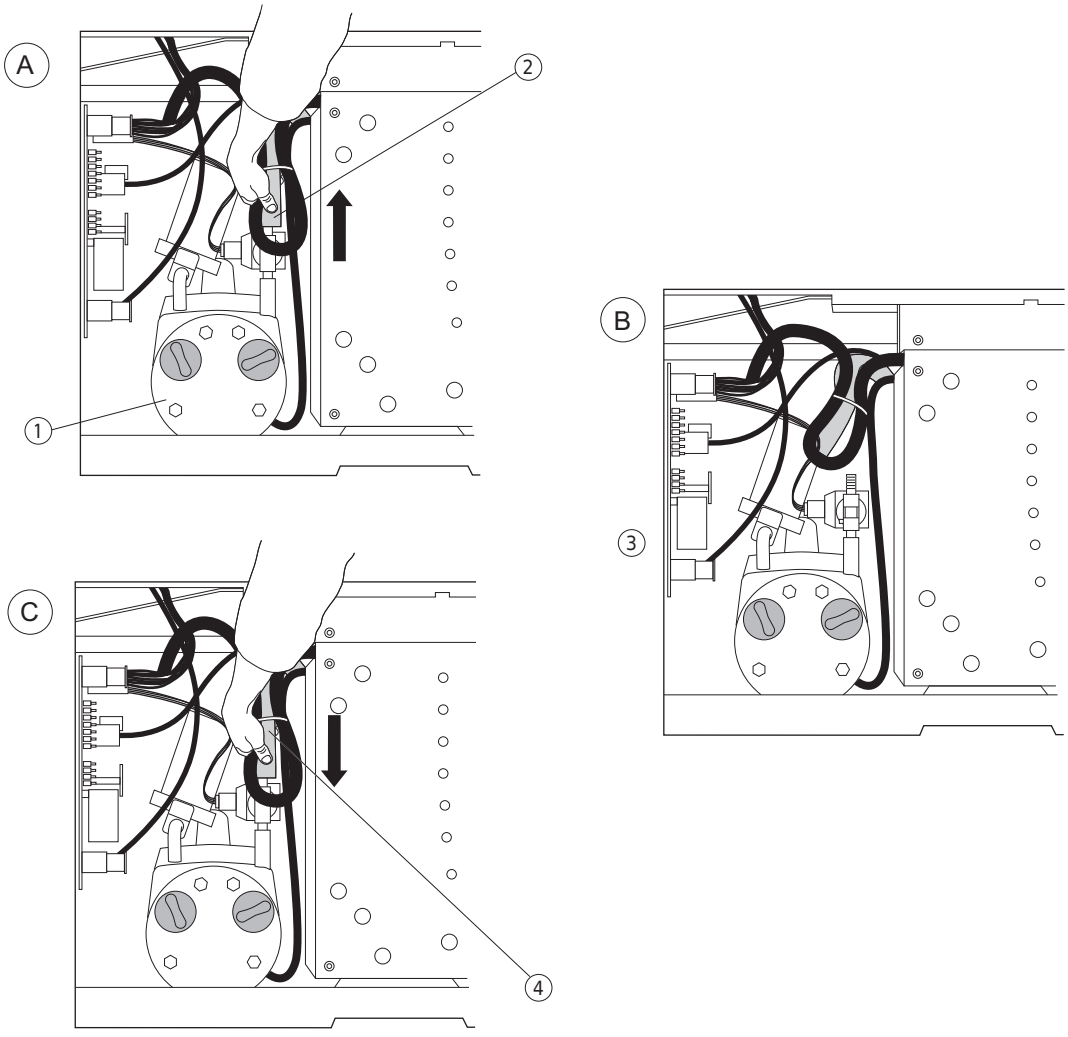
The vacuum will be completely vented several seconds after the hose is detached.

NOTE Several tubing lines are tied to the red hose. As you grasp the hose, place your hand over these lines. Make sure that they stay connected as you pull.

⚠ CAUTION

Do not twist the hose to the left (counterclockwise) as you pull the hose, or you will unscrew the hose fitting.

Figure 3.3 Venting the Chamber Vacuum



1. Vacuum Pump
2. Grasp red hose and pull up (Do *not* disconnect the tubing lines tied to the red hose.)
3. Red hose removed from fitting
4. Replace red hose

8 Replace the hose by pushing it down over the fitting as far as it can go.

9 Pull the interlock level out and left, and while holding it out, step on the foot pedal.

10 Remove your sample.

⚠ DANGER

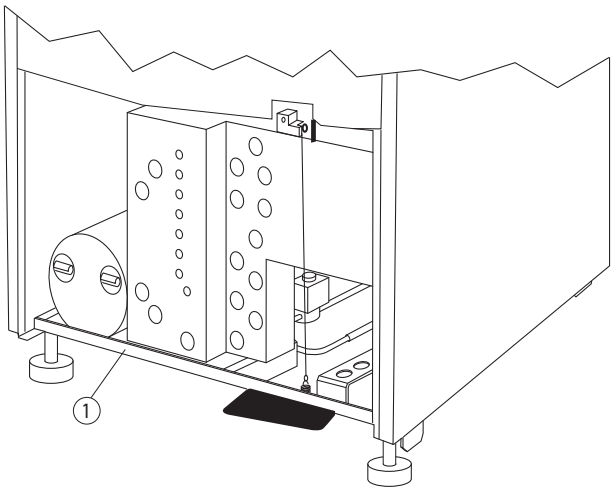
Never try to slow or stop the rotor by hand.

To replace the panel on the centrifuge,

1 Holding the panel at the top (with the instrument label facing out), insert the three grooved brackets on the bottom inside of the door over the front panel retaining strip (see Figure 3.4).

a. Push the top of the front panel into place.

Figure 3.4 Front Panel Retaining Strip



1. Retaining Strip

2 Hold the left top edge in place and insert the Allen wrench through the hole.

a. Turn to the right (clockwise) until the latch engages.

3 Repeat step 2 on the right side

The second latch engages.

JCF-Z Rotor Identification

The rotor identification system can, under two specific conditions, misidentify the JCF-Z continuous flow/zonal rotor. Misidentification has occurred if a rotor name other than JCF-Z appears in the **ROTOR** display when the centrifuge door is closed. If the rotor is misidentified, stop the run and follow one of the steps below.

NOTE Misidentification can be prevented by returning your JCF-Z rotor to the Beckman Coulter factory to have magnets added to the rotor body. The magnets ensure correct identification. Call your local Beckman Coulter Field Service representative* for more information.

JCF-Z rotors manufactured after March, 1997, have factory-installed magnets.

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1 *On the first few uses of a new JCF-Z rotor, or in an older JCF-Z rotor with newly replaced bearings*, run the rotor from 0 to 5000 RPM and back to 0 RPM three times.

This procedure will distribute lubricant around the bearings in the rotating seal assembly, reducing drag.

---

2 *In older JCF-Z rotors with bearings that have not been replaced recently*, follow the same procedure as for a new JCF-Z rotor (perform three runs from 0 to 5000 RPM and back to 0 RPM) to ensure that the bearings are properly lubricated.

If misidentification recurs after the third run, when the bearings are lubricated, this indicates that the bearings are worn and need to be replaced.

a. Replace the bearings following the instructions in the JCF-Z manual (JCFZ-IM).

NOTE If the JCF-Z rotor is misidentified, the run speed will be limited to the maximum speed for the identified rotor. (The maximum speed for the JCF-Z rotor is 20,000 RPM.)

* In the United States, call 1-800-742-2345. Outside the U.S., contact your local Beckman Coulter office or visit us at www.beckmancoulter.com.

CHAPTER 4

Care and Maintenance

Introduction

This section describes routine care and maintenance procedures that you should perform regularly or as required. For maintenance not covered in this manual, contact Beckman Field Service. Refer to the applicable rotor manual and* Rotors and Tubes for J Series Centrifuges *(publication JR-IM) for instructions on the care of rotors and accessories.*

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

⚠ WARNING

Any maintenance procedure or servicing of this equipment that requires removal of any covers can expose parts which involve the risk of electric shock or personal injury. Make sure that the power switch is off (O) and the centrifuge is disconnected from the main power source by removing the Mains (power) plug from the outlet receptacle, and refer such servicing to qualified service personnel.

⚠ WARNING

Do not use alcohol or other flammable substances in or near operating centrifuges.

Maintenance

Perform the following procedures regularly to ensure continued performance and long service life of the centrifuge.

1 Inspect the centrifuge chamber for accumulations of sample, dust, or glass particles from broken sample tubes.

a. Clean as required (see *Cleaning* below).

* In the United States, call 1-800-742-2345. Outside the U.S., contact your local Beckman Coulter office or visit us at www.beckmancoulter.com.

2 Check the air filter on the back panel for obstructions.

a. Keep vents clear and clean.

3 Wipe condensation out of the chamber between runs with a sponge or clean cloth to prevent chamber icing.

4 If chamber icing occurs, defrost the system and wipe moisture out of the chamber before use.

a. To defrost the system, set the temperature to 30°C for 20 minutes.

(These are suggested settings that may be adjusted as appropriate for your laboratory conditions.)

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

Cleaning

1 Clean the centrifuge frequently.

a. Always clean up spills when they occur to prevent corrosives or contaminants from drying on component surfaces.

2 To prevent accumulations of sample, dust, and/or glass particles from broken sample tubes, keep the chamber clean and dry by frequent wiping with a cloth or paper towel.

a. For thorough cleaning, wash the chamber using a mild detergent such as Solution 555.

b. Dilute the detergent with water (10 parts water to 1 part detergent).

c. Rinse thoroughly and dry completely.

3 Clean the centrifuge exterior surfaces by wiping with a cloth dampened with Solution 555.

Dilute the detergent with water (10 parts water to 1 part detergent).

Do not use acetone.

4 Clean the drive hub regularly using Solution 555 and a soft brush.

a. Dilute the detergent with water (10 parts water to 1 part detergent).

b. Rinse thoroughly and dry completely.

Tube Breakage

1 If a glass tube breaks, and all the glass is not contained in the bucket or rotor, be sure to thoroughly clean the chamber.

⚠ WARNING

Be careful when examining or cleaning the chamber and chamber gasket, as sharp glass fragments may be embedded in their surfaces.

2 Examine the chamber gasket to make sure that no glass particles are retained in it.

a. Carefully remove any glass particles that may remain.

3 Carefully wipe away any glass particles that remain in the chamber.

Decontamination

If the instrument and/or accessories are contaminated with radioactive or pathogenic solutions, perform all appropriate safety and decontamination procedures. Refer to *Chemical Resistances* (publication IN-175) to be sure the decontamination method will not damage any part of the instrument

Sterilization and Disinfection

Ethanol (70%) may be used to clean any exterior surface of the centrifuge. See *Chemical Resistances* (publication IN-175) for chemical resistances of centrifuge and accessory materials. For this centrifuge refer to the PET column in the chemical resistances chart for the plastic surfaces and the polyurethane paint column for the painted metal surfaces.

⚠ CAUTION

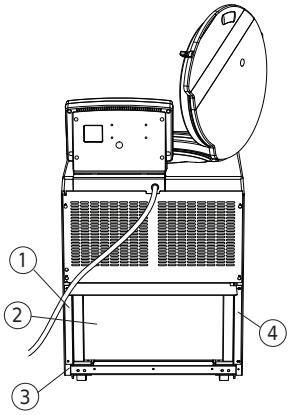
Ethanol is a flammability hazard. Do not use it in or near operating centrifuges.

While Beckman Coulter has tested ethanol (70%) and found that it does not damage the centrifuge, no guarantee of sterility or disinfection is expressed or implied. When sterilization or disinfection is a concern, consult your laboratory safety officer regarding proper methods to use.

Replacing the Air Filter

1 Check the air filter regularly and replace it about once a year, or more often if it looks dirty.

The air filter is not fastened to the centrifuge, so no tools are required for removal or installation.



1. Frame Edge
2. Air Filter
3. Retaining Strip
4. Frame Edge

2 To remove the air filter, hold the side edges and lift the filter straight up until the bottom edge is above the centrifuge bottom retaining strip.

a. Pull the filter out, bottom edge first, and discard it.

3 Install a new filter (885218).

a. The filter has a directional arrow on one of its edges; install the filter with this arrow pointing toward the centrifuge.

b. Holding the filter by the side edges, insert the top half behind the frame edge and lift up until the bottom half clears the retaining strip.

c. Then set the bottom edge down.

Circuit Breaker and Fuses

There are no user-replaceable fuses in the Avanti J-26S XPI centrifuge.

If the centrifuge circuit breaker trips for any reason, the power switch will move to the OFF (**O**) position.

1 Reset the circuit breaker by turning the power switch back to the ON (**I**) position.

a. If it trips again immediately, do not reset it.

Contact Beckman Coulter Field Service.*

⚠ CAUTION

Repeated attempts to reset the centrifuge circuit breaker can cause substantial damage to electrical and electronic components.

Storage and Transport

Storage

To ensure that the centrifuge 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 conditions for storage should meet the environmental requirements described under *Specifications* in CHAPTER 1.

Returning a Centrifuge

Before returning a centrifuge or accessory for any reason, prior permission must be obtained from Beckman Coulter. Contact your local Beckman Coulter office* to obtain the required form and instructions for packaging and shipping.

To protect our personnel, it is the customer's responsibility to ensure that all parts are free from pathogens and/or radioactivity. Sterilization and decontamination must be done before returning the parts.

All parts must be accompanied by a note, plainly visible on the outside of the box or bag, stating that they are safe to handle and that they are not contaminated with pathogens or radioactivity. ***Failure to attach this notification will result in return or disposal of the items without review of the reported problem.***

* In the United States, call 1-800-742-2345. Outside the U.S., contact your local Beckman Coulter office or visit us at www.beckmancoulter.com.

Supply List

Contact Beckman Coulter Sales* or visit www.beckmancoulter.com for information about ordering parts, supplies, and publications. Refer to the High Performance, High Speed, High Capacity Rotors, Tubes & Accessories catalog (BR-8102, available at www.beckmancoulter.com). For your convenience, a partial list of centrifuge supplies is given below.

Refer to the applicable rotor manual for materials and supplies needed for rotors.

Replacement Parts and Supplies

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

Description	Part Number
Air filter	885218
Solution 555 (1 qt)	339555
Zonal Bracket Kit for Cole-Parmer size 16 tubing (6.4-mm [1/4-in.] O.D.) Zonal Bracket (qty 1) Thumbscrew, stainless steel, M4 (threads) × 19 mm (qty 2) Thumbscrew, stainless steel, M4 (threads) × 12 mm (qty 2) Cable Clamp, nylon, 6.4-mm (1/4-in.) I.D. (qty 10)	 366431 366430 893412 893411 000499
Zonal Tubing Adapter for Cole-Parmer size 14 tubing (4.8-mm [3/16-in.] (O.D.) **Note**: kit 366431 is also required. Tubing Adapter, stainless steel, for size 14 tubing (qty 2) Cable Clamp, nylon, 4.8-mm (3/16-in.) I.D. (qty 10)	 363844 363830 003343
Zonal Tubing Adapter for Cole-Parmer size 15 tubing (9.6-mm [3/8-in.] O.D.) **Note**: kit 366431 is also required. Tubing Adapter, stainless steel, for size 15 tubing (qty 2) Cable Clamp, nylon, 9.6-mm (3/8-in.) I.D. (qty 10)	 363845 363831 000596
Elutriation upgrade kit	366562

* In the United States, call 1-800-742-2345. Outside the U.S., contact your local Beckman Coulter office or visit us at www.beckmancoulter.com.

APPENDIX A

Preinstallation Requirements

Preinstallation Requirements

Do not attempt to install this instrument. Its purchase price includes installation by Beckman Coulter personnel. Installation by anyone other than an authorized Beckman Coulter representative invalidates any warranty covering the instrument.

Preinstallation requirements have been sent prior to shipment of the instrument. The following information is provided in case the centrifuge must be relocated.

The centrifuge will be installed upon initial purchase by a Beckman Coulter Field Service representative after preinstallation requirements for power and site preparation have been met. The following equipment is required for preinstallation:

- Voltmeter
- For single phase centrifuges: two 30-ampere circuit breakers
- For three phase centrifuges: three 16-ampere circuit breakers
- Power receptacle (see Figure A.1 or Figure A.2)
- Drill for drilling holes in the floor for installation of anchoring kit bolts (see *Securing the Centrifuge to the Floor*, later in this section). A 9.5 mm ($^3/_8$-inch) drill is required for concrete floors. A 6.4 mm ($^1/_4$-inch) drill is required for wood floors.

Electrical Requirements

Power to the centrifuge should originate directly from a main power line transformer at a power source known to be clear of erratic loads, spikes, and electromagnetic interference. Make sure that there are properly rated thermal circuit breakers at the service panel to protect the centrifuge circuit. If fuses must be used instead of the specified circuit breakers, the fuses may require a rating of greater than 30 amperes (for single-phase centrifuges) or greater than 16 amperes (for three-phase centrifuges).

Terminate the open end of the harmonized cord with a certified single- or three-phase connector suitable for the power supplied in the country of intended use (see Table A.1). Install only one centrifuge per circuit.

Table A.1 Nominal Supply Voltage Ratings for the Avanti J-26S XPI

Nominal Instrument Voltage Rating	Instrument Part Number	Instrument Part Number (Elutriation System)	Nominal Supply Frequency	Power Cord and Plug Description
Single-phase, 200/208/240 V	B14538	B14544	180–264 V, 50/60 Hz, 30 A	permanently attached three-wire UL/CSA-approved cord with NEMA type 6-30P plug
Single-phase, 230 V	B14539	B14545	180–264 V, 50 Hz, 30 A	permanently attached three-wire CENELEC harmonized cord without plug
Three-phase, 220/380 V + Neutral[a]	B14540	B14546	313–457 V, plus neutral, 50 Hz, 16 A	permanently attached five-wire CENELEC harmonized cord without plug

a. Unbalanced three-phase. Split for single-phase operation internally.

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

⚠ WARNING

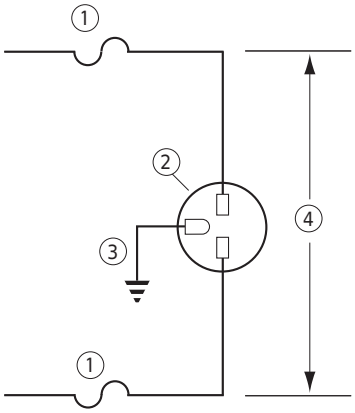
To reduce the risk of electrical shock, this equipment uses a three-wire or five-wire electrical cord and plug to connect the centrifuge to earth-ground. To preserve this safety feature, make sure that the matching wall outlet receptacle is properly wired and earth-grounded.

Prior to instrument purchase, the power configuration should be determined and the appropriate instrument ordered.

Single and Three-Phase Power Connections

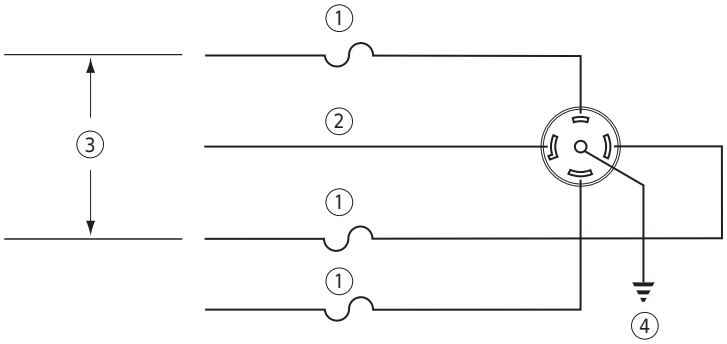
Figure A.1 shows the power connection for single-phase centrifuges, including earth-ground and two power leads with 30-ampere circuit breakers. Figure A.2 shows the power connection for three-phase centrifuges, including earth-ground and three power leads with minimum 16-ampere circuit breakers and common neutral connection. Table A.2 contains wiring information.

Figure A.1 Single-Phase Electrical Requirements



1. 30-ampere Circuit Breaker
2. Wall Outlet: Hubell 9930, Bryant 96-30-FR, or Equivalent (NEMA 6-30 R)
3. Earth-Ground
4. Measured Line Voltage

Figure A.2 Three-Phase "Y" Electrical Requirements



1. 16-ampere Circuit Breaker
2. Neutral
3. Measured Line Voltage Phase to Phase
4. Earth-Ground

Table A.2 Required Wire Connections

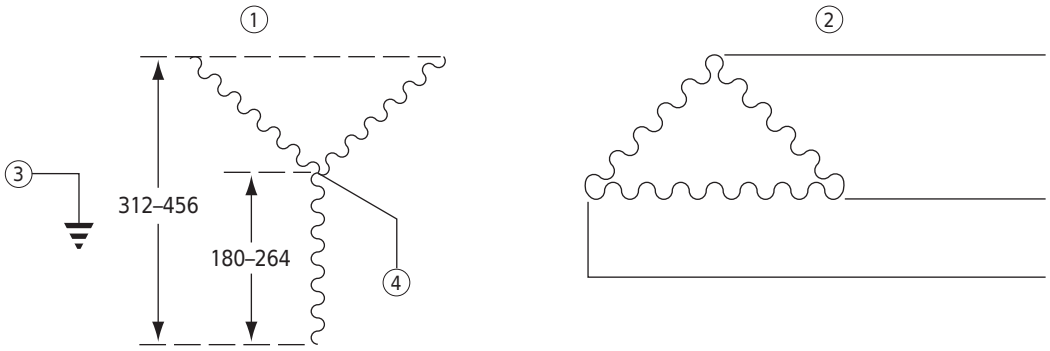
Wire Insulation Color	Terminal	Symbol	
		Harmonized	North American
Green/Yellow	Earth ground	⏚	⏚
Light Blue	Neutral	N	L
Brown	Live or Line	L	L
Black (three-phase connections only)	Live or Line (qty 2)	L	—

Additional Requirements for Three-Phase Power Connections

For three-phase power service to the centrifuge, use the "**Y**" connected configuration shown in Figure A.3. Also note the following information:

- The steady state current draw of the centrifuge can be as high as 12 amperes per phase, depending on the voltage.
- Inrush current to the centrifuge is 100 amperes for up to 2 seconds during the refrigeration start period. Circuit breakers, whether thermal or magnetic actuating, must be a "motor start" delay type.
- The centrifuge can tolerate a drop of 15 volts during the start period at low line voltage (see Figure A.3 for the acceptable voltage ranges). The mains power for the centrifuge must be of sufficient wire gauge to provide this condition. The wire gauge required at a particular site must be determined by a facilities engineer at that site.

Figure A.3 Correct and Incorrect Three-Phase Power Configurations



1. Correct Configuration "Y"
2. Incorrect Configuration "Delta"
3. Safety Ground
4. Circuit Common (Neutral)

Space and Location Requirements

1 Locate the instrument on a clean, level floor.

- The Mains (power) plug is the disconnect device and must remain easily accessible.
- Position the centrifuge so that it is easy to remove the Mains (power) plug from the outlet receptacle.

2 Select a location away from heat-producing laboratory equipment.

If ambient temperature exceeds 38°C (100°F), premature component failure may result.

3 In addition to space for the centrifuge, allow a 7.7-cm (3-in.) clearance on each side of the centrifuge and a 16-cm (6.25-in.) clearance behind the centrifuge for air circulation.

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

4 Position the centrifuge so that the air diverter, shown in Figure A.4, touches the wall behind the centrifuge.

a. Place the power cord to one side of the air diverter.

b. To avoid damaging the power cord when installing or moving the centrifuge, be sure to move the cord out of the way before pushing the centrifuge towards the wall.

⚠ WARNING

Do not place the centrifuge near areas containing flammable reagents or combustible fluids. Vapors from these materials could enter the instrument's air system and be ignited.

Securing the Centrifuge to the Floor

Avanti J-26S series centrifuges are certified to meet the requirements of the European CE mark. To meet these requirements, the centrifuge must be secured to the floor using the anchoring hardware shipped with the instrument. This will prevent the centrifuge from moving in the unlikely event of a rotor mishap.

Complete instructions for installing the anchoring kit are packaged with the hardware, which is shipped with the centrifuge. The instructions (publication B10122) include a full-size template to be used as a guide for drilling holes in the floor. Refer to this document for additional installation instructions.

NOTE Beckman Coulter representatives are not equipped to drill holes in your floor. The holes must be drilled *before* your scheduled installation.

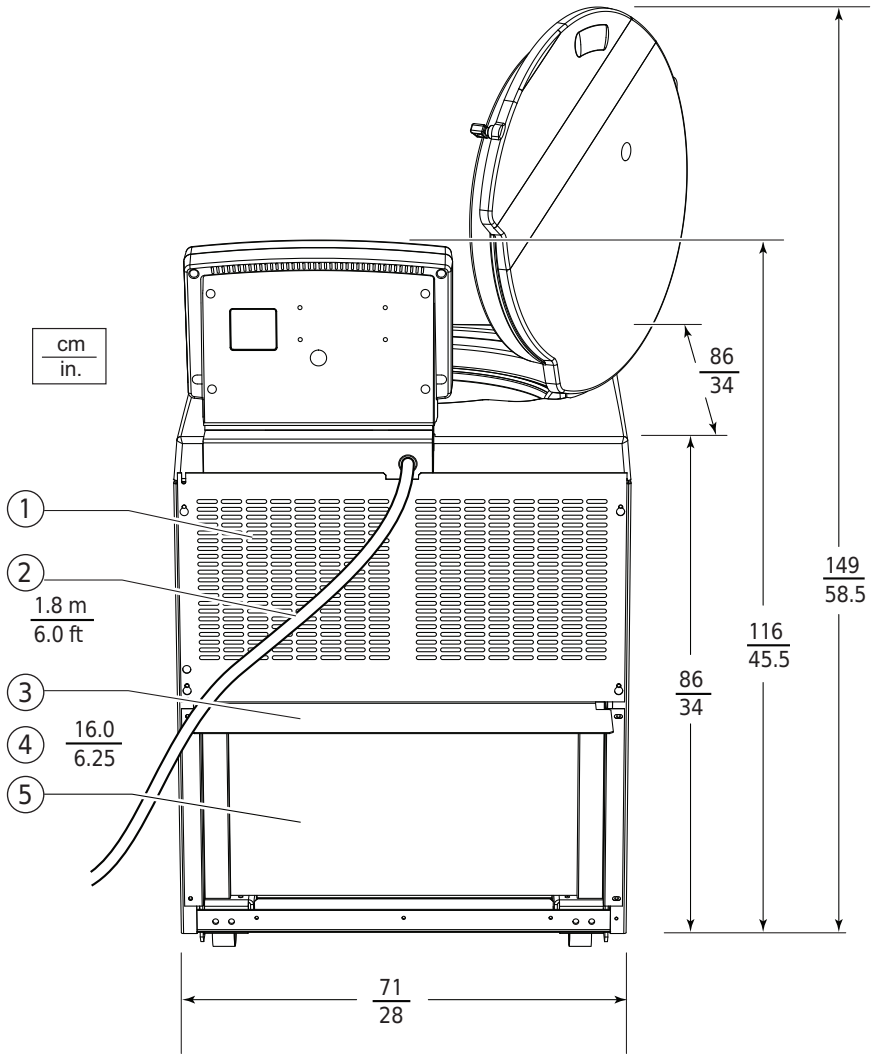
Bio-Safety Level 3 Installation

For laboratories with epoxy aggregate (resinous) floors, such as BSL-3 labs, a non-invasive installation kit (PN 393316) is available. The kit which consists of an adhesive-backed mounting plate, is CSA certified for use on epoxy aggregate floors only.

Non-Invasive Centrifuge Restraint System for Vinyl Floors

For laboratories with vinyl tile floors or vinyl seamless floors, a non-invasive installation kit (PN A84005) is available. The kit which consists of an adhesive-backed mounting plate, is CSA certified for use on vinyl floors only.

Figure A.4 Rear View and Dimensions



1. Air Exit
2. Power Cable
3. Air Diverter
4. Depth
5. Air Intake

Using J2 Series Rotors in the Avanti J-26S XPI

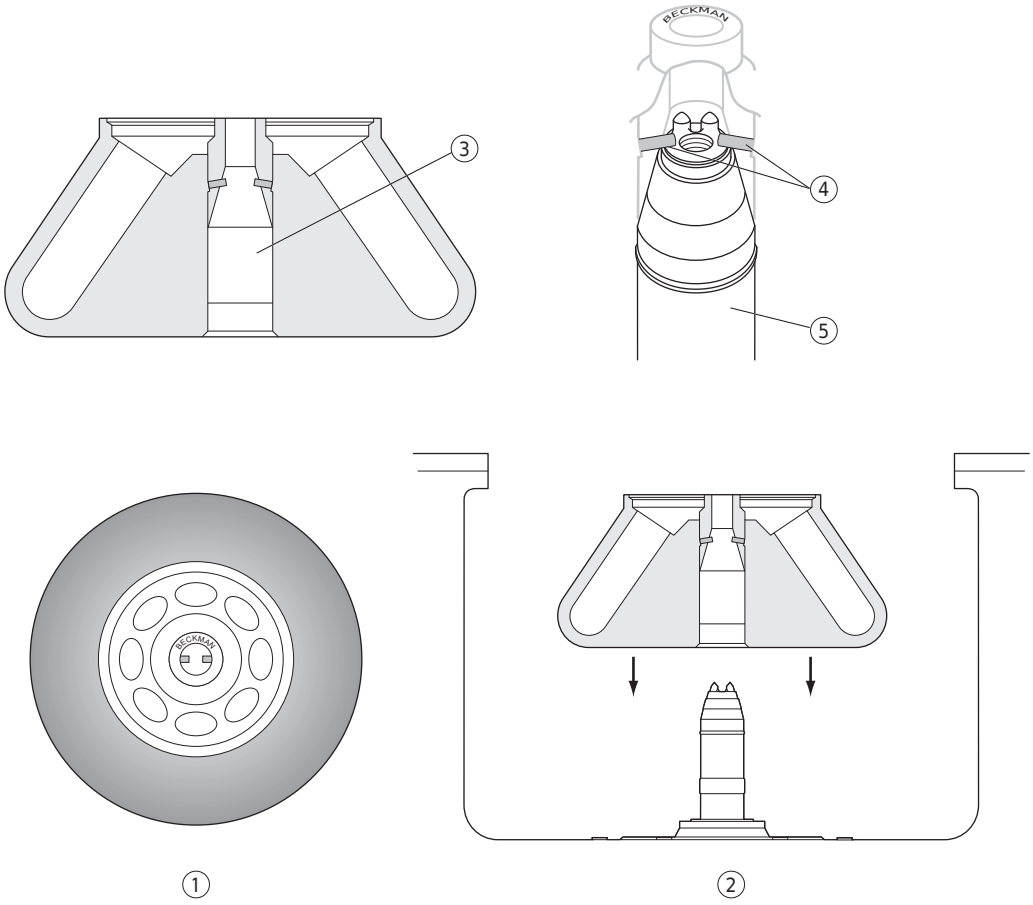
⚠ CAUTION

Do not use the Beckman Coulter JA-10, JS-7.5, JA-14, or JS-13 rotors in the Avanti J-26S XPI centrifuge before reading this information.

Checking for Rotor Drive Pins

Rotors used in Avanti J series centrifuges must have drive pins in the rotor drive hole (see Figure A.5). These drive pins engage with the centrifuge spindle hub to ensure that the rotor does not slip during acceleration. Some Beckman Coulter rotors, including the JA-10, the JS-7.5, the JA-14, and the JS-13, have been manufactured without drive pins because pins were not needed when these rotors were used in J2 series centrifuges.

Figure A.5 Checking the Rotor for Drive Pins



1. Top View
2. Side View
3. Rotor Drive Hole
4. Drive Pins
   (Angled pins shown; pins can also be vertical or horizontal.)
5. Drive Spindle Assembly

The rotor pins are positioned parallel to the **Beckman** name engraved at the center of the rotor body (see Figure A.5). Knowing the pin orientation before you install the rotor will help to ensure that you position the rotor properly on the hub, minimizing the chance of hub damage.

Check all J2 series rotors for drive pins before using them in an Avanti J series centrifuge and do not use rotors without drive pins in the Avanti J-26S XPI. To check for drive pins, hold the rotor up or turn it on its side and look into the drive hole. If you do not see two metal pins in the hole, do not use the rotor in the Avanti J-26S XPI. Call your local Beckman Coulter office* for information on returning the rotor to the factory for upgrading.

Using the JA-18 Rotor

In Avanti J series centrifuges, the JA-18 rotor must be run with the lid attached. See the JA-18 rotor manual (publication J-TB-035) for complete rotor usage instructions.

Using the JCF-Z Continuous Flow/Zonal Rotor

Zonal Bracket Kits

A special bracket and mounting hardware are required when the JCF-Z Continuous Flow/Zonal Rotor is used. These parts are contained in the Zonal Bracket Kit (part number 366431). The Zonal Bracket Kit includes a bracket, mounting hardware, and assembly instructions. This kit is for use with Cole-Parmer tubing size 16 (6.4 mm [1/4-in.] O.D.), the tubing size most commonly used with the JCF-Z rotor.

Two additional kits are available, one which contains adapters for size 14 tubing (4.8 mm [3/16-in.] O.D.) and one which contains adapters for size 15 tubing (9.6 mm [3/8-in.] O.D.). If you wish to use either of these sizes of tubing, you will need to purchase one of these kits in addition to the basic kit (366431).

See *Replacement Parts and Supplies* in CHAPTER 4 for a complete list of Zonal Bracket Kit part numbers and kit contents.

Ensuring Correct JCF-Z Continuous Flow/Zonal Rotor Identification

The centrifuge's rotor identification system can, under two specific conditions, misidentify the JCF-Z continuous flow/zonal rotor. These conditions and corrective actions are listed below.

NOTE JCF-Z rotors manufactured after March, 1997, contain special magnets that ensure correct rotor identification in Avanti J series centrifuges. We recommend that older JCF-Z rotors be returned to the Beckman Coulter factory for addition of the magnets before use in the Avanti J-26S XPI. Call Beckman Coulter Field Service* for more information.

* In the United States, call 1-800-742-2345. Outside the U.S., contact your local Beckman Coulter office or visit us at www.beckmancoulter.com.

The following information pertains to JCF-Z rotors manufactured before March, 1997, and to JCF-Z rotors that have not been modified at the factory.

- When the bearings in the JCF-Z rotating seal assembly get old or worn, the resulting "drag" on the bearings changes the rotor's dynamic properties, making them similar to those of several Beckman Coulter fixed angle rotors. If rotor misidentification occurs when your JCF-Z rotor is used, first perform three runs from 0 to 5000 RPM and back to 0 RPM. If rotor misidentification recurs, replace the bearings. See the JCF-Z rotor instruction manual (publication JCFZ-IM) for bearing replacement instructions. Be sure to follow instructions in the next paragraph below for "wearing in" the bearings.
- On the first few uses of a new JCF-Z rotor, or when the bearings have been replaced in an older JCF-Z rotor, lubrication has not yet been thoroughly distributed around the bearings in the bearing housing. The excess lubrication produces drag on the bearings, which can change the rotor's dynamic properties enough to cause rotor misidentification. To "wear in" the bearings and distribute the lubrication, perform three runs from 0 to 5000 RPM and back to 0 RPM.

NOTE If the JCF-Z rotor is misidentified, the run speed will be limited to the maximum speed for the identified rotor. (The maximum speed for the JCF-Z rotor is 20,000 RPM.)

APPENDIX B

Temperature Calibration Procedure

Introduction

The Avanti J-26S XPI centrifuge specification for temperature control is ±2°C of the set temperature. That means that your sample will stay within 2°C of set temperature at all times, after rotor and system equilibration, described below. (During transient conditions, such as acceleration and deceleration, the rotor temperature may be outside this range.) The following procedure is provided for those cases in which temperature control within ±1°C is required.

In this procedure, you will measure the temperature of your sample after equilibrating the rotor temperature for a minimum of 1 hour. Based on the test results, you can then adjust the centrifuge temperature setting to bring your sample as close as possible to the required temperature.

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1 For runs at other than ambient temperature, precool or prewarm the rotor and test samples to the required temperature.

The length of precooling/prewarming time depends on how different the rotor starting temperature is from the required run temperature.

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2 Install the rotor with adapters, if applicable, and tubes or bottles filled with sample buffer or water (if above 2°C).

---

3 Set the speed to 2000 RPM, the time to **HOLD**, and the temperature to the required run temperature.

a. Start the run.

---

4 After 30 minutes, set the required run speed, and allow the system to run for at least 1 hour.

NOTE *The system must run for at least 1 hour before the temperature of the buffer or water is measured*. The length of time required for equilibration depends on the rotor and centrifuge starting temperatures and the ambient room temperature.

---

5 After at least 1 hour, measure the temperature of the buffer or water using a thermometer or thermocouple.

6 If the measured and set temperatures are different, note how many degrees different they are and adjust the set temperature up or down that number of degrees.

For example:

If the required sample temperature is	And the measured buffer/ water temperature is	Set the temperature to
4°C	6°C	2°C
5°C	4°C	6°C

Beckman Coulter, Inc.
Avanti J Series Centrifuge 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 (3 years for the drive motor) after delivery of the Avanti J Series Centrifuge (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.

Conditions

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 by others is made with the written consent of Beckman Coulter, or unless such repair in the sole opinion of Beckman Coulter is minor, or unless such modifications is merely the installation of a new Beckman Coulter plug-in component for such product.

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.

English / Deutsch / Español / Français / Italiano / Português / Русский / 中文 / 日本語 / 한국어		
Symbol **Simbole** **Symbol** **символ** **Simbolo** 符号 **Symbole** **記号** **Simbolo** 상징	**Title / Titel / Titulo / Titre / Titolo / Titulo / Название / 标题 / タイトル** / 제목	
	Dangerous voltage Gefährliche electrische Spannung Voltaje peligroso Courant haute tension Pericolo: alta tensione	Tensão perigosa Опасное напряжение тока 危险电压 危険な電圧 위험한 전압
	Caution, consult accompanying documents Vorsicht, konsultieren Begleitdokumente Atención, consulta documentos adjuntos Attention, consultent des documents d'accompagnement Attenzione, consulta i documenti di accompagnamento	Cuidado, ulta documentos adjuntos Внимание, советует с сопроводительными документами 注意, 咨询附属单证 注意, 伴う文書に相談しなさい 주의, 동반 문서를 상담하십시오
	Biohazard Potentiell infektiösem Material Riesgo biológico Risque biologiqu Pericolo biologico	Material infeccioso potencial биологической опасности 可能的传染性物 潜在的な感染性物質 전염하는 물자
	On (power) Ein (Netzverbindung) Encendido Marche (mise sous tension) Acceso (sotto tensione)	Fora (o poder) На (мощности) 开（电源） ン（電源） 에 (힘)
	Off (power) Aus (Netzverbindung) Apagado Arrêt (mise sous tension) Spento (fuori tensione)	Fora de (poder) С (сила) （电源） ン（電源） 떨어져 (힘)
	Protective earth (ground) Schutzleiteranschluß Puesta a tierra de protección Liaison à la terre Collegamento di protezione a terra	Terra de proteção (terra) Защитное заземление (земля) 保护接地 保護アース（接地） 방어적인 지구 (지상)
	Earth (ground) Erde (Masse) La tierra (suelo) Terre (sol) Scarica a terra	Terra Земли 接地 アース（接地） 지구 (지상)
	Manufacturer Hersteller Fabricante Fabricant Fabbricante	Fabricante производитель 制造商 メーカー 제조자
	Consult Instructions for Use Konsultieren Sie Anwendungsvorschriften Consulte las instrucciones para el uso Consultez les instructions pour l'usage Consulti le istruzioni per uso	Consulte instruções para o uso Советуйте с инструкциями для пользы 咨询使用说明书 使用説明に相談しなさい 사용 설명을 상담하십시오

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- Using Tubes and Accessories
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