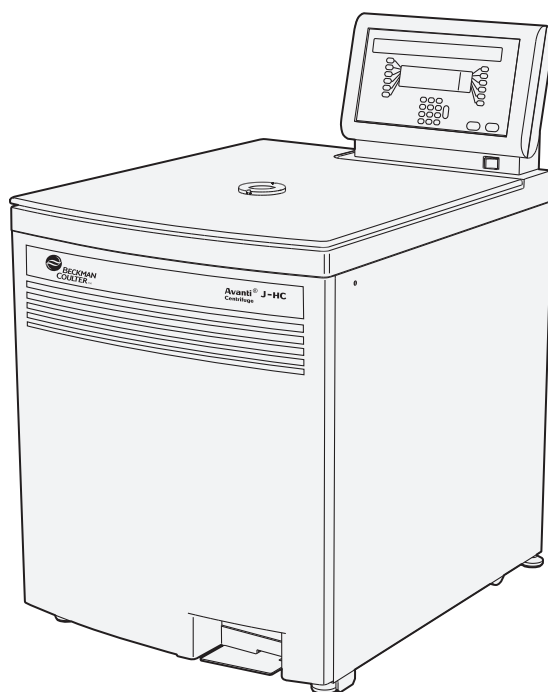


Instructions For Use

Avanti J-HC

High-Capacity Centrifuge



PN J3HC-IM-5AH
September 2022



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



Avanti J-HC
High Capacity Centrifuge
PN J3HC-IM-5AH (September 2022)

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If you have any questions, contact our Customer Support Center.

- Worldwide, find us via our website at www.beckman.com/support/technical
- In the USA and Canada, call us at 1-800-369-0333.
- In Austria, call us at 0810 300484
- In Germany, call us at 02151 333999
- In Sweden, call us at +46 (0)8 564 859 14
- In the Netherlands, call us at +31 348 799 815
- In France, call us at 0825838306 6
- In the UK, call us at +44 845 600 1345
- In Ireland, call us at +353 (01) 4073082
- In Italy, call us at +39 0295392 456
- In other locales, contact your local Beckman Coulter Representative.



Beckman Coulter Eurocenter S.A.
22, rue Juste-Olivier
Case Postale 1044
CH - 1260 Nyon 1, Switzerland
Tel: +41 (0) 22 365 36 11

Glossary of Symbols is available at
beckman.com/techdocs (PN C24689).

May be covered by one or more pat. - see
www.beckman.com/patents

Original Instructions

Revision History

For labeling updates, go to www.beckman.com/techdocs and download the latest version of the manual or system help for your instrument.

Issue AE, 04/2019

Updates were made to the following sections: CHAPTER 1, Specifications.

Issue AF, 10/2019

Updates were made to the following sections: CHAPTER 1, Friction Reduction System (FRS); Table 1.1, Complete and Abbreviated Rotor Names; Table 1.2, Available Rotors for the Avanti J-HC Centrifuge; CHAPTER 2, Preparation; CHAPTER 2, Selecting a Rotor; Table 3.1, Diagnostic Message Chart.

Issue AG, 04/2021

Updates were made to the following sections: RoHS Notice; CHAPTER 1, Function Keys; CHAPTER 1, Keypad; CHAPTER 2, Manual Run; CHAPTER 2, Entering Acceleration and Deceleration Times.

Issue AH, 09/2022

Updates were made to the following sections: [Introduction](#), [Multi Compliance Label](#)

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

Safety Notice

Read all product manuals and consult with Beckman Coulter-trained personnel before attempting to operate 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 Warning, Caution, Important, and Note



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



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

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 centrifuge 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.

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 which 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 equipment 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 centrifuge and damage electrical or mechanical components.

Safety Against Risk of Fire

This centrifuge is not designed for use with materials capable of developing flammable or explosive vapors or hazardous chemical reactions. 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 centrifuge.
- 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 centrifuge unless *all necessary safety precautions are taken*.

- Observe all cautionary information printed on the original solution containers prior to their use.

- Handle body fluids with care because they can transmit disease. No known test offers complete assurance that they are free of micro-organisms. Some of the most virulent — Hepatitis (B and C) and HIV (I–V) viruses, atypical mycobacteria, and certain systemic fungi — further emphasize the need for aerosol protection. Handle other infectious samples according to good laboratory procedures and methods to prevent spread of disease. Because spills may generate aerosols, observe proper safety precautions for aerosol containment. Do not run toxic, pathogenic, or radioactive materials in this 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.

RoHS Notice

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



China RoHS Caution Label — This label indicates that the electronic information product contains certain toxic or hazardous substances. The center number is the Environmentally Friendly Use Period (EFUP) date, and indicates the number of calendar years the product can be in operation. Upon the expiration of the EFUP, the product must be immediately recycled. The circling arrows indicate the product is recyclable. The date code on the label or product indicates the date of manufacture.

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Introduction

Certification

Beckman Coulter Avanti J-HC 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 with the laboratory requirements of applicable regulatory agencies (only when used with Beckman Coulter rotors). Declarations of conformity and certificates of compliance are available at www.beckman.com.

Scope of Manual

This manual is designed to familiarize you with the Avanti J-HC centrifuge, its functions, specifications, operation, and routine operator care and maintenance. Beckman Coulter recommends that you read this entire manual, especially the [Safety Notice](#) and all safety-related information, before operating the centrifuge or performing instrument maintenance.

- [CHAPTER 1, Description](#) contains system specifications and a physical and functional description of the centrifuge, including the operating controls and indicators.
- [CHAPTER 2, Operation](#) contains centrifuge operating procedures.
- [CHAPTER 3, Troubleshooting](#) lists possible malfunctions, together with probable causes and suggested corrective actions.
- [CHAPTER 4, Care and Maintenance](#) contains procedures for routine operator care and maintenance, as well as a brief list of supplies and replacement parts.
- [APPENDIX A, Preinstallation Requirements](#) provides information about space and power requirements for installing and connecting the centrifuge.
- [APPENDIX B, Temperature Calibration Procedure](#) contains a procedure to use when temperature control within $\pm 1^{\circ}\text{C}$ 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

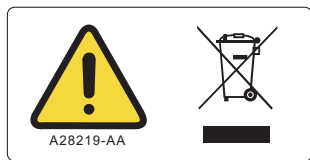
Certain symbols are used in this manual to call out safety-related and other important information. These international symbols may also be displayed on the centrifuge and are reproduced on the inside back cover of this manual.

Typing Conventions

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

- *Key names* (for example, **START** and **STOP**) and *display names and setup field names* (for example, **TEMP°C** and **Rotor**;) appear in boldface type.

Recycling Label



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.

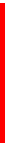
This symbol is required in accordance with the Waste Electrical and Electronic Equipment (WEEE) Directive of the European Union. The presence of this marking on the product indicates:

Multi Compliance Label



This symbol indicates compliance with:

- Recycling – Refer to the Recycling Label section in this document.
- **CE** – A “CE” mark indicates that a product has been assessed before being placed on the market, and has been found to meet European Union safety, health, and/or environmental protection requirements.

- 
- **UK
CA** — A “UKCA” mark indicates that a product has been assessed before being placed in the UK market, and has been found to meet UK safety, health, and/or environmental protection requirements.
 - 169502 – This label indicates recognition by a Nationally Recognized Testing Laboratory (NRTL) that the instrument has met the relevant product safety standards.
 - The RCM mark is intended for use on products that comply with Australian communications Media Authority (ACMA) EMC Requirements.

Introduction

This section describes the Avanti J-HC 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-HC high-capacity centrifuge^{*} generates centrifugal forces required for applications including pelleting of bacteria, yeast, and mammalian cells. The instrument design features a brushless switched-reluctance drive motor,[†] FRS (friction reduction system) vacuum control circuitry, temperature control system, rotor verification system, and a choice of acceleration and deceleration rates.

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 thirty 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 centrifuges. Contact your Beckman Coulter representative for more information.

^{*} Avanti J-HC software and firmware copyright 1999–2013 by Beckman Coulter, Inc., Brea, CA, 92821, U.S.A.

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

Safety Features

Avanti J-HC centrifuges have been designed and tested to operate safely indoors at altitudes up to 2000 m (6252 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 shut and locked. The door locks when **START** is pressed, or when the POWER switch is turned off.
- A steel casing surrounds the rotor chamber to provide operator protection in the unlikely event of a rotor mishap.
- An automatic rotor identification system detects which Beckman Coulter rotor is installed in the centrifuge during acceleration and prevents the rotor from running above its maximum rated speed.
- 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 housing is made of aluminum and molded structural foam, finished with acrylic baking enamel. The door and structural-foam cover panels are finished with polyurethane enamel. The control panel is covered by a protective overlay made of coated polycarbonate.

The door is opened by stepping on a foot pedal, which is located at the bottom right front of the instrument. Initial opening is assisted by a built-in torsion bar. When the door is about three-quarters open, a gas spring opens the door the rest of the way. The door will remain open without support.

A small label, shown below, is located on the top left side of the chamber door above the hinge. This label indicates a potential pinch hazard if hands or fingers are placed in the hinge area when the door is being opened or closed. Operators and observers must take care to move their hands away from the hinge area when the door is opened and closed.



The rubber block on the inside of the door is provided as a hanger for a rotor windshield lid while the door is open.

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

Rotor Chamber

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

A port in the centrifuge door provides visual access to the chamber, enabling verification of rotor speed using a customer-supplied strobe system. See [Speed Verification](#) in [CHAPTER 4](#) for more information.

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 automatically during rotor deceleration.

FRS is disabled when the JS-4.2 and the JS-4.2A rotors are run.

Temperature Control System

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, $\pm 2^{\circ}\text{C}$. If the OFF deceleration setting is used, temperature is controlled to $\pm 4^{\circ}\text{C}$ during deceleration. 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 (more than 4°C over set temperature) 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.
- The user specifies whether the run should shut down or continue if the overtemp setting is reached.
- The system will always shut down and end the spin using maximum brake if the temperature goes above 50°C .

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 shaft if an imbalance occurs during centrifugation.

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

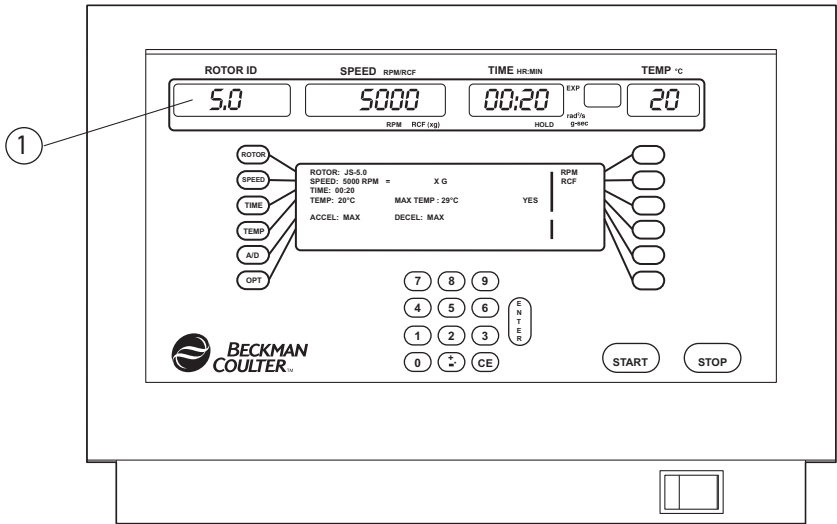
Power Switch

The power switch, located below the control panel, is a two-position rocker switch (**I**, on; **O**, off) that controls electrical power to the centrifuge. It is also a circuit breaker that will trip to cut off power in the event of a power overload. The power switch must be turned on before the chamber door can be opened.

Control Panel

The control panel (see [Figure 1.1](#)) is used to enter run parameters via touch keys and a keypad. There are separate displays for set parameters and actual values.

Figure 1.1 The Control Panel

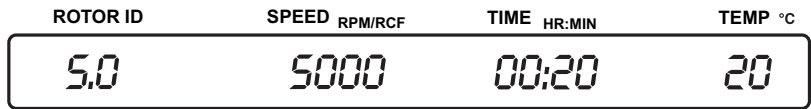


- 1. Actual Value Display

Actual Value Display

The actual value display ([Figure 1.2](#)) indicates the actual centrifuge operating conditions.

Figure 1.2 Actual Value Display



ROTOR ID	Indicates the installed rotor (see Table 1.1).
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 <i>g</i>-seconds mode, indicates the user-entered <i>g</i>-seconds (total accumulated centrifugal force on the sample) and the calculated time remaining until the <i>g</i>-seconds 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), except when the OFF deceleration setting is used, causing the rotor to coast to a stop. In this case, temperature is controlled to $\pm 4^{\circ}\text{C}$.

Table 1.1 Complete and Abbreviated Rotor Names

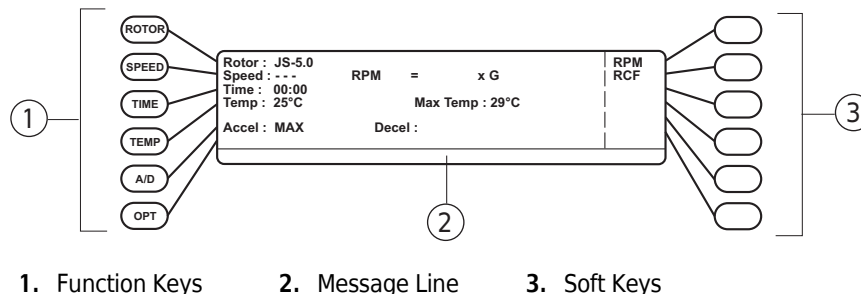
Complete Rotor Name (shown in the setup screen Rotor field)	Abbreviated Rotor Name (shown in the ROTOR ID display and in the setup screen soft key display)
JS-5.0	5.0
JS-3.4A-1250	3.4A
JS-4.2	4.2
JS-4.2A	4.2A
JLA-8.1000	8.1000
JA-10	10

Setup Screen

The setup screen ([Figure 1.3](#)) 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, informational, and diagnostic messages during setup and operation.

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

Figure 1.3 The Setup Screen



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). Pressing a rotor type soft key displays a list of the rotors of that type that can be used in the Avanti J-HC. (Abbreviated rotor 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).
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), G-SEC (<i>g</i>-seconds), 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. Deceleration begins when the set time counts down to zero. The corresponding <i>g</i>-seconds value can be displayed by pressing the G-SEC soft key. <i>g</i>-seconds^a run (G-SEC) — A <i>g</i>-seconds value can be entered and the system will calculate the run time required to reach that value. Valid <i>g</i>-seconds values 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 <i>g</i>-seconds continue accumulating until the rotor stops spinning. Knowing the <i>g</i>-seconds setting that provides good separation in one rotor enables the user to duplicate that separation in different rotors, or to vary the sample volume in the same rotor, without having to know the time required. - 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. A hold run continues 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 rate is maximum only. Available deceleration rates are maximum, slow, timed (1 to 10 minutes from 500 to 0 RPM), and no brake (off). The no brake (off) setting cannot be used with ARIES rotors.
OPT	Pressed to put the centrifuge into program mode, where you can enter run parameters into memory for later use. Up to thirty two-step programs can be stored.

- a. Total accumulated centrifugal force applied to a sample in a spinning rotor, expressed in g-seconds, is given by w^2rt , where w is the angular velocity in radians per second, r is the radial distance from the axis of rotation in millimeters, and t is the run time in seconds.

Keypad

The keypad is used to enter numerical run parameters and to enter program numbers. In addition to keys 0 through 9, the keypad includes $\pm$ (plus/minus/decimal) and **CE** (clear entry) keys.

The $\pm$ key is used to enter a decimal point when entering a rotor number (for example, 8.1000) and to 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 centrifuge restarted by pressing ENTER then START .
ENTER	Pressed to save parameters 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.

Specification	Description
Speed	- Set speed 100 to 10,000 RPM (ARIES rotors: 1000 to 10,000 RPM) in 10-RPM increments; or RCF from $200 \times g$ to maximum for the installed rotor (in $10 \times g$ increments) - Speed control - actual rotor speed ± 25 RPM; g force control sets speed to the nearest 50 RPM
Time	- Set time 1 min to 99 hr 59 min (timed run), total centrifugal effect (g-seconds), or continuous (hold) - Time display - indicates run time remaining (timed run), g-seconds setting and time remaining to accumulate set g seconds (g-seconds run), or elapsed time (hold run)
Temperature	- Set temperature -10 to $+40^{\circ}\text{C}$ in 1°C increments - Temperature control $\pm 2^{\circ}\text{C}$ of set temperature (from 1000 to 10,000 RPM)^a - Temperature display - actual rotor temperature in 1°C increments - Ambient temperature range 15 to $40^{\circ}\text{C}^{\text{b}}$ - Ambient temperature range for 50-Hz centrifuges running the JLA-8.1000 rotor 15 to 38°C
Cooling fluid	Refrigerant R452A (HFO)
Humidity restrictions	<95% (noncondensing)
Friction Reduction System (FRS)	190 mm (7.5 in.) Hg
Drive rated power	4 horsepower (3 kW)
Acceleration	maximum for all rotors
Deceleration	- maximum, slow, timed (1 to 10 min from 500 to 0 RPM), or off (no brake) - for ARIES rotors - max, slow, or timed

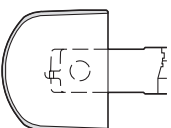
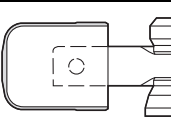
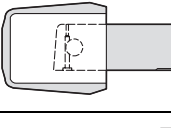
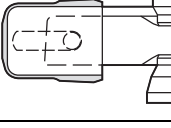
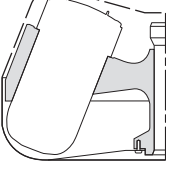
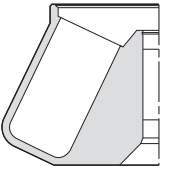
Specification	Description
Dimensions	• Width — 71 cm (28 in.) • Depth — 86 cm (34 in.) • Depth (including air diverter on back panel) — 102 cm (40.25 in.) • Height to top of closed door — 86 cm (34 in.) • Height to top of control head — 116 cm (45.5 in.) • Height to top of open door — 152 cm (59.9 in.) • Door depth — 6.1 cm (2.4 in.) • Rotor chamber diameter — 58.4 cm (23 in.)
Weight	300 kg (660 lb)
Ventilation clearances	• Sides — 7.6 cm (3 in.) • Back — 16 cm (6.25 in.)
Surface finishes	• Control panel — polyester with polycarbonate coating overlay • Door — polycarbonate overlay on top surface; urethane paint on edges and lower surface • Other surfaces — acrylic baking enamel
Maximum heat dissipation into room under steady-state conditions	6900 Btu/hr (2.0 kW)
Noise level 0.91 m (3 ft) in front of centrifuge at 10,000 RPM	≤ 60 dBa
Electrical supply	Class I
Installation (overvoltage) category	II
Pollution degree	2 ^c

- During transient conditions, such as acceleration and deceleration, rotor temperature may be outside this range. If the OFF deceleration setting is used, temperature is controlled to $\pm 4^{\circ}\text{C}$ during deceleration.
- 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.
- Normally only nonconductive pollution occurs; occasionally, however, a temporary conductivity caused by condensation must be expected.

Available Rotors

Only the Beckman Coulter rotors listed in [Table 1.2](#) can be used in the Avanti J-HC centrifuge. The rotors are described in individual manuals shipped with each rotor. Information on rotors and accessories is also available in *Rotors and Tubes for J Series Centrifuges* (JR-IM) and in the *High Performance, High Capacity Rotors, Tubes and Accessories Catalog* (BR-8102).

Table 1.2 Available Rotors for the Avanti J-HC Centrifuge

Rotor Profile	Description	Max RPM/ k factor	Max RCF ($\times g$) at $r_{\max}$	Number of Tubes $\times$ Nominal Capacity	Rotor Manual Number
	JS-5.0 (Swinging Bucket)	5000 9171	$7480 \times g$	4×2.25 liter	J-TB-084
	JS-3.4A-1250 (ARIES) (Swinging Bucket)	3400 $\geq 18,066$	$3360 \times g$	6×1.25 liter	J-TB-080
	JS-4.2 ^{abc} (Swinging Bucket)	4200 11,502	$5020 \times g$	6×1 liter 336 RIA tubes	J6-TB-007
	JS-4.2A (ARIES) ^{abc}	4 200 11,502	$5020 \times g$	6×1 liter 336 RIA tubes	J6-TB-034
	JLA-8.1000 (Fixed 20° Angle)	8000 2500	$15,970 \times g$	6×1 liter	J-TB-073
	JA-10 (Fixed 25° Angle)	10,000 3610	$17,700 \times g$	6×500 mL	J-TB-006

- JS-4.2 and JS-4.2A rotors manufactured before 2000 must be modified before use in the Avanti J-HC. Contact your local Beckman Coulter office for information.
- Customers purchasing a new JS-4.2 or JS-4.2A rotor for use in the Avanti J-HC must also purchase Tie Down Kit (367045).
- The microplate carriers (358682) available for use in the JS-4.2 and JS-4.2A rotors cannot be used in the Avanti J-HC. Round buckets (368575) must be used when these rotors are run in this centrifuge.

Introduction

This chapter contains detailed centrifuge operating procedures. A summary is provided at the start of this chapter. 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.

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-HC Run Procedures

For runs at other than room temperature, 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 (100 to 10,000 RPM; 1000 to 10,000 RPM for ARIES rotors).
- 6 Press **TIME**, press the soft key to select a time mode (**HH:MM**, **Hold**, or **G-SEC**), then use the keypad to enter the run time or *g*-seconds 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** soft key (**MAX** is the only setting available for ARIES rotors). 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 (the **OFF** setting is not available for ARIES rotors). (Or, skip this step and accept the default deceleration rate (**MAX**).
- 10 Check that all parameters are correct and that the door is closed. 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.

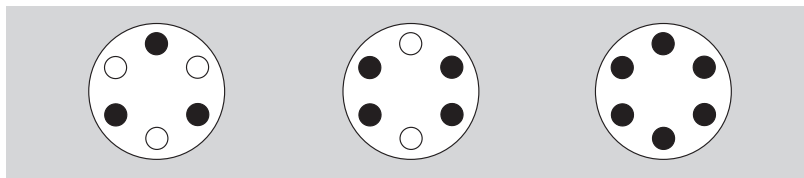
- 4 Press **OPT** then use the keypad to enter the program number.
- 5 Check that all parameters are correct and that the door is closed. Press **ENTER**, then press **STOP**.
- 6 Wait for program step 1 or 2 to end, or end the run by pressing **STOP**.
- 7 When the rotor stops, depress the foot pedal to open the chamber door.

Preparation

Prepare the rotor for centrifugation as described in the rotor manual. When swinging bucket rotors are used, follow the instructions below to ensure proper system operation.

- 1 Lubricate the rotor pins (or bucket pin sockets with the JS-5.0 rotor) once a *week* following the lubrication instructions in the applicable rotor manual.
- 2 Six-place rotors (JS-3.4A-1250, JS-4.2, and JS-4.2A) must contain three, four, or six loads during each run. **Do not run two loads.** (Running two loads may result in frequent centrifuge shutdown due to diagnostic conditions.)
 - a. JS-3.4A-1250 and JS-4.2A rotors: Eye-balance all loads to equal levels and arrange them in the rotor as shown in [Figure 2.1](#). Place an empty bucket in each unfilled position.
 - b. JS-4.2 rotor: Weigh each load and balance opposing loads to within 5 grams. Arrange loads in the rotor as shown in [Figure 2.1](#). Place an empty bucket in each unfilled position.
- 3 When using the four-place JS-5.0 rotor, make sure that all four loads balance to within 25 grams. Four loads must be run at all times.

Figure 2.1 Arranging Loads in Six-Place Swinging Bucket Rotors



NOTE Three, four, or six loads can be centrifuged per run, if they are arranged in the rotor as shown. Do NOT run two loads.

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 Depress 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 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 above the hub, 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

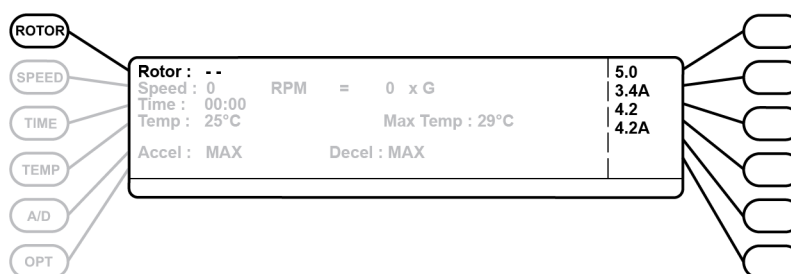
1 Press **ROTOR**.

The **Rotor:** field flashes, and rotor type abbreviation soft keys (**JA:** fixed angle, **JS:** swinging bucket, **JLA:** lightweight fixed angle) appear.

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

A list of rotors of the selected type appears.

Swinging bucket rotors are displayed below.

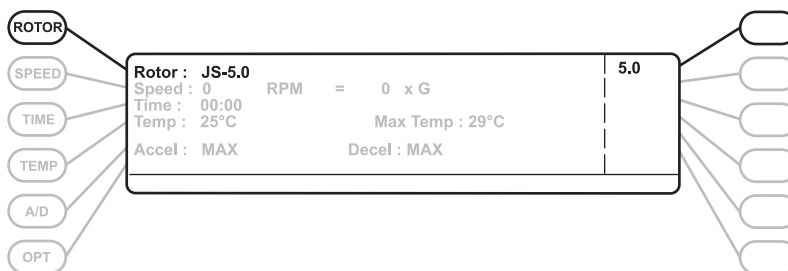


- To select a different rotor type, press **ROTOR** again and then press another soft key.

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

- Press **ENTER**.

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



Entering Run Speed

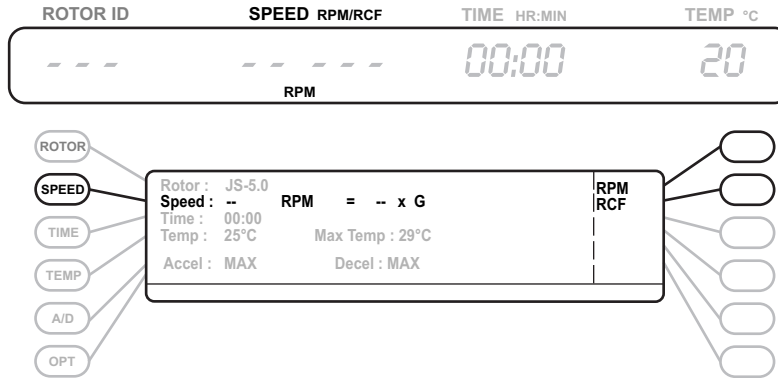
Enter a run speed up to the maximum speed of the rotor in use (10,000 RPM maximum). Or, enter a relative centrifugal field (RCF) value up to the maximum achievable RCF of the rotor.

Entering RPM

1 Press **SPEED**.

The **Speed:** field flashes, and **RPM** and **RCF** soft keys appear.

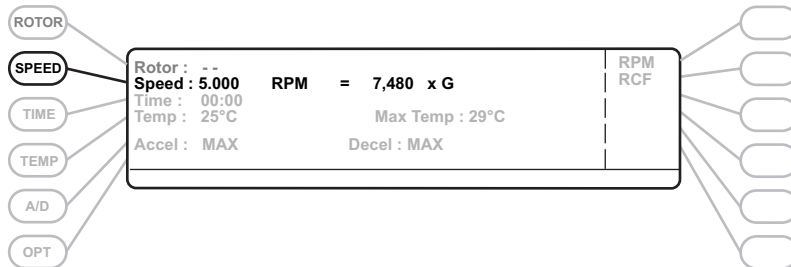
The **RPM** indicator illuminates in the actual value display.



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.



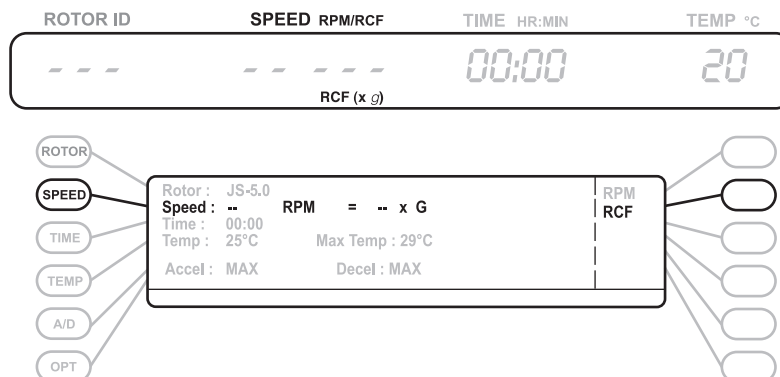
Entering RCF

1 Press **SPEED**.

The **Speed:** field flashes, and the **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 value range.

Entering Run Time

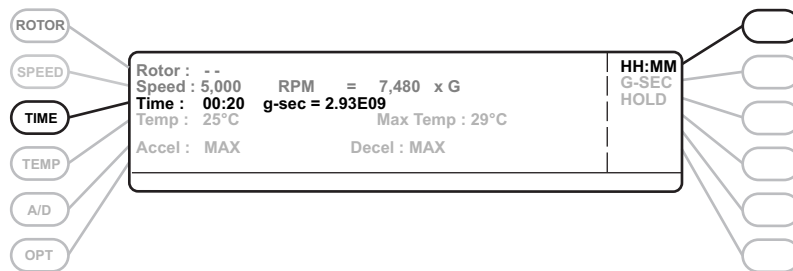
Run time can be entered in hours and minutes or in *g*-seconds. Hold mode is used for continuous operation.

Entering a Timed Run

1 Press **TIME**.

HH:MM, **G-SEC**, and **HOLD** soft keys appear.

- 2 Use the keypad to enter the required time (up to 99 hours, 59 minutes) and press **ENTER**.
Entered time appears in the **Time:** field.

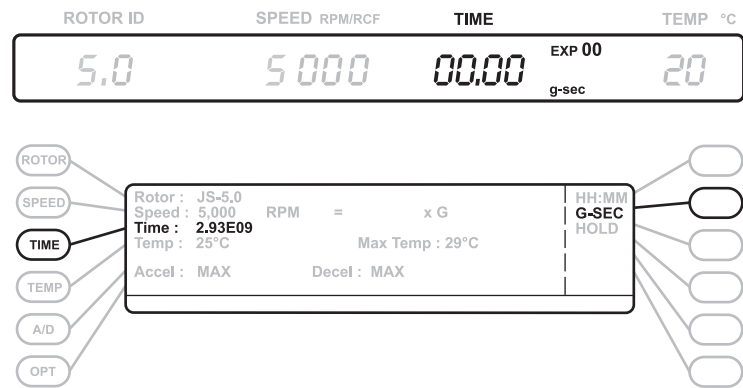


- 3 Press the next function key or press **ENTER**, then **START**.
 - The run begins, and the time remaining begins counting down to 0 in the **TIME** display.
 - If you enter a number over 59 minutes, the centrifuge automatically recalculates the time in hours and minutes after **ENTER** or any function 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 *g*-seconds Run

- 1 Press **TIME**.
HH:MM, **G-SEC**, and **HOLD** soft keys appear.
- 2 Press the **G-SEC** soft key to select the *g*-seconds mode.
The *g*-seconds indicators (**EXP 00** and **g-sec**) light in the **TIME** display.
- 3 Use the keypad to enter a *g*-seconds value.
 - The entry appears in the **Time:** field.
 - The decimal point and **E** appear automatically as you type.

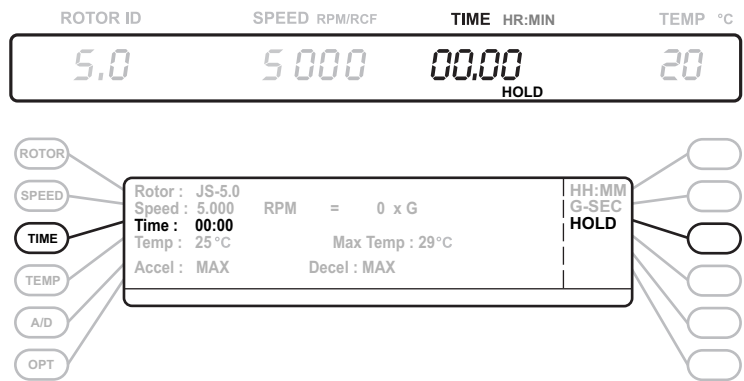
- If you enter a value out of the achievable *g*-seconds range for that rotor, a message prompts you to enter a different value.



- 4 Press the next function key or press **ENTER** then **START**.
 - The centrifuge begins calculating and displaying the accumulated force.
 - Deceleration begins when the set *g*-seconds value is reached.
 - During deceleration, the red indicator light on the **STOP** key flashes.
 - The *g*-seconds continue to accumulate until the rotor stops spinning, so set and actual *g*-seconds values may be different at the end of the run.

Entering a Continuous (Hold) Run

- 1 Press **TIME**.
The **HH:MM**, **G-SEC**, 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**.

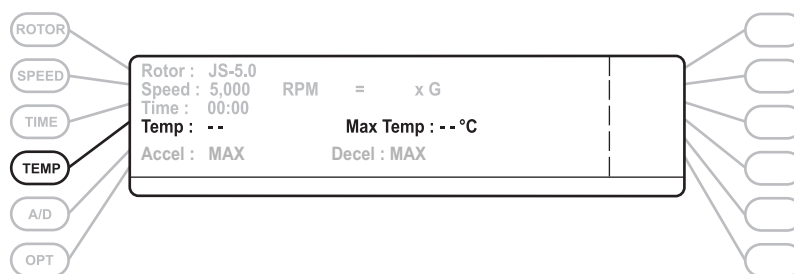
After you start the run, the **HOLD** indicator illuminates in the **TIME** display.
The elapsed run time is displayed. The run continues until **STOP** is pressed.

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.

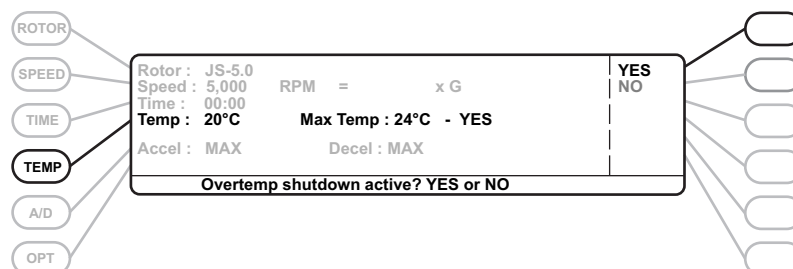
The centrifuge will always shut down if the system temperature reaches 50°C.

You can also specify whether or not you want the system to shut down if the maximum temperature is reached.

- 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 Times

The centrifuge provides a choice of two acceleration rates (one for ARIES rotors) and four deceleration rates (three for ARIES rotors) to protect the gradient and sample-to-gradient interface. [Table 2.1](#) describes these rates. If no rate is selected, the centrifuge automatically accelerates and decelerates at maximum rate.

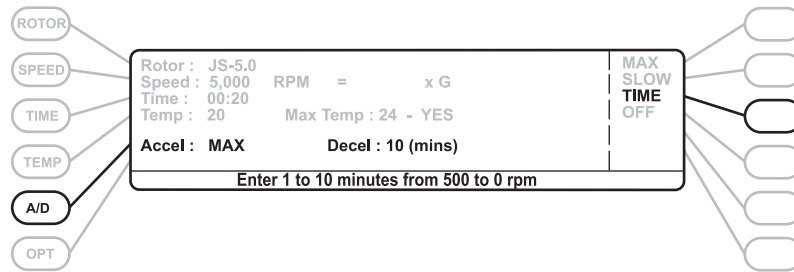
Table 2.1 Acceleration and Deceleration Settings

Setting	Description
Maximum acceleration	Full torque is used from 0 RPM 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 can take from 1 to 10 minutes (time is set by the user).
Off (not available with ARIES rotors)	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.

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. (The **OFF** setting [no brake] is not available with ARIES rotors.)
If you choose **MAX**, **SLOW**, or **OFF**, your selection appears in the **Decel:** field.
 - a. If you choose **TIME**, enter a deceleration time, or accept the 10-minute default setting, and press **A/D** again.



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

- 1 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 *g*-second runs, deceleration begins when the *g*-seconds setting 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 thirty programs, each containing up to two steps (each step is a set of run parameters). Programs are retained in memory even when the power is turned off.

Creating a New Program

1 Press **OPT**.

Default system parameters appear, the **Prog(ram) Recall:** field flashes, and the message line says “Enter program number (1–30).”

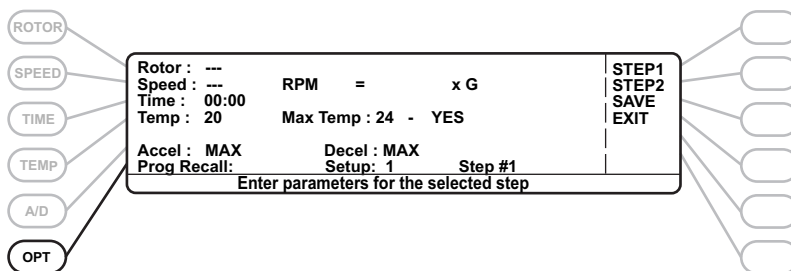
2 Press **OPT** again to move the cursor to the **Setup:** field.

A message prompts you to enter parameters for step 1.

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.

b. If you enter a number that is already assigned to a program, you can either overwrite the program or select another program number.



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

The message “Switch steps, save, or exit program mode” appears.

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

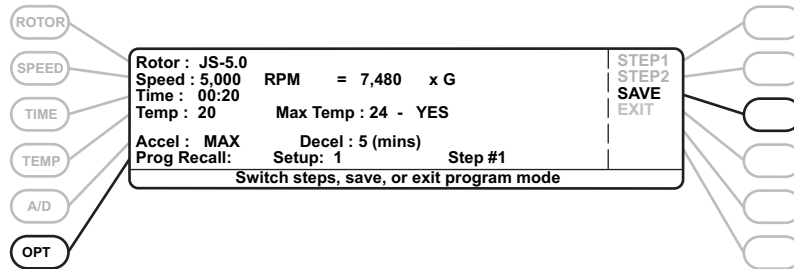
NOTE To program a delayed start, set the time in step 1 to the required delay length and set the speed in step 1 to 0 RPM. Enter run parameters in step 2, setting the step 2 time to any value greater than 00:00. The run will start when the step 1 set time has elapsed.

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.

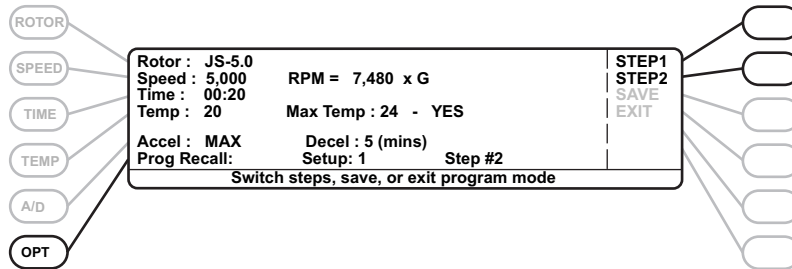


- 5 To add a second step to program 1, press the **STEP2** soft key.

- 6 Enter parameters for step 2.

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

- a. Press **ENTER** when done.
- 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.

The program is saved.

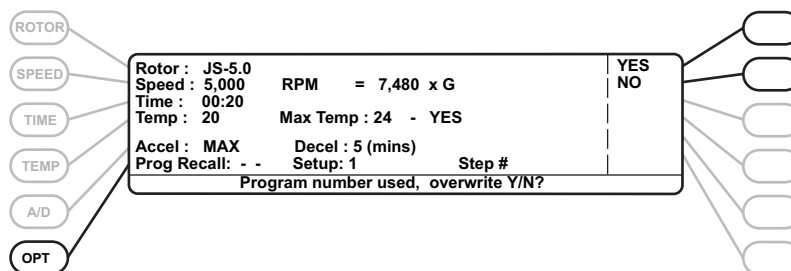
- 8 Press the **EXIT** soft key to exit program mode.

Modifying a Program

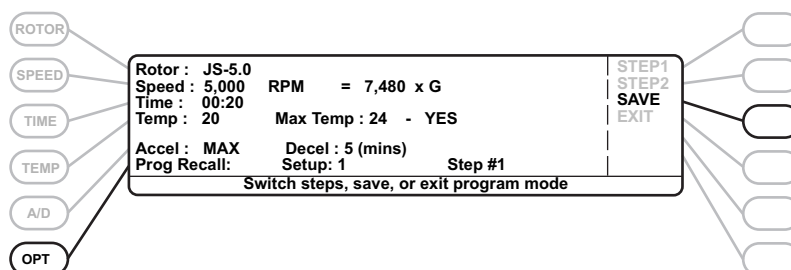
- 1 Press the **OPT** key.

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.



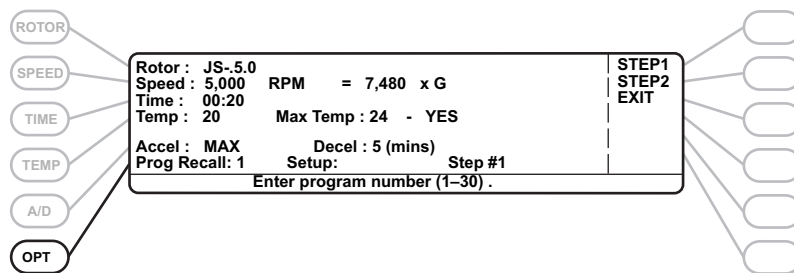
- 3 Press the **YES** soft key.
The step 1 parameters appear.
- 4 To see step 2 parameters, press the **STEP2** soft key.
The step 2 parameters appear.
- 5 Modify the parameters for either step.
The newly entered parameters appear.
 - a. Press **ENTER** when done.
 - b. Repeat for the other step, if required.
- 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**.

CHAPTER 3

Troubleshooting

Introduction

This chapter 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, call Beckman Coulter Customer Field Service (1-800-742-2345 in the United States for assistance; outside the U.S. contact your local Beckman Coulter office or visit us on the web at www.beckman.com).

NOTE It is your responsibility to decontaminate the instrument, as well as any rotors and 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 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 at 1-800-742-2345 (U.S.A. or Canada) or contact 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 Number/ Message	Problem	Result	Recommended Action
S1-S14/ System error	There is a problem with the system control software, EPROM, or RAM	System shuts down	Call Beckman Coulter Field Service. ^a
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. Gently clean the latch area with a dry, lintless cloth. Be careful not to damage sensitive electronics in the area. If L2 or L5 continue to appear after cleaning, call Beckman Coulter Field Service.
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.
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.
I1/ Imbalanced rotor	Rotor load is severely out of balance	System shuts down with maximum brake	1. Correct any condition that could cause a gross imbalance (such as one empty or uninstalled bucket). Make sure that buckets are loaded symmetrically as described in Rotor Operation. 2. For swinging bucket rotors, lubricate the buckets following the instructions in the rotor manual. 3. Restart the run. <i>If imbalance occurs during the first 15 seconds of operation with the JS-3.4A-1250 or JS-4.2A rotors:</i> — Perform step 1 above, then remove opposing pairs of bottles and swap their positions on the rotor yoke. Restart the run.

Table 3.1 Diagnostic Message Chart (*Continued*)

Diagnostic Number/ Message	Problem	Result	Recommended Action
R1/ Dynamic rotor ID not found, Not BII rotor	The system cannot verify the installed rotor	System shuts down with brake	— Make sure that the installed rotor can be run in the Avanti J-HC (see Table 1.2). — Enter the rotor name on the control panel and restart the run. If you are running the JS-4.2 or JS-4.2A rotor, make sure to select the specific model by pressing the appropriate soft key.
R3/ Dynamic rotor ID not matched, set speed exceeds safe speed	The system verifies that the installed rotor is a different model than entered by the user, and the set speed is above the installed rotor's maximum speed.	Run continues; set speed is reduced to maximum for the installed rotor	— Allow the run to continue, or — Press STOP and press CE to clear the diagnostic. Recheck the rotor and restart the run.
D1-15/ Drive error, call Beckman Field Service	Drive system problem (for example, over current, over/under voltage components, over temperature)	System shuts down, usually with no brake. Door may not unlock for up to an hour.	Call Beckman Coulter Field Service. 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.
D1-5, D9/ Drive error, call Beckman Field Service	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. Wait 4 hours before attempting to open the door. Follow the directions under Accessing the Rotor in Case of Power Failure , below.
H4/ Speed error	1. a run is in progress (rotor at speed or accelerating) 2. the operator changes the speed to 0 rpm by pressing SPEED, 0, ENTER. 3. 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.	Press STOP , then press CE to clear the diagnostic. Set the new run speed and then press ENTER, START to begin a new run.
T1-T2/ Overtemp conditions	System temperature over specified limits	System shuts down with maximum brake	The instrument power must be turned off before these diagnostics can be cleared. Allow the centrifuge and rotor to cool before restarting. If an overtemp diagnostic recurs, call Beckman Coulter Field Service.

Table 3.1 Diagnostic Message Chart (*Continued*)

Diagnostic Number/ Message	Problem	Result	Recommended Action
C2/ Rotor over temp, run stopped	Rotor temperature exceeds maximum temperature setting	System shuts down with maximum brake	Call Beckman Coulter Field Service.
C3/ No temp control, refer to manual	Refrigeration system malfunction	System shuts down with maximum brake	— Check the air filter and replace if dirty (see CHAPTER 4, Care and Maintenance). — Call Beckman Coulter Field Service.
F1, F4, F5/ FRS ^b failure, refer to manual	Required FRS level not reached	System shuts down with maximum brake	— Check and clean door sealing area and door gasket. — Wipe any ice and excess moisture from chamber.
F2/ FRS failure, refer to manual	FRS level too high	Run continues	Press CE If F2 message reappears, perform same actions as for F1/F4/F5 error.
F3/ FRS failure, refer to manual	FRS level too high	System shuts down with maximum brake	Call Beckman Coulter Field Service.

a. In the United States call 1-800-742-2345. Outside the United States, contact your local Beckman Coulter office.

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.

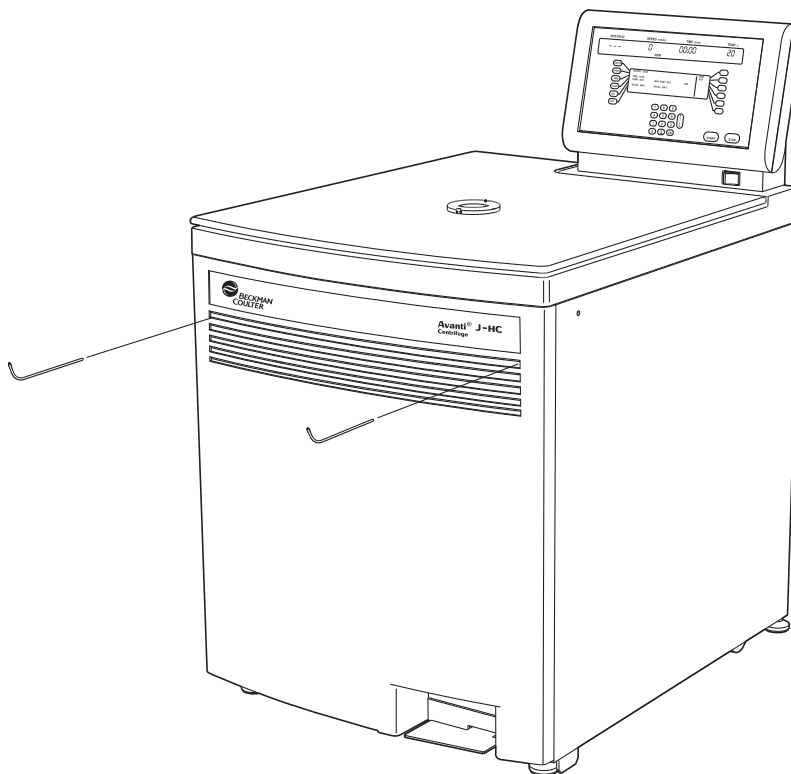
WARNING

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.

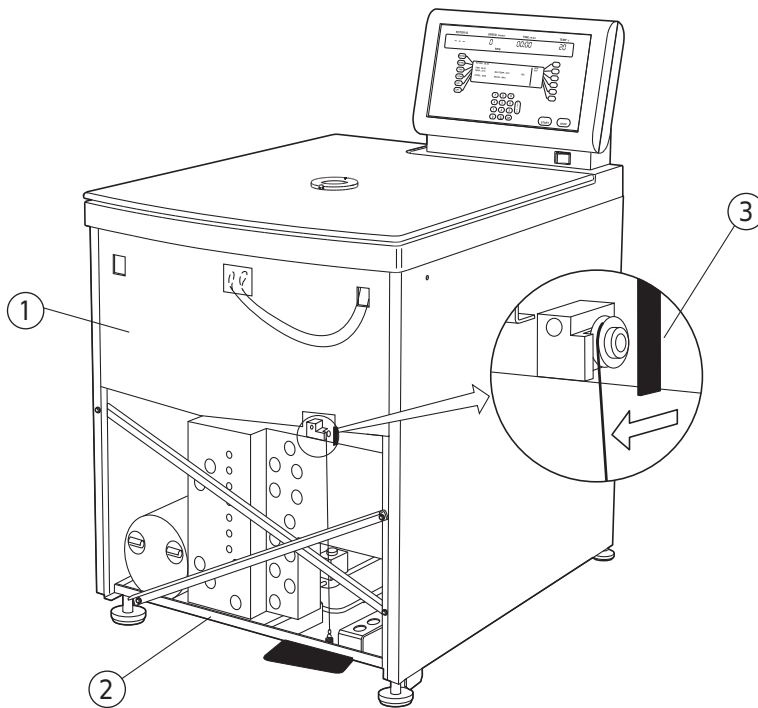
If the facility power fails momentarily, the centrifuge will resume operation when the power is restored. In the event of an extended power failure, you may need to override the door-locking mechanism manually to remove the rotor and retrieve your sample.

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.
The panel can be removed safely.
- 2 Insert a 4-mm or $\frac{5}{32}$ -in. Allen wrench straight through either of the holes and turn the wrench to the left (counterclockwise) about one-half turn.
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.
An inner front panel extends about halfway down from the centrifuge top (see [Figure 3.2](#)). Below this inner panel is a black manual door release interlock switch.

Figure 3.2 Manual Door Release**1.** Inner Front Panel**3.** Manual Door Release Interlock Lever**2.** Retaining Strip

-
- 5** Pull the interlock lever out and 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 doesn't 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.
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.

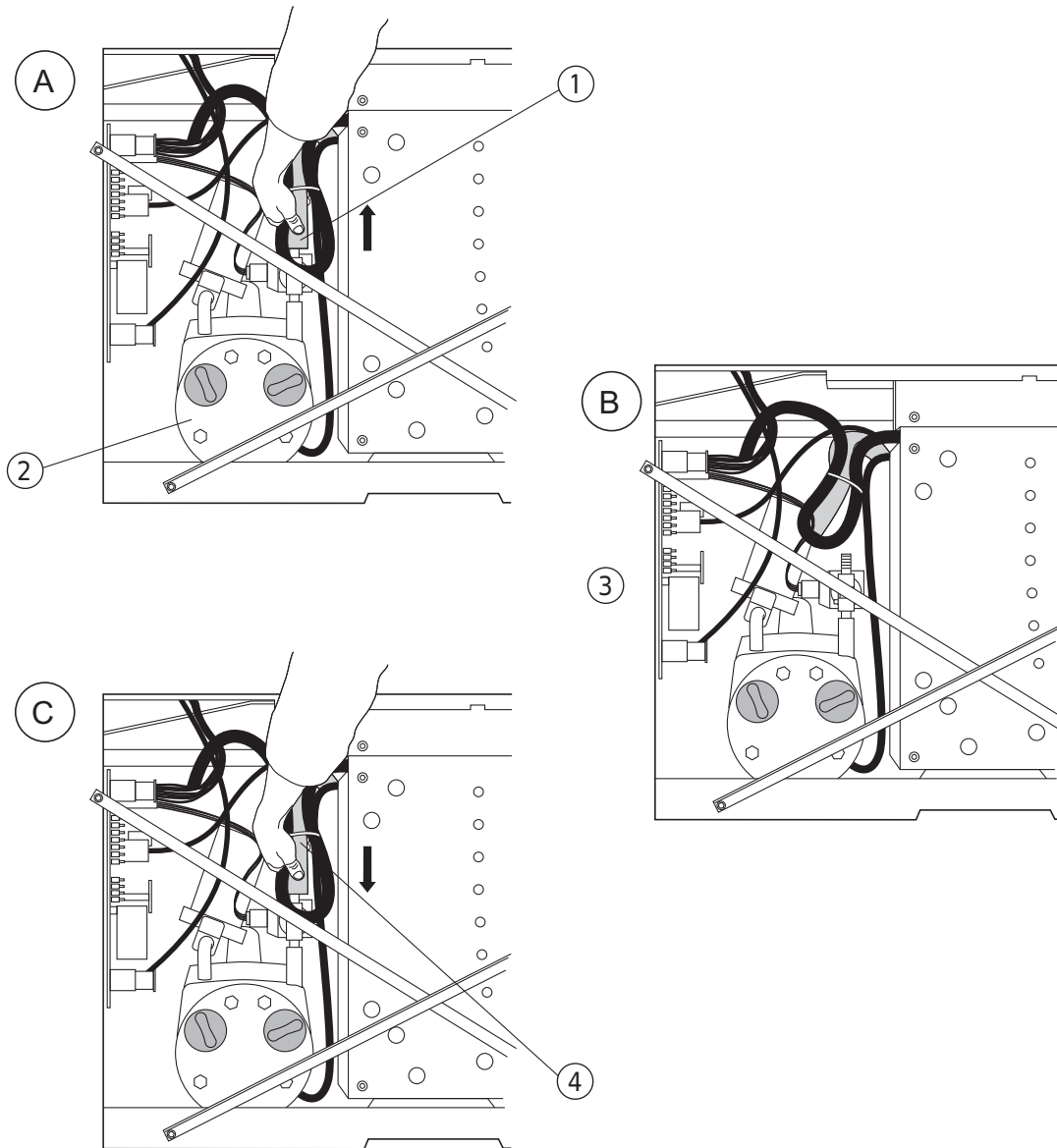
NOTE Several tubing lines are tied to the red hose. As you grasp the hose, place your hand over these lines. Make sure that they stay connected as you pull.



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

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

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

10 Remove your sample.



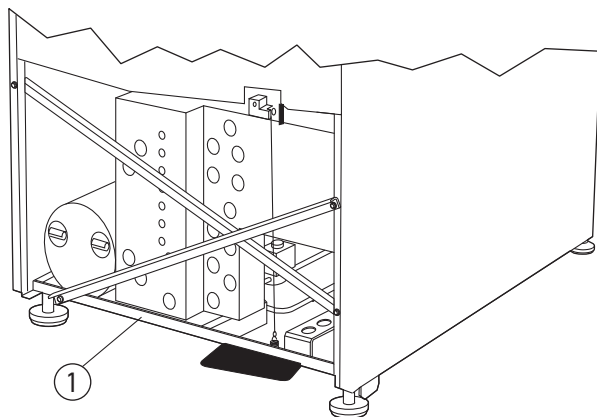
WARNING

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.
- 2 Hold the left top edge in place and insert the Allen wrench through the hole.
 - a. Turn to the right (clockwise) about one-half turn, until you reach a stop. The latch engages.
- 3 Repeat step 2 on the right side. The second latch engages.

Figure 3.4 Front Panel Retaining Strip



1. Retaining Strip

Troubleshooting

Accessing the Rotor in Case of Power Failure

CHAPTER 4

Care and Maintenance

Introduction

This chapter describes routine care and maintenance procedures that you should perform regularly or as required. Contact Beckman Coulter Customer Service if you need assistance. 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 accessories, before requesting service by Beckman Coulter Field Service.



WARNING

Maintenance procedures or servicing of this equipment requiring 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.
Clean as required (see [Cleaning](#), below).
- 2** Check the air filter on the back panel for obstructions.
Keep vents clear and clean.

* Call 1-800-742-2345 (U.S.A. or Canada) or contact your local Beckman Coulter office.

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

Cleaning

Clean the centrifuge frequently. Always clean up spills when they occur to prevent corrosives or contaminants from drying on component surfaces.

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

-
- 1 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.
 - 2 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.
 - 3 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

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.

-
- 1 Examine the chamber gasket to make sure that no glass particles are retained in it. Carefully remove any glass particles that may remain.

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

Decontamination



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

Sterilization and Disinfection

The centrifuge is finished with acrylic baking enamel. Ethanol (70%) may be used on this surface. See *Rotors and Tubes* or publication IN-175 for chemical resistances of centrifuge and accessory materials.



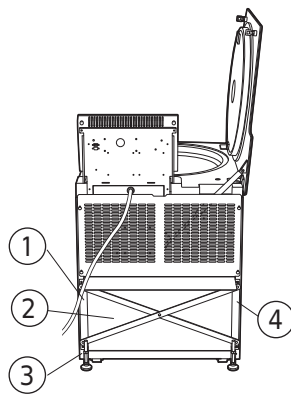
Ethanol is a flammability hazard. Do not use it in or near operating centrifuges.

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

Check the air filter regularly and replace it about once a year, or more often if it looks dirty. It is not fastened to the centrifuge, so no tools are required for removal or installation.

- 1 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.



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

- 2 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-HC 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*.
Call Beckman Coulter Field Service.

CAUTION

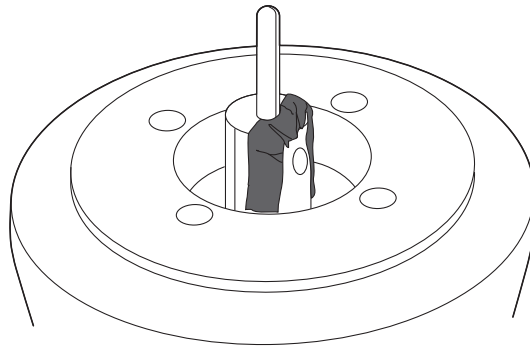
Repeated attempts to reset the centrifuge circuit breaker can cause substantial damage to electrical and electronic components.

Speed Calibration

Speed Verification

To compare the actual rotor speed with the set speed, proceed as follows, using a digital strobe.

- 1 Install a rotor.
- 2 Secure the rotor tie-down bolt onto the drive shaft.
- 3 Place a strip of black tape on half of the tie-down bolt.



- 4 Shut the centrifuge door.
- 5 Set the **SPEED** knob to the selected speed.
- 6 Set the **TIME** to **Hold**.
- 7 Press **ENTER**, then **START**.
The centrifuge will start.
- 8 When the rotor reaches set speed, use a calibrated strobe at the strobe port to verify the actual rotor speed is within ± 25 rpm of the display.
 - a. If there is a discrepancy, check the calibration of your strobe.
 - b. If you cannot determine the problem, call Beckman Coulter Field Service.

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, Description](#).

Returning a Centrifuge

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

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.***

Supply List

Refer to *High Performance, High Speed, High Capacity Rotors, Tubes & Accessories* (BR-8102, available at www.beckman.com) and 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.beckman.com.

Description	Part Number
Air filter	885218
Solution 555 (1 qt)	339555

Preinstallation Requirements

Introduction

Preinstallation requirements have been provided for your Avanti J-HC centrifuge. The following information is included in case the instrument must be relocated.

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

Site Preparation Requirements

The Avanti J-HC centrifuge will be installed 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 chapter). A 9.5-mm ($3/8$ -in.) drill is required for concrete floors. A 6.4-mm ($1/4$ -in.) 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-HC

Nominal Instrument Voltage Rating	Instrument Part Number	Nominal Supply Frequency	Power Cord and Plug Description
Single-phase, 200/208/240 V	367501	185–264 V, 50/60 Hz, 30 A	permanently attached three-wire UL/CSA-approved cord with NEMA type 6-30P plug
Single-phase, 230 V	367502	185–264 V, 50 Hz, 30 A	permanently attached three-wire CENELEC harmonized cord without plug
Three-phase, 220/380 V + Neutral ^a	367503	312–456 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 safety, connect the instrument 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.

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 Avanti J-HC Single-Phase Power Connections

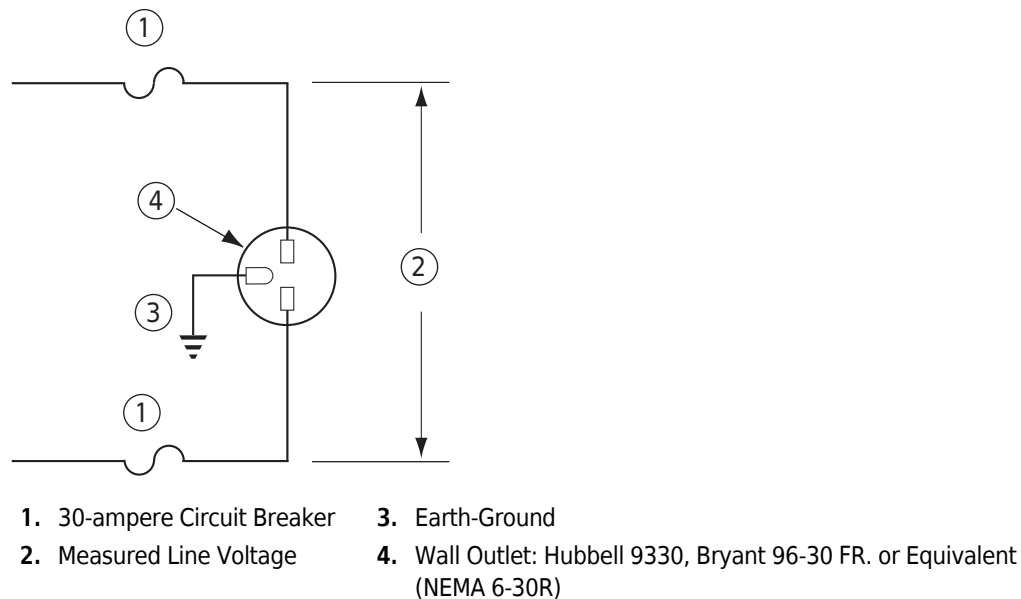
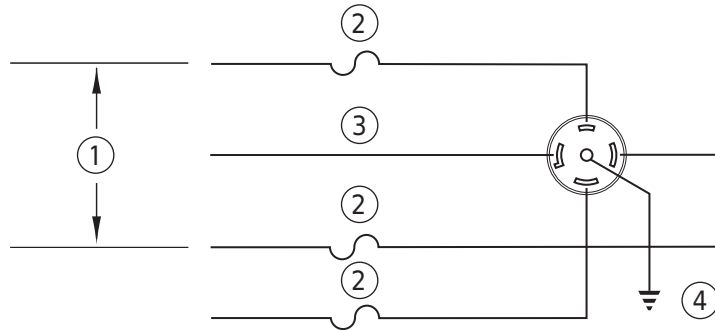


Figure A.2 Avanti J-HC Three-Phase “Y” Power Connections



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

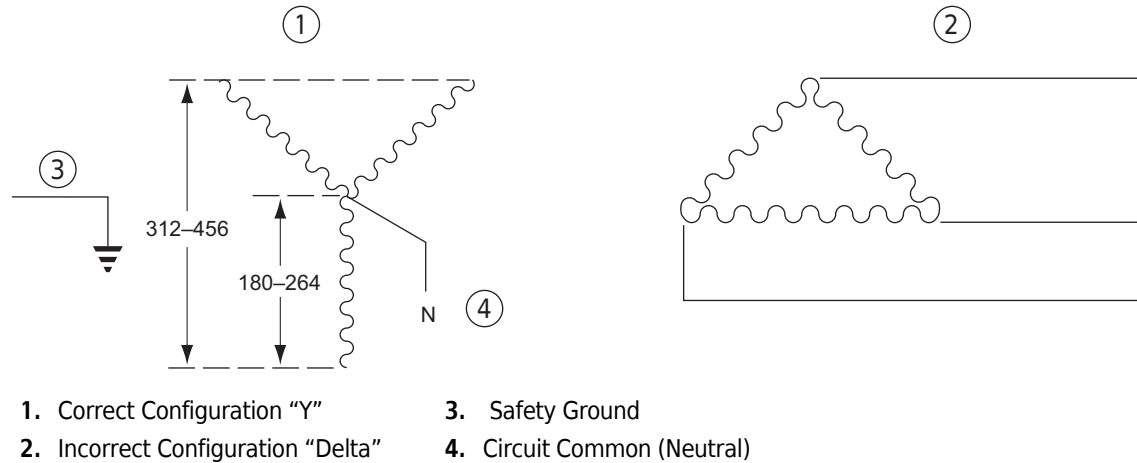
For three-phase power service to the centrifuge, use the “Y” connected configuration shown in [Figure A.3](#). Also note the following information:

- 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. The main supply power cable 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.

⚠ 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.

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



Space Requirements

⚠ WARNING

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

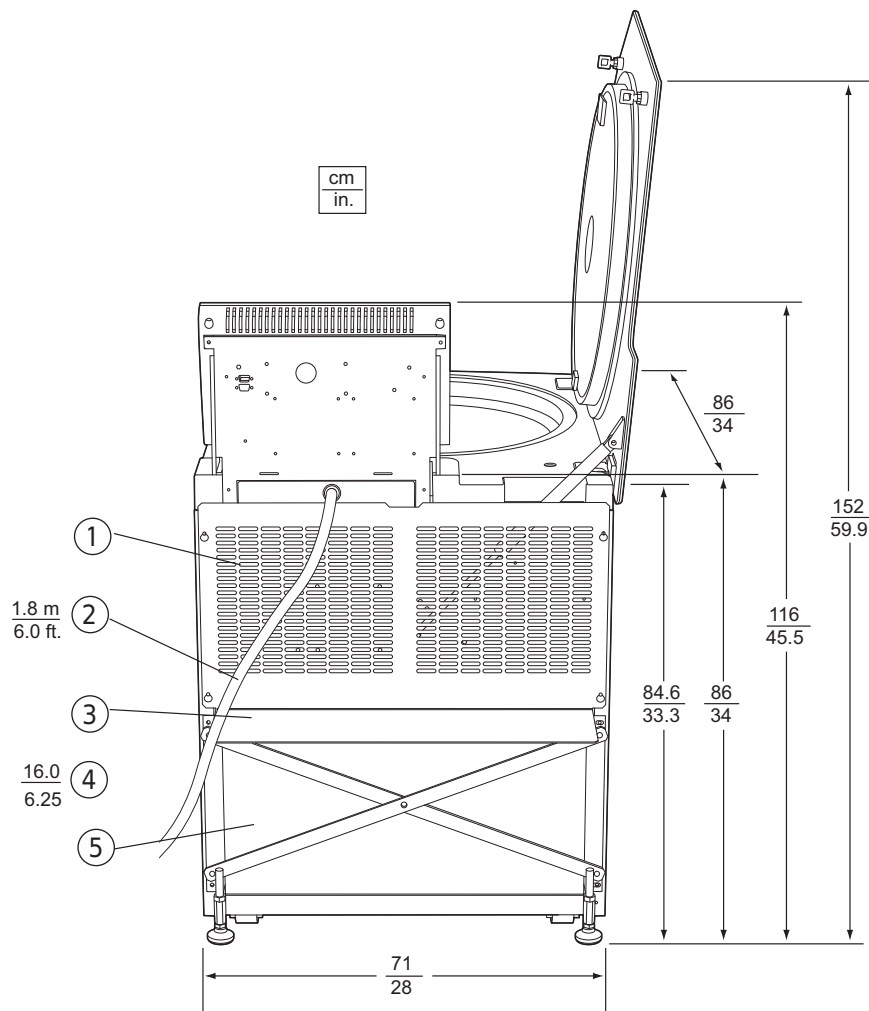
- 1 Locate the instrument on a clean, level floor.
 - The Mains (power) plug is the disconnect device and must remain easily accessible.
 - Position the centrifuge so that it is easy to remove the Mains (power) plug from the outlet receptacle.
- 2 Select a location away from heat-producing laboratory equipment.

If ambient temperature exceeds 40°C (104°F), premature component failure may result.
- 3 In addition to space for the centrifuge itself (see [Figure A.4](#) for dimensions), allow a 7.6-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 against the wall.

Figure A.4 Rear View and Dimensions



- | | |
|-----------------|---------------|
| 1. Air Exit | 4. Depth |
| 2. Power Cord | 5. Air Intake |
| 3. Air Diverter | |

Securing the Centrifuge to the Floor

Anchor the centrifuge to the floor to prevent the centrifuge from moving in the unlikely event of a rotor mishap. Installation hardware and instructions (J3HC-TB-002) are shipped with the centrifuge. The centrifuge must be anchored to the floor to meet European CE Mark requirements.

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

Using the JA-10 Rotor



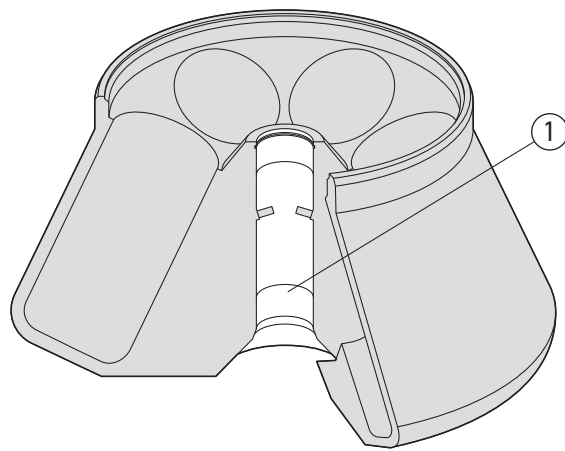
Do not use the JA-10 rotor before reading the information in this section.

Checking for Rotor Pins

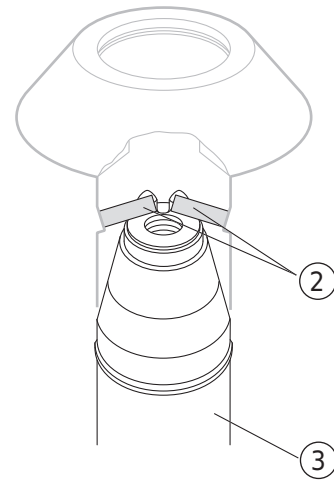
Rotors used in the Avanti J-HC centrifuge must have drive pins in the rotor drive hole (see [Figure A.5](#)). Drive pins engage with the centrifuge drive shaft hub to ensure that the rotor does not slip during acceleration. Some Beckman Coulter rotors, including the JA-10, were originally manufactured without drive pins because they did not need pins to run in older model centrifuges.

-
- 1** *Check the JA-10 rotor for drive pins, and do not use rotors without drive pins in the Avanti J.*
 - a.** To check for drive pins, hold the rotor up or turn it on its side and look into the drive hole.
 - b.** If you do not see two metal pins in the hole, call your local Beckman Coulter office for information on returning the rotor to the factory for upgrading.
-

Figure A.5 Checking the Rotor for Drive Pins



1. Rotor Drive Hole
2. Drive Pins (may be horizontal, vertical, or angled)



3. Avanti J Centrifuge Drive Spindle Hub

Temperature Calibration Procedure

Description

The Avanti J-HC centrifuge specification for temperature control is $\pm 2^{\circ}\text{C}$ 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 temperatures may be outside this range.) The following procedure is provided for those cases in which temperature control within $\pm 1^{\circ}\text{C}$ 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.

-
- 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.

-
- 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 the measurements 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-HC 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 after delivery of the Avanti J-HC 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 modification 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.

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