



Model J2-MC Centrifuge

Instruction Manual



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



SAFETY NOTICE

This safety notice summarizes information basic to the safe operation of the equipment described in this manual. The international symbol displayed above is a reminder that all safety instructions should be read and understood before installation, operation, maintenance, or repair of this centrifuge. When you see the symbol on other pages, pay special attention to the safety information presented. Observance of safety precautions will also help to avoid actions that could damage or adversely affect the performance of the centrifuge.

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 it.

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.

Any servicing of this centrifuge 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 centrifuge is disconnected from the main power source, and refer such servicing to qualified personnel.

Electrical Safety

To reduce the risk of electrical shock, this centrifuge uses a three-wire electrical cord and plug to connect this instrument to earth-ground. 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.

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

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

This centrifuge 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 centrifuge.
- Before starting the centrifuge, make sure that the rotor tie-down knob is securely fastened.
- 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 the 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

If pathogenic, toxic, or radioactive samples are used in this centrifuge, it is the responsibility of the user to ensure that all necessary safety regulations, guidelines, precautions, and practices are adhered to accordingly. Ask your laboratory safety officer to advise you about the level of containment required for your application and about proper decontamination or sterilization procedures to follow if fluids escape from their containers.

- 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. Use only the appropriate rotors and adapters. 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 centrifuge and accessories before requesting service by a Beckman Coulter Field Service representative.



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Instruction Manual



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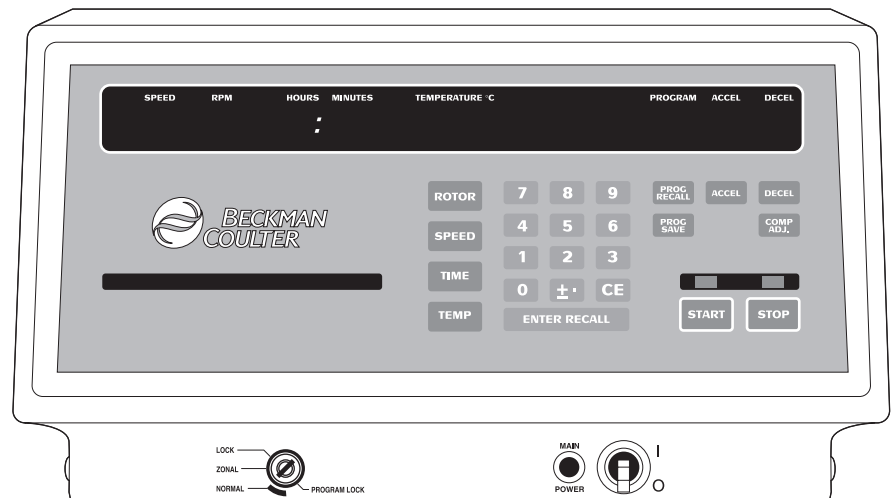
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INSTRUMENT CERTIFICATION

To assure full system quality, the Beckman Coulter Model J2-MC High-Performance Centrifuge has been manufactured in an NSAI-registered ISO 9001 facility. It has been designed and tested to meet the laboratory equipment safety standards and regulations (only when used with Beckman Coulter rotors) of:

- UL
- CSA (or C-UL)
- CE Mark

SCOPE OF MANUAL

This manual is designed to familiarize you with the Beckman Coulter Model J2-MC High-Performance Centrifuge—its function, specifications, operation, and routine operator care and maintenance.

- Section 1 contains system specifications and instructions for preparing your site for installation of the centrifuge.
- Section 2 contains an overall description of the centrifuge, including a description of system controls and indicators.
- Section 3 summarizes procedures for operating the centrifuge.
- Section 4 lists system diagnostic messages, together with probable causes and required corrective actions.
- Section 5 contains procedures for routine care and maintenance of the centrifuge and a brief list of supplies and replacement parts.

We recommend that you read this entire manual, especially the SAFETY NOTICE and all safety-related information, before operating the centrifuge or performing instrument maintenance.

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

NOTES, CAUTIONS, AND WARNINGS

Certain symbols are used in this manual to call out safety related and other important information. These are reproduced and described on the inside cover and/or below.

 **NOTE**

Used to call attention to information that should be followed during installation, use, and/or servicing of the equipment.

**CAUTION**

Used to indicate a potentially hazardous situation which, if not avoided, may result in minor or moderate injury and/or mechanical damage. It is also used to alert against unsafe practices.

**WARNING**

Used whenever an action or condition may potentially cause serious personal injury or loss of life. Mechanical damage may also result.

**WARNING**

Indicates high voltage or risk of electric shock. Turn the power switch off and disconnect the equipment from the main power source. Refer servicing of all areas displaying warning symbols to service personnel.

**TYPOGRAPHIC
CONVENTIONS**

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

- Names of control panel keys, such as **ROTOR** and **SPEED**, appear in boxes.
- Display names, such as **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 Model J2-MC centrifuge.

RADIO INTERFERENCE

This centrifuge has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause interference to radio communications. Operation of this equipment in a residential area may cause interference, in which case the user will be required to correct the interference at his or her own expense.

CANADIAN REGULATIONS

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

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

Specifications and Preinstallation Requirements



SPECIFICATIONS

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

CONTROL FEATURES

Rotor identity	Used to limit speed to rotor maximum and provide automatic temperature control.
Speed	
Set speed	100 to 21 000 rpm
Speed control	Actual rotor speed will be within 20 rpm of set speed.
Speed display	Indicates actual rotor speed in revolutions per minute in 10-rpm increments and three significant figures.
Time	
Set time	Up to 99 hours 59.9 minutes for timed runs; entries greater than 99 hr 59.9 min signal “hold” or continuous operation.
Time display	Indicates time remaining for timed runs, time elapsed for continuous operation.

Rotor temperature	
Set temperature	-20 to 40°C
Temperature control	±2° of set temperature after completion of temperature calibration procedure (see Section 5).
Temperature display	Indicates rotor temperature in degrees Celsius in 1-degree increments.
Acceleration	Select from 3 acceleration rates (including maximum acceleration).
Deceleration	Select from 3 deceleration rates (including maximum dynamic braking, or a coasting stop from full speed).
Operating modes	Key switch selects NORMAL, ZONAL, or PROGRAM LOCK operation.

OPERATIONAL FEATURES

Diagnostic messages	Interlocks prohibit drive operation in the event of certain malfunctions. See Section 4: TROUBLESHOOTING.
Drive unit	High-torque, dc motor; belt-driven rotor spindle.

PHYSICAL DATA

Weight (uncrated)	298 kg (656 lb)
Height	
to chamber door	94.0 cm (37 in.)
to top of control panel	127.0 cm (50 in.)
to top of door (open)	160.0 cm (63 in.)
Width	71.1 cm (28 in.)
Depth	83.8 cm (33 in.)
Minimum clearances	
both sides and rear	15.0 cm (6 in.)
when using JE-6B or JCF-Z rotors	30.0 cm (12 in.)
Diameter of rotor chamber	36.0 cm (14.25 in.)
Power and fusing	See ELECTRICAL REQUIREMENTS
Finish	Urethane paint on chamber door, vinyl paint on other painted surfaces, Mylar ¹ on control panel.
Maximum heat dissipation	
into the room	2.0 kW (7000 Btu/hr)
Humidity restrictions	<95% (noncondensing)
Noise level 0.91 m (3 ft) in front of instrument	
	<63 dBa
Installation category	II
Pollution degree	2

The centrifuge will operate within specifications in a laboratory with ambient temperatures ranging from 16 to 40°C.

¹ A registered trademark of E.I. DuPont de Nemours & Company.

PREINSTALLATION REQUIREMENTS

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

Preinstallation requirements have been sent prior to shipment of the centrifuge. The following information is provided in case the centrifuge must be relocated. The equipment listed is required for installation:

- Voltmeter
- Two 30-ampere circuit breakers
- Power receptacle
- Drill for drilling holes in the floor for installation of anchoring kit bolts (described later in this section). 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

The voltage indicated on the name rating plate on the back of the centrifuge should agree with the measured line voltage. Your Beckman Coulter Field Service representative can rewire the centrifuge, if necessary, to adapt it to the available voltage. (He or she will provide a new rating plate indicating the new voltage to replace the old one.)

The Model J2-MC requires 208- or 240-V power, fused for 30 A.

Range for 208 V, 60 Hz	187 to 223 V
Range for 240 V, 60 Hz	224 to 264 V
Range for 220 V, 50 Hz	210 to 224 V

To reduce the risk of electrical shock, this centrifuge uses a three-wire electrical cord (1.8 m; 6 ft) and plug to connect the instrument to earth-ground. In regions where the centrifuge is supplied with an unterminated cord, a plug that meets local electrical and safety requirements must be supplied. (Your local Beckman Coulter office can provide specific information.) See Table 1-1 for the required wire connections. Make sure that the matching wall outlet receptacle is properly wired and earth-grounded (see Figure 1-1).

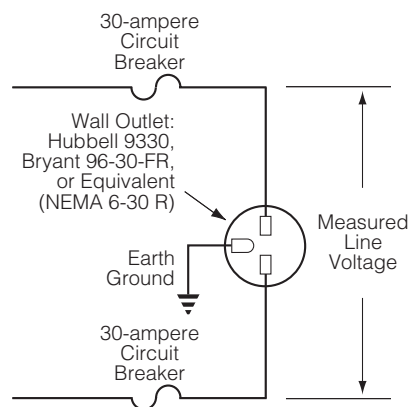




Figure 1-1. Electrical Requirements

Table 1-1. Required Wire Connections

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

To ensure 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 the room), in order to disconnect the centrifuge from the main power source in case of a malfunction.

SPACE

Locate the Model J2-MC in a clean, safe, uncluttered environment. Be sure to provide 15.0-cm (6-in.) clearances on each side and at the rear of the centrifuge for servicing and to ensure sufficient air ventilation during operation (See Figure 1-2).

An airflow bracket will be installed on the back of the centrifuge to ensure the minimum clearances required. A filter bracket and a disposable filter will be installed to keep the air intake area clean.

ANCHORING KIT



WARNING

Do not place the centrifuge near areas containing flammable reagents or combustible fluids.

To comply with regulatory requirements, the Model J2-MC must be secured to the floor using the anchoring kit shipped with the centrifuge. The anchoring hardware prevents the centrifuge from moving in the unlikely event of a rotor mishap. Installation instructions (J2HC-TB-003) are provided as part of the kit. Two steps are required for installation as follows.

1. Drilling holes in the laboratory floor where the centrifuge will be located. The anchoring instructions include a full-size template, which shows where these holes must be drilled in relation to the wall behind the centrifuge. *This step must be done by the customer.*

2. Attaching the mounting brackets to the floor, and inserting the shackles through the floor brackets and the brackets on the centrifuge frame. This step will be done by the Beckman Coulter Field Service representative during installation.

NOTE

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

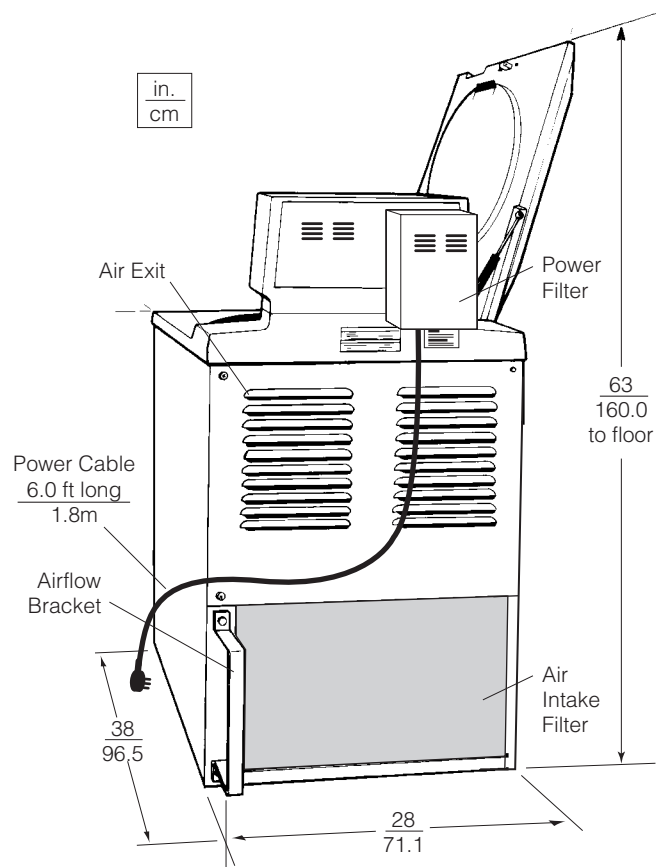
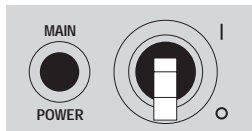


Figure 1-2. Rear View and Dimensions

Description

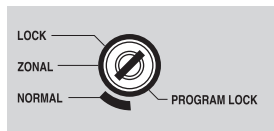
This section describes the control panel and major instrument components. Use the foldout illustration at the back of this manual to locate components.

POWER



The MAIN POWER switch, labeled I (on) and O (off), is located below the control panel. It controls electrical power to the centrifuge. The power must be on before the chamber door can be opened or closed.

KEY SWITCH



A key switch is used to select NORMAL, ZONAL, or PROGRAM LOCK operating modes.

- NORMAL is selected for routine closed-door centrifugation.
- PROGRAM LOCK is selected for operation according to the last recalled program. Parameters cannot be changed and diagnostic messages cannot be cleared until the key is first turned to NORMAL.
- LOCK is selected to prevent use of the centrifuge.
- ZONAL is selected for open-door operation below 3000 rpm when the JCF-Z rotor is used. The key cannot be removed from the lock when in the ZONAL position. There is no overtemp diagnostic when the key is in the ZONAL position.

The key can be turned to any position except ZONAL and then removed from the centrifuge.

CONTROL PANEL

Figure 2-1 shows the control panel, which includes a video display and keys for entering run information.

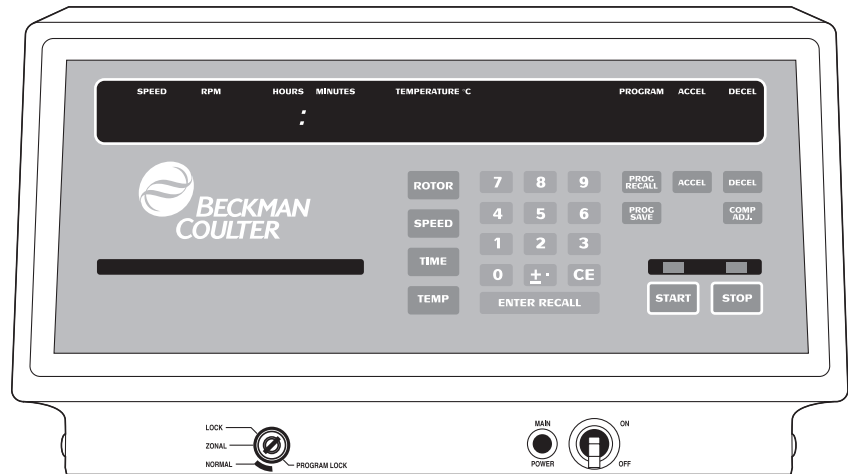


Figure 2-1. The Control Panel

PARAMETER KEYS

ROTOR

Parameter keys are used to enter run settings.

Pressed to enter the rotor code of the rotor in use (see Table 3-1). Entering the rotor code limits the speed setting to the maximum for the rotor in use.

SPEED

Pressed to enter the run speed in rpm (from 100 rpm to the maximum speed of the rotor in use).

TIME

Pressed to enter the run time (up to 99 hours 59.9 minutes; longer time entries specify continuous (hold) operation).

TEMP

Pressed to enter the run temperature (from -20 to 40°C).

ACCEL

Pressed to enter the acceleration setting (1 or 2, or no entry for maximum acceleration).

DECEL

Pressed to enter the deceleration setting (1 or 2, or no entry for a coasting stop [no brake]).

PROG RECALL

Pressed to select a program. Press **PROG RECALL** and then enter the program number (0 through 9) on the keypad.

PROG SAVE

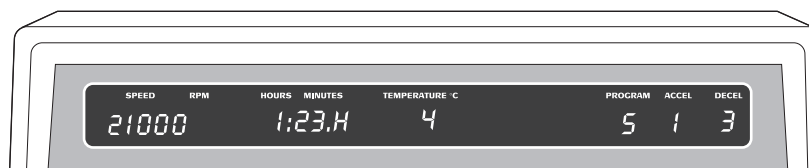
Pressed to save run settings as a program.

COMP ADJ

Pressed to enter temperature compensation values as specified in the applicable rotor manual.

DIGITAL DISPLAY

The digital display indicates rotor speed, run time (remaining or elapsed), temperature, program number (if selected), and acceleration and deceleration settings. The display serves a dual purpose.



- When the power is on, the display shows the current centrifuge operating conditions.
- When a parameter key is pressed, the set values are displayed, and the display flashes to indicate that a value may be entered or changed. The display continues to flash until another parameter key or **ENTER/RECALL** is pressed.

DIAGNOSTIC MESSAGES

Diagnostic messages are displayed on the control panel to indicate certain conditions that need attention. If an abnormal condition occurs, a diagnostic message will flash until **CE** is pressed. In certain conditions the centrifuge cannot be restarted until the condition is corrected. See Section 4, TROUBLESHOOTING for detailed information on diagnostic messages and appropriate actions to take if they occur.

DRIVE UNIT

The sealed, prelubricated drive spindle is belt-driven by a high-torque, DC motor. Motor and spindle are attached to a rubber-mounted subplate to minimize noise and vibration.

If the drive belt breaks during centrifugation, the rotor will decelerate to a stop and the diagnostic message **BELT** will flash on the control panel. The centrifuge will not restart until the diagnostic message is cleared and the belt is replaced (see Section 5, CARE AND MAINTENANCE).

NOTE

Some vibration occurs as a rotor accelerates between 600 and 800 rpm. This vibration, as the rotor shifts to rotate about its center of mass, is normal. Abnormal vibration will trigger the imbalance detector.

DOOR OPERATION

The chamber door is hinged on the left and locks on the right. The door can be opened only by using the door handle and only if power is on and the rotor is stopped (or if the rotor is spinning below 3000 rpm and the key switch is in the ZONAL position). The door locks when either **(START)** is pressed or power is turned off. The diagnostic message DOOR will flash on the control panel if the door is not closed when a run is started in NORMAL and PROGRAM LOCK modes.

NOTE

The door cannot be opened or closed if the power is off.

The door is opened by pulling the door latch lever forward and lifting up on the handle to open the door. Initial opening is assisted by a built-in torsion bar. When the door is about three-quarters open, a gas spring takes over and opens the door the rest of the way. The door will remain open without a support. In the event of a power failure, the door lock can be manually unlocked for sample recovery (see Section 4, TROUBLESHOOTING).

REFRIGERATION SYSTEM



The refrigeration compressor is in the lower rear of the centrifuge, and the evaporator surrounds the rotor chamber. A thermistor inside the bottom of the rotor chamber senses the temperature of the air in the chamber and causes the compressor to cycle on and off. No CFCs are used in the manufacture or operation of the Model J2-MC.

Because the system works only to cool the chamber, run temperatures above room temperature depend on frictional heating, which is a function of the rotor being used and the speed selected.

Filtered cooling air enters the system through the air intake area at the rear of the centrifuge. A bracket installed on the centrifuge ensures minimum clearances for proper air flow.

TEMPERATURE SENSING

The thermistor in the bottom of the rotor chamber continuously monitors chamber temperature. Because rotors differ in size and mass, and there is windage in the chamber, *chamber temperature* and *rotor temperature* are not the same. The microprocessor calculates the required chamber temperature to achieve the selected rotor temperature by using a set of compensation values unique to the rotor in use. During a run, the display indicates *rotor temperature* within 2°C of set temperature (after equilibration).

NOTE

The **COMP ADJ** key allows the user to add to or subtract from the compensation values used by the microprocessor to calculate rotor temperature. The results of a dynamic temperature calibration may indicate that such an adjustment is necessary for temperature control within 1°C. See TEMPERATURE CALIBRATION in Section 5.

The microprocessor monitors the thermistor and verifies a temperature change as the chamber cools to the required temperature (see Figure 2-2). If rotor temperature starts to increase and rises more than 4°C above the set temperature, or if chamber temperature exceeds 45°C, the diagnostic message TEMP will flash on the control panel and the rotor will decelerate to a stop. The overtemp system is not operative in the ZONAL operating mode to avoid unnecessary run shutdown during open-door centrifugation.

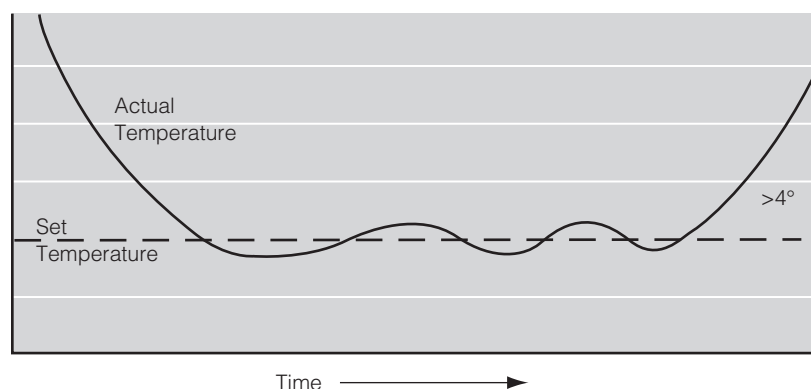


Figure 2-2. Temperature Sensing and Control Diagram

SPEED CONTROL SYSTEM

The speed control system is activated when **(START)** is pressed. Rotor speed is then controlled to within 20 rpm of the selected speed.

The **(ROTOR)** key is used to enter the rotor code into the microprocessor, which activates two additional controls: (1) speed selections greater than the rotor's maximum speed will not be accepted for the run, and (2) during the run, if the rotor exceeds its maximum speed, the diagnostic message SPEED will flash on the control panel and the rotor will decelerate to a stop.

ROTOR CHAMBER

The rotor chamber is stainless steel for durability and corrosion resistance. The chamber is sealed by a silicone rubber gasket. (Instrument gaskets have not been qualified as bioseals for aerosol containment.) The rotor drive spindle and thermistor are visible in the chamber bottom (see Figure 2-3).

The four portholes on the left and right chamber walls allow electrical and liquid lines, used with the JCF-Z continuous flow/zonal rotor and the JE-6B elutriation rotor, to enter the chamber.

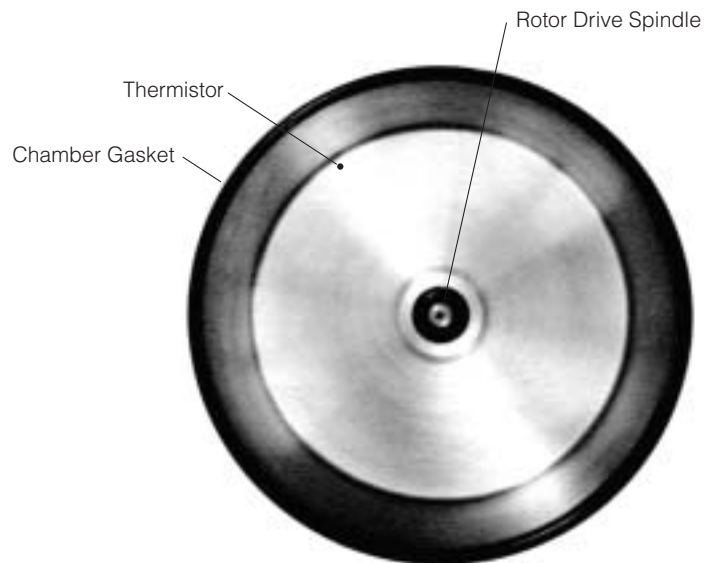
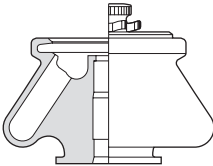
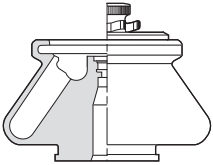
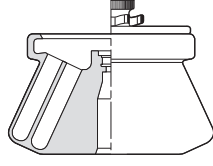
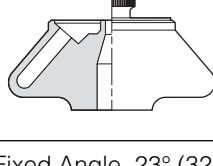
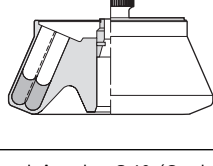
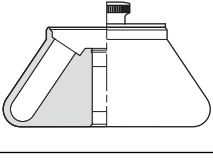


Figure 2-3. Interior View of the Rotor Chamber

AVAILABLE ROTORS

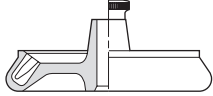
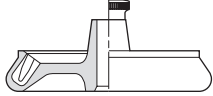
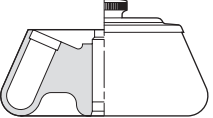
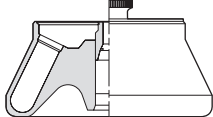
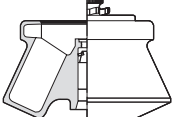
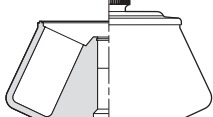
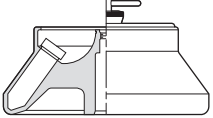
Refer to the applicable rotor manual for complete rotor descriptions.

Rotor Profile and Description	Max RPM ^a	Max RCF (× g)	Max Capacity	Rotor Manual Number
JA-30.50 Ti Fixed Angle, 34° (8 place)  $r_{\max} = 108 \text{ mm}$	21 000	53 300	8 × 50 mL	J-TB-070
JA-25.50 Fixed Angle, 34° (8 place)  $r_{\max} = 108 \text{ mm}$	21 000	53 300	8 × 50 mL	J-TB-056
JA-25.15 Fixed Angle, 25° (24 place)  $r_{\max} = 106 \text{ mm}$ (outer row) $r_{\max} = 86 \text{ mm}$ (inner row)	21 000	52 400 (outer row) 42 500 (inner row)	24 × 15 mL	J-TB-057
JA-21 Fixed Angle, 40° (18 place)  $r_{\max} = 102 \text{ mm}$	21 000	50 400	18 × 10 mL	J-TB-002
JA-20.1 Fixed Angle, 23° (32 place)  $r_{\max} = 115 \text{ mm}$ (outer row) $r_{\max} = 98 \text{ mm}$ (inner row)	20 000	45 700 (outer row) 43 900 (inner row)	32 × 15 mL	J-TB-022
JA-20 Fixed Angle, 34° (8 place)  $r_{\max} = 108 \text{ mm}$	20 000	48 400	8 × 50 mL	J-TB-003

^a Maximum speeds are based on a solution density of 1.2 g/mL in all rotors except for the JA-18.1, which is rated for a density of 1.4 g/mL, the JCF-Z, which is rated for a density of 1.45 g/mL, and the JE-6B, which is rated for a density of 3 g/mL.

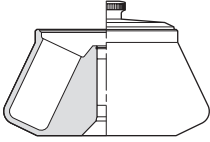
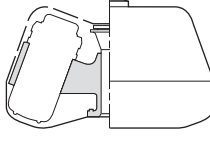
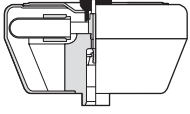
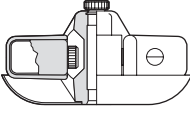
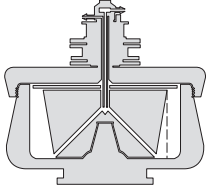
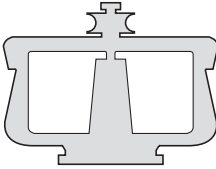
— Continued

Description

Rotor Profile and Description	Max RPM ^a	Max RCF (× g)	Max Capacity	Rotor Manual Number
JA-18.1 Fixed Angle (24 place)  45° adapter $r_{\max} = 116 \text{ mm}$  25° adapter $r_{\max} = 112 \text{ mm}$	18 000	42 100	24 × 1.8 mL	J-TB-037
JA-18 Fixed Angle, 23° (10 place)  $r_{\max} = 132 \text{ mm}$	18 000	47 900	10 × 100 mL	J-TB-035
JA-17 Fixed Angle, 25° (6 place)  $r_{\max} = 132 \text{ mm}$	17 000	39 800	14 × 50 mL	J-TB-017
JLA-16.250 Fixed Angle, 25° (6 place)  $r_{\max} = 134 \text{ mm}$	14 000	29 400	6 × 250 mL	J-TB-072
JA-14 Fixed Angle, 25° (6 place)  $r_{\max} = 137 \text{ mm}$	14 000	30 100	6 × 250 mL	J-TB-004
JA-12 Fixed Angle, 35° (12 place)  $r_{\max} = 144 \text{ mm}$	12 000	23 200	12 × 50 mL	J-TB-051

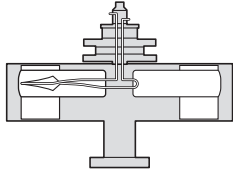
^a Maximum speeds are based on a solution density of 1.2 g/mL in all rotors except for the JA-18.1, which is rated for a density of 1.4 g/mL, the JCF-Z, which is rated for a density of 1.45 g/mL, and the JE-6B, which is rated for a density of 3 g/mL.

— Continued

Rotor Profile and Description	Max RPM ^a	Max RCF (× g)	Max Capacity	Rotor Manual Number
JA-10 Fixed Angle, 25° (6 place)  $r_{\max} = 158 \text{ mm}$	10 000	17 700	6 × 500 mL	J-TB-006
JLA-10.500 Fixed Angle, 20° (6 place)  $r_{\max} = 166 \text{ mm}$	10 000	18 500	6 × 500 mL	J-TB-048
JS-13.1 Swinging Bucket (6 place)  $r_{\max} = 140 \text{ mm}$	13 000	26 500	6 × 50 mL	J-TB-036
JS-7.5 Swinging Bucket (4 place)  $r_{\max} = 165 \text{ mm}$	7 500	10 400	4 × 50 mL	J-TB-007
JCF-Z Continuous Flow/Zonal Continuous Flow Configuration Large pellet core: $r_{\max} = 89 \text{ mm}$ Standard pellet core: $r_{\max} = 89 \text{ mm}$ Small pellet core: $r_{\max} = 81 \text{ mm}$  Zonal Configuration Standard core: $r_{\max} = 89 \text{ mm}$ Reograd core: $r_{\max} = 89 \text{ mm}$ 	20 000 20 000 20 000 20 000 20 000	39 900 39 900 36 300 39 900 39 900	1250 mL 660 mL 240 mL 1900 mL 1750 mL	JCFZ-IM

^a Maximum speeds are based on a solution density of 1.2 g/mL in all rotors except for the JA-18.1, which is rated for a density of 1.4 g/mL, the JCF-Z, which is rated for a density of 1.45 g/mL, and the JE-6B, which is rated for a density of 3 g/mL.

— Continued

Rotor Profile and Description	Max RPM ^a	Max RCF ($\times g$)	Max Capacity	Rotor Manual Number
JE-6B Elutriator Standard chamber: $r_{eb}^* = 86$ mm Sanderson chamber: $r_{eb} = 106$ mm  *Elutriation boundary	6 000 6 000	3 470 4 270	4.2 mL 5.9 mL	JE6B-IM

^a Maximum speeds are based on a solution density of 1.2 g/mL in all rotors except for the JA-18.1, which is rated for a density of 1.4 g/mL, the JCF-Z, which is rated for a density of 1.45 g/mL, and the JE-6B, which is rated for a density of 3 g/mL.

FRICION REDUCTION SYSTEM (FRS)

The friction reduction system uses a mechanical vacuum pump to reduce chamber pressure to below 51 kPa ($1/2$ atm) during operation. Reduced pressure helps a rotor reach maximum speed faster. The pump is located behind the drive unit and requires no maintenance.

The pump comes on when **(START)** is pressed and the chamber door is closed. The FRS shuts down when the time display reaches zero or when **(STOP)** is pressed. In ZONAL operating mode, the FRS shuts down when the rotor unloading speed is entered.

Operation

This section contains detailed centrifuge operating procedures. If you are an experienced user of this centrifuge, turn to the summary provided at the end of this section for a quick review of operating steps.

Refer to the applicable rotor manual for instructions on preparing the rotor and labware for centrifugation.



WARNING

Normal operation may involve the use of solutions and test samples that are pathogenic, toxic, or radioactive. Handle 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.



WARNING

The centrifuge must not be run near flammable liquids or vapors, and such materials should not be run in the centrifuge. Do not lean on the centrifuge or place items on it while it is operating.

PREPARATION AND LOADING

For fast temperature equilibration, cool or warm the rotor to the required operating temperature before the run.

1. Turn the power switch on (I).
2. Lightly coat the centrifuge drive spindle hub with Spinkote™ (306812). Install the rotor according to the instructions in the applicable rotor manual. Always run the rotor with a balanced load.



CAUTION

Do not drop the rotor onto the drive hub. The spindle 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.

3. Close the chamber door.

ENTERING RUN PARAMETERS

If necessary, turn the key to the NORMAL position. Then enter the run parameters, following the instructions below.

ROTOR

To enter or modify the rotor code:

1. Press **ROTOR**. The “ROTOR” display flashes.
2. Use the keypad to enter the rotor code for the installed rotors (Table 3-1).

Example: To enter the JA-20.1 rotor,

press **2** and “2” flashes

press **0** and “0” flashes

press **±.** and “20.” flashes

press **1** and “20.1” flashes

Table 3-1. Rotor Codes

Rotor Name	(ROTOR) Code	Maximum Speed (rpm)
JA-21	21	21 000
JA-20.1	20.1	20 000
JV-20	20	20 000
JA-20	20.2	20 000
JA-18.1	18.1	18 000
JA-18	18	18 000
JA-17	17	17 000
JA-14	14	14 000
JS-13.1	13	13 000
JA-12	12	12 000
JLA-10.500	10.5	10 000
JA-10	10	10 000
JS-7.5	7.5	7 500
JE-6B	6.0	6 000
JCF-Z	20.9	20 000
JLA-16.250	14	14 000
JA-25.50	25.5	21 000
JA-25.15	25.1	21 000
JA-30.50 Ti	30.5	21 000

3. Check the display. If the entry is incorrect, press **(CE)** and reenter the rotor code.
4. Press **(ENTER/RECALL)** or press another parameter key to save the rotor code.

The rotor must be identified before the run. Entering the rotor code provides:

- *Automatic maximum speed limits.* A speed greater than the rotor's maximum cannot be entered for the run speed. If the rotor exceeds this maximum during the run, the diagnostic message **SPEED** will flash on the control panel and the rotor will decelerate to a stop.
- *Temperature compensation.* The displayed temperature will be rotor temperature (after equilibration).

The rotor code can be displayed by pressing **(ROTOR)** again. Pressing **(ENTER/RECALL)** displays the set speed, not the rotor code. The speed setting automatically resets to zero after a rotor code is entered.

(SPEED)

Before entering a run speed, you must have selected a rotor (see instructions above).

To enter or modify the run speed:

1. Press **(SPEED)**. The SPEED display flashes.
2. Use the keypad to enter the required run speed (100 to 21 000 rpm).

Example: To enter 20 000 rpm,
press **(2)** and “2” flashes
press **(1)** and “21” flashes
press **(0)** and “210” flashes
press **(0)** and “2100” flashes
press **(0)** and “21000” flashes

3. Check the SPEED display. If the entry is incorrect, press **(CE)** and enter the correct value.
4. Press **(ENTER/RECALL)** or press another parameter key to save the run speed. If the run speed is greater than that permitted for the selected rotor, the digits will flash rapidly to indicate the error. Press **(CE)** and enter a valid run speed.

The run speed can be changed at any time during the run (except when the key switch is in the PROGRAM LOCK position), and the rotor will accelerate or decelerate to the new speed.

(TIME)

To enter or modify the run time:

1. Press **(TIME)**. The TIME display flashes.
2. Use the keypad to enter the required run time (0 to 99 hours 59.9 minutes). For a continuous (hold) run, enter 9999. Tenths of minutes are entered by first pressing **(±.)**.

Example: To enter 1 hr, 20 min,
 press (1) and “: 1.0” flashes
 press (2) and “:12.0” flashes
 press (0) and “1:20” flashes
 press (0) and “1:20.0” flashes
 To add 0.5 min to this time,
 press (±) (5) and “1:20.5” flashes

Example: To designate a hold run,
 press (9) (9) (9) (9) and “99.99.0” flashes

3. Check the TIME display. If the entry is incorrect, press (CE) and enter the correct value.
4. Press (ENTER/RECALL) or press another parameter key to save the run time.

In a timed run, the TIME display will show the time remaining in the run. (The display counts down in tenths of minutes, changing every 6 seconds.) The time begins counting down after (START) has been pressed, and the run ends when the time value reaches zero.

In a hold run, the TIME display will show the time elapsed in the run. (The display counts up in minutes, changing every minute.) The time begins counting up after (START) is pressed; a capital H is displayed in the “tenths” position. Press (STOP) to end a hold run.

(TEMP)

To enter or modify the run temperature:

1. Press (TEMP). The TEMPERATURE display flashes.
2. Use the keypad to enter the required run temperature (-20 to 40°C). Press (±) for a minus sign. (Press (±) again to remove the minus sign.) The plus sign is not displayed.

Example: To enter -4°C,
 press (±) and “-0” flashes
 press (4) and “-4” flashes

3. Check the TEMPERATURE display. If the entry is incorrect, press **CE** and enter the correct value.
4. Press **ENTER/RECALL** or press another parameter key to save the run temperature.

During the run, the display will indicate *rotor* temperature after equilibration. To verify the accuracy of the temperature sensing system, perform a temperature calibration procedure as described in Section 5, CARE AND MAINTENANCE.

ACCEL and **DECEL**

Two acceleration and deceleration settings are available. The selected acceleration and/or deceleration settings are displayed in the ACCEL and DECEL display area. If no rates are selected, the maximum rates will be selected automatically and *no numbers will appear in the displays*.

To enter or modify an acceleration setting:

1. Press **ACCEL**. The ACCEL display flashes.
2. Use the keypad to enter the required acceleration setting.

Keyboard Digit	Acceleration Rate (time from 0 to 500 rpm; above 500 rpm, maximum acceleration to run speed)
1	2 minutes
2	45 seconds
no entry	maximum acceleration from 0 rpm to run speed

3. Check the ACCEL display. If the entry is incorrect, press **CE** and reenter the digit.
4. Press **ENTER/RECALL** or press another parameter key to save the acceleration setting.

To enter or modify a deceleration setting:

1. Press **DECEL**. The DECEL display flashes.
2. Use the keypad to enter the required deceleration setting.

Keyboard Digit	Deceleration Rate
0	Coast (no brake) from run speed to 0 rpm
1	Maximum brake to 500 rpm, then coast to 0 rpm
no entry	Maximum brake from run speed to 0 rpm

3. Check the DECEL display. If the entry is incorrect, press **(CE)** and reenter the digit.
4. Press **(ENTER/RECALL)** or press another parameter key to save the deceleration setting.

NOTE

To clear an ACCEL or DECEL entry, press **(ACCEL)** or **(DECEL)**, **(CE)** and **(ENTER/RECALL)**. The number will disappear from the display, and the maximum rate will be used.

COMP ADJ

The **(COMP ADJ)** key is used to add or subtract from the temperature compensation values used by the microprocessor to calculate rotor temperature. Its use is optional.

If the results of a dynamic temperature calibration (described in Section 5, CARE AND MAINTENANCE) indicate that the rotor is warmer or cooler than the displayed temperature, use the **(COMP ADJ)** key to adjust the temperature compensation values. For example, if a dynamic calibration shows that the rotor is -6°C and the display showed -4°C , the rotor was too *cold* and 2°C should be added to the compensation values (that is, +2 is the COMP ADJ value). If the rotor is too *warm*, subtract the temperature difference (that is, use negative COMP ADJ digits).

To add or subtract from the temperature compensation value:

1. Press **(COMP ADJ)**. The word “COMP” flashes below the TEMPERATURE display.
2. Use the keypad to enter the digit(s) representing the temperature compensation adjustment. Press **(±)** for a minus sign. Press **(±)** again to remove the minus sign.

3. Check the TEMPERATURE display. If the entry is incorrect, press **CE** and reenter the digit(s).
4. Press **ENTER/RECALL** or press another parameter key to save the temperature compensation adjustment.

NOTE

To clear a COMP ADJ entry, press **COMP ADJ**, **0**, and **ENTER/RECALL**.

PROG RECALL and
PROG SAVE

Up to ten sets of run parameters, called programs, can be stored. Programs are stored and recalled by keypad number. Programs are retained when the power is turned OFF, and are NOT cleared by pressing **CE**.

To recall a stored program:

1. Press **PROG RECALL**.
2. Use the keypad to enter the program number (0 through 9).

The run parameters for that program will be displayed for 3 seconds. The program can then be displayed by pressing **ENTER/RECALL**. (You must press **ROTOR** and **COMP ADJ** to display those entries.) To start the run using the program, press **START**.

If run parameters have not been entered for a selected program number, the number will continue to flash in the PROGRAM display. Zeros will be displayed for all of the parameters except temperature, which will show 25°C (the default value). See below for instructions on entering or modifying run parameters in a program.

PROGRAM LIBRARY	
PROG.	DESCRIPTION/PARAMETERS
0	
1	
2	
3	
4	
5	
6	
7	
8	
9	

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NOTE

Erasable labels are provided to record the program library. The labels may be affixed to the centrifuge next to the control panel.

To enter or modify a program:

1. Press **PROG RECALL**.
2. Use the keypad to enter a program number (0 through 9).

3. Press a parameter key (for example, **(SPEED)**). Both the PROGRAM display and the display corresponding to the key pressed will flash.
4. Use the keypad to enter the required setting. If you change the ROTOR selected, you must re-enter a speed.

NOTE

DO NOT press **(ENTER/RECALL)** to save the setting. Pressing **(ENTER/RECALL)** will enter the setting into the microprocessor but NOT into the program memory.

5. Press the next parameter key (for example, **(TEMP)**). The previously entered setting is saved, and the microprocessor is ready for the next setting. Repeat step 4.
6. When all the run parameters have been entered, press **(PROG SAVE)**. The number in the PROGRAM display flashes twice as the settings are stored. The run parameters appear in the displays for 3 seconds and can then be recalled by pressing **(ENTER/RECALL)**.
7. To start the run using this program, press **(START)**.

To modify a program for a single run:

The procedure above discusses how to modify a program and save the changes. The instructions below describe how to change one or more run parameters for a single run, without saving the changes.

1. Press **(PROG RECALL)**.
2. Use the keypad to enter the program number (0 through 9).
3. Press a parameter key (for example, **(SPEED)**). Both the PROGRAM display and the display corresponding to the key pressed will flash.
4. Use the keypad to enter the required setting. If you change the ROTOR selected, you must re-enter a speed.
5. Press **(ENTER/RECALL)**. The setting will be accepted by the microprocessor but will not be saved to the program memory.

The parameters for the run will be displayed for 3 seconds. The PROGRAM display then clears, indicating that the centrifuge is not running from program memory.

6. Repeat steps 3 through 5 to change any other settings.
7. To start the run using this set of parameters, press **(START)**.

START

Press **START** to start a run. The green light above the switch indicates that the rotor is accelerating or at speed. (For repeat runs and all runs in the PROGRAM LOCK mode, press **ENTER/RECALL** then **START** to start the run.)

STOP

Press **STOP** to end a run. The green light above the switch indicates that the rotor is decelerating. The light goes out and a tone sounds when the rotor stops.

SUMMARY OF MODEL J2-MC OPERATING STEPS

To operate in the NORMAL mode:

Make sure that the power switch is turned on (I), then

1. Turn the key to the NORMAL position.
2. Enter the required settings for ROTOR, SPEED, TEMP, and TIME.
3. Enter ACCEL, DECEL, and COMP ADJ settings as required.
4. Press **START**. Press **STOP** to end a hold run. Timed runs will end when the TIME display reaches zero.
5. After the rotor stops, as signaled by the audible tone, open the chamber door and remove or empty the rotor.

To repeat the run, press **ENTER/RECALL**, then **START**.

To operate in the ZONAL mode:

1. Turn the key switch to the ZONAL position.
2. Enter the following parameters:
 - 20.9 for the JCF-Z continuous flow/zonal ROTOR
 - 2000 rpm for SPEED
 - 9999 for TIME
 - TEMP as required

3. Enter optional parameters if required: ACCEL, DECEL, and COMP ADJ.
4. Press **(START)**.
5. When the rotor is spinning at 2000 rpm, load the rotor.
6. After loading, remove the fittings and liquid lines from the chamber. Reinstall stoppers in all portholes.
7. Close the chamber door.
8. Enter the run speed. The FRS comes on. The rotor accelerates to set speed. Use an auxiliary timer to indicate the end of the run.
9. When the run is complete, enter 2000 rpm for SPEED. The FRS shuts off, the rotor decelerates to 2000 rpm, and the door unlocks.
10. Open the chamber door and unload the rotor.
11. After unloading, press **(STOP)**.

To operate in the PROGRAM LOCK mode:

Enter program run settings following the directions for use of the **(PROG RECALL)** and **(PROG SAVE)** keys, earlier in this section. Then recall and run the program as follows.

1. Use the keypad to enter a program number (0 through 9).
2. Turn the key switch to PROGRAM LOCK. Remove the key if required.
3. Press **(ENTER/RECALL)**, then **(START)**.

Once in the PROGRAM LOCK mode, **(ENTER/RECALL)**, **(START)**, and **(STOP)** are the only functional control panel keys. Run parameters cannot be changed and diagnostic messages cannot be cleared until the key is turned to NORMAL.

NOTE

If **(STOP)** is used to end a PROGRAM LOCK run, the diagnostic message RESET will flash on the control panel. To clear the message, first turn the key to NORMAL, then press **(CE)**.

Troubleshooting

This section discusses diagnostic messages, together with probable causes and recommended actions. Other troubleshooting procedures are also provided.

DIAGNOSTIC MESSAGES

In the event of certain abnormal conditions, one of the diagnostic messages shown in Figure 4-1 will flash on the control panel. The message will flash until the **CE** key is pressed (see Table 4-1). In the case of the BELT, DOOR, IMBAL, and SPEED diagnostics, the drive cannot be restarted until the condition is corrected.

If the key switch is in the PROGRAM LOCK position, turn the key to NORMAL and then press **CE** to clear a flashing message.

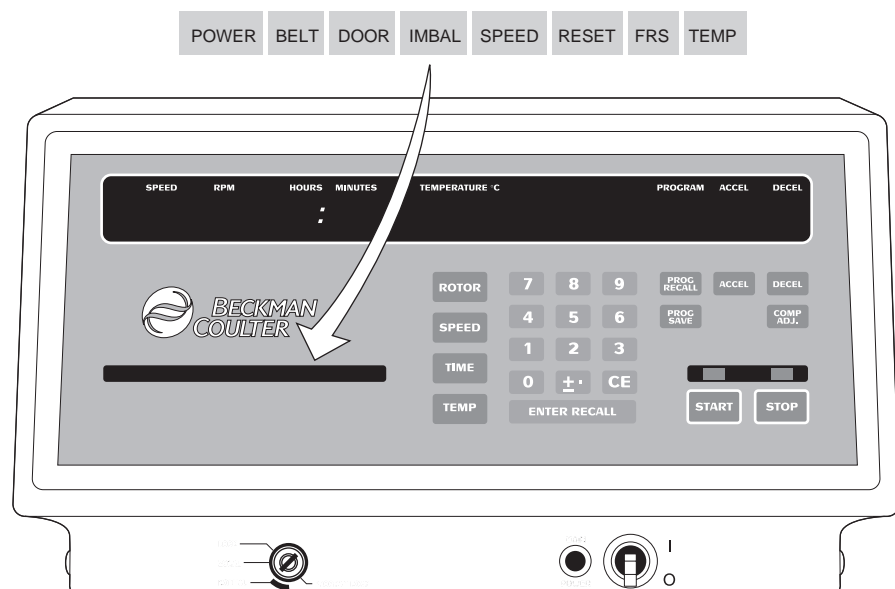


Figure 4-1. Location of the Diagnostic Messages on the Control Panel

Table 4-1. Diagnostic Messages

Message	Problem	Recommended Action
POWER	There was a power failure.	If facility power failed only momentarily, the rotor will accelerate back to speed and the run will continue. The POWER message flashes until (CE) is pressed, alerting the operator of the interruption. If the power failure was long enough to allow the rotor to coast to a stop, the run will not continue when power is restored. Press (CE) , (ENTER/RECALL) , and (START) to restart the run.
BELT	The drive belt is broken.	Allow the rotor to coast to a stop (wait at least 20 minutes). The drive belt must be replaced before the centrifuge will operate again. Instructions are provided in MAINTENANCE. Press (CE) and turn POWER OFF.
DOOR	The chamber door is open.	Close the chamber door. Press (CE) , (ENTER/RECALL) , and (START) .
IMBAL	The rotor is unbalanced.	Allow the rotor to brake to a stop. Then open the door and check the rotor for proper loading. Do not restart the run until you are sure the rotor is symmetrically loaded. To restart the run, press (CE) , (ENTER/RECALL) , and (START) .
SPEED	There is an electronics malfunction.	Call Beckman Coulter Field Service.
RESET	The (STOP) key was pressed while operating in PROGRAM LOCK mode.	The rotor will decelerate according to the program. To clear the message, turn the key to NORMAL, then press (CE) . To start the next run, turn the key back to PROGRAM LOCK, then press (ENTER/RECALL) and (START) .
FRS	The Friction Reduction System is malfunctioning.	FRS failure may be due to a dirty chamber gasket, sample leakage, or leakage around the port holes in the chamber wall while using the JCF-Z rotor. Press (CE) to clear the message. After the run, check for leakage. Clean the chamber gasket with a tissue and 70% ethanol* (do not grease it). Also, check that the FRS filter bottles are tightly screwed into their lids (location shown in Figure 5-2). If FRS problems continue, contact Beckman Coulter Field Service.
TEMP	The refrigeration system is not cooling and rotor temperature has exceeded set temperature by more than 4°C; or the rotor chamber has exceeded 45°C.	The rotor will decelerate to a stop. Press (CE) and turn POWER OFF. Call Beckman Coulter Field Service; there has been a refrigeration malfunction.
brush (appears in SPEED display)	The motor brushes need replacing.	This message will only be on when rotor speed is 0 rpm. Acts as a reminder that motor brushes need replacing (described in Section 5, CARE AND MAINTENANCE) before the next run; does not affect centrifuge operation. Do not run the centrifuge longer than 8 hours after the diagnostic appears.

*Flammability hazard. Do not use in or near operating centrifuges.

OTHER PROBLEMS

Table 4-2 lists other problems and the recommended actions to take to correct them. If the problem persists, contact Beckman Coulter Field Service for assistance.

Table 4-2. Other Problems

Problem	Recommended Action
Rotor seems too warm or too cold.	To verify the accuracy of temperature control, perform a dynamic temperature calibration (described in Section 5, CARE AND MAINTENANCE). It may be necessary to adjust the automatic temperature compensation when using that rotor at that speed and temperature. Low temperatures cannot be achieved with all rotors at all speeds.
Centrifuge will not start.	<ol style="list-style-type: none"> 1. Check the key switch. The centrifuge will not operate with the key in the LOCK position. 2. Press ENTER/RECALL, then START. 3. Clear any flashing messages. 4. Be sure to enter ROTOR, then SPEED, TIME, and TEMP. (When ROTOR is entered, the run speed automatically resets to zero.)
Rotor is stuck to drive spindle hub.	<p>Allow the rotor to come to room temperature and then try to remove it. If the rotor is still stuck, use the T-bar removal tool (338896). First remove the rotor lid. For JA-17, -20, -20.1, and -21 rotors, also remove the small O-ring and slide the aluminum collar (338689) sideways into the empty O-ring groove. Then screw the removal tool into the center of the rotor to separate the rotor from the spindle. For JA-18 and JS-13.1 rotors, use the removal procedures described in the rotor manual.</p> <p>To avoid this problem, keep the spindle hub lightly lubricated with Spinkote.</p>

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 centrifuge from the main power source, 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, it may be necessary to override the door-locking mechanism manually to remove the rotor and retrieve your sample.



WARNING

Never try to slow or stop the rotor by hand.

Allow at least 20 minutes for the rotor to coast to a stop. (The digital display and the brake will be inoperative with the power off.) To trip the door lock, insert a thin wire such as a straightened paper clip one inch *straight* through the hole below the chamber door handle (see Figure 4-2). While holding the wire in the hole, pull the door latch lever forward and then lift up on the handle. Remove your sample.

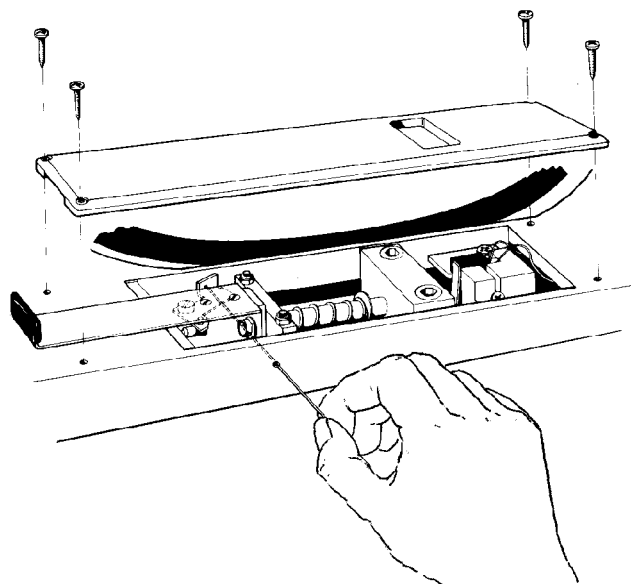


Figure 4-2. Tripping the Door Lock

Care and Maintenance

This section describes routine care and maintenance procedures. For maintenance not covered in this manual, contact Beckman Coulter Field Service.¹ Refer to the applicable rotor manual and to Rotors and Tubes for J Series Centrifuges (publication JR-IM) for instructions on the care of rotors and their accessories.

 **NOTE**

It is your responsibility to decontaminate the centrifuge, as well as any rotors and 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, and refer such servicing to qualified service personnel.



WARNING

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

¹ In the U.S., call 1-800-551-1150. Outside the U.S., contact your local Beckman Coulter office.

MAINTENANCE

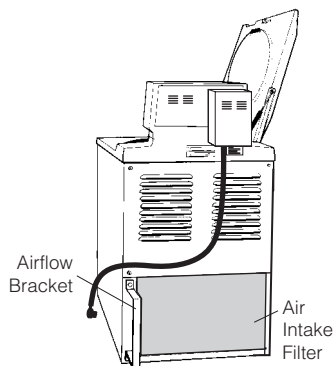
Perform the following procedures regularly to ensure continued performance and long service life of the centrifuge.

Regularly inspect the interior of the centrifuge chamber for accumulations of sample, dust, or glass particles from broken sample tubes. Clean as required (see CLEANING below).

DEFROSTING

Use a clean cloth or sponge to wipe condensation out of the rotor chamber between runs to prevent chamber icing. The rotor chamber should be defrosted *daily* if routine low-temperature work is being done. Defrost the system by leaving the door open with the power off (O) overnight. Then remove moisture from the chamber before use. To remove icing more quickly, set the temperature to 40°C and run a rotor at maximum speed for 5 minutes. Then remove the rotor and sponge up the water.

REPLACING THE AIR FILTER



Check the air filter regularly and replace it every three months or as required. Efficiency of the refrigeration system may be seriously reduced by buildup of dust on the filter. The air filter 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. Pull the filter out, bottom edge first, and discard it.
2. Install a new filter (885218) or use any commercially available filter (400 × 600 mm; 16 × 25 in.). The filter has a directional arrow on one of its edges; install the filter with this arrow pointing toward the centrifuge. Holding the filter by the side edges, insert the top half behind the frame edge and lift up until the bottom half clears the lower frame edge. Then set the bottom edge down.

CLEANING

Frequent cleaning is recommended to prolong the life of the centrifuge. Always clean up spills when they occur to prevent corrosives or contaminants from drying on component surfaces.

- 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. For thorough cleaning, wash the chamber using a mild detergent such as Beckman Solution 555™, diluted 10 to 1 with water. Rinse thoroughly and dry completely.

Clean the chamber gasket regularly by wiping it with a tissue and 70% ethanol,² but do not lubricate it.

- Clean the centrifuge exterior surfaces by wiping with a cloth dampened with Solution 555, diluted 10 to 1 with water. Do not use acetone.
- The control panel is coated with a mylar finish. Use only a cloth dampened with water on the control panel.
- Clean the drive spindle hub regularly using Solution 555 (diluted 10 to 1 with water) and a soft brush. Rinse thoroughly and dry completely. Lubricate the hub with Spinkote to prevent rotors from sticking.

Tube Breakage

If a glass tube breaks, and all the glass is not contained in the bucket or rotor, carefully clean the interior of the chamber.



WARNING

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

- Examine the chamber gasket to make sure that no glass particles are retained in it. Carefully remove any glass particles that may remain.
- 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 *Chemical Resistances* (publication IN-175) to be sure the decontamination method will not damage any part of the instrument.

² Flammability hazard. Do not use in or near operating centrifuges.

STERILIZATION AND DISINFECTION

The centrifuge door is finished with urethane paint; other surfaces are finished with vinyl paint. Ethanol (70%)³ may be used on these surfaces. See publication IN-175 for chemical resistances of centrifuge and accessory materials.

While Beckman Coulter has tested these methods and found that they do 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 DRIVE BELT

If the diagnostic message BELT is flashing on the control panel, replace the drive belt. When the SPEED display indicates 0 rpm, turn the power off (O).



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, and refer such servicing to qualified service personnel.

1. Remove the lower front panel by unscrewing the two nuts under the bottom edge of the panel with a 12-mm (7/16-in.) wrench. Visually confirm that the pulleys have stopped turning.
2. Remove the two screws mounting the drive control board chassis to the frame. Carefully remove the chassis (it is still wired to the instrument) and set it flat. Find the broken belt and remove it.
3. Disconnect the connector marked RTR (see Figure 5-1).
4. To install a new belt, first fit the belt over the cable from the spindle tach and RTR connector into the spindle pulley groove, *keeping the serrated surface of the belt to the outside*. With your left hand, hold the belt taut, stretching it toward the motor pulley. With your right hand, push against the motor to extend the spring, and then fit the belt into the groove around the spindle pulley. Gradually release the motor; spring tension will tighten the belt.

³ Flammability hazard. Do not use in or near operating centrifuges.

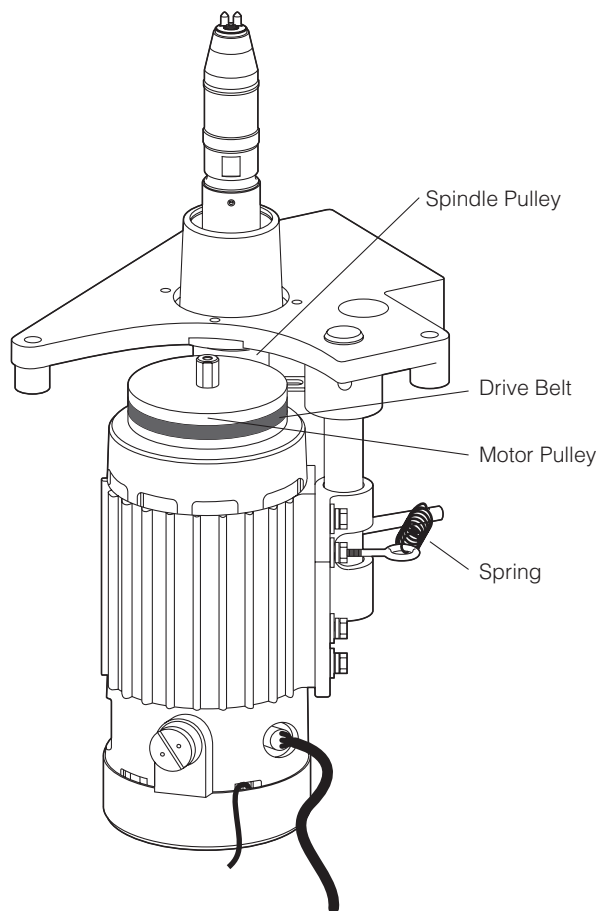


Figure 5-1. Replacing the Drive Belt

5. Reconnect the spindle tach cable (RTR) to its matching harness connector.
6. Locate the drive belt safety interlock. Reconnect it.
7. Replace the current control board, mounting it to the frame with the two screws removed in Step 2.
8. Install the front panel and then reconnect the centrifuge to the power source.
9. Turn the power on (I), press **CE**, and make a brief test run—accelerate to speed and then decelerate—to verify that the centrifuge functions normally.

If a problem persists, contact Beckman Coulter Field Service for assistance.

REPLACING THE DRIVE MOTOR BRUSHES



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, and refer such servicing to qualified service personnel.

The diagnostic *brush* appearing in the SPEED display indicates that the two drive-motor brushes need replacing. Both brushes, the wired brush and the unwired brush, must be replaced at the same time. It is not necessary to abort a run that will take fewer than 8 hours of additional centrifuge time; however, the brushes should be changed as soon as possible.



CAUTION

Complete replacement of the motor will be necessary if the centrifuge is operated for a significant time (over 8 hours) after the brush diagnostic comes on.

1. Remove the two nuts along the bottom edge of the front instrument panel and set the panel aside. Push against the motor so that the motor swings to the rear and the spring (Figure 5-2) is extended. This slackens the drive belt. Remove the belt from the motor pulley. Slowly release the motor, allowing the spring to contract and the motor to swing toward you.
2. Raise the motor with one hand and pull out the support rod. Grasp the motor mounting bracket and lower the motor gently to the floor.
3. To replace the wired brush, disconnect the purple brush wire by grasping the two halves of the plastic connector and pulling the halves apart. *Don't pull on the wire.* Remove the brush from the motor by unscrewing the brush cap counterclockwise with the tool provided in the new brush kit (367800). Remove the old brush assembly (and wire) from the holder (see Figure 5-3). The worn end of the wired brush will show copper if the brushes are worn out.

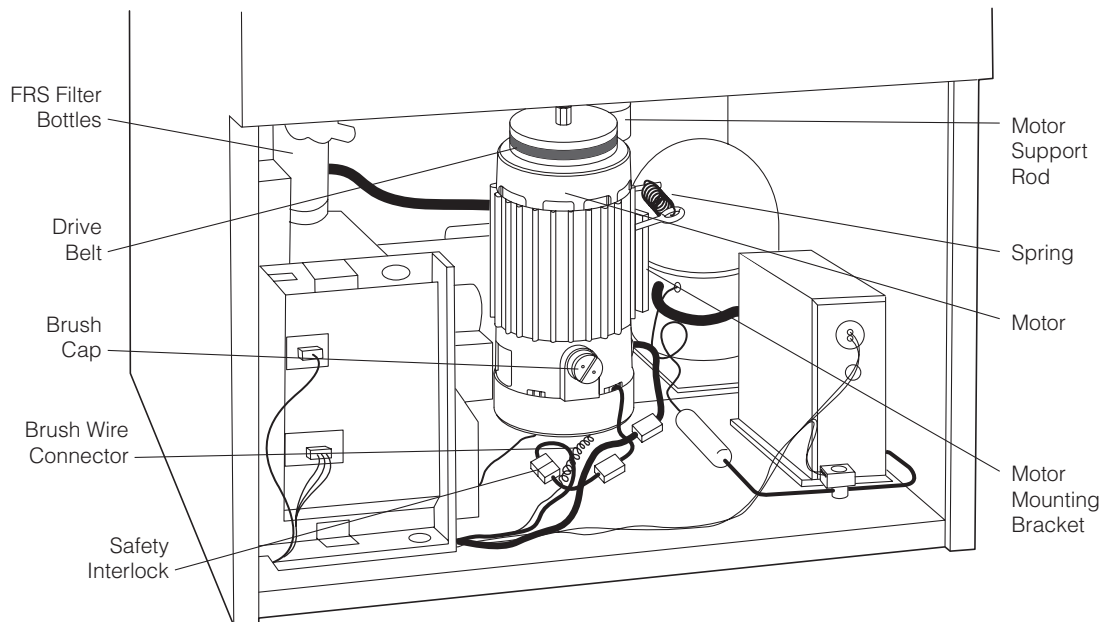


Figure 5-2. Drive System

4. Install the new wired brush assembly and cap in the holder. Reassemble the brush wire connector. Use the tool (Step 3) to tighten the cap firmly into the holder, ensuring good electrical contact. Be careful not to damage the wire.
5. The unwired brush is on the opposite side of the motor from the wired brush. Remove and replace the unwired brush assembly and cap in the same manner as above.
6. Reverse the motor removal procedure to reinstall the motor. Make sure the support rod is pushed all the way in, or vibration could dislodge the motor.
7. To complete the installation, reinstall the drive belt (see DRIVE BELT REPLACEMENT above). Reinstall the front instrument panel. When power has been restored to the centrifuge and the POWER switch is turned on (I), the brush diagnostic should no longer appear in the SPEED display area.
8. *With no rotor in the centrifuge*, run the centrifuge at 15 000 rpm for as long as possible up to 8 hours (run at *least* 30 minutes) to make sure that the new brushes are properly seated. Failure to run-in the brushes will lead to very short brush life and the possibility of significant motor damage.

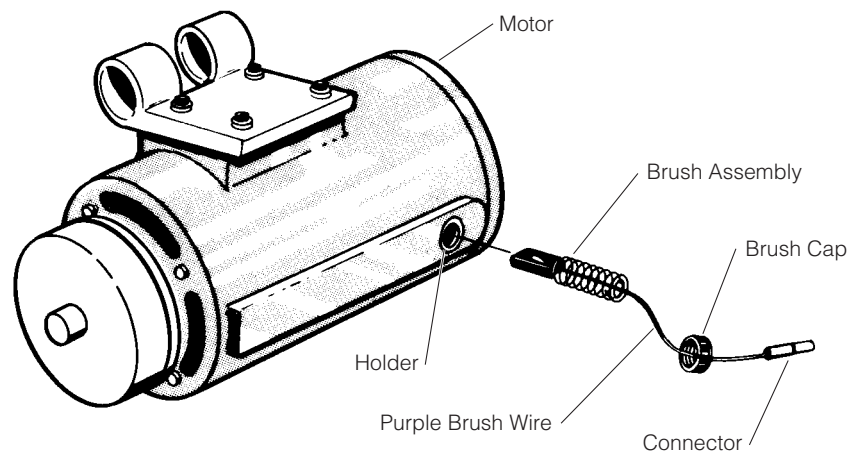


Figure 5-3. Removing the Wired Brush Assembly for Replacement

TEMPERATURE CALIBRATION

The following dynamic temperature calibration procedure will verify the accuracy of the temperature sensing and refrigeration systems. Perform this procedure when temperature control within $\pm 1^\circ\text{C}$ is required.

Test the rotor at the run speed and temperature required for sample separation. You will need a thermometer calibrated in 0.2°C , and two large bottles or tubes of water. *Precool* the rotor and water to the approximate run temperature.

1. Turn the power on (I), and turn the key switch to NORMAL.
2. Open the chamber door and install the precooled rotor. Load two tubes or bottles containing equal volumes of water into opposing rotor positions. Then close the chamber door.
3. Enter the **(ROTOR)** code.
4. Enter **(SPEED)** and **(TEMP)** settings. Enter 9999 for **(TIME)**.
5. Press **(START)**.
6. After about one hour of centrifugation, record the temperature in the digital display. Then press **(STOP)**.
7. As soon as the STOP light goes out, open the chamber door and immerse the thermometer into one of the water-filled containers to precool it. Then measure and record the temperature of the second water-filled container.

8. Compare the two recorded temperatures. If the rotor temperature is warmer or cooler than the *displayed* temperature, add or subtract the temperature difference using the **(COMP ADJ)** key when repeating these run conditions.
 - If the rotor is warmer, enter negative digits.
 - If the rotor is cooler, enter positive digits. (A plus sign is not displayed.)

Refer to the discussion under **(COMP ADJ)** in Section 3, OPERATION.

This calibration procedure should be performed for each rotor at run speed and temperature before using the **(COMP ADJ)** key. Once determined, enter the **(COMP ADJ)** digits for each run that uses the same rotor and same run conditions.

MOVING AND STORING THE CENTRIFUGE

If it is necessary to move the centrifuge, do the following.

1. Make sure that the power is turned off (O), then disconnect the centrifuge from the main power source.
2. Use a 19-mm ($\frac{3}{4}$ -in.) wrench to raise the two front feet. As the feet screw into the centrifuge, the caster foot lowers until the centrifuge will roll freely.
3. Roll the centrifuge back-first to the new site. *Push against the front of the instrument only; do not push on the control panel.* The rear casters do not swivel.
4. Readjust the front feet until the front caster is off the floor and the centrifuge is level to the eye (see Figure 5-4). Be sure both front feet are firmly in contact with the floor, and have equal pressure.

STORAGE

Before storing a centrifuge for an extended period, cover the centrifuge to protect it from dust and dirt. Temperature and humidity conditions for storage should meet the environmental requirements described under SPECIFICATIONS.

SUPPLY LIST

Refer to the *High Performance, High Speed, High Capacity Rotors, Tubes & Accessories* catalog (BR-8102, available at www.beckmancoulter.com) and the applicable rotor manual for materials and supplies needed.

NOTE

To receive copies of referenced publications, contact
 Beckman Coulter, Inc., Technical Publications
 Department, 1050 Page Mill Road, Palo Alto, CA
 94304, U.S.A., Telephone (650) 859-1753; Fax
 (650) 859-1375.

Air filter (1)	885218
Drive belt	976937
Drive Brush Kit	367800
Beckman Solution 555 (1 qt)	339555
Rotor Cleaning Kit	339558
Spinkote lubricant (2 oz)	306812
Silicone vacuum grease (1 oz)	335148

WARRANTY FOR THE MODEL J2-MC CENTRIFUGE

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 Model J2-MC 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 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.

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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.

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