

SORVALL[®]

SORVALL[®]

RT7

**OPERATING
INSTRUCTIONS**

 **Kendro**
Laboratory Products

OPERATING INSTRUCTIONS

SORVALL[®] RT7 *Tabletop Centrifuges*

Kendro Laboratory Products
Newtown, Connecticut
U.S.A.

SORVALL[®]

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Laboratory Products

This manual is a guide for use of the

SORVALL® RT7 **Tabletop Centrifuges**

Data herein has been verified and is believed adequate for the intended use of the centrifuge. Because failure to follow the recommendations set forth in this manual could produce personal injury or property damage, always follow the recommendations set forth herein. Kendro Laboratory Products does not guarantee results and assumes no obligation for the performance of products that are not used in accordance with the instructions provided. This publication is not a license to operate under, nor a recommendation to infringe upon, any process patents.


Publications prior to the Issue Date of this manual may contain data in apparent conflict with that provided herein. Please consider all data in this manual to be the most current.

NOTE, CAUTION, and WARNING within the text of this manual are used to emphasize important and critical instructions.

WARNING informs the operator of a hazard or an unsafe practice that could result in personal injury, affect the operator's health, or contaminate the environment.

CAUTION informs the operator of an unsafe practice that could result in damage of equipment.

NOTE highlights essential information.

CAUTION and **WARNING** are accompanied by a hazard symbol  and appear in the left sidebar near the information they correspond to.

Important Safety Information

Certain potentially dangerous conditions are inherent to the use of all centrifuges. To ensure safe operation of this centrifuge, anyone using it should be aware of all safe practices and take all precautions described below and throughout this manual.



WARNING

Use SORVALL® rotors only. Use of another manufacturer's rotor can cause rotor failure which could result in personal injury and/or centrifuge damage.

When using radioactive, toxic, or pathogenic materials, be aware of all characteristics of the materials and the hazards associated with them in the event leakage occurs during centrifugation. In the event of a rotor failure, neither the centrifuge nor the rotor can protect you from particles dispersed in the air. To protect yourself, we recommend additional precautions be taken to prevent exposure to these materials, for example, use of controlled ventilation or isolation areas.

Always be aware of the possibility of contamination when using radioactive, toxic, or pathogenic materials. Take all necessary precautions and use appropriate decontamination procedures if exposure occurs.

Never use any material capable of producing flammable or explosive vapors or creating extreme exothermic reactions.

Never exceed the maximum rated speed of the installed rotor; to do so can cause rotor failure.

Always reduce (derate) rotor speed as instructed in this manual whenever:

- the rotor speed/temperature combination exceeds the solubility of the gradient material and causes it to precipitate.
- the compartment load exceeds the maximum allowable compartment load specified. See Chapter 3, Basic Operation.

Failure to reduce rotor speed under these conditions can cause rotor failure.



CAUTION

Do not operate or precool a rotor at the critical speed, as this will have a detrimental effect on centrifuge component life (see individual rotor instruction manual).

Do not operate the centrifuge with the rotor out of balance. Operating the rotor out of balance can cause damage to the centrifuge drive assembly.

Do not operate the centrifuge unless the rotor is properly seated on the drive spindle and locked in place. See the rotor instruction manual.

Locate the centrifuge on a level surface to avoid rotor imbalance during operation.

The centrifuge can be damaged if it is connected to the wrong voltage. Check the voltage before plugging the centrifuge into a power source. Kendro is not responsible for incorrect installation. See Chapter 2, Installation.

Always maintain the centrifuge in the recommended manner. See Chapter 4, Care and Maintenance.

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Chapter 1: DESCRIPTION

This manual provides you with the information you will need to install, operate and maintain your SORVALL® RT7 Tabletop Centrifuge. If you encounter any problem concerning either operation or maintenance that is not covered in the manual, please contact Kendro for assistance. In the United States, call toll free (800) 522-SPIN (800 522-7746). Outside the United States, contact your local distributor or agent for SORVALL® products.

Centrifuge Description

The RT7 combines the features of the tabletop centrifuge and those of the larger refrigerated centrifuge in a compact tabletop instrument. It is similar to other SORVALL® Tabletop Centrifuges, with an added refrigeration system that consists of an evaporator/rotor chamber and a low-temperature condensing unit.

The RT7 features digital readout displays, a closed-loop speed control and has a tachometer port that allows rotor calibration. The chamber door is counterbalanced for easy opening and safe closing. The lid latch is locked manually by turning the door release knob counterclockwise to the LOCKED position, then mechanically an interlock engages when the rotor begins spinning to prevent the chamber door from being opened during operation. The gyro-action, self-centering drive has a hex drive spindle which assures proper seating of rotors. The centrifuge also has a slow-start feature that slowly accelerates the rotor from 0 to 500 rpm.*

Centrifuge Specifications

Maximum Speed**	7000 rpm
Temperature Control Range	-5°C to +25°C ¹
Temperature Control Accuracy	±2°C
Maximum heat output during operation	3156 Btu per hour

(continued)

*Speed in revolutions per minute (rpm) is related to angular velocity, ω , according to the following:

$$\omega = (\text{rpm}) \left(\frac{2\pi}{60} \right) = (\text{rpm}) (0.10472)$$

Where ω = rad/s. All further references in this manual to speed will be designated as rpm.

** Maximum speed is dependent on rotor and line voltage.

¹ See page 3-8, Rotor Speed/Temperature Differential Compensation.

Centrifuge Specifications, cont'd

Electrical Requirements 115 Vac, 60 Hz, 15A, single phase*
220-240 Vac, 50 Hz, 8A, single phase*

Dimensions:

Width 81 cm (32 inches)
Depth 64 cm (25 inches)
Height 32 cm (12.5 inches)

Mass (Weight) 83 kg (182 lbs)

* CSA and UL approved.



WARNING

Always reduce (derate) rotor speeds of the installed rotor as instructed in the Rotor Manual whenever the compartment load exceeds the maximum allowable compartment load specified. Failure to reduce rotor speed under these conditions can cause rotor failure.

Rotors

The table below lists the rotors available for the RT7 Centrifuge. For more information about other rotor accessories and tubes refer to the most current SORVALL® Product Guide.

Table 1.1 Rotor Specifications

Rotor	Maximum Operating Speed (rpm) in RT7	Maximum Compartment Mass (grams)	Maximum Relative Centrifugal Force (RCF) in RT7
SL-50RT Fixed Angle Rotor	7000	200	5840
RTH-250 Swinging Bucket Rotor	3200	1175**	2135 ¹
RTH-750 Swinging Bucket Rotor	4000	1805**	3313 ¹

** Includes bucket, adapter, tubes, caps and samples.
¹ With buckets.

Chapter 2: INSTALLATION

This chapter contains instructions to prepare your SORVALL® RT7 Tabletop Centrifuge for operation.



WARNING

The RT7 uncrated weighs 83 kg (182 lbs). Be careful when lifting and installing the centrifuge. Failure to use proper lifting techniques can result in personal injury and/or possible damage to the centrifuge.



CAUTION

Do not lift the centrifuge by the front panel or the lid. To do so can result in damage to these parts. Do not place the RT7 on its side; any position other than upright can cause compressor contamination.



CAUTION

The centrifuge can be damaged if connected to the wrong voltage. Check the voltage before plugging the centrifuge into any power source. Sorvall is not responsible for incorrect installation.

Inspection

When you receive your centrifuge, carefully inspect it for any signs of shipping damage. If you find damage, report it immediately to the transportation company and file a damage claim, then notify Kendro.

Check the parts received with the centrifuge against the shipping list; if any parts are missing, contact Kendro (see back cover).

Electrical Requirements

The centrifuge has specific power requirements and must be connected to the correct supply for proper performance. The nameplate on the back of the cabinet specifies one of the following:

115 Vac (+3% -5%), 60 Hz, single phase, 15 A*
220-240 Vac (230 nom., +3% - 5%), 50 Hz, single phase, 8 A*

The power cord has a universal keyed plug that inserts into the receptacle at the back of the centrifuge. The other end of the power cord has a NEMA5-15P, three-prong molded cap with a ground pin and parallel blades. The plug will fit Hubbell receptacle No. 5261 for 115 volt (parallel blades) or receptacle No. 5561 for 220 volt (tandem blades). The power cord must be attached when the centrifuge is installed.

Installation

To install the centrifuge:

1. Place the centrifuge on a sturdy bench or work table that will support its weight leaving space for sample preparation. Be sure to leave a minimum clearance of 5 cm (2 inches) on all sides.

*CSA certified, UL listed

2. Insert the universal keyed end of the power cord into the receptacle at the back of the centrifuge.
3. Make sure the centrifuge is level. If necessary, place the leveling pads provided under the corners of the centrifuge.
4. Make sure the POWER is set to "0" (off position), then plug the power cord into a wall receptacle. The centrifuge is now ready for use.

Chapter 3: OPERATION

This chapter describes the function of each operating control and indicator and provides the information necessary to operate your SORVALL® RT7 Centrifuge.

Controls and Indicators

Figure 3-1 shows the location of operating controls and indicators. Table 3-1 lists them by item number and describes their function.

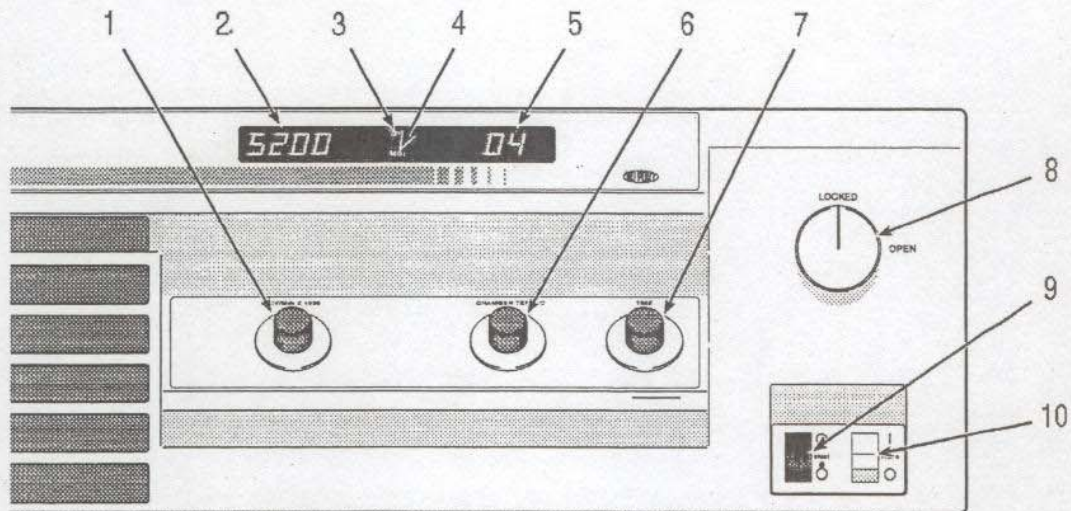


Figure 3-1. Controls and Indicators

**Table 3-1. Controls and Indicators
(keyed to figure 3-1)**

Item	Name	Function
1	REV/MIN x 1000 dial	Sets desired run speed. At full counterclockwise position the speed control is turned off and the rotor will not spin. (the settings on the dial indicate actual rotor speed.)
2	REV/MIN display	Indicates actual rotor speed from 0 to 7000 rpm \pm 100 rpm.
3	OPEN light*	Lights at the end of the run to indicate that the door may be opened.
4	FAULT light*	Lights when a rotor imbalance occurs, when chamber over or under temperatures occurs, when a drive belt malfunction occurs, when overspeed of the rotors occurs, or when the brushes need to be changed. The centrifuge will not restart until the problem has been corrected.
5	CHAMBER TEMP° C display	Displays chamber temperature from -20°C to +40°C.
6	CHAMBER TEMP° C dial	Sets desired chamber temperature from -20°C to +40°C.
7	TIME dial	Sets length of run time up to 30 minutes (or 35 minutes on 50 Hz instruments). At ∞ , sets indefinite run time. The TIME dial acts as a start switch to begin centrifuge run.
8	Door release knob	When the knob is turned to OPEN it will release the door latches; when knob is turned to LOCKED it engages the door latches.

* These messages are backlit, meaning that each message lights only when the condition that it represents exists.

Table 3-1. Controls and Indicators (cont'd)

Item	Name	Function
9	BRAKE switch	When set to "⊙", the centrifuge brakes to approximately 200 rpm at end of run then coasts to a stop. When set to "⊙", the centrifuge coasts to a stop without braking.
10	POWER switch	The power switch is an on/off toggle switch that, when set to "I" applies power to the centrifuge.

Rotor Considerations

a. Rotor Installation, Loading and Balancing

Refer to the rotor instruction manual for loading and balancing procedures as well as information regarding the selection and use of tubes, bottles, and adapters.

b. Overspeed Detection

See Overspeed Detection System Operation, page 3-8.

Precooling a Rotor in the RT7 Centrifuge

For operation at temperatures other than ambient, the rotor and rotor chamber should be precooled before the run using either of the precooling methods described.

a. Precooling a Rotor in the Centrifuge

1. Follow steps 1 through 6 of the operating instructions (pages 3-4 and 3-5).
2. Set the REV/MIN x 1000 dial to 1500 rpm.

The length of time it will take to precool a rotor will vary depending on the temperature selected, rotor weight, and rotor material.



WARNING

When loading the rotor, be sure not to exceed the maximum compartment mass of the rotor (see Table 1-1 or the individual rotor instruction manual). If maximum compartment mass is exceeded, maximum rotor speed must be lowered as described on page 3-6, Reducing Speed for Rotor Compartment Loads in Excess of Design Mass. Failure to do so can cause rotor failure which could result in personal injury and/or centrifuge damage.

b. Precooling the Centrifuge Chamber Only

If the rotor has been precooled outside of the chamber (for example, in a refrigerator or cold room), the chamber should be precooled before the run.

1. With the chamber door closed, set the CHAMBER TEMP°C dial to the temperature desired.
2. When the chamber is cooled to the proper temperature, install the precooled rotor and begin the centrifuge run.

NOTE To expedite cooling of the centrifuge chamber, run the rotor without samples at 1500 rpm.

Running Hazardous Material



WARNING

Because of the characteristics of the samples likely to be processed in this centrifuge, biological or radioactive contamination may occur. Always be aware of this possibility, and take normal precautions. Use appropriate decontamination procedures should exposure occur.

Because the centrifuge chamber of the RT7 is not designed for biocontainment, some vapors or aerosols released from uncapped, leaking or broken tubes may leak from the chamber during operation. Once a run is completed and the chamber door is opened, the vapors or aerosols which have concentrated in the chamber will be released in the laboratory area. For this reason, when materials which are pathogenic, toxic, or otherwise hazardous in nature are to be run, the centrifuge should be placed in a biohazard safety enclosure and operated using all appropriate safety precautions. *Observe the WARNING found on the Safety Information Page.*

Use appropriate decontamination procedures should exposure to any hazardous material occur. See Chapter 4 for the procedure to follow if a centrifuge or rotor that has been used with a hazardous material must be returned to our service facilities for repair.

Operation

To perform the run:

1. Turn the TIME dial off, and set the POWER switch to "I". (The condenser fan will turn on and continue to operate whenever the POWER switch is in the on position).

NOTE The FAULT light may come on when the power is turned on with the door locked. The light will go off when the door is unlocked.

It is recommended that the chamber door be kept closed when the centrifuge is not in use to prevent condensation from forming in the rotor chamber.



CAUTION

Be sure the rotor is properly balanced and seated on the drive spindle. See rotor instruction manual.



WARNING

Always check that the rotor has stopped spinning *before* opening the chamber door. Do not open the door while the rotor is still in motion; to do so can result in possible injury.

2. When the OPEN light comes on, turn the door release knob to the OPEN position, and lift the chamber door up.
3. Place the rotor on the drive spindle and lock it in place by turning the rotor locking screw counterclockwise. Turn the door release knob to the LOCKED position (the door latches will engage).
4. Set the CHAMBER TEMP°C dial to the run temperature desired.
5. Set the BRAKE switch to "⊙" if braking is desired.
6. Set the REV/MIN x 1000 dial to the desired run speed.
7. Set the TIME dial to the run time desired.

NOTE The settings on the REV/MIN x 1000 dial indicate approximate rotor speed. Verify it by checking the REV/MIN display.

An ON/OFF switch is incorporated in the TIME dial. This switch prevents rotation of the rotor if the door is locked and the timer is on.

At the end of the run remove the rotor as described below.

To remove the rotor:

1. Leave the POWER switch set to "I".
2. Set the TIME dial to the off position.
3. When the OPEN light comes on, turn the door release knob to OPEN position and lift the chamber door up.
4. Remove the rotor, close the chamber door, and set the POWER switch to "0".



WARNING

This procedure is included for *emergency sample recovery only* and should never be used for any purpose other than those explained in this section.

When the main power shuts off, the brake will not operate. Unplug the centrifuge power and wait until the rotor stops spinning before using the mechanical override.

Emergency Sample Recovery

If the main power shuts off because of a power failure or system malfunction while the rotor is spinning, the chamber door will not open. Visually check through door view port to verify that the rotor has stopped spinning. A mechanical override is provided to allow sample recovery in the case of an emergency.

The mechanical override loop is located under the right, front corner of the centrifuge as shown in figure 3-2. To operate the override, insert a screwdriver or similar object into the metal loop and while pulling down, turn the door release knob to the OPEN position and lift the chamber door up.

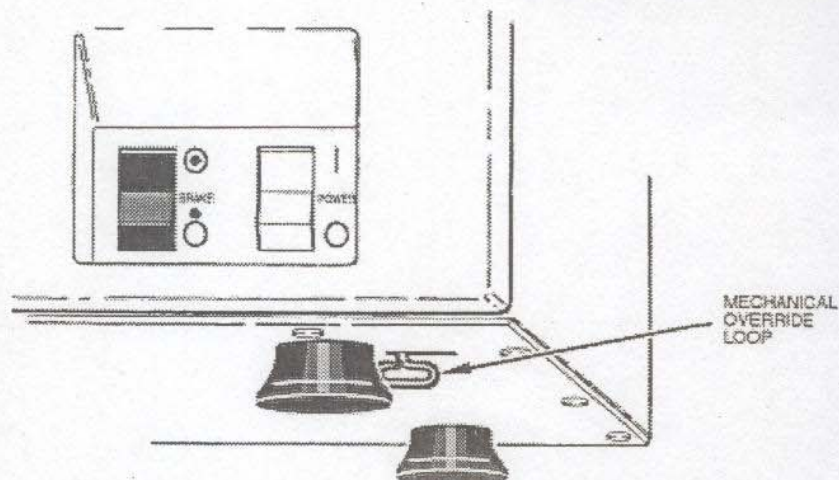


Figure 3-2. Location of Mechanical Override Loop

NOTE Leave a clearance area around the lower right corner of the centrifuge to prevent obstruction of the mechanical override.

Reducing Speed for Rotor Compartment Loads in Excess of Design Mass

There is a maximum allowable compartment mass established for each centrifuge rotor. To prevent rotor failure, the total contents of any compartment, including buckets, specimen, tubes, cover, and adapters (if used), must not exceed the figure given on page 1-2 unless rotor speed is reduced proportionately.

Strict adherence to the maximum allowable compartment mass or reduced speed is required to prevent rotor failure. *Observe WARNING on the Safety Information Page in front of this manual.*

The rotor speed is reduced in proportion to the square of the ratio for the maximum allowable compartment mass to the actual compartment mass (including buckets, specimen, tubes, covers, and adapters). If the compartment mass is more than that specified for the rotor, the reduced speed can be determined by using the formula given below:

$$\text{Reduced Speed} = \text{Maximum Rotor Speed} \times \sqrt{\frac{\text{Maximum Compartment Mass}}{\text{Actual Compartment Mass}}}$$

Troubleshooting

Some problems that may occur that can be corrected by the user are described in Table 3-2. If a problem cannot be solved by the recommended action given in the table, call Kendro for Service. Also call Kendro for Service if a problem occurs that is not described in the table or elsewhere in this chapter.

Table 3-2. Troubleshooting (Fault Light)

Possible Cause	What to Check	Corrective Action
Rotor imbalance.	(1) Check rotor balance.	Balance loads.
	(2) Buckets swing freely.	Lubricate buckets.
	(3) Broken glass or foreign material stuck in bucket.	Remove debris from bucket.
Chamber over/under temperature.	(1) Display temperature <-10°C or > +45°C.	Check temperature dial setting. Call service.
Motor brushes worn.	(1) Brush warning circuit breaker's tripped?	Replace brushes then reset circuit breaker.
Broken drive belt.	(1) Check for broken or loose drive belt.	Adjust belt tension. Replace drive belt.
Overspeed	(1) Speed set above maximum rated speed of rotor?	Set speed below maximum rotor speed.
	(2) See page 3-8, Overspeed Detection System Operation.	Follow instructions for using SL-50RT at speeds between 3500 - 4000 rpm, page 3-8.

NOTE The circuit breaker is located on the back left side of the centrifuge. To reset it, push button in with finger.

Overspeed Detection System Operation

The RT7 is equipped with an overspeed protection circuit which safely limits the top speed of the rotor in use while allowing maximum acceleration rate of the rotors.

The overspeed detection circuitry measures the time for the rotor in use to accelerate between 3500 and 4000 rpm. If the acceleration time is less than the predetermined time constant, the rotor in use is identified as an SL-50RT rotor and the overspeed is set at 7600 ± 200 rpm. If the acceleration time is greater than the predetermined time constant, the rotor is identified as a swinging bucket rotor and the overspeed setting remains at its default setting of 4300 ± 100 rpm.

When using the SL-50RT rotor, if a run speed of greater than 4300 rpm is desired, the run speed should be set to greater than 4000 rpm during the initial acceleration period. If it is desirable to set a lower speed and then set a speed higher than 4400 rpm at a later time, the lower speed must be less than 3500 rpm. In order to properly detect the SL-50RT rotor and thus set a higher overspeed trip point, the rotor must accelerate from 3500 to 4000 rpm without interruption.

Rotor Speed/Temperature Differential Compensation

The RT7 refrigeration system controls chamber temperature. Under certain run conditions, the sample temperature may be different than the set temperature. This is known as temperature offset. Temperature offset is a function of the set temperature, speed and rotor being used and can vary by several degrees. If accurate temperature control is required, we recommend that a test run be made to determine the correct temperature offset for that protocol.

Test Run Procedure

NOTE To plot set temperature versus actual sample temperature at a specific speed and ambient condition, we recommend doing several test runs at various set temperatures and recording the data on one of the blank graphs given in the back of this manual.

Temperature offset data can be obtained by doing a test run for a specific rotor/sample temperature/speed combination and ambient condition. Using an immersible centigrade thermometer calibrated in 1.0°C increments, perform the following steps.

1. Prepare two tubes or bottles of dispensable fluid. Balance according to instructions in rotor instruction manual.

NOTE The dispensable fluid should have a freezing point somewhat below the desired sample temperature.

2. Precool the thermometer to 1.0°C below the desired sample temperature.
3. Set the TEMPERATURE to the desired sample temperature.
4. Load the prepared tubes or bottles into the rotor, and precool. Then, run the rotor on HOLD at the desired speed.
5. Run the rotor for at least one hour, then stop the run and open the chamber door as soon as the rotor comes to a complete stop. Open one rotor compartment, and immerse the precooled thermometer into the liquid. Agitate the thermometer in the liquid for approximately five (5) to ten (10) seconds. Record the indicated temperature.
6. Adjust the TEMPERATURE setting according to the recorded temperature indication. For example: if the recorded temperature is 2°C warmer than the desired temperature, reset TEMPERATURE downward 2°C.
7. Record all data on the Rotor Speed/Temperature Differential Graphs at the back of this manual for future use.

NOTE Although the displayed chamber temperature will vary under certain run conditions, the actual sample temperature will vary only a few tenths of a degree.

Chapter 4: MAINTENANCE

This chapter describes routine maintenance procedures that you should perform on a regular basis. As the user, it is your responsibility to make certain that these procedures are followed when necessary. Also, to keep your centrifuge in good working condition and ensure accurate test results, we recommend that, in addition to these routine procedures, you have the speed control, timer, rotor imbalance detector, temperature control, door interlock and latches checked periodically by a Kendro Field Service Engineer or other qualified service personnel. If further service is needed, contact your local representative for SORVALL® products.

ROUTINE MAINTENANCE ACTIVITY BY USER	FREQUENCY
Inspect the centrifuge.	Weekly.
Clean the rotor chamber.	Daily, or immediately after a spill.
Wash the drive spindle.	Weekly, or when rotor is installed.
Clean the cabinet panels.	Once a month.
Clean condenser coils.	Once a year.

To ensure the integrity of the system the following checks should be done by a qualified service technician:

MAINTENANCE BY QUALIFIED SERVICE TECHNICIAN	FREQUENCY
Check the FAULT system.	Yearly.
Recalibrate electronic circuits.	Once a year.
Have centrifuge ground continuity tested.	Once a year.
Inspect door latches.	Once a year.



WARNING

Because of the high voltages in this centrifuge, only personnel trained in electronics should test or repair the electrical circuits.

If hazardous materials have been processed in the centrifuge, take all necessary precautions when cleaning or servicing the centrifuge to avoid personal exposure to contamination.

Inspection and Cleaning

a. Inspection

Inspect the centrifuge each week for signs of wear, encrusted biological deposits, and general cleanliness. Follow the cleaning procedures described below when necessary.

b. Cleaning

Rotor Chamber

The rotor chamber should be kept clean and wiped dry. Wash the rotor chamber with a mild, nonalkaline dishwashing liquid, then rinse and dry with a soft absorbent cloth.

**CAUTION**

Chlorides are extremely harmful to aluminum alloy rotors and can cause stress corrosion cracking. Therefore, if chlorides are used to disinfect the chamber, be sure to rinse the chamber thoroughly with water to remove all of the chloride cleanser.

Use 70% ethanol to disinfect the rotor chamber or a 2% glutaraldehyde solution to sterilize it. For general radioactive decontamination, use a solution of equal parts of 70% ethanol, 10% SDS, and water. Follow this with ethanol rinses then deionized water rinses. Dry with a soft absorbent cloth. Dispose of all wash solutions in proper radioactive waste containers.

Periodically defrost the rotor chamber of the RT7 to maintain efficient cooling. The chamber can be defrosted by either leaving the door open with the power off until the frost melts, or by running a rotor for approximately five minutes at 40°C. When the chamber has been completely defrosted, wipe the chamber dry.

Drive Spindle

Before each run, wipe the spindle with a soft cloth before a rotor is installed to reduce the chance of the rotor sticking. Once a week, wash the drive spindle with warm water.

Cabinet

Clean the enameled cabinet panels with a household wax cleaner. Use a mild, nonalkaline detergent and water to clean the centrifuge.

Condenser Fins

To maintain the efficiency of the RT7 refrigeration system, keep the condenser fins (located in the front of the centrifuge) free of dirt and dust. Clean the fins with a brush or vacuum cleaner at one to three month intervals.

Motor Brush Inspection and Replacement

**WARNING**

Potentially dangerous electrical circuits are exposed when power is connected with cabinet panels removed. Before proceeding, disconnect the power so that high voltage hazards will be eliminated.

NOTE If the fault light comes on and trips the circuit breaker it may be necessary to replace the motor brushes. See page 3-7.

1. Unplug the centrifuge power cord.
2. Remove the four screws from the left side access cover and remove the cover (see **WARNING** on page 4-4.)
3. Unplug the brush warning plug from the harness (see figure). Unscrew the plastic brush caps from the motor, and pull the brushes from their holders.

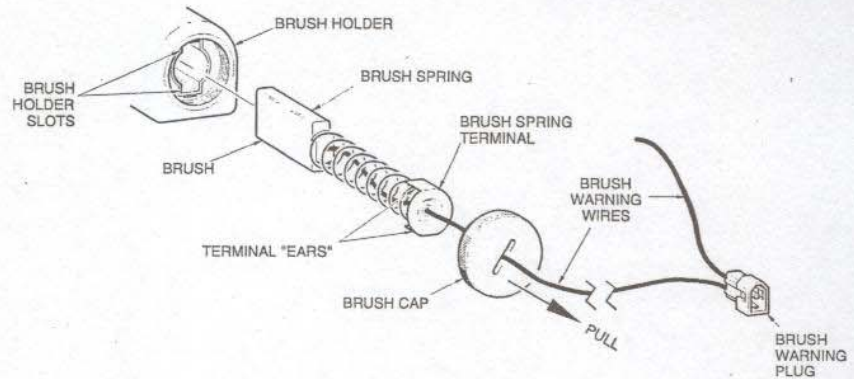


Figure 4-1. Motor Brush Assembly

- a. If brush life is no longer adequate, motor reconditioning or replacement is necessary.

NOTE The spare brushes are located under left side panel.

4. Installing new brushes:
 - a. Install the front motor brush first. This will make it easier to install the rear brush which is more difficult to see.
 - b. Insert the brush into the brush holder.
 - c. Line up the terminal "ears" on the brush spring terminal with the slots in the brush holder.
 - d. Screw the brush cap into the brush holder far enough so the cap stays in place (1 - 1 1/2 turns).
 - e. Pull on the brush warning wire on the outside of the brush cap to remove slack in the wire (see figure 4-1). The wire should pull out from the brush cap approximately 1/4" and then return when released. This check is necessary to ensure that the brush warning wire did not get pinched in the brush spring during installation. If the brush warning wire does not travel freely as described above, loosen the brush cap slightly and try again. If necessary, remove the brush cap and try reinstalling the brush.
 - f. Screw the brush cap in all the way, then loosen the brush cap approximately 1/4 turn.
 - g. Test the brush warning wire again for free travel, then tighten the brush cap until fully seated.
 - h. Install rear brush following step 4b - 4g.



CAUTION

Damage to the motor can occur if the brush warning wire does not travel freely as described in step 4e.

NOTE When testing for free travel of the brush warning wire in the rear brush, you will find it easier if you hold the brush warning plug in your right hand while pulling the brush warning wire away from the brush cap with your left hand.

**WARNING**

The upper screw towards the left-rear of the centrifuge has a grounding lockwasher and must be installed in the correct location on the access panel to ensure proper grounding of the panel (paint is removed from that spot to accurately identify its location). Failure to install the screw in the appropriate location could result in a possible shock hazard should the panel become energized.

5. Reconnect the brush warning plug to the harness.
6. Replace the cover and fasten the four screws.
7. With the power switch set to "0", plug in the centrifuge power cord.
8. Install an empty rotor with buckets and run it at maximum rpm for one hour to seat the new brushes.

NOTE In order to maintain maximum brush life from the new brushes, the brushes should be seated as described in step 8.

Parts Ordering Information

To order replacement parts, telephone toll free (800) 522-SPIN (800 522-7746) in the United States. Outside the United States, contact your local distributor or agent for SORVALL® products. Be sure to provide a description of the part, the centrifuge model and serial number.

NOTE The serial number is located on the front of the centrifuge frame and is visible through the bottom slot of the control panel grill.

Service Decontamination Policy

If a centrifuge or rotor that has been used with radioactive or pathogenic material requires servicing by Kendro personnel, either at the customer's laboratory or at a Kendro facility, comply with the following procedure to ensure the safety of all personnel:

1. Clean the centrifuge or rotor to be serviced of all encrusted material and decontaminate it (see Maintenance Section of the centrifuge or rotor instruction manual) prior to servicing by the Kendro representative or returning it to the Kendro facility. There must be no radioactivity detectable by survey equipment.

The SORVALL® Product Guide contains descriptions of commonly used decontamination methods and a chart showing method compatibility with various materials. The centrifuge or rotor instruction manual contains specific guidance about cleaning and decontamination methods appropriate for the product it describes.

Clean and decontaminate your centrifuge or rotor as follows:

For tabletop centrifuges:

- a. Remove rotor from the rotor chamber.
- b. Decontaminate cover, bowl, and drive using an appropriate method.

For rotors:

Remove tubes, bottles, and adapters from the rotor and decontaminate rotor using an appropriate method. If tubes or rotor caps are stuck in the rotor, or the rotor lid is stuck, notify Kendro representative; be prepared with the name and nature of the sample so the Kendro Chemical Hazards Officer can decide whether to authorize the rotor's return to a Kendro facility.

2. Complete and attach Decontamination Information Certificate (in the back of your rotor or instrument manual) to the centrifuge or rotor before servicing or return to Kendro facility. If Certificate is not available, attach a written statement verifying decontamination (what was contaminant and what decontamination method was used).

If the centrifuge or rotor must be returned to a Kendro facility:

1. Contact your Kendro representative to obtain a Return Service Order Number (RSO No.); be prepared with the name and serial number of the centrifuge or rotor and the repairs required.
2. Send item(s) with the RSO Number clearly marked on the outside of packaging to the address obtained from your Kendro representative.

NOTE United States federal regulations require that parts and instruments must be decontaminated before being transported. Outside of the United States check local regulations.

If a centrifuge or rotor to be serviced does not have a Decontamination Information Certificate attached and, in Kendro's opinion presents a potential radioactive or biological hazard, the Kendro representative will not service the equipment until proper decontamination and certification is complete. If Kendro receives a centrifuge or rotor at its Service facilities which, in its opinion, is a radioactive or biological hazard, the sender will be contacted for instructions as to disposition of the equipment. Disposition costs will be borne by the sender.

Decontamination Information Certificates are included with these instructions. Additional certificates are available from the local Account Representative or Field Service Engineer. In the event these certificates are not available, a written statement certifying that the unit has been properly decontaminated and outlining the procedures used will be acceptable.

NOTE The Field Service Engineer will note on the Customer Service Repair Report if decontamination was required and, if so, what the contaminant was and what procedure was used. If no decontamination was required, it will be so stated.

APPENDIX

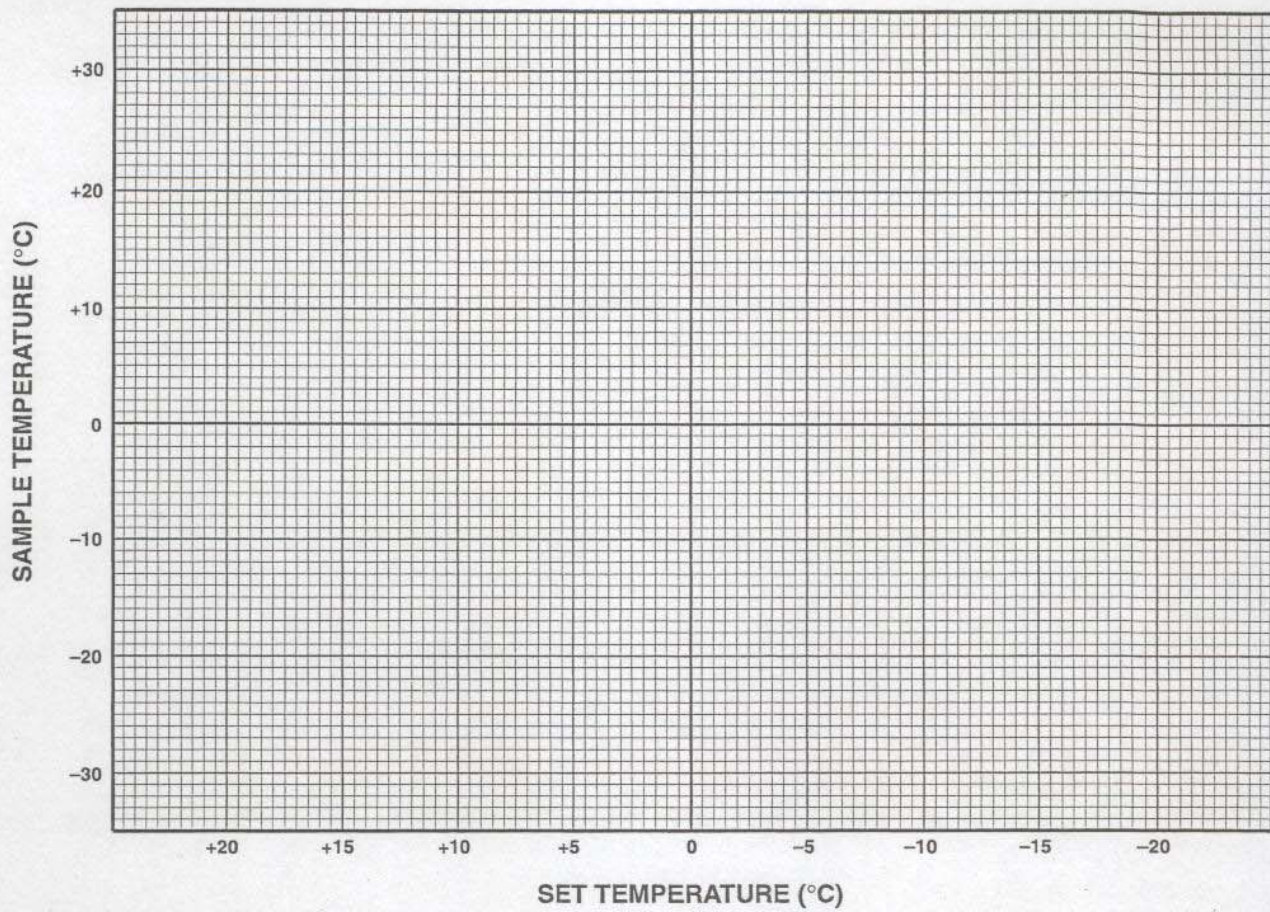
Warranty

Kendro Laboratory Products, L.P. makes no warranty of any kind, expressed or implied, except as stated in this warranty policy.

The SORVALL® RT7 Tabletop Centrifuge is warranted to be free from defects in material and workmanship for a period of one (1) year from the date of delivery. Kendro will repair or replace and return free of charge any part which is returned to its factory within said period, transportation prepaid by user, and which is found upon inspection to have been defective in materials or workmanship. This warranty does not apply to any damage to any instrument resulting from: normal wear and tear; misuse; abuse; use of electrical currents or circuits other than those specified on the plate affixed to the instrument; or use of any rotor other than a SORVALL® rotor intended for use in this instrument.

Kendro reserves the right to change, alter, modify or improve any of its instruments without any obligation whatsoever to make corresponding changes to any instrument previously sold or shipped.

The foregoing obligations are in lieu of all other obligations and liabilities including negligence and all warranties, of merchantability or otherwise, expressed or implied in fact or by law, and state our entire and exclusive liability and buyer's exclusive remedy for a claim or damages in connection with the sale or furnishing of goods of parts, their design, suitability for use, installation or operation. Kendro will in no event be liable for any special or consequential damages whatsoever, and our liability under no circumstances will exceed the contract price for the goods for which liability is claimed.



Rotor Speed/Temperature Differential Chart for

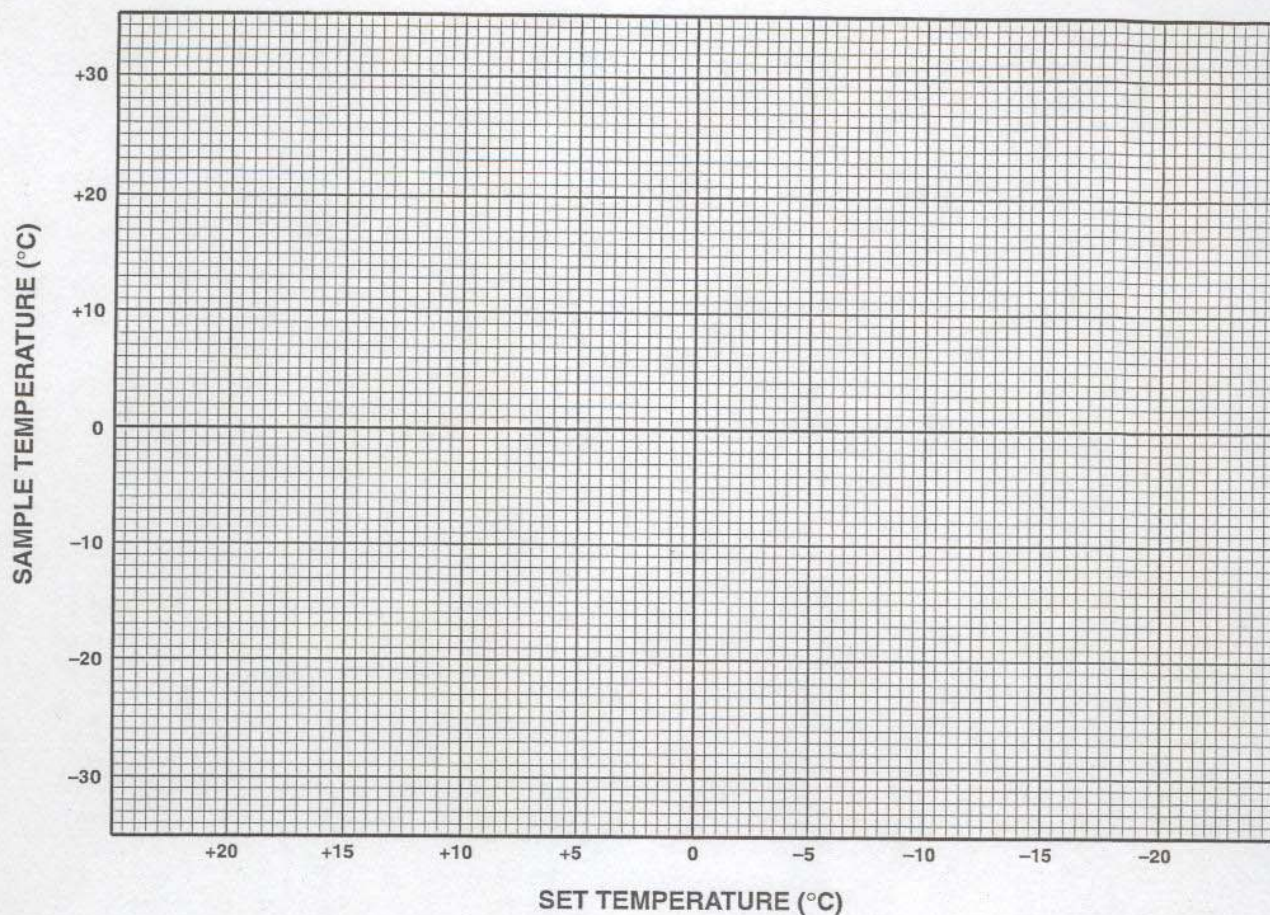
Rotor _____

Instrument _____

Ambient Temperature _____

Rotor Speed _____

Blank Rotor Speed / Temperature Differential Graph



Rotor Speed/Temperature Differential Chart for

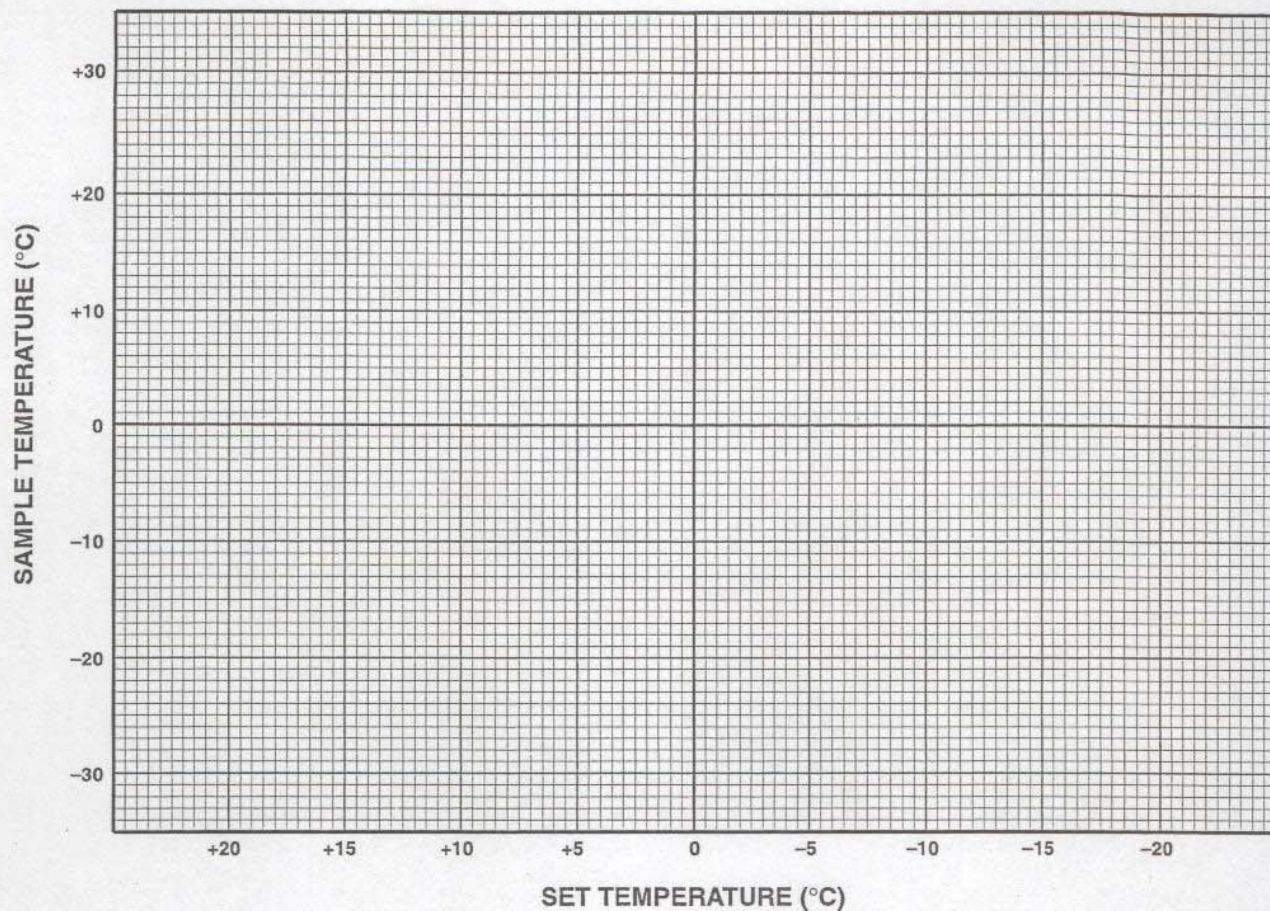
Rotor _____

Instrument _____

Ambient Temperature _____

Rotor Speed _____

Blank Rotor Speed / Temperature Differential Graph



Rotor Speed/Temperature Differential Chart for

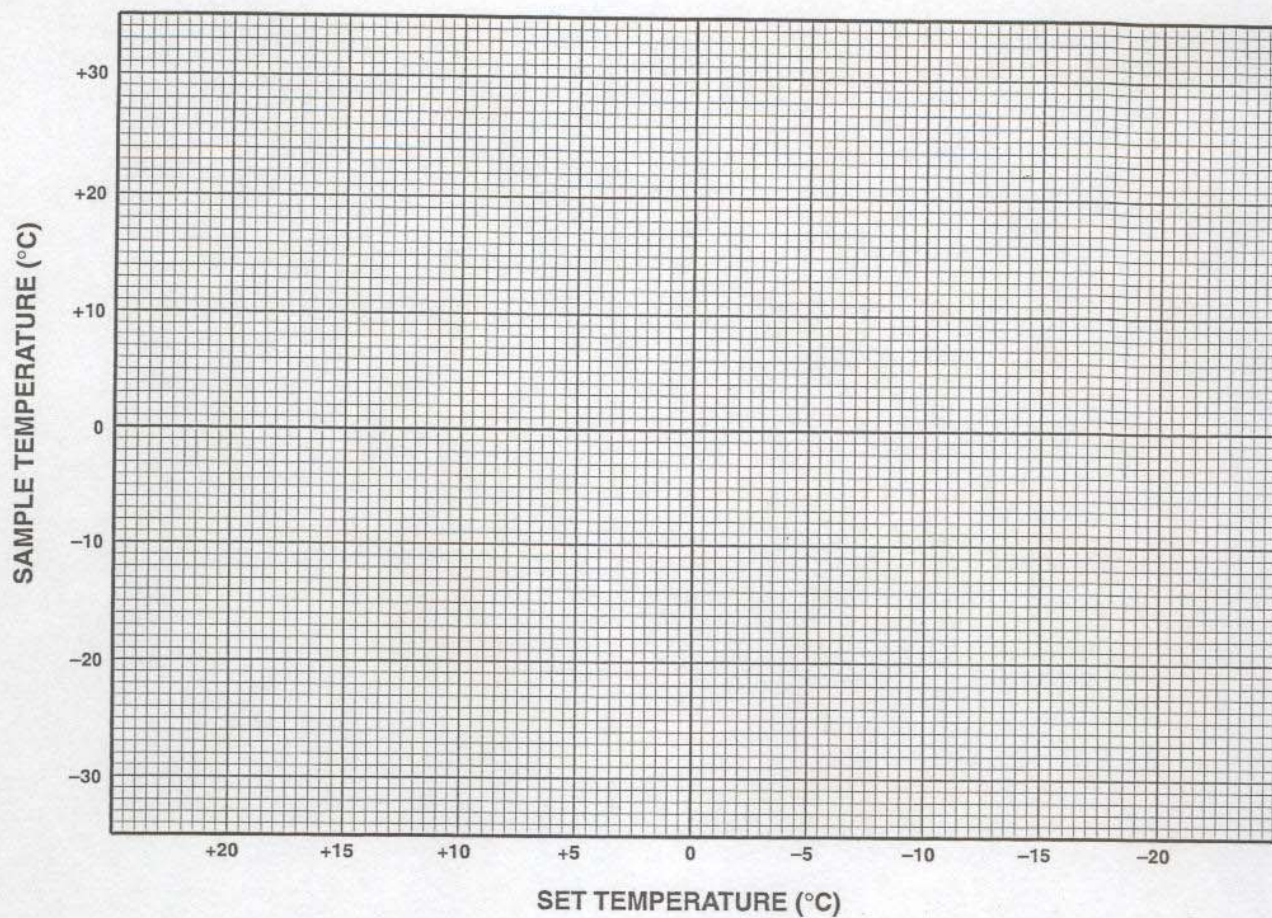
Rotor _____

Instrument _____

Ambient Temperature _____

Rotor Speed _____

Blank Rotor Speed / Temperature Differential Graph



Rotor Speed/Temperature Differential Chart for

Rotor _____
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DECONTAMINATION INFORMATION CERTIFICATE
Complete and attach to equipment **BEFORE** servicing (instructions on reverse)

PLEASE PRINT

DECONTAMINATION CERTIFIED BY _____ TITLE/POSITION _____
PHONE _____ FAX _____ DEPARTMENT _____
INSTITUTION _____ ADDRESS _____
CITY _____ STATE _____ ZIP _____
INSTRUMENT _____ SERIAL NUMBER _____
ROTOR _____ SERIAL NUMBER _____
PART _____ PART NUMBER _____
HAZARDOUS CONTAMINANT(S) _____ DECONTAMINATION DATE _____
DECONTAMINATION METHOD(S) _____
DECONTAMINATION CERTIFIER'S SIGNATURE _____ DATE _____

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INSTRUCTIONS

When an instrument that has been used with radioactive, pathogenic, or otherwise hazardous materials requires servicing by Kendro personnel either at the customer's laboratory or at Kendro facilities, the following procedure must be complied with to insure safety of our personnel:

1. The instrument or part to be serviced shall be cleaned of all blood and other encrusted material and decontaminated prior to servicing by our representative. No radioactivity shall be detectable by survey equipment.
2. A Decontamination Information Certificate shall be completed and attached to the instrument or part.

If an instrument or part to be serviced does not have a Decontamination Information Certificate attached to it, and, in our opinion, presents a potential radioactive or biological hazard, our representative will not service the equipment until proper decontamination

and certification has been completed. If an instrument is received at our Service facilities and, in our opinion, poses a radioactive or biological hazard, the sender will be contacted for instructions as to disposition of the equipment. Disposition costs will be borne by the sender.

Decontamination Information Certificates are included with these Operation Instructions. Additional certificates are available from your local technical or customer service representative. In the event these certificates are not available, a written statement certifying that the instrument or part has been properly decontaminated and outlining the procedures used will be acceptable.

NOTE Kendro Service representatives will indicate on a Customer Service Repair Report if decontamination was required, and if so, what the contaminate was and what procedure was used. If no decontamination was required, it should be so stated.

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