Thermo Electron Micro GP 5521

Ventilated Microcentrifuge

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Thermo
ELECTRON CORPORATION

Models:

5519*, 5520 and 5521
Ventilated MicroCentrifuge

5522, 5523 and 5527*
Refrigerated MicroCentrifuge

Operating and Maintenance Manual

Manual No: 7005520 Rev. 2

Read This Instruction Manual.

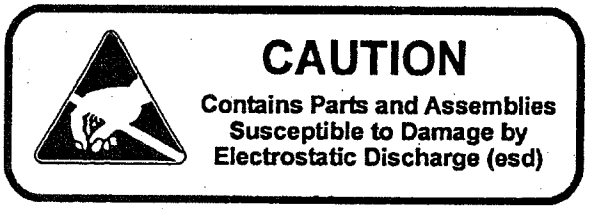
Failure to read, understand and follow the instructions in this manual may result in damage to the unit, injury to operating personnel, and poor equipment performance.

CAUTION! All internal adjustments and maintenance must be performed by qualified service personnel.

Refer to the serial tag on the back of this manual.

The material in this manual is for information purposes only. The contents and the product it describes are subject to change without notice. Thermo Electron Corporation makes no representations or warranties with respect to this manual. In no event shall Thermo be held liable for any damages, direct or incidental, arising out of or related to the use of this manual.

**** Model 5519 is identical to Model 5520 and Model 5527 is identical to Model 5522 except that Models 5519 and 5527 are shipped with a 5800851 rotor.***



MANUAL NUMBER 7005520

REV	ECR/ECN	DATE	DESCRIPTION	By
2	21577/OS-266	4/25/03	Updated performance	ccs
1	M. Spence	2/20/03	Added Models 5519 and 5527 (5520 & 5522 with 5800851 rotor)	ccs
--	--	8/21/02	Updated 5800851 rotor descriptions per manufacturer	ccs
0	--	11/7/00	Original	ccs

Important operating and/or maintenance instructions. Read the accompanying text carefully.

Ce symbole attire l'attention de l'utilisateur sur des instructions importantes de fonctionnement et/ou d'entretien. Il peut être utilisé seul ou avec d'autres symboles de sécurité. Lire attentivement le texte d'accompagnement.

Wichtige Betriebs- und/oder Wartungshinweise. Lesen Sie den nachfolgenden Text sorgfältig.

Importante instruccions de operacion y/o mantenimiento. Lea el texto acompanante cuidadosamente.

Potential electrical hazards. Only qualified persons should perform procedures associated with this symbol.

Ce symbole attire l'attention de l'utilisateur sur des risques électriques potentiels. Seules des personnes qualifiées doivent appliquer les instructions et les procédures associées à ce symbole.

Gefahr von Stromschlägen. Nur qualifizierte Personen sollten die Tätigkeiten ausführen, die mit diesem Symbol bezeichnet sind.

Potencial de riesgos electricos. Solo personas das capacitadadas deben ejecutar los procedimientos asociadas con este simbulo.

Equipment being maintained or serviced must be turned off and locked off to prevent possible injury.

Risques potentiels liés à l'énergie. L'équipement en entretien ou en maintenance doit être éteint et mis sous clé pour éviter des blessures possibles.

Geräte, an denen Wartungs- oder Servicearbeiten durchgeführt werden, müssen abgeschaltet und abgeschlossen werden, um Verletzungen zu vermeiden.

El equipo recibiendo servicio o mantenimiento debe ser apagado y segurado para prevenir danos.

Hot surface(s) present which may cause burns to unprotected skin, or to materials which may be damaged by elevated temperatures.

Présence de surface(s) chaude(s) pouvant causer des brûlures sur la peau non protégée, ou sur des matières pouvant être endommagées par des températures élevées.

Heiße Oberfläche(n) können ungeschützter Haut Verbrennungen zufügen oder Schäden an Materialien verursachen, die nicht hitzebeständig sind.

Superficias calientes que pueden causar quemaduras a piel sin proteccion o a materiales que pueden estar danados por elevadas temperaturas.

- √ Always use the proper protective equipment (clothing, gloves, goggles, etc.)
- √ Always dissipate extreme cold or heat and wear protective clothing.
- √ Always follow good hygiene practices.
- √ Each individual is responsible for his or her own safety.

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Regardless of your needs, our professional telephone technicians are available to assist you Monday through Friday from 8:00 a.m. to 6:00 p.m. Eastern Time. Please contact us by telephone or fax. If you wish to write, our mailing address is:

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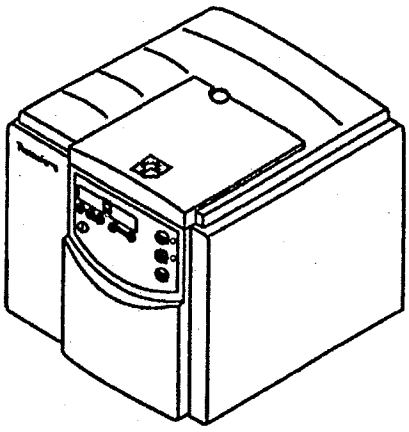
Section 1 - Introduction



The MicroCentrifuge is a quiet, high-speed bench-top centrifuge for medical, industrial, and scientific laboratories. The unit can achieve centrifugal force of up to 17,000 xg, making it ideal for sedimentation of protein precipitates and separation of blood serum.

Note: The MicroCentrifuge is available in two versions, ventilated and refrigerated. Specific instructions that apply to the refrigerated version only will be identified as RF.

The unit reaches full speed within 15 seconds, even when fully loaded, and brakes to a stop in approximately 15 seconds. It features a maintenance-free, brushless motor and an easy-to-use front panel that provides three versatile modes of operation: automatic timed run, momentary spin (pulse) and continuous operation (hold mode). Acceleration and deceleration rates may be controlled to optimize runs - rapid for fast separations and slow for delicate samples. Repeat runs with precisely the same speed and time settings may be achieved at the touch of a button.

The MicroCentrifuge is a variable-speed unit with a range of 1000 to 13,500 RPM. The unit accommodates lightweight, dynamically balanced polypropylene rotors. The rotors cannot corrode, offer excellent acceleration and deceleration characteristics and totally contain tubes, allowing complete sample recovery even if a tube breaks.

The 5800891 rotor holds up to 24 sample tubes and provides aerosol containment for biological samples. The 5800851 rotor holds up to 24 x 1.5-2.0mL and 24 x 0.5mL sample tubes, the 5800852 rotor holds up to 48 x 0.5mL microtubes or 24 x 0.6mL Microtainers and the 5800853 rotor holds up to 40 x 0.25mL/0.4mL or 6 x 50mm glass tubes. Also, the 5800851 and 5800891 rotors have room to accommodate screw-cap microtubes, microtube filters, and micro spin-columns. Section 4.1 provides a speed and force table for these rotors.

A fail-safe cover interlock ensures that the cover is closed before a run can begin and keeps the cover closed until the rotor has reached a safe low speed (below 150 RPM), even in the event of a power failure.

Section 2 - Installation

2.1 Receiving the Unit

The centrifuge is shipped in a carton that protects it from shipping hazards. Retain the carton and packing material through the warranty period in case you need to ship or return the unit. Please be sure to complete the Warranty Registration Card and drop it in the mail.

2.2 Site Preparation

The unit normally resides on a bench-top. The MicroCentrifuge (ventilated model) can be placed in a cold room (no colder than 0°C) for processing temperature-sensitive samples. When removing the centrifuge from a cold environment, allow at least two hours for any condensate to evaporate before using.

Note: When used in a cold room environment, some bearing noise may become evident. The bearing lubricant thickens at low temperatures. As the centrifuge speeds up, it is thinned and distributed more evenly. After this occurs, any noise should subside.

The specifications at the end of this manual give the dimensions of the unit. Provide clearance of 3 inches (8cm) at the back and both sides for heat dissipation. Provide clearance of 11 inches (28cm) above the unit to open the cover.

Place the unit on a clean, dry surface to ensure that the suction feet grip the surface firmly. Be sure that the area beneath the unit is clear of debris and loose materials such as paper. The surface must be level to ensure quiet, vibration-free operation. A stable location is important since an improperly loaded unit can vibrate and the centrifuge must not be permitted to move during operation.

2.3 Power Configuration

The centrifuge model numbers with voltage and frequency requirements are listed in the table below.

Model	Voltage	Frequency
5520	120VAC	50/60Hz
5521	220-240VAC	50/60Hz
5522 (RF)	120VAC	60Hz
5523 (RF)	220-240VAC	50Hz

Locate the 50/60 Hz selector switch to the left of the power receptacle on the back of the centrifuge. Adjust this switch to match the line frequency at the site.

Ensure that your site is configured to match the centrifuge's power requirements. Connecting the MicroCentrifuge to an incorrect voltage or frequency will void the warranty.

a. Fuses

Fuses are located at the back of the unit (Figure 2-1).

To install fuses:

Locate the power entry module on the back of the unit. The removable fuse drawer is located inside the module. A small latch holds the drawer in place. Press this latch, then slide the drawer out.

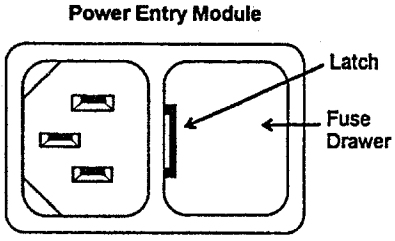
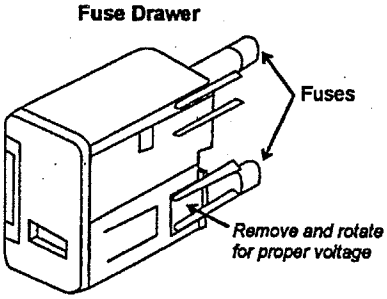


Figure 2-1



- Model 5520: The fuse drawer has one spare and one active fuse installed at the factory. Fuse is rated for 6.25 Amps (part no. 3052772).
- Model 5521: The fuse drawer has two active fuses installed at the factory. Fuse is rated for 4.0 Amps (part no. 3051745).
- Model 5522: The fuse drawer has one spare and one active fuse installed at the factory. Fuse is rated for 8 Amps (part no. 3052771).
- Model 5523: The fuse drawer has two active fuses installed at the factory. The fuse is rated for 6.3 Amps (part no. 3052773).

Ensure that the fuses are securely in place and reinstall the entire drawer into the power entry module.

b. Power Cord

A power cord is provided with each MicroCentrifuge. The unit requires a grounded power supply (3-prong power outlet). If your facility does not have properly grounded power outlets, arrange for proper grounding. Do not remove the grounding pin from the centrifuge power cord. Do not use an adapter to connect to a 2-prong outlet.

2.4 Moving the Unit

Suction cups located on the base of the centrifuge are a safety feature to adhere the unit to the work surface and prevent movement. To move the unit to another location, carefully insert an object such as a tongue depressor under each suction cup to break the vacuum seal of that cup (do not damage the suction cup surface). When all four cups are disengaged, the unit can be easily lifted. When the unit is in its new location, ensure that all suction cups fully contact the bench top.

2.5 Front Control Panel

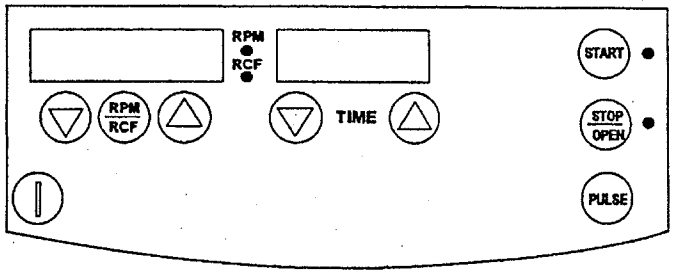


Figure 2-2 - The Front Control Panel

The On/Off button must be in the On position to operate the unit. This button applies power to the control panel and refrigeration system (RF only). The red STOP indicator shows that the centrifuge is plugged in. (In refrigerated models, temperature is displayed whenever the unit is plugged in.) The On/Off button is inoperative during the actual run. Shut off refrigeration with the On/Off button, but stop a run with the STOP button.

The control panel contains numeric displays for RPM/RCF (SPEED/FORCE), TIME and TEMPERATURE (RF only). These displays have two states or modes: Actual and Set. In Actual Mode, current run conditions are indicated, such as:

- rotor speed or force
- elapsed time of, or time remaining in, the run
- actual temperature (RF only).

The display in Set mode indicates the desired settings for the run and is operative:

- whenever the up and down arrows are used
- briefly at the start of a run
- briefly after the unit is switched ON

When the display shows Actual parameters, the numbers are bright. When the display shows Set parameters, the numbers are dim. The numeric displays can also display warning or error messages (see Section 3.3). Descriptions of the displays appear below.

The displays for the MicroCentrifuge are:

- **Speed/Force display:**

  The number in the display above this symbol represents the rotor speed in RPM or force in RCF. When RPM is selected, the display indicates Revolutions Per Minute. When RCF is selected, the display indicates Relative Centrifugal Force. Press this button to toggle between RPM and RCF. Use the arrow buttons to change the set speed or force. The display shows speed within 100 RPM and never requires calibration. Select a speed from 1000 through 13,500 RPM in increments of 100 RPM. Select a force from 100 to 1000 xg in increments of 50 xg, from 1,000 - 10,000 xg in increments of 100 xg, and from 10,000 - 17, 000 xg in increments of 200 xg.

- **Time display:**

  The number in the display above this symbol indicates time. Time is displayed as minutes:seconds. The time can be set from 1 second to 99 minutes, using the arrow buttons. In normal timed mode, the system counts down from the set point. In continuous or momentary spin modes, the system counts up from the setpoint.

- **Temperature display (RF only):**

  The number above this symbol represents temperature in whole degrees Celsius from - 9°C through 40°C.

Use the arrow buttons to view or change the Set parameters for Speed/Force, Time or Temperature (RF only). The first time the button is pressed, the numeric display simply switches from Actual readings to Set parameters, without changing them. If the button is pressed again, the selected parameter increases or decreases once for each press of the button. If the button is held down, the setting changes continually until the button is released.

The longer the button is held down, the more rapidly the setting changes. Typically, a button is held down to approach a desired setting, then the up or down button is pressed repeatedly to select the exact setting. When the arrow buttons are released for 3 seconds, the display returns to the Actual readings.

This button starts a run. The run is governed by the Set parameters. The associated green light blinks until the rotor reaches the set run speed. Then the light stays on steadily until the end of the run.

This button stops the run, and unlocks the cover when the rotor has slowed to below 150 RPM. (A run will also stop automatically when the set time has elapsed or the momentary run button is released.) The red light will flash as an indication that the rotor is still slowing down (braking). When the run ends, the red light stays on, indicating that the rotor has stopped and the cover can be opened.

The centrifuge will run up to set speed while this button is pressed, and stop when it is released.

2.6 Refrigeration (RF only)

Model 5522 and 5523 are refrigerated units. Whenever the cover of one of these units is closed and the unit is switched ON, the refrigeration system begins to cool the rotor chamber to the set temperature.

Note: The unit is not designed for use as a refrigerator. The natural fanning action of the rotor serves to maintain a uniform temperature distribution inside the chamber. Therefore, at zero RPM, there is no correlation between set and actual chamber temperatures.

If a run begins and the rotor chamber is not at the specified temperature, the run will not be aborted. If desired, press STOP to discontinue the run and pre-cool the chamber by spinning the rotor (empty) until the temperature is satisfactory.

If a temperature higher than ambient is specified, the units will not heat the rotor chamber except through the normal heating effect of the equipment (friction and motor heat).

Remove frost or condensation from the rotor chamber by first allowing it to melt, then removing it with a sponge or cloth. When a centrifuge is not in use, turn it off or leave the cover open (disables refrigeration).

2.7 First Run

Plug in the centrifuge. If an arrow key is pressed first, the display will briefly show 10,000 RPM, 1:00 minute and 25°C (RF only), the default set values. Press the Stop/Open Cover button to release the cover interlock. Open the cover. Remove any loose material from the rotor chamber. Install a rotor, as described in Section 3.1. Close the cover and press it down until it latches.

Use the up or down arrow buttons to select Set parameters. Experiment with the buttons to see how they control the displayed settings. Press and hold a button to scroll quickly. This does not activate the rotor. Note that when all buttons are released for over 3 seconds, the display returns to Actual readings.

Select an appropriate time, speed and temperature (RF only) and then press the START button. The rotor will accelerate to set speed, spin for the set time, and brake to a stop. Press the Stop/Open Cover button to release the safety interlock.

Section 3 - Operation

3.1 Rotor and Accessories

A balanced load is essential with all high-speed centrifuges. An unbalanced load produces vibration and causes excessive wear of motor bearings. Therefore, always load the rotor symmetrically. When using tube adapters, install an adapter in the opposite tube position. The total weight of samples loaded in opposing positions must be equal in weight to within 1.0 gram. The position numbers, present on rotors, identify opposing tube positions.

Samples of different specific gravities can be processed in the same run, provided that the samples of a given type are balanced around the rotor as though they were the only ones in the rotor.

a. Rotor Installation

To install the rotor, lower it straight onto the shaft. Align the holes in the rotor with the positioning pins on the shaft. To do this, hold the rotor in one hand and hold the shaft, as it protrudes through the rotor, with the other hand. Rotate them in opposite directions until the pins line up with the holes and the rotor drops down into position. Do not apply excessive force. Screw the metal locking nut (clockwise) on the shaft to hold the rotor down. Be sure the orange rubber ring is facing downward. Hold the rotor and tighten the nut moderately with your fingers; do not overtighten it.

The 5800891 rotor cover must be installed prior to the rotor being placed in the centrifuge. Verify that the o-ring seals (2) are in place around the outer and inner perimeters of the rotor. To install the cover, place the rotor on a flat surface and then place the rotor cover on top of the rotor. Using the palm of your hand(s), press down evenly around the cover to fully engage the seals.

The 5800851, 5800852 and 5800853 rotor covers prevent generation of aerodynamic noise during the spin. The covers also prevent gross aerosol effects in the event of tube failure. They fit snugly over the rotor and pull off easily. To place the cover properly, rotate the cover until it drops easily onto the adapter spline. Press down until the rim of the cover contacts the rotor. The spline at the top of the shaft adapter drives the lid during rotation.

Caution! Improper placement of the cover may allow it to come off during a spin.

b. Rotor Removal

To remove the rotor, first remove the cover (5800851, 5800852 or 5800853 only). Then unscrew (counterclockwise) and remove the metal locking nut. The rotor can now be lifted straight out of the rotor chamber. You can refrigerate the rotor without removing the tubes but do not operate the rotor when the rotor temperature is below 0°C.

To remove the 5800891 rotor cover, remove the rotor from the centrifuge and place it on a flat surface. Place your thumbs on the inner perimeter of the cover, and your fingers on the outer edge. Pry it up from the outer edges.

3.2 Operating Modes

The MicroCentrifuge models offer three operating modes: Timed, Continuous (Hold), and Momentary.

Timed Run - To start a timed run or spin:

1. Select the Set parameters using the control panel buttons (refer to Section 2.7) and then press START.

- *To view the set parameters at any time, press any arrow key.*
- The spin duration may be changed at any time, even during the spin, by pressing and holding the arrow keys until the new desired setting(s) is displayed. If a time less than the elapsed time is programmed (for example, one second), the spin ends immediately. If a time greater than the elapsed time is programmed, the elapsed time continues until the newly selected time is reached (the time does not reset).

  The speed and temperature (RF only) may similarly be changed during a run. Three seconds after the parameter arrow key is released, the centrifuge will adjust to the newly set parameter.

Hold Mode - To select Hold (continuous) mode:

1. Select the set parameters using the control panel buttons (refer to Section 2.5). Scroll down through zero time on the Time display until the word Hold appears in the display.

   This mode is used for runs greater than 99 minutes.

Momentary Mode - To operate in the momentary mode:

1. Select the set parameters using the control panel buttons (refer to Section 2.5). Press and hold the PULSE button. The run begins when the button is pressed and ends when the button is released.

Note: In this mode, the unit displays set parameters for three seconds, the time display counts upward and displays the elapsed time since the PULSE button was pressed.

In this mode, very quick separations can be performed, or the progress of a run may be closely monitord. (This is useful for easily separated samples, for simultaneous mixing of samples, and to deposit condensate droplets at the bottom of the tube.)

3.3 Warning Messages and Error Codes

The beeper sounds in three situations:

- Two times on power up.
- Three times at the end of a spin.
- Three times when a warning occurs.

Warnings appear in place of the numeric displays in the following cases:

LId: This appears briefly if the START button is pressed with the cover is not closed. Closing the cover resets the warning.

PFAIL: This appears at the end of a power failure that interrupts a run if the rotor is still spinning when power is restored. Press STOP to reset this warning.

Error Codes: This requires factory-authorized maintenance. A typical error means the internal microprocessor has detected impermissible readings or a failure elsewhere in the unit. An error code number appears on the front panel. When an error code is displayed first unplug and reconnect the unit to power and try the run again. If the error code reappears, tell the service personnel which number appeared when the problem is reported.

Err 1: No Tachometer

Tachometer signals were not present during run. The rotor coasts to a stop. Cover opening is inhibited after this error.

OSPd: Overspeed

Speed is 15,200 RPM. The rotor will brake to a stop.

run A: Runaway

During stopping, rotor has not been decelerating for 8 seconds, or when at standby, rotor speed exceeds 600 RPM. The rotor coasts to a stop.

rEFr: Refrigeration Failure (RF only)

The unit displays this code if the measured temperature exceeds 45°C at any time during the run.

FSAFE: Fail-safe Time-out

Independent circuitry on the circuit board has sensed a lack of activity from the control microprocessor. All power outputs are disabled (including motor, latch solenoid, etc.).

COPF: COP Watchdog/OpCode Trap Error

The microprocessor itself has sensed a lack of activity from the program that controls the centrifuge. The rotor coasts to a stop.

COP: COP Watchdog Not Enabled

The microprocessor COP is not enabled. The rotor coasts to a stop.

UndFI: Undefined Interrupt

The microprocessor was interrupted by an undefined source. The rotor coasts to a stop.

ILLOP: Op-Code Trap Error

The rotor coasts to a stop.

Warnings during a spin: "Lld", "PFAIL" and "Error" messages can occur during a spin. In this case, the rotor brakes or coasts to a stop and the run ends.

Section 4 - Applications

Misapplication of any tube can cause tube rupture. To avoid this, never spin tubes faster than their recommended G-force, and never centrifuge disposable tubes more than once. If the tubes are not rated for the needed force, use more suitable tubes. If breakage does occur, residue will be captive in the tube cavity in the rotor. It may be recoverable by pipetting.

a. Corrosive Solvents

This centrifuge is made of materials designed to resist attack from common laboratory chemicals. The rotor and lid are made of polypropylene and the interior of the rotor chamber is stainless steel. Use covered sample tubes if the samples contain acids or solvents known to attack these materials. Promptly cleaning spills from the rotor and from the sample chamber minimizes the effects of corrosive chemicals. Replace any component that exhibits crazing, frosting, peeling, or similar faults. Do so before any resulting vibration requires more expensive repair. Replace the shaft adapter, rotor, lid, or metal locking nut if they become cracked, scratched, or gouged.

b. Sample Heating

The rotor chambers of Model 5520 and 5521 centrifuges are ventilated during operation. However, during very long runs, some heat inevitably travels to the samples. Sample heating can be minimized by placing the unit in a refrigerator or cold room.

4.1 Speed and Force Table

Rotor Cat. No.	No. of Tubes and Tube Size	Adapter Cat. No	Max Speed (RPM)	Outer row Max RCF (xg)	Outer row Radius (cm)
5800891[1]	24 x 1.5ml	-	13,500	17,014	8.35
(Aerosol	24 x 0.6ml B/D Microtainers™	5805763**	13,500	17,217	8.45
Contained)	24 x 0.5ml PCR microtubes	5805763**	13,500	15,180	7.45
	24 x 0.4ml microtubes	5805764**	13,500	17,014	8.35
	24 x 0.25ml microtubes	5805764**	13,500	14,772	7.25
5800851[2]	24 x 1.5ml	-	13,500	17,014	8.35
	24 x 0.6ml B/D Microtainers™	5805763**	13,500	17,217	8.45
	24 x 0.5ml microtubes	-	13,500	14,120	6.93
	24 x 0.5ml PCR microtubes	5805763**	13,500	15,180	7.45
	24 x 0.4ml microtubes	5805764**	13,500	17,014	8.35
	24 x 0.25ml microtubes	5805764**	13,500	14,772	7.25
5800852[2]	48 x 0.5ml PCR microtubes	-	13,500	16,300	8.00
	48 x 0.5ml PCR microtubes		13,500	15,282	7.50
	24 x B/D Microtainers™	-	13,500	17,523	8.60
5800853[2]	40 x 0.4ml microtubes	-	13,500	17,115	8.40
	40 x 0.25ml microtubes	-	13,500	15,282	7.50
	40 x 0.8ml (6x50mm) glass	-	13,500	17,319	8.50

Microtainers™ is a trademark of Becton Dickinson

* RCF displayed on control panel is based upon radius of rotation for 5800891 and 5800851 rotors for 1.5/2.0ml tubes.

** Order 2 pks of adapters separately. Adapters 5805763 and 5805764 are packaged 12/pk.

[1] 5800891 rotor - Provides Aerosol Containment and has been tested for microbiological containment by PHLS-CAMR, Porton Down. Meets requirements of US OSHA Bloodborne Pathogen Final Rule: (Regulation 29 CFR Part 1910.1030. Complete with 3052729 Aerosol Containment Cover, 3052758 Inner and 3051178 Outer rubber O-ring seals.

[2] 5800851, 5800852, 5800853 rotors

4.2 Chemical Resistance Table

	Plastic										Metal					Other			
	PA	PC	PE	PP	PU	NL	DN	CN	NN	PS	TI	SS	AL	MB	MG	RR	BN	VN	PF
Acids, dilute or weak	E	E	E	E	G	E	F	N	F	E	G	G	F	F	N	F	E	E	E
Acids*, strong or conc.	E	N	E	E	F	N	N	N	N	F	N	N	N	N	N	N	F	G	N
Alcohols, aliphatic	E	G	E	E	F	E	E	E	N	E	E	E	E	E	F	E	E	G	E
Aldehydes	G	F	G	G	G	G	G	G	F	N	E	E	E	E	E	E	N	E	E
Bases	E	N	E	E	N	G	N	G	F	E	E	E	E	E	E	G	G	N	N
Esters	G	N	G	G	N	E	G	G	E	N	E	E	E	E	E	N	N	N	E
Hydrocarbons, aliphatic	G	F	G	G	E	N	E	E	E	N	E	E	E	E	E	N	E	E	E
Hydrocarbons, aromatic	F	N	G	F	N	N	E	E	E	N	E	E	E	E	E	N	N	E	E
Hydrocarbons, halogenated	F	N	F	F	N	N	G	E	G	N	E	E	E	E	N	N	N	F	E
Ketones	G	N	G	G	N	N	E	E	E	N	E	G	G	G	E	N	N	N	E
Oxidizing Agents, strong	F	N	F	F	N	N	N	N	N	N	E	F	N	N	N	N	F	E	E
Salts	E	E	E	E	E	E	E	E	E	E	E	F	F	F	N	E	E	E	E

* For Oxidizing Acids, see "Oxidizing Agents, strong".

PA - POLYALLOMER
PC - POLYCARBONATE
PE - POLYETHYLENE
PP - POLYPROPYLENE
PU - POLYURETHANE
NL - MODIFIED PHENYLENE OXIDE (NORYL)
DN - ACETAL HOMOPOLYMER (DELRIN)
CN - ACETAL COPOLYMER (CELCON)
NN - NYLON
PS - POLYSTYRENE

TI - TITANIUM
SS - STAINLESS STEEL
AL - ALUMINUM
MB - MANGANESE BRONZE
MG - MAGNESIUM
RR - RUBBER
BN - BUNA-N
VN - VITON
PF - PHENOLIC FIBER

Classification of Resistance
E=Excellent
G=Good
F=Fair
N=Not Recommended

4.3 Decontamination Table

Compatible Processes For Decontamination																				
Sterilization	**Plastic**										**Metal**					**Other**				
	P	P	P	P	P	N	D	C	N	P	T	S	A	M	M	R	B	V	P	P
Mechanical																				
Autoclave*	S	M	U	S	M	U	S	S	S	U	S	S	S	S	S	S	S	M	S	M
Ethylene Oxide Gas	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	U	U	S	S	S
Dry Heat 160°C@2Hrs.	U	U	U	U	U	U	U	U	U	U	S	S	U	S	S	U	U	U	U	U
Chemical																				
Ethanol	S	S	S	S	U	S	S	S	U	M	S	S	S	S	S	S	S	S	S	S
40% Formalin	S	S	S	S	U	S	S	S	S	U	S	S	S	S	S	S	U	S	S	S
Methanol	S	M	S	S	M	S	S	S	U	M	S	S	S	S	S	S	S	U	S	S
2-Propanol	S	S	S	S	M	S	S	S	U	S	S	S	S	S	M	S	S	S	S	S
5% Sodium Hypochlorite**	S	S	S	S	U	S	U	U	U	S	S	M	U	U	U	S	U	S	S	M
3% Hydrogen Peroxide	S	S	S	S	S	S	M	S	U	S	S	S	S	S	U	S	S	S	S	M
100% Hydrogen Peroxide	S	S	S	S	S	U	U	U	U	S	S	S	S	S	S	U	U	S	S	U
5% Phenol Solution	M	U	U	S	U	U	M	M	U	M	M	M	M	M	M	M	U	S	S	U

PA - POLYALLOMER
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MG - MAGNESIUM
RR - RUBBER
BN - BUNA-N
VN - VITON
PF - PHENOLIC FIBER
PT - PAINTED SURFACES

*Autoclaving
121°C 20 min.@
2 ATM (15 PSIG)

**Household Bleach

S=SATISFACTORY
M=MARGINAL
U=UNSATISFACTORY

WARNING:

This chart describes the material compatibility of various sterilization methods. It does not specify the adequacy of sterilization. Refer to Section 4.2 Chemical Resistance Table for material compatibility during centrifugation.

Section 5 - Maintenance

The MicroCentrifuge is maintenance-free. Specifically, the drive motor is permanently lubricated and has no brushes to replace.

5.1 Cleaning

Keep your centrifuge clean to ensure good operation and to extend its life. Clean the entire sample chamber, rotor, and lid at the end of each 8-hour shift and immediately after any spill.

To clean the rotor chamber, cabinet and suction feet, use a damp sponge, warm water, and a mild liquid soap. Do not use acetone. Remove stubborn stains with a plastic scrub pad, not steel wool. Never pour water directly into the sample chamber. Scrub the rotor's tube cavities with a stiff test-tube brush that has end bristles and a non-metallic tip. After cleaning any part, dry well, preferably using a clean, absorbent towel.

a. Decontamination

Decontamination is required if tube breakage occurs and infectious, pathogenic, or radioactive material is released into the unit. If spillage is confined to the polypropylene rotor, it may be sufficient to decontaminate the rotor, which is compatible with household bleach at a one-to-ten dilution and radioactivity decontamination washes such as Count-Off.

Sterilization can be done by autoclaving. Remove sample tubes before autoclaving, unless they are completely full of sample. Remove caps, stoppers, and other tube closures, before autoclaving to keep tubes from collapsing under pressure. Autoclave the polypropylene rotor and accessories at 121°C @ 15 psig for 20 minutes. Do not stack rotors during autoclaving. After the rotor cools to the touch, perform a standard cleaning as described above.

5.2 Cover Interlock Bypass

If power fails, the cover remains locked. To remove samples from the unit before power is restored, use the cover interlock bypass.

Do not attempt mechanical bypass if the rotor is moving.

Bypass procedure:

1. Unplug the centrifuge from electrical power. Do not perform cover interlock bypass unless instrument is removed from live electrical outlet.
2. At the lower right front of the centrifuge, remove the small plastic plug.
3. Reach under and pull on the string that is attached to the plug. The latch will open.
4. Reinstall the plug at the lower right front of the centrifuge.
5. Return the centrifuge to operation.

Section 6 - Troubleshooting

If the unit fails, follow this procedure:

No motor operation and no display lights are lit.

Verify that the unit is plugged into a live electric outlet. Check the circuit at the fuse or circuit breaker, or plug a lamp or other appliance into the outlet to verify it.

If there is power, examine the centrifuge fuse. Unplug the unit and locate the fuse drawer at the rear of the unit. Remove the fuse drawer according to Section 2.3. Examine the fuse. If it is blown or in doubt, replace it with one of the spare fuses from the plastic bag shipped with the unit (see Section 2.3). Plug the centrifuge back in and see if it works. If replacing the fuse did not solve the problem, call Technical Services for assistance.

No motor operation, but the displays are lit.

Check that the cover is properly closed. Press the START button. If you do not hear rotation, call Technical Services for assistance.

Contact your local representative for assistance on any other failure or erratic operation.

Section 7 - Parts List

Part No.	Description
3052592	Rotor Cover (5800851, 5800852, 5800853)
3052729	Rotor Cover (5800891)
3053068	Rotor Nut (5800851, 5800852, 5800853)
3052745	Rotor Nut (5800891)
3052942	Rotor Nut Washer
3051745*	4 Amp Fuse
3052772*	6.25 Amp Fuse
3052773*	6.3 Amp Fuse
3052771*	8 Amp Fuse
3052642*	8 Amp Fuse
3052632*	10 Amp Fuse
3052758	O-ring (5800891 rotor - inner)
3051178	O-ring (5800891 rotor - outer)
3050782	Grease tube (for O-rings)

** see Section 2.3 for fuse selection*

Fuses Not Replaceable By Operator

F1	6.3A	Fast	250V
F2	0.75A	Fast	125V
F3	0.75A	Fast	125V

Section 8- Specifications

Model	Voltage (VAC)	Frequency	FLA
5520	120	50/60 Hz	4.0
5521	220-240	50/60Hz	2.0
5522 (RF)	120	60 Hz	7.0
5523 (RF)	220-240	50Hz	4.0

Maximum Speed 13,500 RPM
Maximum Force 17,000 xg
Number of Tubes 24 x 1.5/2.0mL and 24 x 0.5mL sample tubes (5800851 rotor)
48 x 0.5mL microtubes

Maximum Sample Volume 60 mL
[24 x 2.0mL and
24 x 0.5mL (5800851 rotor)]

Operator Controls
Rotation 1,000 – 13,500 by 100 RPM
Spin Duration 0:01 through 0:59, by 1 sec.
1:00 through 4:45, by 15 sec.
5:00 through 99, by 1 min.

Momentary Spin (Pulse) &
Continuous Operation (Hold) Modes

Repeatability
Rotation Within 10 RPM
Spin Timing 0.1 sec.
Temperature (RF) Range +4°C to ambient (±1°C)

Motor Brushless DC motor (maintenance free)

Refrigeration system (RF) Hermetic compressor 1/4 HP

Refrigerant (RF) R-404A (HP62)

Dimensions
Height 9.8 in (24.9cm) cover closed
19.8 in (50.3cm) cover open
Width 12 in (30.5cm)
Depth 13.3 in (33.8cm) Ventilated
23.2 in (58.9cm) Refrigerated

Weight
5520 36 lbs (16.4kg)
5521 42.5 lbs (19.3kg)
5522 70.5 lbs (32kg)
5523 77 lbs (35kg)

Clearance Add 3.0 in (7.6cm) to all sides

Certification
5520, 5522 CSA Certified
5521, 5523 CE Marked

Specifications are subject to change without notice.

THERMO ELECTRON CORPORATION STANDARD CENTRIFUGE WARRANTY

The Warranty Period starts two weeks from the date your equipment is shipped from our facility. This allows for shipping time so the warranty will go into effect at approximately the same time your equipment is delivered. The warranty protection extends to any subsequent owner during the first year warranty period.

During the first 24 months, component parts proven to be non-conforming in materials or workmanship will be repaired or replaced at Thermo's expense, labor included. Installation and calibration are not covered by this warranty agreement. The Technical Services Department must be contacted for warranty determination and direction prior to performance of any repairs. Expendable items, glass, filters and gaskets are excluded from this warranty.

Replacement or repair of components parts or equipment under this warranty shall not extend the warranty to either the equipment or to the component part beyond the original warranty period. The Technical Services Department must give prior approval for return of any components or equipment. At Thermo's option, all non-conforming parts must be returned to Thermo postage paid and replacement parts are shipped FOB destination.

THIS WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER WRITTEN, ORAL OR IMPLIED. NO WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE SHALL APPLY. Thermo shall not be liable for any indirect or consequential damages including, without limitation, damages relating to lost profits or loss of products.

Your local Thermo Sales Office is ready to help with comprehensive site preparation information before your equipment arrives. Printed instruction manuals carefully detail equipment installation, operation and preventive maintenance.

If equipment service is required, please call your Technical Services Department at 1-888-213-1790 (USA and Canada) or 1-740-373-4763. We're ready to answer your questions on equipment warranty, operation, maintenance, service and special application. Outside the USA, contact your local distributor for warranty information.

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THERMO ELECTRON CORPORATION INTERNATIONAL CENTRIFUGE DEALER WARRANTY

The Warranty Period starts two months from the date your equipment is shipped from our facility. This allows for shipping time so the warranty will go into effect at approximately the same time your equipment is delivered. The warranty protection extends to any subsequent owner during the first year warranty period. Dealers who stock our equipment are allowed an additional six months for delivery and installation, provided the warranty card is completed and returned to the Technical Services Department.

During the first 24 months, component parts proven to be non-conforming in materials or workmanship will be repaired or replaced at Thermo's expense, labor excluded. Installation and calibration are not covered by this warranty agreement. The Technical Services Department must be contacted for warranty determination and direction prior to performance of any repairs. Expendable items, glass, filters, reagents, tubing, and gaskets are excluded from this warranty.

Replacement or repair of components parts or equipment under this warranty shall not extend the warranty to either the equipment or to the component part beyond the original warranty period. The Technical Services Department must give prior approval for return of any components or equipment. At Thermo's option, all non-conforming parts must be returned to Thermo postage paid and replacement parts are shipped FOB destination.

THIS WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER WRITTEN, ORAL OR IMPLIED. NO WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE SHALL APPLY. Thermo shall not be liable for any indirect or consequential damages including, without limitation, damages relating to lost profits or loss of products.

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