SILENCER®

JET
Series

Instruction Manual

GFMD
Global Focus
Marketing & Distribution

Proudly designed and manufactured in the great United States

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While every effort has been made to ensure the completeness and accuracy of this manual, Global Focus Marketing & Distribution, Ltd. will not be liable for failure to follow standard safety precautions.

Printed in the United States of America.

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Chapter 1

Getting Started

SCOPE

This manual contains information with regards to application, installation, and operation of the Silencer® JET table-top centrifuge, and must be read prior to setup or operation of the centrifuge.

UNPACKING AND INSPECTION

Your new Silencer® centrifuge is packed in a specially designed shipping carton. Upon arrival please check the condition of carton and note any damage. Keep all packing materials for the warranty period of the centrifuge.

After unpacking your Silencer® carefully inspect it for damage. It is your responsibility to report all damages to the transportation company and filing, if necessary, any damage claims.

At this point take a moment to ensure you have received the correct rotor, tube adapters, etc. If not or if you have any questions regarding compatibility with your tubes, please contact GFMD, Ltd. at 800-323-4306 before proceeding.

⚠ WARNING Do not operate this equipment in a combustible atmosphere!

SETUP

For your own safety and to prevent damage to the centrifuge, be sure to read this manual before continuing with setup or operation of this centrifuge.

For smooth operation and long equipment life, choose a stable, level bench top.

Avoid sources of heat and/or moisture such as sinks, water baths, heating ducts, and direct sunlight. A suitable environment is 20° to 25° C (68° to 77° F) with a relative humidity range of 30% to 60%. The minimum clearance is 6" on all sides. A cooler ventilated location and leaving the lid open between cycles will allow longer and/or more frequent cycles without overheating of samples. The maximum number of cycles that may be run consecutively will depend upon operating speed, set time, ventilation around the centrifuge, and ambient temperature. Samples that may be adversely affected by being warmed to 39°C during centrifugation should be centrifuged in a refrigerated centrifuge such as the Silencer® TANK-R.

Plug the power cord into a properly grounded outlet and turn on main power interrupt (on back of unit next to power cord). For safety, equipment life, and proper performance, your Silencer® JET's power requirements are 115V AC, 5 amperes, 60Hz. The power cord must be UL listed or CSA certified, 18 AWG, and 6' 7" or less in length.

Getting Started

⚠ WARNING	Operating the centrifuge without proper grounding can cause dangerous electrical conditions and could result in serious operator injury!

CAUTION	Operation of centrifuge on an emergency power circuit can cause damage to electronic circuits.

CAUTION	Operation of centrifuge on a power strip increases ground resistance and can cause damage to electronic circuits.

ROTOR INSTALLATION

Insert the rotor onto the motor shaft ensuring the alignment pins in the motor shaft adapter fit correctly into the alignment groove in the bottom of the rotor. The rotor must be installed correctly for proper operation.

Replace the rotor securing hex screw. The screw must be securely tightened.

Chapter 2

About The JET

PURPOSE

The Silencer® JET is a quiet, general purpose centrifuge designed to be used to accelerate sample separation through the application of relative centrifugal force (RCF). This product is not intended to diagnose, treat, cure or prevent any disease.

DESCRIPTION

The direct drive system employs a powerful, specially designed, balanced, brushless motor ensuring a smooth quiet operation spanning the full speed range of the instrument. This design also promotes long bearing life and eliminates brush maintenance, thereby reducing operating costs.

Excellent stability against imbalance is achieved due to special vibration absorbing drive assembly mounts.

The operator and the JET are protected by several safety features:

- The centrifuge cannot be started with the lid open.
- The centrifuge will not run if the lidlock fails to securely lock.
- Once the rotor is in motion the lid cannot be opened until the rotor has stopped.
- The see-through high-strength lid allows the operator to view the rotor chamber without opening the lid.
- The rotor chamber is strong and easy to clean.

For complete equipment specifications see Appendix A.

Chapter 3

Using The JET

ORIENTATION

Take time now to acquaint yourself with the JET's displays and controls. The basic operation is very simple and the controls are mostly self-explanatory.

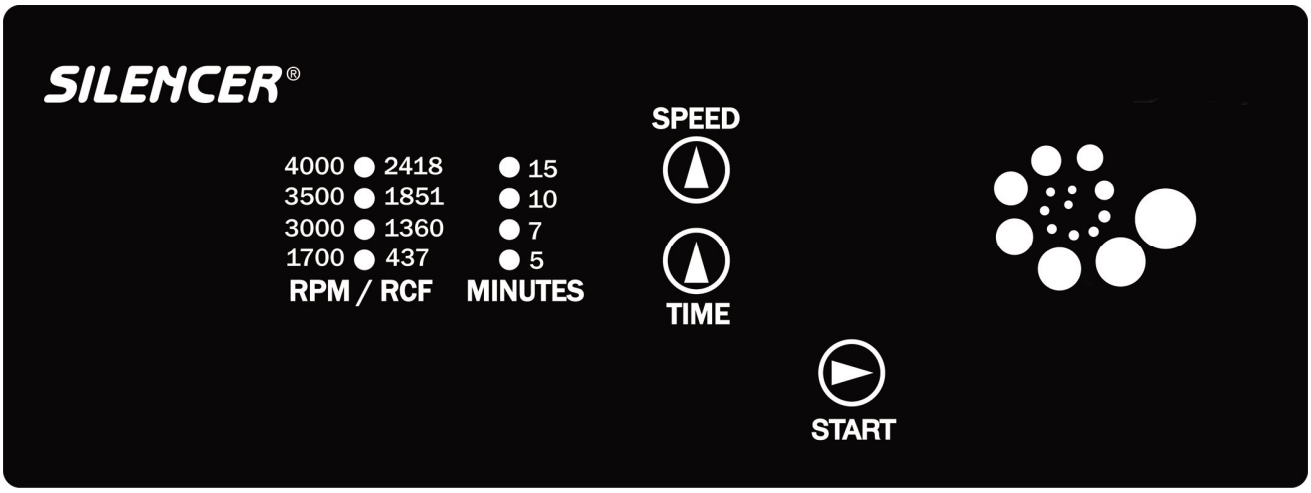

Figure 3.1

WARNING	Turning the power off does not remove power to the centrifuge. Remove all power to the unit by unplugging the power cord.

CONTROLS

START

If pressed when the unit is in the STANDBY mode, the START button will start the run cycle.

Pressing the START button during a run cycle stops the cycle.

SPEED

Press the SPEED button to increment the speed to the desired RPM / RCF setting.

TIME

Press the TIME button to increment the time to the desired time setting.

DISPLAYS

RPM/RCF

There are four LEDs to indicate the selected speed. A blinking LED is an indication that an error has occurred.

MINUTES

There are four LEDs to indicate the selected time in minutes. Blinking LEDs normally indicates that the unit has reached set speed. If the RPM / RCF LED is also blinking an error has occurred.

⚠ WARNING Do not operate this equipment in a combustible atmosphere!

OPERATION

Chapter 1 must be read and the JET must be setup accordingly before continuing.

The set speed and time defaults to the last used speed and time setting. The settings can be changed using the SPEED and TIME buttons.

Open the lid and load your samples, taking care to maintain a balanced load.

Close the lid and press the START button. The lidlock will engage, and the centrifuge will accelerate to the set speed. Upon reaching the set speed the time LEDs will start blinking.

When the set time has elapsed the time LEDs will stop blinking and the centrifuge will decelerate to a stop.

When the rotor has come to a complete stop the lidlock will release.

OPERATION TIPS

- Do not drop or slam the lid!
- Use the emergency lid lock release only for emergencies.
- Only use the supplied emergency lid lock release tool.
- Unplug the centrifuge before using the emergency lid lock release tool.
- Leave the lid open between cycles.

If there are any questions regarding operation please contact GFMD, Ltd. at 800-323-4306.

Chapter 4

Cleaning

⚠ WARNING	Turning the power off does not remove power to the centrifuge. Remove all power to the unit by unplugging the power cord.

⚠ WARNING	Standard safety precautions for handling of biological hazards must be followed!

CAUTION	Do not get any liquids into the top of the motor. Many disinfectants are extremely corrosive and may damage the motor.

CAUTION	Allowing liquid levels in the rotor chamber to rise to the bottom of the motor seal may result in serious damage to the centrifuge.

- The rotor must be removed from the centrifuge for disinfecting. The rotor can be disinfected with PH neutral disinfectants if rinsed and dried prior to use. The disinfectant manufacturer's instructions must be followed. Do not use if the disinfectant manufacturer warns against use on aluminum, stainless steel, or neoprene.
- Clean tube breakages and spills immediately and thoroughly. The interior can be disinfected with PH neutral disinfectants. Disinfectants such as bleach can be used for the rotor chamber only. The interior must be rinsed and dried thoroughly before using the centrifuge. Use water sparingly when rinsing, as the motor seal is not watertight.
- Residue from broken tubes is highly abrasive. Operating the centrifuge with residue from broken tubes can damage the finish on the accessories and rotor chamber possibly compromising their protection from chemicals.

  A white powder inside the rotor chamber is indicative of the debris from broken plastic tubes not being thoroughly removed prior to operating.

  A charcoal grey residue inside the rotor chamber is indicative of the debris from broken glass tubes not being thoroughly removed prior to operating.
- The exterior should be kept clean with the use of a mild soap and a damp (not wet) lint-free cloth. The centrifuge must be dried thoroughly before using.

CAUTION	Use of disinfectants with PH >8 is not recommended.

Chapter 5

Troubleshooting

STATUS CODES

The numbering is based on counting up from the lowest RPM / MINUTES setting LED to the highest. The RPM setting LED represents the most significant digit and the MINUTES setting LED represents the least significant digit. The LEDs will blink to indicate an error has occurred.

This is a list of error codes and the brief description that the centrifuge displays when an error is encountered. Check under symptoms for more details.

ERROR: 1.1	Check the lid safety interlock switch for proper alignment and continuity.
ERROR: 1.2	Check the lid safety interlock switch for proper alignment and continuity.
ERROR: 1.3	Do not attempt to open the lid until the unit has stopped.
ERROR: 2.1	Indicates no power is getting to the motor.
ERROR: 2.2	Indicative of a momentary drop or loss of line voltage.
ERROR: 2.3	Indicative of low line voltage or a momentary sag.
ERROR: 3.1	Indicates an over current error.
ERROR: 3.2	Motor Drive Hardware Fault
ERROR: 3.3	Motor Drive Transistor Over Temp
ERROR: 4.1	Over Speed
ERROR: 4.2	Under Speed

ERROR RESET

Pressing the front panel START button resets error messages.

TROUBLESHOOTING TABLE

SYMPTOM	**The lid remains locked and the LEDs are not illuminated when the main power switch is turned on.**	
	POSSIBLE CAUSES	**POSSIBLE SOLUTIONS**
	No power to the JET.	Ensure the JET is plugged in, and there is power to the receptacle.
	The fuses are blown.	Replace the fuses with 5A, 250V, time delay fuses. If the fuses blow again contact GFMD, Ltd. at 800-323-4306 for assistance.

Troubleshooting

SYMPTOM	Will not start when the START button is pressed and "ERROR: 1.1" is displayed.	
	POSSIBLE CAUSES	**POSSIBLE SOLUTIONS**
	The lid safety interlock switch is defective or misaligned.	Check the lid safety interlock switch for proper alignment and continuity.
	Lid is not closed completely preventing the lid from locking.	Make sure the lid is completely closed.
	Locking mechanism is mechanically binding.	Check for proper lid lock solenoid movement.
	Lid lock safety interlock switch is defective or misaligned.	Check the lid lock safety interlock switch for proper alignment and continuity.

SYMPTOM	Will not start when the START button is pressed and "ERROR: 2.1" is displayed.	
	POSSIBLE CAUSES	**POSSIBLE SOLUTIONS**
	Indicates no power is getting to motor.	Ensure the motor wires are properly connected to MOTA1, MOTB1, and MOTC1 on the Power PCB.
	The motor tachometer cable is unplugged.	Ensure the motor tachometer cable is connected to MOTOR1 on the Power PCB.
	The power sagged so the unit did not start before the bootstrap capacitors discharged.	Check electrical outlet for stable line voltage, and ensure that the circuit isn't overloaded. Reset the unit by turning the main power switch off for approximately 20 seconds and then back on.

Troubleshooting

SYMPTOM	Shuts down and a status code is displayed.	
	POSSIBLE CAUSES	**POSSIBLE SOLUTIONS**
	ERROR: 1.2 - Indicates the lid safety interlock switch failed during a run cycle or an attempt was made to open the lid during the run cycle	If there was not an attempt to open the lid before the unit came to a complete stop, see suggestions for the centrifuge not starting and giving an "ERROR: 1.1" error. If someone attempted to open the lid during the run cycle, please wait until the unit has come to a complete stop before opening the lid. Manually releasing the lid during the cycle creates a hazardous condition and is an OSHA safety violation.
	ERROR: 1.3 - Indicates the lid safety interlock switch failed during deceleration or an attempt was made to open the lid before the unit came to a complete stop.	If there was not an attempt to open the lid before the unit came to a complete stop, see suggestions for the centrifuge not starting and giving an "ERROR: 1.1" error. If someone attempted to open the lid during the run cycle, please wait until the unit has come to a complete stop before opening the lid. Manually releasing the lid during the cycle creates a hazardous condition and is an OSHA safety violation.
	ERROR: 2.2 - Indicative of a momentary drop in line voltage or loss of line voltage.	Check for a loose power cord connection to the outlet, an overloaded circuit, or line voltage below 110 VAC.
	ERROR: 2.3 - Indicative of low line voltage or a momentary sag in line voltage.	Check for a loose power cord connection to the outlet, an overloaded circuit, or line voltage below 110 VAC.
	ERROR: 3.1 - Indicative of excess motor current or a current spike.	Ensure the plug to outlet connection is secure and the unit is not plugged into a power strip.
	ERROR: 3.2 - Motor driver shutdown due to current spike or driver temperature.	Ensure the plug to outlet connection is secure, the unit is not plugged into a power strip, the vent fan is running, and there is adequate space around the centrifuge.

	ERROR: 3.3 - The motor drive MOSFETs are too warm.	Ensure the vent fan is running and there is adequate space around the centrifuge.
	ERROR: 4.1 - The speed is not stable and exceeded the allowable maximum speed.	Ensure the plug to outlet connection is secure, the unit is not plugged into a power strip, and the power circuit is not overloaded.
	ERROR: 4.2 - The speed is not stable and dropped too low.	Ensure the plug to outlet connection is secure, the unit is not plugged into a power strip, and the power circuit is not overloaded.

SYMPTOM	**The sample temperature is exceeding 39°C.**	
	POSSIBLE CAUSES	**POSSIBLE SOLUTIONS**
	The rotor chamber heat extraction fan isn't running.	Verify that the fan is running.
	Cycle times are too long, operating speed is too high, and /or cycles are too frequent.	Lower the operating speed, shorten spin time, and/or allow more cooling time between cycles with the lid open.
	Centrifuge is under a heat vent.	Relocate the centrifuge away from heat vents.
	Centrifuge's immediate ambient environment is warm due to other equipment.	Relocate unit away from heat producing equipment.

Chapter 6

Limited Warranty Statement

The Silencer® JET is warranted to be free from defects in material and workmanship for a period of one year from the date of delivery. GFMD, Ltd., or its agent, will repair or replace and return free of charge any part that is returned, transportation prepaid by user, to GFMD, Ltd., or its agent, within said period, and that is found upon inspection to have been defective in materials or workmanship.

These warranties do not include normal wear from use, or operator maintenance. It does not apply to any instrument or part that has been altered by anyone other than an employee of the manufacturer or its agent nor to any instrument that has been damaged through accident, negligence, failure to follow operating instructions, natural disaster, the use of electric currents of circuits other than those specified on the plate affixed to the instrument, insufficient or excessive electrical supply, operation on emergency or backup generators, abnormal mechanical or environmental conditions, misuse or abuse.

GFMD, Ltd. 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 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 any claim or damages in connection with the sale or furnishing of goods or parts, their design, suitability for use, installation or operation. GFMD, Ltd., or its agent, 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 that liability is claimed.

Appendix A

Specifications

PERFORMANCE SPECIFICATIONS

- Maximum speed:
  - JET-H8 w/ 8 x 10ml Horizontal Rotor — 4,000 RPM
  - JET-FA10 w/ 10 x 10ml FA Rotor — 4,500 RPM
- Maximum RCF:
  - JET-H8 w/ 8 x 10ml Horizontal Rotor — 2,418 x g
  - JET-F10 w/ 10 x 10ml FA Rotor — 2,802 x g
- Approximate acceleration rate (0 - Max. RPM): 15 seconds
- Approximate deceleration rate (Max. - 0 RPM):
  - JET-H8 w/ 8 x 10ml Horizontal Rotor — 45 seconds
  - JET-F10 w/ 10 x 10ml FA Rotor — 60 seconds
- Maximum noise level: 58 dBA
- Speed Control +/- 2%
- Timer +/- 5%
- Power requirements: 115 volts, 5 amperes

UNIT SPECIFICATIONS

- Dimensions 13”w x 16.5”d x 11.5”h
- Spill resistant control panel
- Completely enclosed rotor chamber
- High-strength alloy rotor chamber
- See-through high-strength lid
- Dual safety interlock to ensure lid is closed and locked
- Direct drive system
- Brushless D.C. motor
- Microprocessor control

Appendix B

Service Log

Service Log		
Date	**Service Performed**	**By**

Appendix C

Replacement Parts List

Description	Qty Needed	Part No.
Gasket, Lid	1 ea.	SIL00476
Gasket, Motor, JET	1 ea.	SIL00456B
Hinge, Lid, JET	2 ea.	SIL00512
Latch, Lidlock	1 ea.	SIL00642B
Lid, JET	1 ea.	SIL00661
Lidlock Assembly	1 ea.	SIL00672
Switch, Lid Interlock (part of SIL00672)	1 ea.	SIL02456
Switch, Lock Interlock (part of SIL00672)	1 ea.	SIL02457
Motor Assembly, JET	1 ea.	SIL00731
P.C.B., Display / Control, JET	1 ea.	SIL00814

Parts are sold individually. The quantity listed is the quantity used per unit.

Appendix D

Lid Release Tool

⚠ WARNING	The lid release tool is provided for emergency access to samples only. Unplug the centrifuge before attempting this procedure!

The correct tool must be used for your unit or the lid safety interlock switch may become damaged. If the interlock switch is damaged the unit can't detect the lid being closed and therefore won't start.

To use the release tool:

1. Unplug the centrifuge.
2. Insert the tool completely into the release access port on the left side of the unit (just below the lid locking bracket).
3. Push the handle towards the back of the unit and lift the centrifuge lid.