

SILENCER®

STEALTH **Series**

Instruction Manual



Proudly designed and manufactured in the great United States

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Chapter 1

Getting Started

SCOPE

This manual contains information with regards to application, installation, and operation of the Silencer[®] STEALTH benchtop 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[®] STEALTH'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 pin in the motor shaft fits correctly into the alignment groove in the bottom of the rotor. The rotor must be installed correctly for proper operation.

Replace the rotor securing nut. The nut must be securely tightened.

Chapter 2

About The STEALTH

PURPOSE

The Silencer[®] STEALTH 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 STEALTH 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 STEALTH

ORIENTATION

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

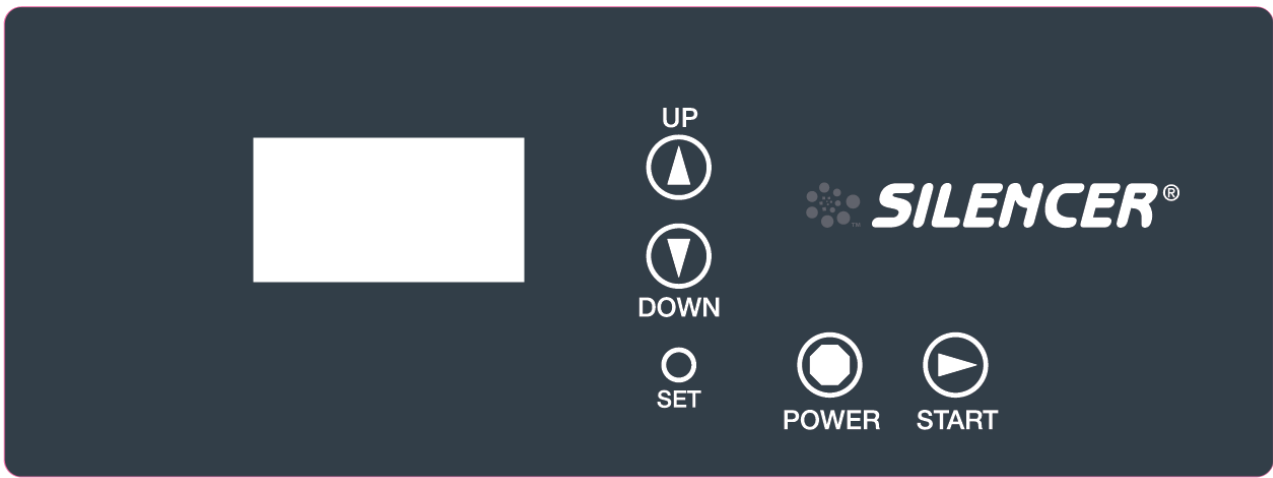


Figure 3.1



WARNING

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

CONTROLS

POWER

Press the POWER button once to bring the unit out of SLEEP mode and into STANDBY mode. This unlocks the lid and turns the display on. Pressing the POWER button while the power is on turns the display off and puts the unit into a low power SLEEP mode.

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

Pressing the POWER button while in any SET mode cancels and returns the centrifuge to the STANDBY MODE.

SET

Press to enter the SET POINT mode

UP

Press the UP button to increase the value of the selected item.

Using The STEALTH

DOWN

Press the DOWN button to decrease the value of the selected item.

START

If pressed when the unit is in the STANDBY mode, the START button will start the run cycle, which is indicated by the display going into inverse mode (dark background and light text).

Pressing the START button while in any SET mode will accept changes and return to the STANDBY mode.



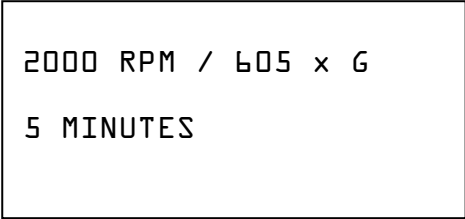
WARNING

Do not operate this equipment in a combustible atmosphere!

OPERATION

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

Press the POWER button to bring the centrifuge out of the SLEEP mode, turn the display on, and unlock the lid.



2000 RPM / 605 x G
5 MINUTES

The set speed and time defaults to the last saved speed and time setting. The settings can be changed in the SET POINT mode or a saved program can be recalled in the PROGRAM RECALL mode.

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, the display will show the actual speed, and the centrifuge will accelerate to the set speed. Upon reaching the set speed the time will start counting down, and the display will show the time remaining.

When the set time has elapsed, the centrifuge will decelerate to a stop.

When the rotor has come to a complete stop the lidlock will release, and display will revert back to set speed and time.

Using The STEALTH

SET POINT

The SET POINT mode shows the current speed and time settings.

NOTE: The current settings can not be changed if the centrifuge is in the LOCKED mode.

```
SET POINTS
▶ RPM: 2000 RCF: 0605
  TIME: 005 MINUTES
```

The currently selected item is indicated with an arrow. To select another parameter for modification press and release the SET button.

Modify the selected parameter by pressing the UP or DOWN button.

Cancel changes by pressing the POWER button.

Accept the changes and return to the STANDBY mode by pressing the START button.

If you wish to save these settings press and hold the SET button for approximately two seconds to enter the PROGRAM STORE mode (indicated by three short beeps).

PROGRAM STORE

The PROGRAM STORE mode displays the three program locations.

```
PROGRAM - STORE
▶ PROG NUMBER: 1
  PROG NUMBER: 2
  PROG NUMBER: 3

RPM    TIME
2000   005
```

The currently selected program is indicated with an arrow. Press the SET button to select another program location.

The current saved speed and time for the selected program is displayed below the program list.

Press the POWER button to cancel programming and return to the STANDBY mode.

Press the START button to store the settings into the selected program location and return to the STANDBY mode.

Using The STEALTH

PROGRAM RECALL

Press and hold the SET button for approximately 2 seconds to enter the PROGRAM RECALL mode (indicated by three short beeps).

The PROGRAM RECALL mode displays the three selectable programs.

```
PROGRAM - RECALL
▶ PROG NUMBER: 1
  PROG NUMBER: 2
  PROG NUMBER: 3

RPM    TIME
2000   005
```

The currently selected program is indicated with an arrow. Press the SET button to select another program location.

The programmed speed and time for the selected program is displayed below the program list.

Press the POWER button to cancel program selection and return to the STANDBY mode.

Press the START button to accept the program selection and return to the STANDBY mode.

SETTINGS MENU

Press the POWER button to put the centrifuge into the SLEEP mode (indicated by one beep).

Press and hold the SET button while pressing and releasing the POWER button.

Continue to hold the SET button until the unit enters the SETTINGS MENU (indicated by 2 short beeps)

Release the SET button.

```
SETTINGS MENU
▶ BEEPS (EOR):      1
  BEEPS (error):    5
  RCF MODE:         OFF
  BRAKES:           9
  OPTIONAL EOR LED: 2
```

The SETTINGS MENU shows the current user settings.

The currently selected item is indicated with an arrow. To select another parameter for modification press and release the SET button.

Modify the selected parameter by pressing the UP or DOWN button.

Using The STEALTH

Accept the changes and return to the STANDBY mode by pressing the START button.

BEEPS (EOR)

This determines the number of times the centrifuge will beep at the end of each run. The default is 1 and the allowable settings are 0 to 9.

BEEPS (error)

This determines the number of times the centrifuge will beep when an error is incurred. The default is 5 and the allowable settings are 5 to 9.

RCF MODE

This allows the operator to choose how speed will be set. If the RCF MODE is OFF the speed is set by RPM in 100 RPM increments. If the RCF MODE is ON the speed is set by RCF in increments of 10xg.

BRAKES

This adjusts the braking level. The default is 9 and the allowable settings are OFF to 9.

OPTIONAL EOR LED

This setting has no effect unless the optional End of Run Light is installed. This setting determines the length of time (in minutes) that the green LED will remain on at the end of each run. The default is 2 and the allowable settings are 0 to 99.

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.

Using The STEALTH

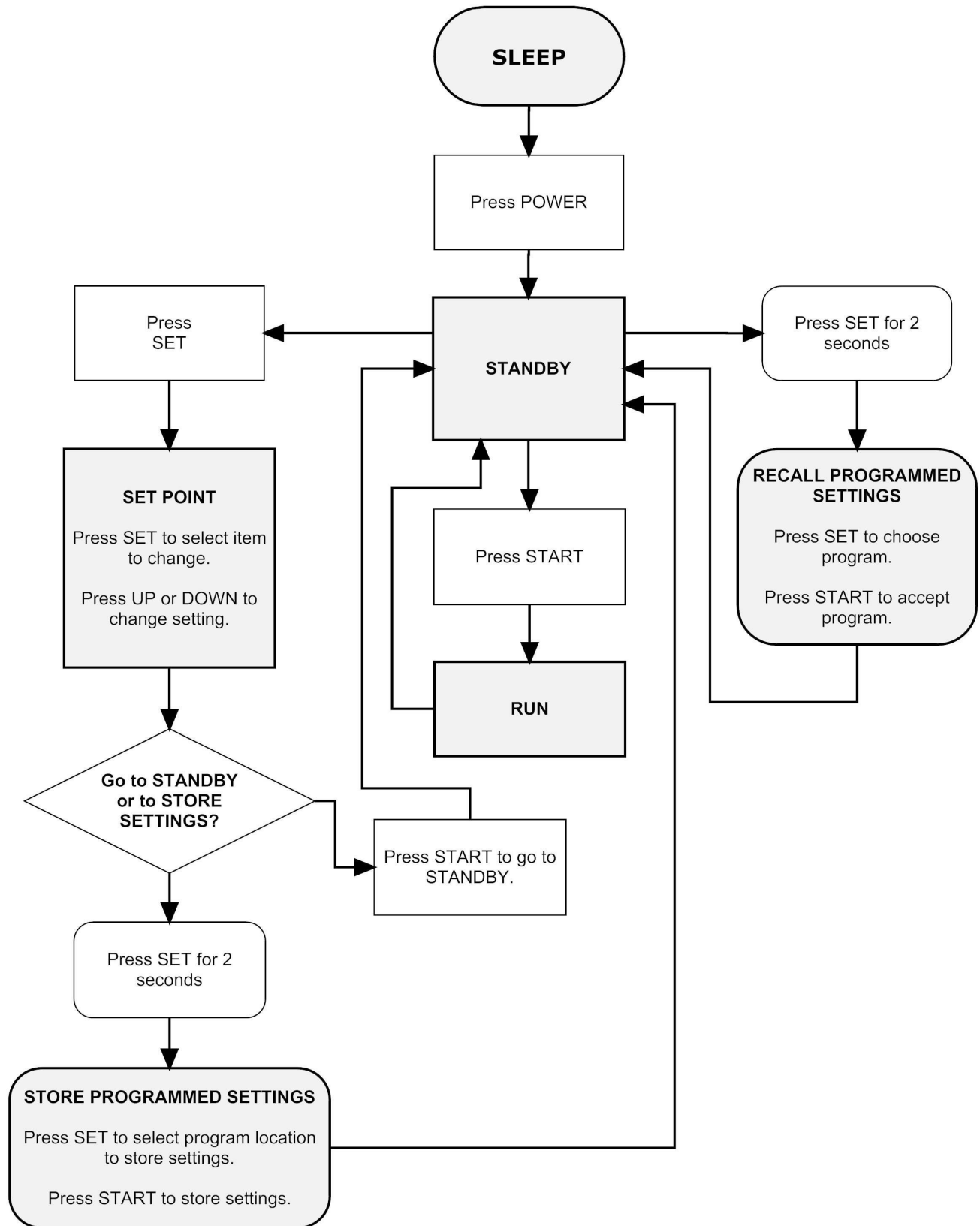


Figure 3.2

Care Of The STEALTH

⚠ 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.

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

- 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.
- The horizontal rotor and carriers must be cleaned and lubricated with the cleaner/lubricant Tri-Flow™ (see Appendix F for details):

- ◇ after cleaning or decontamination of rotor, carriers, or rotor chamber
- ◇ after tube breakages
- ◇ when experiencing frequent rotor imbalances at speeds below 1,000 RPM
- ◇ when experiencing excessive vibration at speeds below 1,000 RPM
- ◇ at least once per month (more frequent in high frequency use or high speed applications)

Chapter 5

Troubleshooting

STATUS CODES

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 Indicates no power is getting to the motor.
- ERROR: 1.2 Indicative of low line voltage or a momentary sag.
- ERROR: 1.3 Indicative of a momentary drop or loss of line voltage. (LOCKING)
- ERROR: 3.0 Imbalance at speeds < 100 RPM. Check the imbalance sensor.
- ERROR: 3.1 Dynamic imbalance: Perform the rotor cleaning and lubricating.
- ERROR: 3.2 Imbalance: Ensure carriers are in the proper position and the load is balanced.
- ERROR: 3.3 Tighten rotor nut and motor screws. Ensure the rotor is level.
- ERROR: 7.1 Check the lid safety interlock switch for proper alignment and continuity.
- ERROR: 7.2 Check the lid safety interlock switch for proper alignment and continuity.
- ERROR: 7.3 Do not attempt to open the lid until the unit has stopped. (LOCKING)
- ERROR: 8 Ensure the line voltage is stable & the circuit isn't overloaded.

ERROR RESET

Pressing the front panel POWER button will reset most error messages.

Locking errors indicate an issue that needs to be addressed before the unit is put back into service. Unplug the centrifuge for approximately 20 seconds in order to reset locking errors.

TROUBLESHOOTING TABLE

SYMPTOM	The lid remains locked and the displays are not illuminated when the POWER button is pressed.	
	POSSIBLE CAUSES	POSSIBLE SOLUTIONS
	No power to the STEALTH.	Ensure the STEALTH is plugged in, there is power to the receptacle, and the main power switch is on.
	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: 7.1” 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: 1.1” is displayed.	
	POSSIBLE CAUSES	POSSIBLE SOLUTIONS
	Indicates no power is getting to motor.	<p>Ensure the motor wires are securely connected to the Drive / Brake Relay Socket.</p> <p>Ensure the motor wires from the Drive / Brake Relay Socket are properly connected to BLACK1, GREEN1, and RED1 on the Power PCB.</p> <p>The Drive / Brake Relay’s drive contacts may be pitted or worn.</p> <p>The Drive / Brake Relay may be loose in the relay socket.</p>
	The motor tachometer cable is unplugged.	Ensure the motor tachometer cable is connected to MOTOR1 on the Power PCB.
	Bad Hall Effect Sensor in the motor.	See Appendix H for testing procedure.
	The power sagged so the unit did not start before the bootstrap capacitors discharged.	<p>Check electrical outlet for stable line voltage, and ensure that the circuit isn’t overloaded.</p> <p>Reset the unit by turning the main power switch off for approximately 20 seconds and then back on.</p>

Troubleshooting

SYMPTOM	Shuts down and a status code is displayed.	
	POSSIBLE CAUSES	POSSIBLE SOLUTIONS
	ERROR: 1.2 - 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: 1.3 - Indicative of a momentary drop in line voltage, loss of line voltage, or low line voltage.	Reset the unit by turning the main power switch off for approximately 20 seconds and then back on.
	ERROR: 3.0 - Indicates a rotor imbalance occurred at a speed below 100 RPM.	Check for an open imbalance switch, a bent switch actuator, or a break in the wiring between the switch and the Control / Display PCB.
	ERROR: 3.1 - Indicates a rotor imbalance occurred at a speed between 100 and 700 RPM.	This is normally indicative of a dynamic imbalance, which would mean the rotor and carriers need cleaning (see Chapter 4 Care Of The STEALTH), or a substantially unbalanced load. If cleaning the rotor and carriers does not resolve the error, ensure the carriers are in the proper rotor position and the load is balanced.
	ERROR: 3.2 - Indicates a rotor imbalance occurred at a speed between 700 and 1500 RPM.	This is indicative of a static imbalance. Ensure the carriers are in the proper rotor position and the load is balanced.
	ERROR: 3.3 - Indicates a rotor imbalance occurred at a speed greater than 1500 RPM.	Imbalances at this speed are normally caused by the rotor not being level. Ensure the rotor retaining nut is tight, the motor mounting hardware is tight, and the counter-top is level.

Troubleshooting

	<p>ERROR: 7.2 - Indicates the lid safety interlock switch failed during a run cycle or an attempt was made to open the lid during the run cycle</p>	<p>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: 7.1” error.</p> <p>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.</p>
	<p>ERROR: 7.3 - 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.</p>	<p>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: 7.1” error.</p> <p>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.</p>
	<p>ERROR: 8 - Indicates the speed was too erratic.</p>	<p>Check electrical outlet for stable line voltage, and ensure that the circuit isn’t overloaded.</p>

<p>SYMPTOM</p>	<p>The sample temperature is exceeding 39°C.</p>	
	<p>POSSIBLE CAUSES</p>	<p>POSSIBLE SOLUTIONS</p>
	<p>The rotor chamber heat extraction fan isn’t turning on.</p>	<p>Verify that the fan is turning on when the cycle is started, continues to run during the cycle, and for several minutes after the rotor comes to a complete stop.</p>
<p>Cycle times are too long, operating speed is too high, and /or cycles are too frequent.</p>	<p>Lower the operating speed (see Appendix B R.C.F. Chart for appropriate speed), shorten spin time, and/or allow more cooling time between cycles with the lid open.</p>	

Troubleshooting

	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

New Silencer[®] centrifuges are 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.

There is an additional one year warranty on parts plus an additional three years on the motor. During this period 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. Labor is not included during this period.

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 - STEALTH-H34 w/ Horizontal rotor 4,000 RPM
- Maximum RCF - STEALTH-H34 w/ Horizontal rotor 2,800 x g
- Approximate acceleration rate (0 – 4,000 RPM):
 - STEALTH-H34 w/ Horizontal rotor 30 seconds
- Approximate deceleration rate (4,000 - 0 RPM):
 - STEALTH-H34 w/ Brake on 30 seconds
 - Brake off 360 seconds
- Maximum noise level - Horizontal rotor 58 dBA
- Speed Control +/- 2%
- Timer +/- 5%
- Power requirements - 115 volts, 5 amperes

UNIT SPECIFICATIONS

- Dimensions: 15.6"W x 19"D x 13.75"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
- Rotor imbalance protection
- Direct drive system
- Brushless D.C. motor (1 HP)
- Microprocessor control
- Digital speed display
- Digital R.C.F. display
- Digital time display
- Timer range 1 - 999 plus hold
- Variable automatic dynamic braking system

Appendix B

R.C.F. Chart

RELATIVE CENTRIFUGAL FORCE CHART

RPM	R.C.F.
STEALTH-H34	
w/ horizontal rotor	
500	44
600	63
700	86
800	112
900	142
1,000	175
1,100	212
1,200	252
1,300	296
1,400	343
1,500	394
1,600	448
1,700	506
1,800	567
1,900	632
2,000	700
2,100	772
2,200	847
2,300	926
2,400	1,008
2,500	1,094
2,600	1,183
2,700	1,276
2,800	1,372
2,900	1,472
3,000	1,575
3,100	1,682
3,200	1,792
3,300	1,906
3,400	2,023
3,500	2,144
3,600	2,268

RELATIVE CENTRIFUGAL FORCE CHART

RPM	R.C.F.
	STEALTH-H34
	w/ horizontal rotor

3,700	2,396
3,800	2,527
3,900	2,662
4,000	2,800

Appendix D

Replacement Parts List

Description	Qty Needed	Part No.
Tri-Flow™, 2 oz, Non-Aerosol	1 ea.	SIL00181
Gasket, Lid	1 ea.	SIL00452
Gasket, Motor	1 ea.	SIL00456A
Hinge, Lid	2 ea.	SIL00511
Latch, Lidlock	1 ea.	SIL00643B
Lid	1 ea.	SIL00660
Lidlock Assembly	1 ea.	SIL00671B
Solenoid (part of SIL00671B)	1 ea.	SIL00131
Switch, Lid Interlock (part of SIL00671B)	1 ea.	SIL02456
Switch, Lock Interlock (part of SIL00671B)	1 ea.	SIL02457
Motor Assembly	1 ea.	SIL00757B
PCB, Display/Control ELITE / STEALTH	1 ea.	SIL00816B
P.C.B., Power, MACH / ELITE / STEALTH	1 ea.	SIL00841
Relay, Drive / Brake	1 ea.	SIL01103
Switch, Imbalance	1 ea.	SIL02441

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

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.

Care of Rotor & Accessories

WARNING

Follow standard safety precautions for handling of potential biological hazards!

Proper rotor / carrier care is required on horizontal rotors to maintain smooth performance and to minimize rotor imbalances caused by dynamic carrier imbalances. The frequency it is required is dependent upon variables such as workload, tube breakages, and cleaning / disinfecting frequency. This procedure should be performed after any tube breakage (after all glass has been removed and the rotor chamber has been cleaned), and after any cleaning or disinfecting of the carriers or the rotor chamber is performed. If there is a procedure calling for scheduled cleaning and/or disinfecting, please add this procedure as the last step of that procedure.

MATERIALS REQUIRED

1. Tri-Flow® cleaner / lubricant (available as GFMD, Ltd. cat. no. SIL00181)
2. Cotton Swabs
3. Rubber Gloves

CLEANING & LUBRICATING PROCEDURE

1. Ensure all the carriers (buckets) have the same serial number. The serial number will be on the outside bottom of the carrier.
2. Ensure the carriers are in their correct rotor position. The rotor position number will be on the outside bottom of the carrier.
3. Starting with rotor position 1.
4. Remove the insert (tube holder) from the carrier and set aside.
5. Remove the carrier from the rotor.
6. Ensure there is no debris or residue from broken tubes in the carriers that may affect balance.
7. Set the carrier upside down on a convenient work surface.
8. Shake the Tri-Flow® well and apply a small amount into the recessed area on one side of the carrier.

CARE OF ROTOR & ACCESSORIES

9. Clean the recessed area out using a cotton swab.
10. Repeat steps 8 & 9 using fresh cotton swabs until the swabs do not show any gray/black residue after use. Leave a film of lubricant when finished.
11. Perform steps 8 - 10 on the recessed area on the other side of the metal carrier.
12. Shake the Tri-Flow[®] well and apply a small amount to a fresh cotton swab and clean the rotor pivot pins by wiping with the cotton swab.
13. Repeat step 12 with fresh cotton swabs as necessary to thoroughly clean the rotor pins. Leave a film of lubricant when finished.
14. Replace the carrier onto its rotor position.
15. Ensure there is no debris or residue from broken tubes in the insert that may affect balance.
16. Replace the insert into its carrier.
17. Perform steps 4 - 16 on rotor positions 2 - 4.
18. Ensure that the opposite inserts are of the same type, balanced, and oriented the same.

Appendix G

Imbalance Sensor Assembly Testing



WARNING

Follow standard safety precautions for handling of potential biological hazards!

The cleaning and lubricating procedure in Appendix F must be performed prior to performing this test for the test to be valid.

MATERIALS REQUIRED

1. Four 10ml (16mm x 100mm) Tubes or six 7ml (13mm x 100mm) Tubes
2. Rubber Gloves

IMBALANCE SENSOR TESTING PROCEDURE

1. Ensure all the carriers (buckets) have the same serial number. The serial number will be on the outside bottom of the carrier.
2. Ensure the carriers are in their correct rotor position. The rotor position number will be on the outside bottom of the carrier.
3. Ensure that the opposite inserts are of the same type, balanced, and oriented the same.
4. Ensure the carriers are pivoting smoothly. Test them by pressing down on the outer edge of each carrier and releasing. The carriers should swing a few times and end with the carrier vertical. If the carriers are not swinging smoothly contact GFMD, Ltd. at 800-323-4306 before proceeding.
5. Set the speed for 3,000 RPM.
6. Load two empty 10ml tubes opposite two 10ml tubes with 10ml of water in each creating a 20 gram imbalance. If using 7ml tubes load three empty tubes opposite three 7ml tubes with 7ml of water in each creating a 21 gram imbalance.
7. Press START. The unit should shut down and give an imbalance error prior to reaching a speed of 1,000 RPM. If the speed exceeds 1,000 RPM stop the unit by pressing START again.
8. If the unit shuts down with an imbalance error the test is complete. Remember to remove all tubes before returning to service.
9. If the unit did not shutdown with an imbalance error increase the imbalance by adding one more empty tube opposite one more full tube to increase the imbalance. Contact GFMD, Ltd. at 800-323-4306.

Do NOT put the unit back into service until the imbalance sensor is functioning properly!

Appendix H

Motor Hall Effect Sensor Testing

⚠ WARNING

Follow standard safety precautions for handling of potential biological hazards!

The motor has three Hall effect sensors that are used for angular position information to determine which phase needs to be energized. Hall effect sensor A is also tach feedback for speed control. Some models do not have the DRIVE / BRAKE RELAY and the BRAKE RESISTORS but the Hall effect sensor testing is the same.

1. MOTOR1 pin 1 (yellow) is VCC (+5 VDC).
2. MOTOR1 pin 5 (gray) is VSS (common).
3. Measure the DC voltage from VSS to MOTOR1 pin 2 (brown) while slowly turning the rotor by hand.
4. The voltage should switch between high and low (> 4 VDC and < 1 VDC).
5. Repeat steps 3 and 4 for MOTOR1 pin 3 (blue) and MOTOR1 pin 4 (orange).

