

## **WARRANTY**

Drucker Diagnostics warranties that this centrifuge is free from defects in materials and workmanship for 2 years. Should the centrifuge require warranty or out-of-warranty service please contact:

Drucker Diagnostics

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+1-866-265-1486 (U.S. only) • +1-814-692-7661 • Fax: 814-692-7662  
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**NOTE:** The programmable run-time has been preset for

**10 Minutes**

Instructions to change this setting are located on page 7.



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## Operator/Service Manual

### Model 653V

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### Model Description:

The **Horizon Model 653V** is a continuous-duty, electronically-controlled, variable-speed, laboratory centrifuge with a lid safety interlock system. The unit is controlled by an electronic push-button timer that is variable from 1 to 30 minutes, for precise spin times and ease of use. Samples can be safely viewed through the transparent lid. Entry into the machine is restricted during operation by the safety interlock system. The Horizon features a lighted control panel that displays the status of the machine, easily viewable from a distance. For warranty information, turn to the back cover.

### Intended Use:

This is a general purpose laboratory centrifuge intended for safe and rapid density based separation of fluids, including physiologic fluids, in approved specimen receptacles, for qualitative or quantitative test procedures. This device is intended to be operated by properly trained personnel who have carefully read and understood the Operating Manual.

Users should also comply with the specimen receptacle manufacturer's specific instructions for use, in addition to any other protocols established by the testing organization.

### Supplied Equipment\*:

The following items come standard with each Horizon centrifuge:

1. One (1) Horizon centrifuge
2. One (1) six-place horizontal rotor p/n 7786048
3. Six (6) 2-place 100mm test tube carriers p/n 7713030
4. One (1) Operator's manual

\* The rotor and rotor accessories are rated for a rotation frequency of 3,400 RPM.

**WARNING:** For the safety of both the operator and service personnel, care should be taken when using this centrifuge if handling substances that are known to be toxic, radioactive or contaminated with pathogenic microorganisms. When Risk Group II materials are used, (as identified in the World Health Organization "Laboratory Bio-Safety Manual"), a Bio-Seal should be employed. In the event that materials of a higher risk group are being used, more than one level of protection must be provided. The use of flammable or explosive materials as well as those materials which have a vigorous chemical reaction is prohibited.

### Replacement Parts:

Part No.	Description
7724177	Rubber Foot
7751068	Switch, lid safety
7735016	Motor, 1/2 H.P., Brushless
7717039	Brushless motor control PC board
7751043	Circuit Breaker
7760002	Power cord
7714101	Pawl, latch, lid
7714103	Knob, latch, lid
7712263	Lid
7713029	Air inlet cover, lid
7724071	Hinge, friction
7732018	Lid gasket
7732019	Rotor chamber gasket
7713027	Exhaust Air Deflector
7713030	2-Place Tube Carrier
7786048	6-Place Horizontal Rotor

Contact your authorized dealer or Drucker Diagnostics for information on ordering parts or accessories.

### Available Accessories:

#### **1525 Tube cushion**

p/n 1525



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## Troubleshooting:



**NOTE:**  
The latch must be turned completely clockwise to its stop position in order for the centrifuge to operate.



## Features:

- Swing-out horizontal rotor design incorporating a unique test tube carrier that produces **horizontally separated samples** while requiring no additional parts
- Variable-speed
- Cool-Flow air flow design that prevents overheating of samples
- Heavy gauge steel construction for safety and durability
- Lid safety switch that prevents the centrifuge from operating unless the lid is closed and latched
- Removable rotor for easy cleaning
- Locking lid that allows entry into the centrifuge only after the rotor has completely stopped
- Brushless DC Motor; requires no routine maintenance, cool running
- Clear lid for safe observation of samples and optical calibration of speed
- Electronically controlled timed operation variable from 1 to 30 minutes
- Push-button operation
- Indicator lights:
 

'RUN'	green	-lights when power is applied to the motor
'LATCH'	yellow	-lights when the lid is closed and latched
'UNLOCKED'	red	-lights when the lock system is deactivated
- Audible indicator at the end of each run
- Out-of-balance detection

## Specifications:

<b>Speed Range</b>	500 to 3,200 (+/- 100) RPM
<b>Force Range</b>	40 to 1540 xg
<b>Maximum capacity:</b>	120 mL (12 x 10 mL)**
<b>Overall Dimensions (H x W x D):</b>	8.5 in. x 12.5 in. x 15.5 in.
<b>Centrifuge Motor:</b>	1/2 H.P. Brushless DC
<b>Nominal Acceleration Time:</b>	20 seconds
<b>Nominal Braking Time:</b>	10 seconds
<b>Protection Breaker:</b>	4 Amp. re-settable
<b>Timer (electronic):</b>	1 to 30 min +/- 1%
<b>Current Requirement:</b>	1.5 Amps
<b>Voltage Requirement:</b>	115 Volts
<b>Frequency:</b>	50/60 Hz
<b>Weight:</b>	30 lbs.

*Any use other than those specified by the manufacturer is explicitly prohibited.*

\*\* Maximum sample density is 1.15 grams / mL, (water density = 1.00 grams / mL)

<b>1. Problem: The rotor does not spin freely.</b>
Solutions: - Make sure nothing has fallen into the rotor chamber. - If there is nothing obstructing the rotor, contact your authorized dealer or Drucker Diagnostics for further assistance.
<b>2. Problem: Excessive noise when the machine is running.</b>
Solutions: - Check to see that the load is balanced. - Make sure that nothing has fallen into the rotor chamber. - Make sure that the rotor is installed correctly and that the center thumb screw is tight. - Have a technician test the motor and replace it if necessary.
<b>3. Problem: The centrifuge does not run.</b>
Solutions: - Check the electrical outlet. - Make sure the lid latch is turned completely clockwise to its stop position. When the lid is closed properly, the latch light on the control panel will illuminate. - Check the circuit breaker switch at the bottom right of the machine. If the switch is white, the breaker has tripped. Contact your authorized dealer or Drucker Diagnostics for assistance. - Make sure that the load is balanced. The 653V is equipped with out-of-balance detection. If an unbalanced load is detected, the unit will safely power down. - The printed circuit board may be damaged. Have a technician test and replace the circuit board if necessary.
<b>Problem: The latch light does not come on when the lid is closed.</b>
Solutions: - Make sure that the unit has power. - Make sure the lid latch is turned completely clockwise to its stop position. The latch makes contact with a switch underneath the front top of the cabinet. If this switch is not activated, the light will not turn on and the machine will not run.
<b>5. Problem: The machine does not unlock after a run has completed.</b>
Solutions: - The lid should remain locked until the rotor has come to a complete stop and then unlock for 60 seconds. If additional unlock time is needed, press the 'OPEN / EMERGENCY STOP' button with the machine plugged in and the rotor stopped. If the lid remains locked after this and will not unlock, the electronics may have been damaged. Contact your authorized dealer or Drucker Diagnostics. To access the rotor chamber, follow the procedure on page 13, "Emergency Lid Removal".
<b>6. Problem: The run time is not set to the desired length.</b>
Solutions: - Check the run preset by following the instructions on page 6. If the preset is not the desired length, follow the instructions on page 7 to change the preset.

**Control Panel:**



**'RUN' INDICATOR** Lights up when the machine is in operation, (power is being applied to the motor).

**'LATCH' INDICATOR** Lights up when the lid has been closed and latched properly.

**'UNLOCKED' INDICATOR** Lights up to indicate that the locking mechanism has been deactivated, allowing access to the rotor chamber .

**SPEED CONTROL** Use this input to set the running speed of the centrifuge. The speed may also be adjusted while the centrifuge is running.

**'START' BUTTON** Begins a new run, (the lid must be closed, see pg. 6).

**'OPEN / EMERGENCY STOP' BUTTON** Allows access into the rotor chamber by disengaging the locking mechanism. Entry is only permitted when the rotor is stopped. Pressing this button during operation will terminate the run and unlock the lid after the rotor has come to a stop.

**LID SAFETY SWITCH** The lid safety switch prevents the centrifuge from operating while the lid is open. If the knob is not turned completely clockwise to its stop position the centrifuge cannot operate. Programming functions are accessed by first opening the lid safety switch.

**Safety:**

*The Horizon model 653V complies with all requirements of UL standard 3101-2-20.*

**Horizon Lid Safety Switch:** The Horizon lid is secured to the top of the cabinet by a latching knob and pawl system. When the knob is rotated clockwise, the pawl grips the underside of the cabinet opening and prevents the lid from opening. A mechanical stop positions the pawl and prevents it from rotating completely. When rotated to the stop position, the pawl makes contact with a micro-switch mounted underneath the cabinet top. The lid safety switch prevents the centrifuge from operating while the lid is open. An indicator light on the front of the machine will light up when the lid has been latched properly.

**Horizon Lid Safety Interlock System:** In addition to the Lid Safety Switch, the Horizon has a true "0 RPM" lid locking system. The lid safety interlock system keeps the lid locked at all times, (even during power failure), and requires that the rotor be at rest in order to unlock the lid. The centrifuge will not allow entry into the rotor chamber unless the centrifuge has power and the rotor is stopped. To open the lid, make sure that the centrifuge is plugged in and, with the rotor stopped, press the 'OPEN / EMERGENCY STOP' button.

**Note:** After the centrifuge has started spinning, it may be possible to rotate the lid knob enough to cause the pawl to lose contact with the lid safety switch. If this happens, the centrifuge motor may lose power, **but the lid will still remain locked.** If the knob is accidentally moved and this situation should occur, rotate the knob fully clockwise to its stop position and the centrifuge will resume operation.

**Circuit Breaker:** The Horizon is protected with a 4 Amp circuit breaker located at the rear of the machine mounted to the base. Any electrical short circuit will cause the breaker to cut power to the machine.

**Emergency Lid Removal:**

In the event of power failure, it may be impossible to unlock the lid by conventional means. In this case, entry into the rotor chamber may be made by removing the latch label and using a pen to manually disengage the locking mechanism (see photo). Pull the mechanism towards the control panel and then unlatch and open the lid. If the unit is damaged, contact your authorized dealer or Drucker Diagnostics.



**Calibration and Earth Ground Testing:**

It is recommended that the top speed, ground continuity and line leakage be tested every two years for continued safe operation. Contact your authorized dealer or Drucker Diagnostics for further information or testing availability.

Before using any cleaning or decontamination methods except those recommended by the manufacturer, users should check with the manufacturer that the proposed method will not damage the equipment. See page 11, (bottom), for the recommended cleaning solutions.

## **Rotor Removal and Installation:**

### **To remove the rotor:**

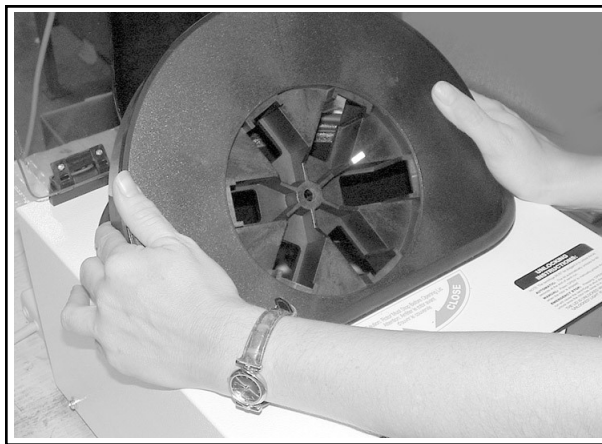
1. Unlock the centrifuge by pushing the 'OPEN / EMERGENCY STOP' button and unlatch and open the lid.

**CAUTION:** Unplug the centrifuge from the electrical outlet at this time to eliminate the possibility of electrical shock or other injury.

2. Remove the test tube carriers.
3. Remove the thumb screw in the center of the rotor.
4. Pull up on the rotor until it is clear of the motor shaft.
5. Remove the rotor from the rotor chamber.

### **To install the rotor:**

1. Place the rotor into the rotor chamber at an angle (see picture) and then position it onto the rotor shaft cone.
2. Once a proper fit has been achieved, replace the thumb screw and tighten. The thumb screw must be properly tightened or the rotor may be damaged.
3. Replace the tube carriers and verify that they are seated properly.



4. It is recommended that the initial setup procedures be performed to ensure that the rotor has been installed correctly and that no damage has been done to the centrifuge during the rotor installation or possible rotor chamber cleaning. See page 5 for this procedure.

## **Setup Location:**

1. Unpack the centrifuge and verify that all of the supplied equipment is present.
2. Choose a setup location which meets the following criteria:
  - a) A bench top clearance height of 24" is required in order to open the lid.
  - b) The clearance envelope is the space around the centrifuge which is required for safety. Choose a setup location which will allow for a clearance envelope of at least 28" x 28", (with the centrifuge at the center). No person or hazardous material shall be permitted in the clearance envelope during operation. The operator time within the envelope shall be limited to the time necessary for loading, unloading and centrifuge operation only.
  - c) Proper ventilation is necessary to prevent the overheating of samples as well as premature failure of the centrifuge. Choose an area which will allow unencumbered air flow.
  - d) No adjustment is necessary for leveling the centrifuge, however, the surface should be flat and level.
  - e) **Be sure the outlet is always within reach as the line cord is the means of emergency disconnection!**

## **Initial Setup Procedure:**

***If any problems are found during the initial setup procedure, refer to the troubleshooting section on page 14.***

1. Plug the centrifuge in to an approved electrical outlet. **For electrical safety, the unit must always be properly grounded.**
2. For safety purposes, the locking system is always activated. To deactivate the system, (in order to insert or retrieve samples), press the 'OPEN / EMERGENCY STOP' button on the control panel. The 'UNLOCKED' indicator light should illuminate. *If it does not, refer to page 14 on troubleshooting.* The lid will be unlocked for 15 seconds after pushing the 'OPEN / EMERGENCY STOP' button.
3. Turn the latch counter-clockwise and open the lid.
4. Spin the rotor by hand; check for free and level rotation. *If the rotor does not spin freely, refer to page 14 on troubleshooting.*
5. Check the thumb screw in the middle of the rotor and make sure that it is tight.
6. Place the test tube carriers inside the rotor and verify that they are seated properly.
7. Close the lid. Rotate the lid knob clockwise to its complete stop position. The 'LATCH' indicator light should be illuminated. If it is not, make sure that the lid is latched properly. The centrifuge will not run unless the lid is latched and the 'LATCH' light is on.

(continued next page)

(Continued)

8. Turn the speed control to Full Speed.
9. Turn the centrifuge on by pushing the 'START' button.
10. The 'RUN' indicator light will illuminate.
11. The unit will accelerate to full speed.
12. Listen to the sound of the centrifuge. A smooth whirring sound should be heard. *If there are any loud or unusual sounds, stop the centrifuge by pushing the 'OPEN / EMERGENCY STOP' button immediately and refer to page 14 on troubleshooting.*
13. While the machine is running, try to turn the latch counter-clockwise. Power may be cut to the motor but you should not be able to fully turn the latch. *If it is possible to turn the latch and open the lid while the unit is running, contact your authorized dealer or Drucker Diagnostics.* Close and latch the lid.
14. Push the 'OPEN / EMERGENCY STOP' button. The 'RUN' indicator light should go out and the motor should slow to a stop.
15. The lid should remain locked until the rotor has stopped. *If the machine unlocks prematurely, contact your authorized dealer or Drucker Diagnostics.* Once the rotor has stopped, a beeper will sound and the interlock system will become disengaged for sixty (60) seconds. The 'UNLOCKED' indicator light will be illuminated during this time.
16. To gain entry into the centrifuge after this period has ended, simply press the 'OPEN / EMERGENCY STOP' button. The lid will unlock for fifteen (15) additional seconds. Repeat if necessary.

***After the centrifuge has passed this procedure, it is ready for operation.***

***If you would like to make adjustments to your machine's settings, please continue on to "Additional Set-Up Procedures".***

### **Additional Set-Up Procedures (Optional):**

#### **1. Verify the Run-Time Preset:**

**NOTE: The centrifuge must be plugged in and the lid must be opened to access programming functions!**

- a. Push and hold the 'START' button for approximately three (3) seconds. The 'LATCH' indicator light will begin to flash; indicating program mode.
- b. When you release the 'START' button, the 'RUN' indicator light will begin to flash. Each flash of the 'RUN' indicator light represents one minute of run time. If the time indicated is not desired, follow the instructions on the rear of the centrifuge to change it.

(Continued next page)

### **Care and Preventative Maintenance:**

With proper care and maintenance, your Horizon centrifuge will provide years of laboratory service. For proper care, the following steps should be taken:

1. **Provide Adequate Ventilation:** For cooling purposes, the Horizon draws in ambient air through the rear of the lid and exhausts this air out the rear of the base. Do not block the rear of the centrifuge as this will not allow the machine to properly ventilate itself.
2. **Always Spin Balanced Loads:** Make certain that opposing tube holders are filled with an equal volume sample or an equivalent weight water-filled tube. The Horizon has a cushioned motor mounting design which, along with its rubber feet, produces excellent vibration dampening. However, out-of-balance loads may break glass test tubes and may produce unsatisfactory separation results. Proper load balancing will improve sample separation and extend the life of the centrifuge. Refer to page 8 on balanced loads for additional information on balancing the load.
3. **Keep the Tube Carriers Clean:** **NOTE:** *Always follow the safety guidelines of your laboratory to properly clean up and/or dispose of materials in the event that a substance known to be potentially toxic, radioactive or contaminated with a pathogenic microorganism is spilt in or on the centrifuge.* Small glass fragments left in the tube carrier after a tube breakage may adhere to the next test tube inserted in that carrier. When this tube is handled, these fragments may puncture protective gloves and lacerate the operator's fingers or hand. Remaining fragments may provide stress points on subsequent tubes and result in additional breakage. If a tube breakage occurs, carefully remove the tube carrier. Properly dispose of the sample and tube fragments and thoroughly clean both the inside and outside of the tube carrier. Insert a new tube cushion (if necessary) and replace the tube carrier in the rotor.
4. **Motor and Electrical Maintenance:** The Horizon uses a brushless DC motor. It should not need servicing for the life of the centrifuge. The electrical components are selected for high reliability and should not need service.
5. **Keep the Rotor Chamber Clean:** Every six months, or whenever there is a tube breakage, (refer to the note in #3), it may be necessary to remove the rotor and clean the rotor chamber. Follow the instructions on page 9 to remove and re-install the rotor.

**CAUTION DURING CLEANING:** Once the lid has been opened, unplug the line cord from the electrical outlet to eliminate the risk of electric shock during cleaning.

The rotor chamber, rotor and accessories shall be thoroughly cleaned using either isopropyl alcohol, soap and water or bleach. The use of Fully/Partially Halogenated Hydrocarbons, Ketones, Esters and all other chemicals not prescribed by the manufacturer may cause damage to the rotor and tube holders and shall not be used.

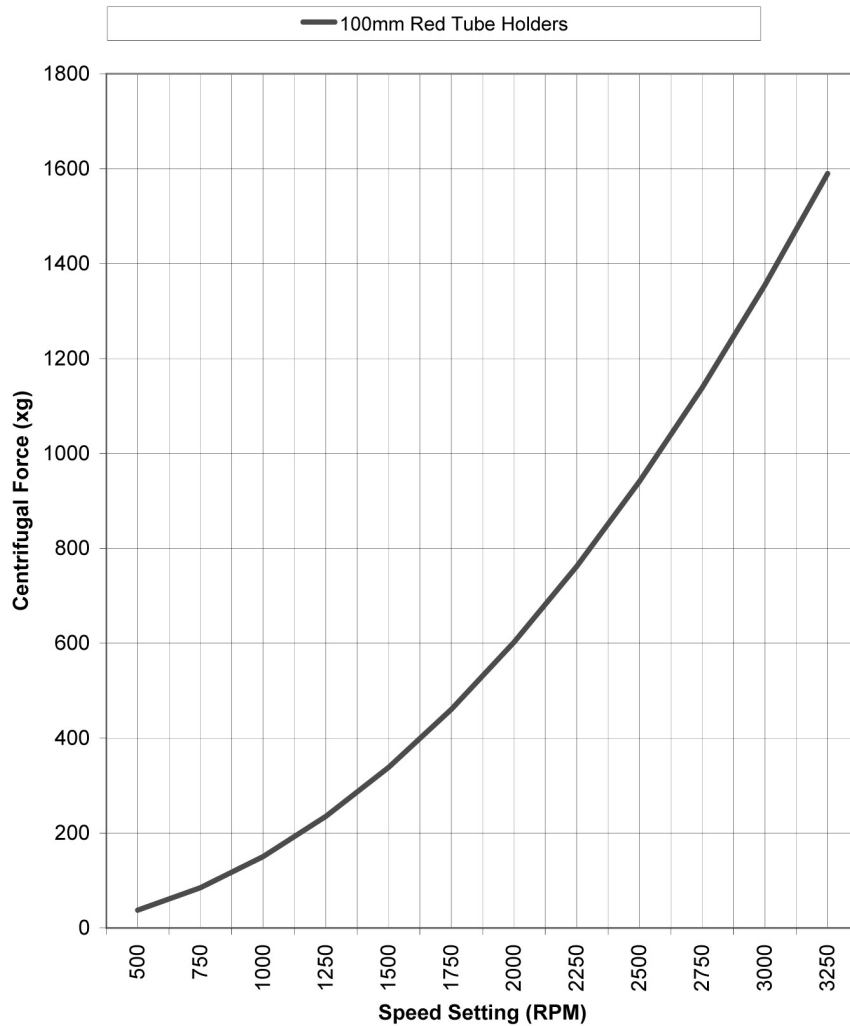
Apply cleaning solutions with a towel or cloth. ***Do not submerge the centrifuge in water or other cleaning solutions as this will cause damage and void your warranty!***

6. **Rotor and Tube Carriers:** It is recommended that the tube carriers be replaced after 24 months. Periodically check the thumb screw in the center of the rotor to ensure that it remains tight.

## Force Chart:

(Continued)

**Model 653V Force Chart**



This chart will allow you to set your Model 653V centrifuge to a desired g-force by providing the appropriate speed for the rotor you are using.

### **Instructions for using this chart:**

Find the desired force on the left-hand column and then follow across at that level until you meet the line for the tube holder you use. Follow this intersection point down to the bottom of the chart to reveal the speed required to produce that force.

### **2. Change the Run-Time Preset:**

- Push and hold both the 'START' and 'OPEN / EMERGENCY STOP' buttons for approximately three (3) seconds. The 'LATCH' indicator light will begin to flash; indicating program mode. Release the two buttons.
- Press the 'START' button once for each minute of desired run time. The 'RUN' indicator light will flash once for each entered minute.
- Press the 'OPEN / EMERGENCY STOP' button to save the change and exit programming mode.
- If desired, use the "verify the preset time" procedure to confirm that the adjustment is correct.




## Operation:

**NOTE:** Follow the initial setup procedure on page 5 before initial operation.

1. Plug the centrifuge into an approved electrical outlet.
2. Push the 'OPEN / EMERGENCY STOP' button and then open the lid.
3. Insert cushions (if needed) into the tube carriers for the tube size you are using. Refer to 'Tube Carrier Configurations' (page 9) for assistance.

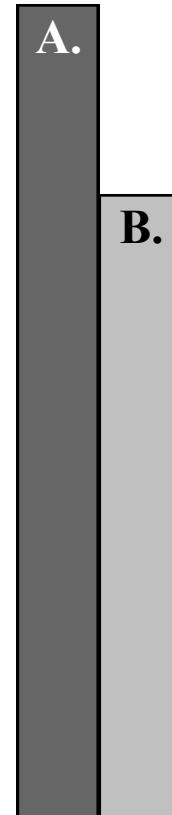
### BALANCED LOADS

**Your centrifuge must contain a balanced load in order to work properly. To ensure that the load is balanced, keep these rules in mind when inserting cushions and test tube samples:**

1. Opposing tube carriers must be identical and must contain the same cushion, or none at all.
  2. Opposing tube carriers must be empty or loaded with equally weighted samples.
  3. If an odd number of samples is to be spun, fill a tube with water to match the weight of the unpaired sample and place it across from this sample.
4. Place the test tube samples into the tube carriers. Be sure to follow the rules for balanced loads.
  5. Close the lid and turn the lid knob clockwise to its complete stop position. The 'LATCH' indicator light should turn on to indicate that the latch is closed properly.  
**If the lid knob is not completely latched, the 'LATCH' indicator light will not turn on and the centrifuge will not operate!**
- 
- NOTE:** Latch the lid knob clockwise to its stop position or the centrifuge will not operate!
6. Set the speed control to the desired speed.
  7. Turn on the machine by pushing the 'START' button on the control panel.
  8. The centrifuge should begin to spin. The 'RUN' indicator light should illuminate.  
**IF A PROBLEM IS FOUND DURING A SPIN THAT REQUIRES THE CENTRIFUGE TO SHUT DOWN, PRESS THE 'OPEN / EMERGENCY STOP' BUTTON !**
  9. The run indicator light will begin to flash when one minute remains in the cycle.
  10. After time has elapsed, the 'RUN' indicator light will extinguish and the rotor will brake to a complete stop.
  11. The 'UNLOCKED' indicator light will illuminate, a beeper will sound and the locking mechanism will disengage allowing entry into the rotor chamber. *If it does not, refer to page 14 on troubleshooting.*
  12. Turn the lid knob counter-clockwise and open the lid.
  13. Remove the samples.
  14. If the machine re-locks before the samples are removed, press the 'OPEN / EMERGENCY STOP' button to unlock the lid for an additional fifteen (15) seconds. Repeat if necessary.

## Tube Holder Configurations (Plastic Holders Only):

The horizontal rotor shipped with your Horizon centrifuge is capable of spinning tubes up to 16mm x 100mm. Use the following chart and drawing to determine which tube holder and cushion combination should be used with your application.

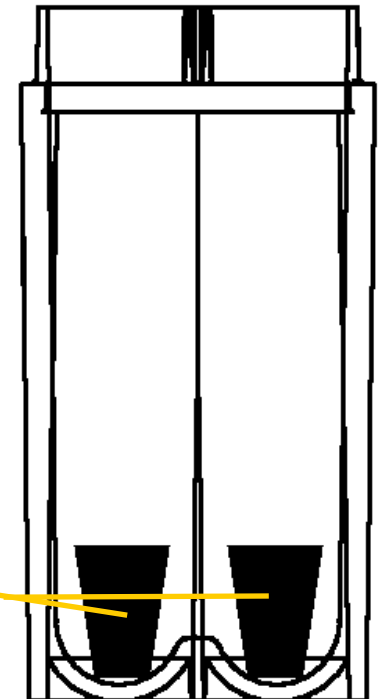


### Configuration A (100 mm tubes):

Use the tube holder as is with no additional tube cushions.

### Configuration B (75mm tubes):

Place a 1" tube cushion in the bottom of each of the tube locations in the tube holder as shown in the picture to the right.



**1 Inch  
Tube Cushions**  
p/n 1525  
(configuration B)

\* This part is available as an accessory. Contact Drucker Diagnostics for assistance.