



OPERATION AND CARE MANUAL FOR V&P SCIENTIFIC'S CAROUSEL MAGNETIC LEVITATION STIRRER WITH ENVIRONMENTAL CONTROL

Caution!

Be advised that the Carousel Magnetic Levitation Stirrer has very strong magnetic fields from both the levitation and pull down magnets. People with pacemakers should not get closer than 6 inches to the carousel. Remove all magnetic influenced tools and objects from the immediate area to prevent them from being pulled onto the magnets or from striking people as they are pulled onto the magnets. Keep credit cards, watches and other magnetic sensitive items at least 1 foot from the carousel's magnetic fields.

Initial Set Up:

1. Remove the four inside corner hold down bolts (they attach carousel base to the crate bottom).
2. Remove crate bolts that hold the top and sides of the crate to the crate bottom and lift top and sides of the box off the base.
3. Carefully remove internal packing and plastic wrapping material.
4. Have 4 men grasp under the aluminum base of the carousel and lift it from the floor to the counter top where you want to place it. The carousel weighs ~ 190 lbs.
5. There are 5 Allen wrenches made from Beryllium Copper alloy (non-magnetic) in the spare parts box. Use these special tools for any adjustments that may need to be made to the machine.
6. Level the carousel by adjusting the 4 corner feet.
7. Install the four 3/8" screws (found in the spare parts box) into the hold down holes in the base. These help seal the incubator.

Operation:

Flip the rocker switch to the "on" position. Adjust the speed with the up and down arrows to obtain whatever speed you wish between 1 and 30 RPM (the number of lifts per minute (LPM) will be determined by multiplying the number of lift station by the RPM). The number in the display is the Hertz frequency (cycles/second) and each cycle/second equals 1/2 RPM. So by dividing the display value by 2, you obtain the RPM and the LPM. Most customers who culture in 96 well microplates find the optimal LPM is around 14. However you need to determine the optimal LPM for your culture system.

Caution! The speed of the carousel contributes a centrifugal force that can in combination with the magnetic field eject levitation stir balls from the microplate.

Once the stirrer is on and running, it may be stopped in several ways. The preferred way to stop it is to open the access door and break the safety switch circuit. To start it again just close the access door or close the safety switch with your hand. When adding or removing microplates, we recommend using the safety switch by hand to advance the carousel to the next position.

The carousel can also be stopped by pressing the run/stop button. To start it after that, you have to wait 4 or 5 seconds (for the display lights to go out) and then flip the rocker switch off and then on again. You can also stop the carousel by turning the rocker switch off. However you must also wait several seconds for the display to go dark before the rocker switch will turn the system on.

When turning the system off for a long period of time use the rocker switch.

Temperature Control for Incubator Functioning:

This Carousel Levitation Stirrer is designed and constructed to be a self contained incubator. It has a 200 watt heating element that is controlled by a Series 93, Watlow microprocessor-based temperature control. The Series 93 Users Manual is at Appendix A and contains detailed instructions for advanced operation.

Basic temperature control is set to operate in the range from 23°C to 41°C. To set the desired temperature, simply press either the up or down arrows on the display to increase or decrease the temperature setting (bottom display).

Loading and Unloading Microplates:

To load and unload microplates, operate the Carousel at low speed using the arrows on the display. To stop the Carousel, simply lift the access port which activates the safety switch and will brake the motor. Position the Carousel so there is one microplate in the middle of the access opening by pushing the safety switch IN.

To load a microplate into a "hold down shoe" simply hold the plate at a 10° angle and slide the leading edge under the spring-loaded clip and then into the "toe" of the hold down shoe. The trailing edge of the microplate should then snap down into the "heel" of the shoe and will be held in place by the spring-loaded clip. **Check each plate to make sure it is properly seated.**

To unload a microplate, just lift up on the trailing edge of the microplate until it clears the heel and pull it towards you until it disengages.

Do not attempt to load or unload plates while the carousel is moving.

Adjusting Levitation Height:

Adjusting levitation height of balls in the microplates is easily accomplished by changing the shims under the hold down shoe. We have provided 1/8" shims, 3/16" shims and 1/4" shims. The current shim height in the Carousel is 1/4" and appears to be the perfect height for stirring aqueous solutions. Depending upon the viscosity and surface tension of your liquid, you may want to adjust the levitation height up or down. To change the shims use the Beryllium Copper (non-magnetizeable) Allen wrench to remove the bolts from the hold down shoe and shim.

When placing shims on the wheel, always have the numbered side up. To increase the levitation height, use a shorter shim (3/16" shim). **(Note that we do not recommend the use of 1/8" or no shim, for fear of pulling the balls out of the wells containing primarily a water solution. A more viscous solution or higher liquid volume however may be stirred at the lower height.)**

In addition to the height of the plate in the magnetic field, the speed of the carousel can also contribute a centrifugal force that will in combination with the magnetic field eject levitation stir balls from the microplate. With the ¼" shims we do not recommend speeds greater than 9 RPM.

You can safely decrease the levitation height by increasing the shim thickness. The following combinations are possible: no shim, 1/8" shim, 3/16" shim, 1/4" shim, 1/8" + 3/16" shims and 1/8" + 1/4" shims.

Important! Because the bolts that fasten the hold down shoe and shims to the carousel wheel project through and below the wheel, they may hit the pull down magnets under the wheel if they are too long. It is very important that you use the right length bolt. We have included these spare bolts with the shims. The following list will help you select the right bolt if you decide to change the levitation height.

Shim Thickness	Bolt Length	Thread
0"	1/2"	10-32
1/8"	1/2"	10-32
3/16"	1/2" or 5/8"	10-32
1/4"	5/8"	10-32
1/8"+3/16"	3/4"	10-32
1/8"+1/4"	3/4"	10-32

Important! Do not stack all three shims together as this will raise the plates too high and they will hit the levitation magnets.

Care:

The cover is made with an acrylic plastic - avoid contact with alcohol and organic solvents and products like Windex. It should be cleaned only with solutions designed for use on acrylic ("Brilliance" is such a product). The hold-down shoes are polycarbonate and can be cleaned with mild detergents. Avoid exposure to UV light. When not in use, turn the power switch off. Do not operate stirrer at temperatures above 41C. Periodically remove carousel cover and check levitation and pull down magnets for a build up of magnetic debris on the surface. To remove the cover first **swing the control panel door face up** so you can see better. Next, **open the hood door**. As you lift the cover up you need to move it to the back and right so it will clear the projection on the motor. Once it is free rotate the cover 45 degrees clockwise and set it on the magnet/motor brace. Remove any magnetic debris with a dry cloth. Periodically tighten the three set screws that connect the drive shaft to the carousel wheel. To replace, reverse the process and make sure no electrical cables dangling into the open space.

We have included an accessory kit that contains Beryllium Copper Allen wrenches (non-magnetizeable) spare set screws for the drive shaft and Button head screws for the hold down shoes and shims. We have also included spare fuses for the PACESETTER controller (Watlow (F250V1A), Heater (F250V2A) and the fans (F250V1/4A). The fuse receptacles are located in the rear of the motor/control box and are labeled. The carousel motor is an AC Inverter Motor and requires no maintenance.

Warranty:

There is a one-year warranty against defective parts. We will replace or repair the defective part and not charge a labor fee. Damage to the machine caused by user is not covered.