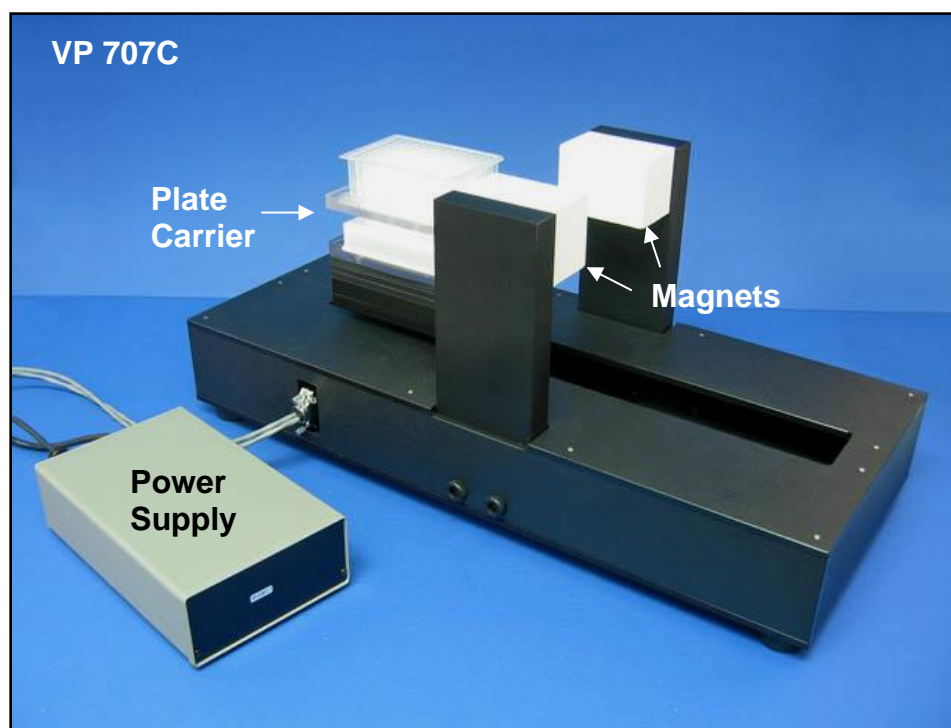## OPERATION MANUAL FOR THE VP 707C
LINEAR SHUTTLE MAGNETIC LEVITATION STIRRER*
*US Patent 6,357,907

WARNING!!!!!

- Be advised that the Linear Shuttle Levitation Stirrer has very strong magnetic fields coming from the two levitation magnets.
- **People with pacemakers should not get closer than 24 inches.**
- Remove all magnetic influenced tools and objects from the immediate area to prevent them from being pulled onto the magnet or from striking anyone as the objects are pulled towards the magnet.
- Keep credit cards, watches, and other magnetic sensitive items at least 24 inches from the Linear Shuttle Levitation Stirrer's magnetic fields.
- The Linear Shuttle Levitation Stirrer weighs 67 lbs. Please exercise caution when lifting instrument onto bench tops or into incubators. For more information see SETUP section.

SETUP

LINEAR LEVITATION STIRRER INSTALLATION

1. Carefully remove internal packing and plastic wrapping material. Keep in mind the magnet warning on page 1.

2. The Levitation Stirrer weighs ~ 67 lbs. Make sure that the operating location of the Levitation Stirrer will accommodate the weight of the instrument. External dimensions are approximately 25"x11"x11" (LxWxH). With two people, one on either end, grasp the Levitation Stirrer from the bottom to lift it from the shipping container.

3. **Do not use the magnets (white square objects at top of instrument) as handles!!**

4. Connect power cord into 24V variable control power supply. The gray communication/power cable has three plugs:
   a. Connect the round 2 pin DC plug into the power supply, tighten securing ring.
   b. Connect 5 pin, 2 hole plug into smart motor port of the Levitation Stirrer as shown in Figure 1 and tighten attachment screws.
   c. Connect the RS 232 plug on the communication/power cable to the computer's serial port and tighten attachment screws. This is usually "com1" by default.

5. Connect the power supply to a 115 V outlet.

6. Turn on the power supply. The motor has a program already programmed into it, so the Tumble Stirrer will immediately begin to stir at a medium speed.

SOFTWARE INSTALLATION

1. Exit all programs on the computer to which the Levitation Stirrer is now connected. Insert the V&P Scientific/Animatics CD into the drive. Installation of the Animatics control program should start automatically. If the program fails to automatically launch, then browse to the CD-ROM drive and double click on Setup.exe. Once installation is completed, restart the computer.

2. The HELP FILE in the Animatics software is a valuable resource for assistance in customizing the control program. Sample programs are also available in a folder in the Animatics application folder.

OPERATION

USING THE ANIMATICS PROGRAM TO CHANGE SHUTTLE SPEED

1. Connect the Smart Motor Tumble Stirrer to a computer loaded with the Animatics "Smart Motor Interface" software via the RS 232 cable as described above.

2. Turn the motor on.

3. Run Animatics program.

4. If the program opens to the following screen, "Smart Motor Playground"(Figure 2) then click the "Show SMI" button at the bottom (red box) to get to the programming window, "Smart Motor Interface" (Figure 3). The Smart Motor Playground allows for manual, real time operation of the tumble stirrer through the software. To return to Smart Motor Playground, click the toolbar button shown with red circle in Figure 3.
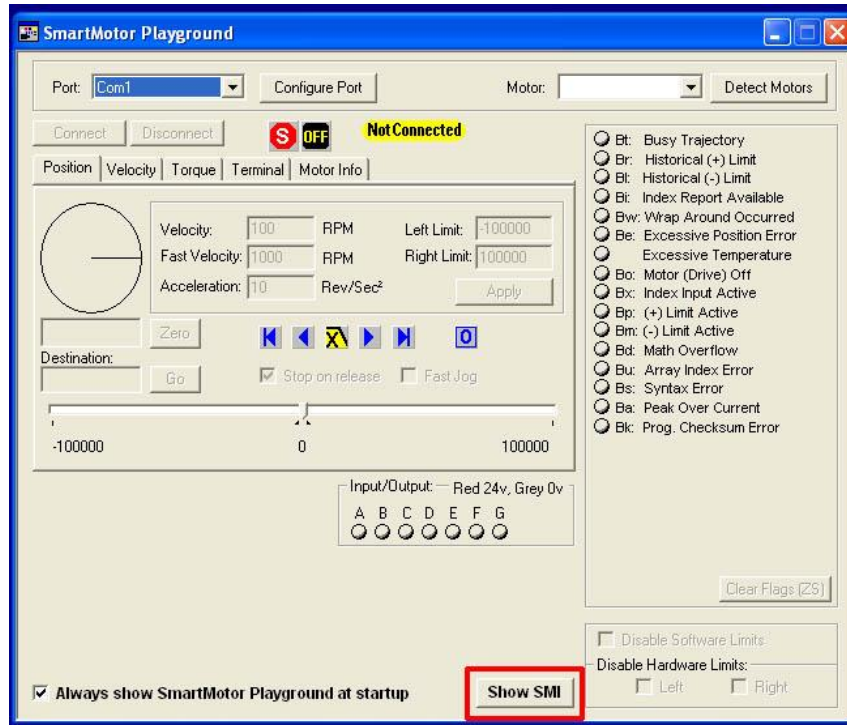

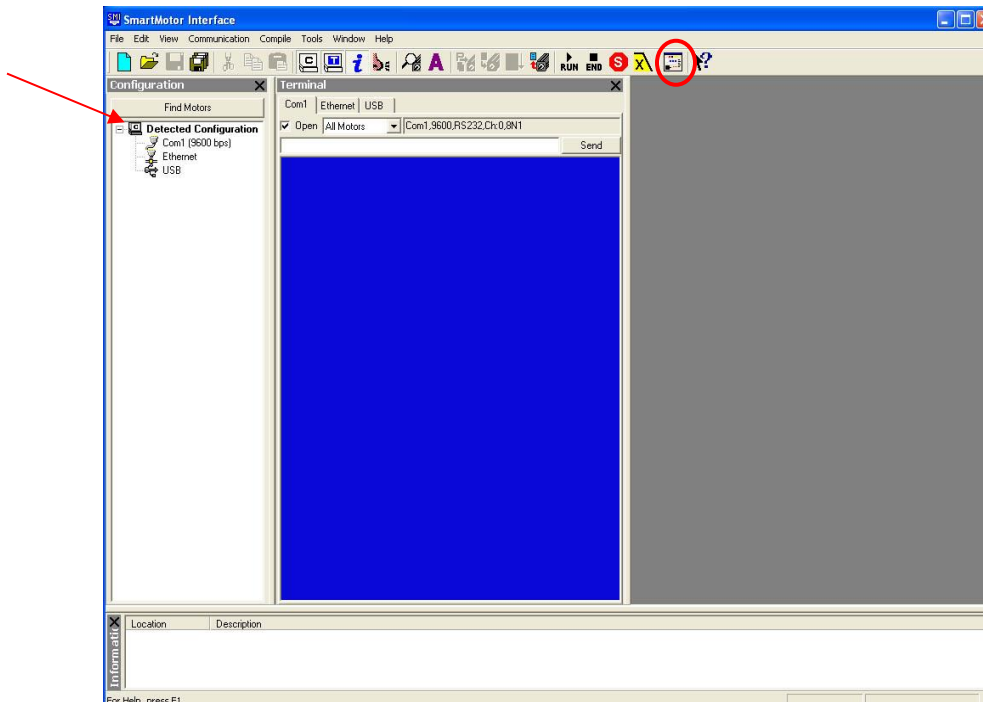**Figure 2. "Smart Motor Playground" window.**

Figure 3. The Smart Motor Interface,"SMI".

5. Once SMI program is open, the next step is to detect the motor. To do this, go to the file menu "Communication" and select "Detect/Address Motors on RS-232 Chain". The detected motor will now be displayed on the left under Detected Configuration (red arrow, Figure 3).

6. A factory-installed Motor Control Program is the basic program needed to run the Levitation Shuttle Stirrer. Table 2 shows the command lines of the factory installed program. PLEASE NOTE: Lines 1-24 and 26-39 are machine command codes which include acceleration, deceleration and starting velocity commands that should NOT BE CHANGED.

7. The velocity setting for the factory installed program is 200,000 (Line #25: V= 200000) and will produce 6 complete cycles/minute of the Shuttle through the magnetic dipole or 12 lifts and drops of the levitation balls/minute.

8. To modify this program for a different rate of cycles/minute first upload it by going to the file menu "Communication" and select "Upload program" and select the correct motor (if more than one motor is connected). The current program will be opened in the main window. Save this program file as "Default Program – 12 Lifts per Minute".

9. To change the speed, change the velocity value (V): The velocity setting for the factory installed program is 200,000   (Line #25: V= 200000). To double the default velocity, change V= 200000 to V= 400000. This will increase speed ~2 fold.

10. Once the new speed is entered, save and download the modified program to the motor: First go to the file menu "Compile" and select "Compile & transmit SMX file". Save the new program under a new name, select the motor, and click the Ok button. If no errors are found it will be compiled and sent to the motor. If there are any problems, the software will provide instructions.

11. To test the downloaded program remove power from the motor, wait for the LED on the power supply to go out and then restore the power. The program will always be executed upon power up. In this case, the motor will move according to the program that has been sent. It is fully stand-alone now and will operate without the computer.

12. Table 1 lists the approximate cycles or lifts per minute at different velocity settings. Use this table as a guide for custom settings for different experiments. **Top speed: V= 3,200,000**

Table 1. Conversion from Velocity to Cycles or Lifts per Minute

Velocity Setting (V)	Cycles/Minute	Lifts/Minute
200,000	6	12
400,000	12	24
600,000	18	36
800,000	24	48

Table 2. Default Command Lines from Motor Control Program

Line #	Command
1	KP=42
2	KI=28
3	KD=550
4	KL=20
5	F
6	LIMH
7	LIMD
8	AMPS=300
9	E=500
10	MV
11	A=500
12	V=100000
13	G
14	PRINT("MOVING CLOCKWISE - PRESS LIMIT SWITCH",#13)
15	TWAIT
16	PRINT("LIMIT SWITCH WAS PRESSED",#13)
17	WAIT=4000
18	AMPS=1000
19	MP
20	D=-20
21	G
22	TWAIT
23	O=0
24	PRINT("HOMING COMPLETE!",#13)
25	**V=200000**
26	A=100
27	WHILE 1
28	TWAIT
29	P=0
30	G
31	TWAIT
32	P=-54200
33	G
34	TWAIT
35	P=0
36	G
37	LOOP
38	END
39	END

LOADING AND UNLOADING MICROPLATES

To load and unload microplates, turn the power switch off when the Shuttle is at the end of a cycle and away from magnets. Load a microplate into the hold-down shoe by simply holding the plate at a 10-degree angle and sliding the leading edge 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. Check each plate to make sure it is properly seated. To unload a microplate, lift up on the trailing edge of the microplate until it clears the heel and pull it towards you until it disengages.

All Levitation Stirrers are equipped with microplate "hold down shoes" designed to fit the Polyfiltronic/Whatman 384 deep well blocks (Uni Plate 400 - 400 ul volume) and ABgene's 96 deep well blocks (2.2 ml volume) #AB-0661. Both these deep well blocks have a broad flat flange on the bottom and no skirt. This feature allows us to easily capture the plate and hold it securely in the strong magnetic field.

CARE

- The hold-down shoes are polycarbonate. Clean with mild detergents. Avoid exposure to UV light.
- When not in use, turn the power switch off.
- Do not place the power supply in a humid chamber with elevated temperature.
- Do not place stirrer in chamber with temperatures above 50°C.
- Periodically check the Levitation magnets for a build up of magnetic debris on the surface. Remove any magnetic debris with a dry cloth.
- The Linear Shuttle motor is a "Brushless" Servo Motor and requires no maintenance.

<div align="center">

WARRANTY

</div>

V&P Scientific, Inc. warrants this product to be free from defects in material and workmanship when used under normal laboratory conditions for one year. This warranty begins from the date of delivery by V&P Scientific.

In the event this product fails under normal laboratory conditions within the specified period of time because of a defect in material or workmanship, V&P Scientific will, at its option, repair or replace the product. Damage to the product caused by user negligence is not covered.

Please keep the special shipping carton in case the unit needs to be shipped back to V&P Scientific. Please contact V&P Scientific at the address below for return authorization and shipping instructions.

This warranty is made in lieu of other warranties expressed or implied including the warranties of merchantability and fitness for a particular purpose. V&P Scientific shall not be liable for loss or damages arising from the use of these products nor for consequential damages of any kind.