SERVICE MANUAL
VXMTAL / VXMTALB
VXMTDG / VXMTDGB
MULTI-TUBE VORTEX MIXERS

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CHAPTER 1 GETTING STARTED

CHAPTER 2 TROUBLESHOOTING

CHAPTER 3 MAINTENANCE PROCEDURES

CHAPTER 4 FINAL TESTING

1.1 INTRODUCTION

This calibration service manual contains the information needed to perform routine maintenance and calibration on Ohaus Vortex Mixers. Familiarity with the unit's Instruction Manual is assumed. The contents of this manual are summarized below:

Chapter 1 Getting Started – Contains information on service facilities, tools and test equipment, specifications, and the control functions of the Multi-Tube Vortex Mixers.

Chapter 2 Troubleshooting – Contains a diagnostic guide.

Chapter 3 Maintenance Procedures – Contains preventive maintenance procedures, calibration procedures, and spare part replacement procedures.

Chapter 4 Final Testing – Contains a Speed Check; Pulse, Noise/Load and Timer Test; and HI-POT Test.

1.2 Definition of Signal Warnings and Symbols.

Safety notes are marked with signal words and warning symbols. These show safety issues and warnings. Ignoring the safety notes may lead to personal injury, damage to the instrument, malfunctions, and false results.

Signal Words

WARNING for a hazardous situation with medium risk, possibly resulting in severe injuries or death if not avoided.

CAUTION for a hazardous situation with low risk, resulting in damage to the device or the property, loss of data, or minor injuries if not avoided.

Attention (no symbol)
for important information about the product.

Note (no symbol)
for useful information about the product.

Warning Symbols

 General Hazard

 Electrostatic discharge sensitive

 Electric Shock Hazard

 Hot surface

1.3 Safety Precautions

CAUTION: Read all safety warnings before installing, making connections, or servicing this equipment. Failure to comply with these warnings could result in personal injury and/or property damage. Retain all instructions for future reference.

- AC mains powered:

  - Verify that the local AC power supply is within the input voltage range printed on the equipment's data label. - Only connect the AC power cord to a compatible grounded electrical outlet.

- Do not position the Multi-Tube Vortex Mixer such that it is difficult to disconnect the power cord from the power receptacle.
- Only run unit on a sturdy, clean work surface
- This equipment is intended for indoor use and should only be operated in dry locations.
- Operate the equipment only under ambient conditions specified in the user instructions.
- Do not operate the equipment in hazardous or unstable environments.
- Disconnect power from the equipment before cleaning or servicing the equipment.
- Service should only be performed by authorized personnel.
- Use electrostatic protection measures when handling the electronic components.
- Never run the Multi-Tube Vortex Mixer without all 4 feet firmly attached.

1.4 SERVICE FACILITIES

To service a Multi-Tube Vortex Mixer, the service area should meet the following requirements:

- Should be temperature controlled and meet Multi-Tube Vortex Mixer specifications for temperature and environmental requirements.
- Must be free of vibrations such as fork lift trucks close by or large motors.
- Area must be clean and free of excessive dust.
- Work surface must be stable and level.
- No lubrication or other technical user maintenance is required.
- Should be given care normally required for any electrical appliance.
- Avoid wetting or unnecessary exposure to fumes.
- Do not use a cleaning agent or solvent that is abrasive to plastics on the front panel.
- Always ensure the power is disconnected from the unit prior to any cleaning.
- Ensure the unit is plugged into the appropriate power source (120 or 230V)

1.5 TOOLS AND TEST EQUIPMENT REQUIRED

The service shop should contain the following equipment:

1. Standard hand tools.
2. Standard Electronics tool kit.
3. Soft, lint-free cleaning cloth and alcohol wipes
4. Anti-static wrist strap and mat
5. #2 Philips Head Screwdriver
6. Small Flathead Screwdriver
7. 12 inch pound torque driver
8. 7 inch-pound torque driver
9. California Instruments Tester or equivalent 230V power source.
10. Digital Photo Tachometer
11. Strobe
12. Loctite #248
13. Loctite #411
14. Loctite Applicator
15. Safety Glasses
16. Gloves (Rubber, Latex, or similar material)
17. Cotton Swabs
18. 10lb Weight Fixture
19. Megger 230315 HIPOT Insulation Tester or equivalent.

1.6 SPECIFICATIONS

Overall dimensions (L x W x H): 9.5 x 15.1 x 16” (24.1 x 38.4 x 40.6cm)

Electrical (50/60 Hz):
120V/230V: 100 watts

Fuses:
120V: 5mm x 20mm, 5 amp quick acting
230V: 5mm x 20mm, 1 amp quick acting

Speed range:
Analog: 1200 to 2400rpm
Digital: 500 to 2500rpm

Accuracy: +/- 25rpm

Orbit: 3.6mm

Weight capacity: 10lbs (4.5kg)

Timer:
Analog: mechanical timer runs 0 to 60 seconds
Digital: digital timer, 1 second to 9999 minutes (increased in 1 second increments)

Controls:
Digital: see page 12
Analog: see page 13

Ship weight:
120V: 42.1lbs (19.1kg)
230V: 46.9lbs (21.3kg)

1.6.1 Admissible Ambient Conditions: Use only in closed rooms

Indoor use only.

Altitude	0 to 6,562 ft (2000 M) above sea level.
Temperature range	4 ºC to 40 ºC (39.2º to 104 ºF)
Non-Operating Temperature Range	-20 to 65 ºC (-4 to 149 ºF)
Atmospheric humidity	20% to 85% relative humidity, non-condensing
Non-Operating Humidity	20% to 85% relative humidity, non-condensing
Installation Category	II
Pollution degree	2

1.7 CONTROLS

CONTROL PANEL – DIGITAL UNIT

The front panel of the Multi-Tube Vortexer contains all the switches, controls and displays needed to operate the unit.

A. On/off rocker switch: Turns main power on/off.

B. Speed display: Displays the speed of the vortexer.

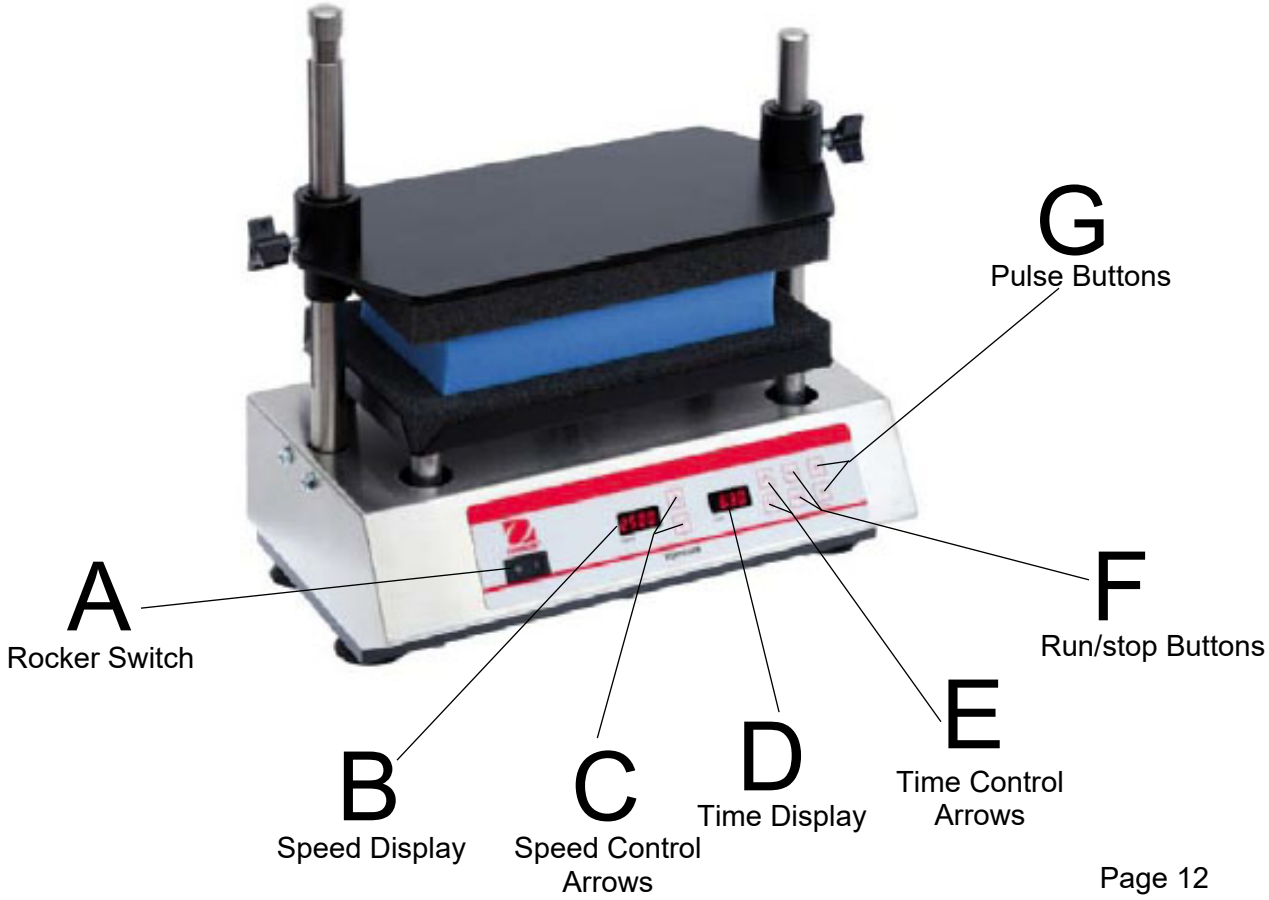
C. Up/down arrows: for set-point control.

D. Time display: Displays accumulated time (continuous mode) or how much time is remaining (timed mode). The display range is from 0 to 9,999 minutes in one (1) second increments. The display will indicate minutes and seconds until the timer reaches 99 minutes and 59 seconds (99:59), then the display will automatically display minutes up to 9,999.

E. Up/down arrows: for set-point control.

F. Run/stop buttons: Activates vortexing.

G. Pulse on/off buttons: Activates pulse mode.

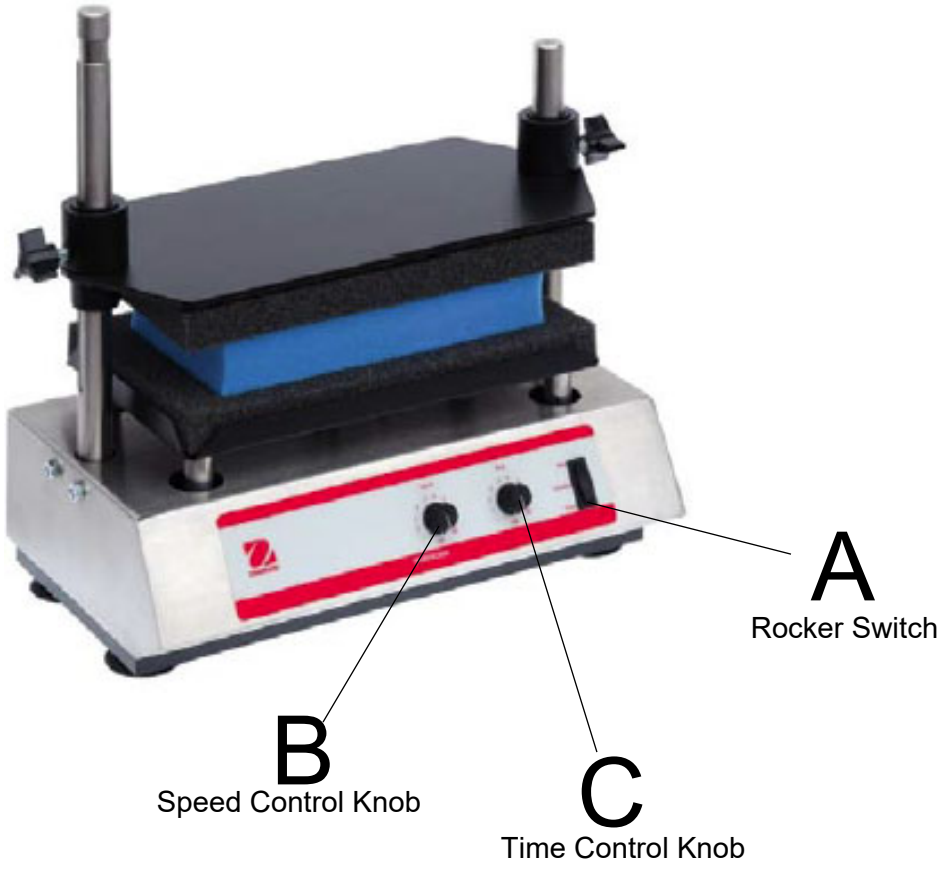


CONTROL PANEL – ANALOG UNIT

A. **Rocker switch:** run, standby, timer,

B. **Speed knob:** variable 1 to 10 dial markings,

C. **Time knob:** variable 1 to 10 dial markings



2.1 TROUBLESHOOTING

This section of the manual contains troubleshooting information. Follow all directions step by step. Make certain that the work area is clean. Handle vortex mixer components with care. Use appropriate Electro-Static Protection Devices.

2.1.1 General Procedures for Troubleshooting

1. Do the most obvious, user-level remedies.
2. **Visual Check:**
   - Clean the unit and operating table before evaluating any mechanical problems. Remove any debris inside the Housing.
   - Check condition of the knobs, switch, etc.
   - Examine the Housing for dents
3. Check that internal parts are clean and free of debris.

If a problem arises that is not covered in this manual, contact Ohaus: www.ohaus.com.

2.2 PROBLEM SOLVER

TABLE 2-1. PROBLEM SOLVER

Symptom	Possible Cause	Remedy
Unit will not run / No Power	Blown fuse	Add or replace fuse as necessary. If problem persists, replace the main PCB. If problem persists, contact your Ohaus representative for repair.
Membrane buttons are not functioning.	Loosened wire connections to the membrane switch.	Resecure all connections to the membrane switch. If problem persists, replace the Membrane Switch. If problem still persists, replace the main PCB. If problem still persists, please contact your Ohaus representative for repair.
Unit doesn't shake	There is a mechanical obstruction or a defective PCB.	Tighten loose screws and fix any misaligned parts. If problem persists, replace the PCB. If problem persists, contact your Ohaus representative for repair.
Display isn't shown or displays the wrong information.	PCB is misconnected or damaged.	Check wires and connections to the PCB. If problem persists, replace the PCB. If problem persists, contact your Ohaus representative for repair.
Unit runs at wrong speed.	Unit is uncalibrated or PCB is dysfunctional.	Recalibrate the unit and perform all the tests in section 4.1. If problem persists, replace the PCB. If problem persists, contact your Ohaus representative for repair.
Other/miscellaneous problem	Miscellaneous.	Contact your Ohaus Representative for repair.

3.1 PREVENTIVE MAINTENANCE

Ohaus Vortex Mixers should be carefully handled; stored in a clean, dry, dust-free area; and cleaned periodically. Follow these precautionary steps:

– When a Multi-Tube Vortex Mixer has had chemicals or liquids spilled on it, all exterior surfaces should be cleaned as soon as possible with a damp cloth.

– Do not leave a sample on the Multi-Tube Vortex Mixer when it is not in use.

3.1.1 Preventive Maintenance Checklist

The Multi-Tube Vortex Mixer should be inspected and checked regularly, as follows:

1. Inspect and clean the area around the top plate.

2. Clean the outside using a damp cloth.

CAUTION

DO NOT USE CHEMICAL CLEANERS OR SOLVENTS OF ANY TYPE. SOME CLEANERS ARE ABRASIVE AND MAY AFFECT THE FINISH.

3. Check the Power Cord for broken or damaged insulation.

4. Make a visual inspection for faulty connectors, wiring, and loose hardware.

3.1.2 Recalibration General Procedure

1. Be aware of the tool requirement for each step.

2. After recalibrating the Multi-Tube Vortex Mixer perform all the final tests in Chapter 4 to confirm the recalibration was performed correctly and the unit is completely functional.

3. Parts or assemblies may be updated without any updates to this manual. Always inspect the unit before disassembly for any major changes and reassemble accordingly.

3.1.3 Recalibrating the Multi-Tube Vortex Mixer

1. Plug unit into 120V or 230V based on model tested and turn the time knob between the #3 and #4.

2. Hold down the switch in the "timer" position and turn the speed knob between the #3 and #4. Let go of the switch.

3. Aim the tachometer at the piece of reflective tape on the motor shaft located between the Housing and the Tray.

4. Slowly turn the speed knob until the tachometer reads between 1175 rpm and 1225 rpm.

5. When the number is stable, push switch to the "timer" position and let go. The unit will turn off.

6. Turn off the speed knob, but leave the time knob between the #3 and #4.

7. Hold down the switch in the "timer" position and turn the speed knob between the #7 and #8. Let go of switch.

8. Aim the tachometer at the piece of reflective tape on the motor shaft located between the Housing and the Tray.

9. Slowly turn the speed knob until the tachometer reads between 2375 rpm and 2425 rpm.

10. When the number is stable, push switch to the "timer" position and let go. The unit will turn off.

11. Turn off both the speed knob and the timer knob.

3.2 OPENING THE MULTI-TUBE VORTEX MIXER

BEFORE CONTINUING, TURN ON THE UNIT AND VERIFY THAT THE CLAIMED ISSUE OCCURS. IF THE UNIT WORKS PROPERLY, DO NOT PROCEED IN DISASSEMBLING IT.

Common hand tools are sufficient to disassemble the Multi-Tube Vortex Mixer.
Turn the Multi-Tube Vortex Mixer off and unplug the power cord before you begin.

Warning: Disconnect from power supply and allow the Multi-Tube Vortex Mixer to stabilize!

Use electrostatic protection when servicing!

Electrostatic damage is difficult to detect, because the faults it causes are not clear-cut. To avoid electrostatic damage during production, conducting floors, controlled air humidity, and EMC mats are used. When servicing the unit it is also advisable – as soon as the instrument is opened – to neutralize electrostatic charges.

Before opening the unit:

1. Look at outside of unit to ensure unit is free of scratches, nicks, and dents.

2. Document any damage that may have been done by the user.

To open the unit:

3. Manually unscrew and remove the knobs on the sides of the support plate.

4. Slide the support plate up and off of the support rods.

5. Remove the tube rack and foam pad.

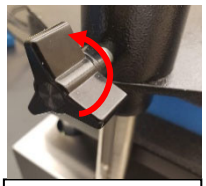
6. Use a #2 Phillips screw driver to remove the 8 screws in the top plate. Remove the top plate.

7. Manually unscrew and remove the flexible spacers from the base plate.

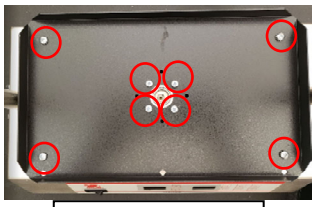
8. Lay the unit on its side or its back, ensuring that no weight is on the power entry module. Use blocks as shown.

9. Manually unscrew and remove the rubber feet from the base plate.

10. Using a #2 Phillips screw driver, remove the 10 screws from the base plate. When reinstalling, use a 7 in-lb torque driver.

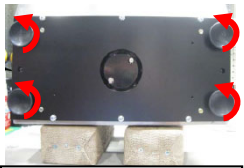


3.2: Step 3



3.2: Step 6

3.2: Step 7



3.2: Steps 8-9

3.2: Step 10

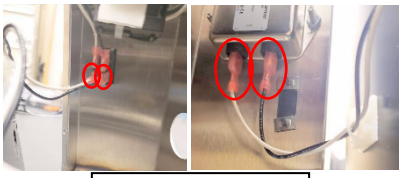
11. Using a 7/16” nut driver or wrench, remove the two screws in the base plate attached to the support rods.

11. Displace the base plate without causing tension on the wires.

12. Digital Units: Disconnect the two red FASTON connectors (attached to the base plate) from the transformer. Disconnect the other ends of the two wires from the Marquardt switch.

13. Workmanship Check: Look inside the unit to ensure wiring routing is away from motor and other moving parts.

3.2: Step 11



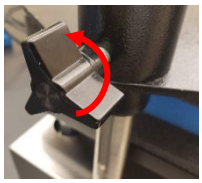
3.2: Step 13

3.3 REPLACING THE RUBBER FEET

1. Complete steps 8 and 9 of section 3.2: Opening the Multi-Tube Vortex Mixer.

2. Replace the feet with the spare feet as necessary, applying blue Loctite to the threads before installing.

3.4 REPLACING THE SUPPORT PLATE/KNOBS



1. Complete step 3 of section 3.2: Opening the Multi-Tube Vortex Mixer.

2. If replacing knobs only, install and tighten the new knobs. Otherwise, move to the next step.

3. Slide the support plate up and off of the support rods. Slide on the new support plate, install and tighten the new knobs.

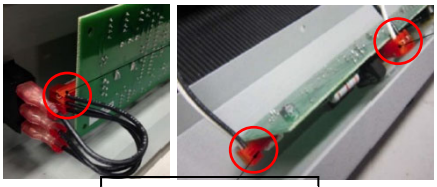
3.5 REPLACING THE PRINTED CIRCUIT BOARD AND KNOBS (Analog Only)

1. Complete all 14 steps in section 3.2: Opening the Multi-Tube Vortex Mixer.

2. Use an Allen wrench to loosen the set screws in the two front knobs. Remove the knobs.

3. Use a 5/16” nut driver to remove the hex nuts under the knobs.

4. Disconnect the three orange MTA connectors from the PCB, keeping track of which connector goes on which port.



3.5: Step 13

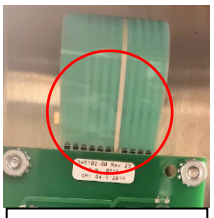
5. Remove the PCB and replace it with the spare part. Using the reverse process of disassembly, reconnect the wires and reassemble the unit. Be sure to replace the hex nuts and knobs.

3.6 REPLACING THE PRINTED CIRCUIT BOARD (Digital Only)

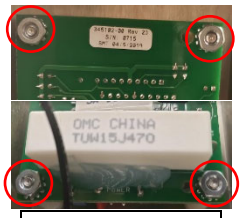
1. Complete all 14 steps in section 3.2: Opening the Multi-Tube Vortex Mixer.

2. Disconnect the ribbon cable from the PCB.

3. Use a 5/16” nut driver to remove the 4 kep-nuts that hold the PCB in place.



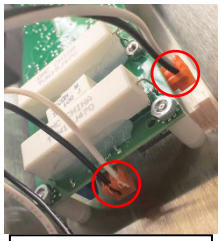
3.6: Step 2



3.6: Step 3

4. Displace the PCB and disconnect the two orange 2-pin connectors from the PCB. Remove the board, 4 washers, 4 long spacers, and 4 short spacers.

5. Use the spare hardware and spare PCB to replace the part. Use the reverse process of disassembly to rewire and reassemble the unit.



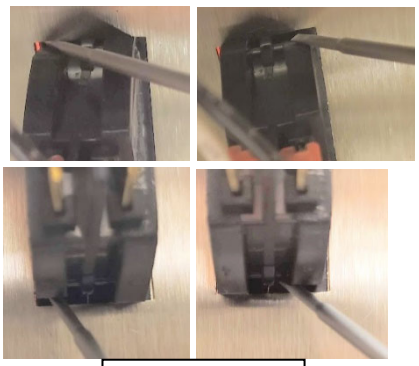
3.6: Step 4

3.7 REPLACING THE MEMBRANE SWITCH (Digital Only)

1. Complete all 14 steps in section 3.2: Opening the Multi-Tube Vortex Mixer.

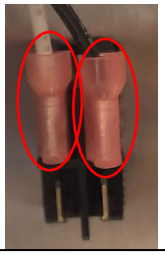
2. Complete step 2 of section 3.6: Replacing the Printed Circuit Board (Digital Only).

3. Use a small screw driver (or equivalent) to press in on each of the four arms of the Marquardt switch while simultaneously pressing outwards on the switch to “pop” it out of the housing.



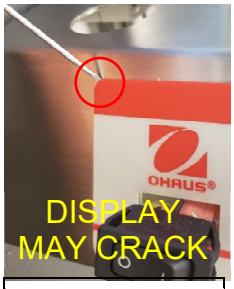
3.7: Step 3

4. Disconnect the remaining two FASTON connectors from the Marquardt switch. Keep track of which wire is connected to which port.



3.7: Step 4

5. Being careful not to scratch the housing, use a blade, flat screw driver, or thin wedge to peel the membrane switch off of the face of the unit and remove it.
The display on the membrane switch will likely crack in this process. Only proceed if a spare membrane switch is available.



3.7: Step 5

6. Install the new membrane switch, lining it up and pressing onto the unit so it sets properly. Be sure to connect the ribbon cable from the new membrane switch to the PCB. Press the new Marquardt switch into the unit. Use the reverse process of disassembly to rewire and reassemble the unit.

4.1 FINAL TESTING

After recalibration of the Vortexer, perform the Speed Check and the HI-Pot Test.

NOTE:
Make sure the test area is free from drafts and the surface the Vortexer rests on is level and vibration-free.

4.2 Speed Check

ANALOG:

1. With NO WEIGHT on the unit (see photo below), turn the speed knob to setting #10 and push the switch to the “Run” position.
2. Aim the tachometer at the reflective tape on the motor shaft between the tray and housing and make sure it reads **between 2375 rpm and 2425 rpm.**
3. Set the speed knob setting to #5, aim the tachometer at the tape, and make sure it reads **between 1200 rpm and 2400 rpm.**
4. Set the speed knob to setting #1, aim the tachometer at the reflective tape, and make sure it reads **between 1175 rpm and 1225 rpm.**

DIGITAL:

1. With NO WEIGHT on the unit (see photo below), turn unit on, and set the time to "0."
2. Set the speed to 2500 rpm. Press "Run" and wait for the LED to stop blinking. Aim the tachometer at the reflective tape on the motor shaft between the Housing and the Tray. Make sure it reads **between 2375 rpm and 2625 rpm.** Press "Stop."
3. Set the speed to 1500 rpm. Press "Run" and wait for the LED to stop blinking. Aim the tachometer at the reflective tape and make sure the tachometer reads **between 1425 and 1575 rpm.** Press "Stop."
4. Set the speed to 500 rpm. Press "Run" and wait for the LED to stop blinking. Aim tachometer at the reflective tape and make sure the tachometer reads **between 475 and 525 rpm.** Press "Stop."

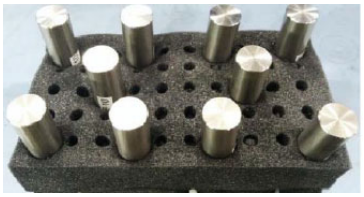
4.3 Pulse, Noise/Load, and Timer Testing

ANALOG:

1. Secure the 10lb weight fixture to the unit (pictured below).
2. Set the speed knob to setting #10 and set the timer knob to setting #10.
3. To check the 1 minute timer, push switch to the “timer” position and let go. Start the stopwatch. Make sure unit shuts off in 1 minute.
4. Make sure no clunking noise is heard resulting from the posts against the housing (this noise is much louder than the normal operation noise).
5. After 1 minute, turn the time knob and the speed knob off and remove the 10lb weight fixture.

DIGITAL:

1. Set the time to “0” and speed to “500”.
2. Turn pulse “on” and let run for 10 seconds to make sure unit is pulsing.
3. Make sure the timer is counting up. Turn pulse “off”.
4. Turn unit off and secure 10lb weight fixture (pictured below).
5. Turn unit back on. Press the time arrows to set time to 1 minute (1:00) and set the speed to 2500 rpm. Press “Run”.
6. Make sure the unit shuts off in 1 minute. Make sure no clunking noise is heard resulting from the posts against the housing (this noise is much louder than the normal operating noise).
7. After 1 minute, turn the power switch off and remove the 10lb weight fixture.



4.4 HI-POT Test

1. Verify the Hi-Pot Tester is in the ‘OFF’ position and the TESTER GROUNDED indicator is ‘ON’, the LEAKAGE SENSITIVITY CONTROL is in the ‘12MA’ position, the GROUND CHECK/BYPASS switch is in the ‘GROUND CHECK’ position, and the meter reads ‘0 VOLTS’.
2. Plug the unit to be tested into OUTPUT plug located on the front of the Hi-Pot Tester.
3. Set the speed position of the unit to “5” and test in both the “ON” and “TOUCH” mode.
4. Press the CONT push button, the HV ON indicator should come "ON".
5. Slowly increase the VOLTAGE CONTROL knob to ‘1400’ volts. This potential must be maintained for two seconds with any failure conditions (there is an audible buzzer and FAILURE indicator that will indicate a failure condition).
6. Press the HV OFF push button, the HV ON indicator should go "OFF".
7. Adjust the VOLTAGE CONTROL knob to the "0" position.
8. Press the On/Off rocker switch to the "Off" position.
9. Disconnect black RETURN test probe.
10. The AC Hi-pot testing of the unit is now complete and the unit can be disconnected from the tester. If a failure condition occurs, the source of the failure must be corrected and the proper production records maintained. If no failure condition occurs, the unit has passed this test and the proper production records must be maintained.