SERVICE MANUAL

SHLD0403DG
SHLDMP03DG
4KG LIGHT DUTY SHAKERS

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1.1 INTRODUCTION

This spare parts service manual contains the information needed to perform routine maintenance and service on the Ohaus Light Duty Shaker. 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 Light Duty Shaker.

Chapter 2 Troubleshooting – Contains a diagnostic guide and error code table.

Chapter 3 Maintenance Procedures – Contains preventive maintenance procedures and disassembly, repair and replacement procedures.

Chapter 4 Final Testing – HI-POT and a production 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 Light Duty Shaker 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 printed circuit board or any electronic components.
- Only use original replacement parts and accessories.
- Do not run the unit with any cracked or broken sample tubes or lids.
- Avoid cold starts: Unit is not designed to start after being in a cold room environment. Bring unit into cold room from a room temperature environment, operate and remove unit from cold room as soon as operation is complete.

1.4 SERVICE FACILITIES

To service a Light Duty Shaker, the service area should meet the following requirements:

- Should be temperature controlled and meet Light Duty Shaker specifications for temperature 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 on the front panel which is abrasive to plastics.
- 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 bags, wrist strap, and mat for PCBs
5. Turn table
6. Wire cutters and wire ties
7. #1 and #2 Philips Head Screwdrivers
8. Small and large Flat Head Screw Drivers
9. Manual torque driver (Setting at 10 inch pounds)
10. Loctite
11. Adjustable Wrench
12. Hand drill
13. 5 pound weight tray
14. Safety Glasses
15. Gloves (Rubber, Latex, or similar material)
16. Cotton Swabs
17. 230V Power Source (California Tester Power Supply or equivalent)
18. Megger 230315 HIPOT Insulation Tester or equivalent.

1.6 SPECIFICATIONS

Overall dimensions LxWxH: 16.3 x 10.3 x 4.3” (41.3 x 26.0 x 10.8cm)

Tray dimensions LxW:	11.75 x 7.75” (29.9 x 19.7 cm)
Electrical:	120 volts: 5 amps, 25 watts 230 volts: 5 amps, 25 watts
Fuses:	5mm x 20mm, 5 amp quick acting
Speed Range:	100 to 1200 rpm
Speed Accuracy:	±2% of set speed
Orbit:	0.125” (3 mm)
Capacity (SHLD0403):	~8lbs (3.6kg), up to 1000rpm ~5lbs (2.3kg), over 1000rpm
Capacity (SHLDMP03):	4 microplates or 2 micro-tube racks
Timer:	1 second to 9999 minutes (increased in 1 second increments)
Controls:	See section 1.7
Tray Material:	Aluminum
Ship Weight:	25lbs (11.4kg)

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	-10 ºC to 60 ºC (14º to 140 ºF)
Non-Operating Temperature Range	-20 to 65 ºC (-4 to 149 ºF)
Atmospheric humidity	Maximum 80% relative humidity, non-condensing
Non-Operating Humidity	Maximum 80% relative humidity, non-condensing
Installation Category	II
Voltage fluctuations	Mains supply voltage fluctuations up to +/- 10% of the nominal range
Over voltage category	II
Pollution degree	2
Power load	25W
Current consumption	5.0 A
Power supply voltage	108 V – 132 V or 207 V – 253 V
Power line fuse	5mm x 20mm, 5 Amp Fuse

1.7 CONTROLS

Control Panel - Light Duty Shaker

The front panel of the Light Duty Shaker contains all the controls and displays needed to operate the unit.

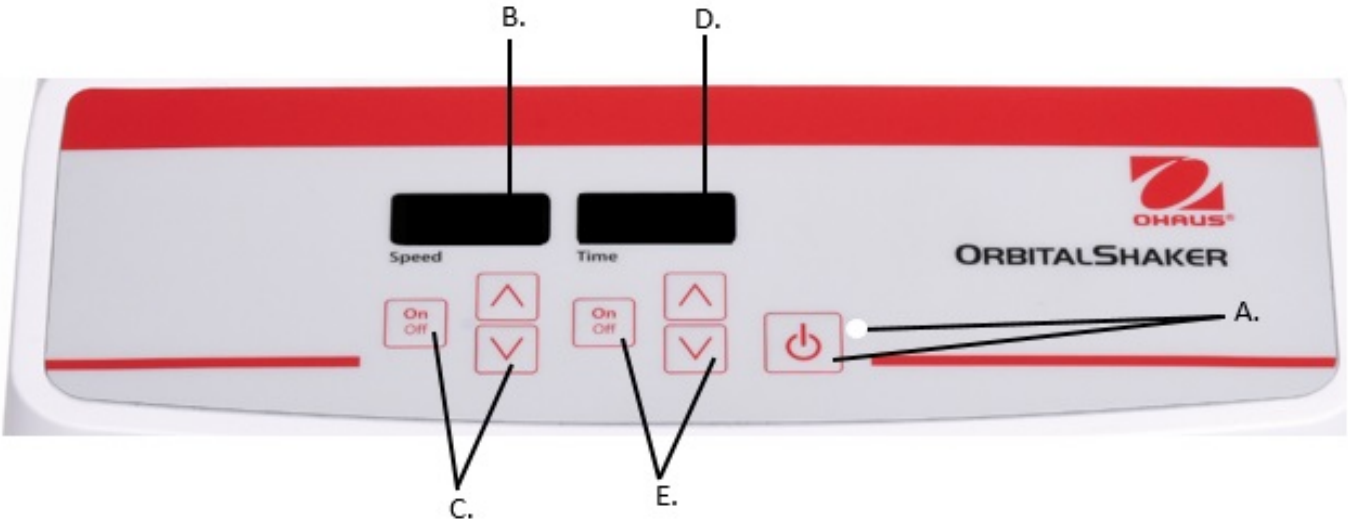
A. Standby button/standby indicator light: The standby indicator light will illuminate when the unit is plugged in. The unit will be in standby mode. Press the standby button to start the speed and time functions. The standby indicator light will shut off. Press the standby button again and the unit will once again be in standby mode.

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

C. Up/down arrows: For set-point control. On/off button starts/stops shaking function.

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 setpoint control. On/off button starts/stops the time function.



2.1 TROUBLE SHOOTING

This section of the manual contains troubleshooting information. To isolate specific problems, use Table 2-1, Problem Solver. Follow all directions step by step. Make certain that the work area is clean. Handle Light Duty Shaker 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:** Examine the tray for signs of bending, twisting or corrosion.
   - Clean the unit and operating table before evaluating any mechanical problems. Remove any debris inside the Housing.
   - Examine the Housing for dents
   - Examine the tray for corrosion due to high humidity or exposure to chemicals.
3. Check that internal parts are clean and free of debris.
4. Use the Problem Solver (Table 2-1) to locate the symptom.
   Follow the suggested remedies in the order they appear.
5. Check the cables leading to the PCBs for cuts, abrasions or other signs of excessive wear and tear
6. Replace all damaged parts. See Spare Parts list.

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	Blown fuse	Add or replace fuse as necessary. If problem persists, replace the PCB. If problem persists, contact your Ohaus representative for repair.
Unit is excessively noisy	Mechanical obstruction.	Check for loose screws and parts. If problem persists, replace the Belt. If problem persists, replace the Shaker Base. If problem persists, contact your Ohaus representative for repair.
E3 or E4	Improper positioning of load. Maximum load exceeded.	Ensure the load is evenly distributed and does not exceed the maximum load capacity for the unit. If problem persists, replace the Belt. If problem persists, replace the Shaker base. If problem still persists, please 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 damaged mechanical part inside the unit.	Tighten loose screws and move wire ties away from the shaker base. If problem persists, replace the Belt. If problem persists, replace the Shaker Base. If problem still persists, contact your Ohaus representative for repair.
Unit does not show the display and beeps upon start up.	PCB or PCB connections are damaged.	Reconnect wires and connections to the main PCB. If problem persists, replace the main PCB.
Potentiometer is damaged.	PCB is dysfunctional.	Replace the main PCB.

3.1 PREVENTIVE MAINTENANCE

Light Duty Shakers should be carefully handled, stored in a clean, dry, dust-free area, and cleaned periodically. Follow these precautionary steps:

– When a Light Duty Shaker 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 Light Duty Shaker when it is not in use.

3.1.1 Preventive Maintenance Checklist

The Light Duty Shaker should be inspected and checked regularly, as follows:

1. Remove the mat to inspect and clean the area around the tray.

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 Replacement Part General Procedure

1. Be aware of tool and Loctite requirements for each step. The listed tool is typically the tool used for assembly of the unit, it may be easier to use other tools for disassembly.

2. It may be necessary to use the heat gun to loosen Loctite bonds present on most hardware

   -Do not use the heat gun / soldering iron around plastic parts such as the top and bottom housing of the unit. More direct heat can be applied to hardware in these areas if necessary.

-Be aware of overheating or unintentionally loosening Loctite bonds other than those required.

3. After a part is replaced, some steps for reassembly of the unit are shown. If a step in reassembly is not shown, reassemble the unit using the reverse procedure of disassembly.

4. If a part requires multiple screws for reassembly, it is recommended to hand tighten all screws before using a torque driver to secure them into place. Torque to the maximum torque of the specified torque driver unless otherwise stated.

5. After reinstalling the replacement part(s) perform all the final tests in Chapter 4 to confirm the spare parts were installed correctly and the unit is completely functional.

6. 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.

7. Cut the tails off of all installed wire ties to ensure they do not interfere with any moving components of the unit.

3.2 OPENING THE LIGHT DUTY SHAKER

Common hand tools are sufficient to disassemble the Light Duty Shaker.
Turn the Light Duty Shaker off and unplug the power cord before you begin.

Warning: Disconnect from power supply and allow the Light Duty Shaker to cool!

Use electrostatic protection when servicing!

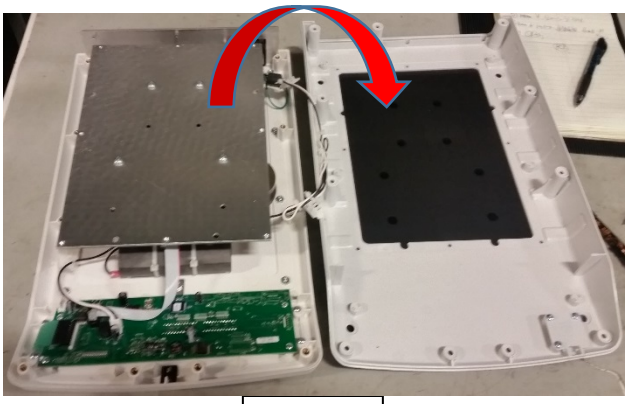
Electrostatic damage is difficult to detect, because the faults it causes are not clear-cut. To avoid electrostatic damage during production, conducting floors, controlled air humidity, and EMC mats are used. When servicing the unit it is also advisable – as soon as the instrument is opened – to neutralize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

3.2 OPENING THE LIGHT DUTY SHAKER *(cont)*

1. Remove a total of 19 screws from the bottom of the unit using a Phillips Head Screwdriver. 11 of these screws are on the perimeter of the unit and 8 are on the inside. When reinstalling, torque the 8 inside screws to 10 inch pounds.

Step 1

2. With the serial label facing you, turn the bottom housing to the right while still keeping the top and bottom housing attached. The Light Duty Shaker is now open.



Step 2

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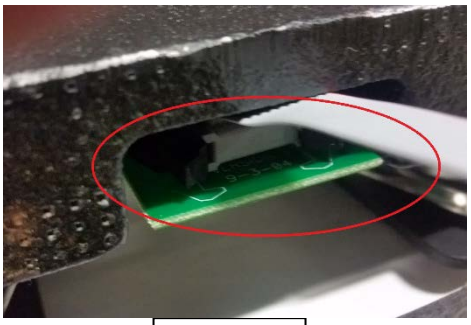
3.3 REPLACING THE SHAKER BASE

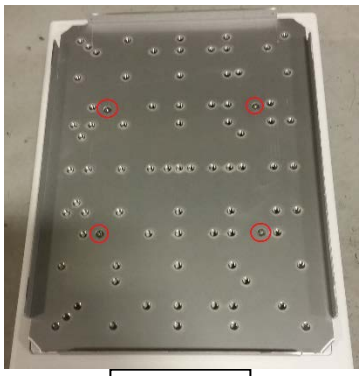
1. Complete all 2 steps in section 3.2: Opening the Light Duty Shaker.

2. Remove the connection on the Shaker Base that connects to the PCB. Squeeze the ends of the retaining clip to initiate the release.



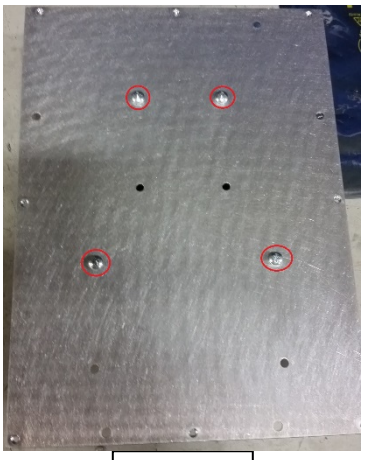
Step 2

3. Remove 4 screws from the top of the unit using a Phillips head screw driver.



Step 3

4. Remove 4 screws on the metal plate attached to the Shaker Base Assembly using a Phillips head screw driver. The Shaker Base can now be replaced. Reassemble the unit using the reverse process of disassembly.

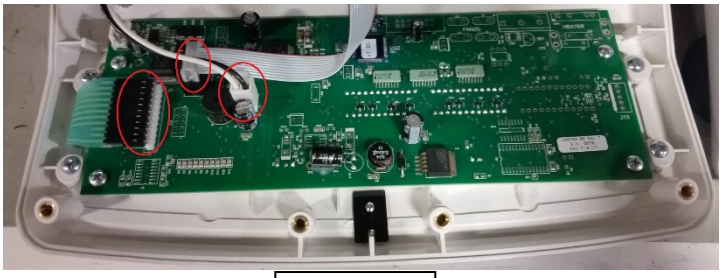


Step 4

3.4 REPLACING THE MAIN BOARD

1. Complete all 2 steps in section 3.2: Opening the Light Duty Shaker. **Use ESD Protection when handling electronics!**

2. Disconnect all 3 connections as shown to the Shaker Base, Power Supply, and Membrane Switch.



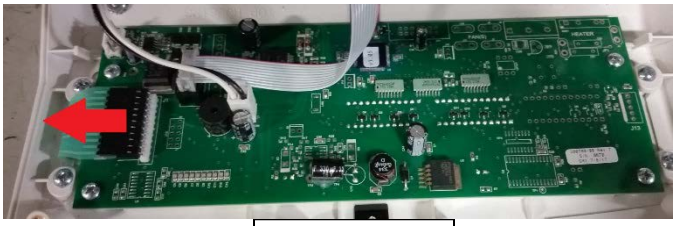
Step 2

3. Remove 4 screws from the PCB using a Phillips head screw driver. When reinstalling the PCB, turn each screw only a couple of times and then move to tighten another screws. Repeat this process until the PCB is firmly attached, but do not overtighten it. These precautions prevent the new PCB from becoming damaged or warped.

Step 3

3.5 REPLACING THE MEMBRANE SWITCH

1. Complete all 2 steps in section 3.2: Opening the Light Duty Shaker. **Use ESD Protection when handling electronics!**



3.5: Step 2

2. Remove the membrane switch's connection to the PCB by gently pulling the connector away from the rest of the board.

3. Rip off the defective membrane switch that is strongly adhered to the front bezel using a small flat head screw driver. Replace the membrane switch as shown and then reassemble the unit with the reverse process of disassembly.

3.5: Step 3

3.6 REPLACING THE FUSES

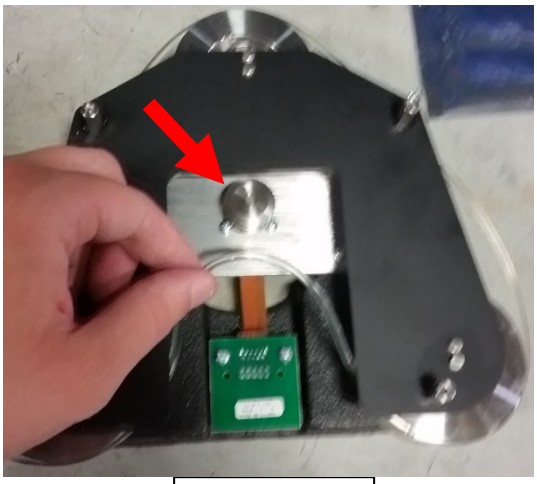
1. Locate the power supply on the back of the unit and then use a small flat head screw driver to pry open the fuse drawer. Replace the blown fuses with the spare fuses and then reinsert the fuse drawer.

3.6: Step 1

3.7 REPLACING THE SHAKER V-BELT

1. Complete all 4 steps in section 3.3: Replacing the Shaker Base.

2. Remove the Belt and then replace it with the replacement Belt by routing it as shown over the motor shaft and in contact with the 3 pulleys.



3.7: Step 2

4.1 FINAL TESTING

After and during the servicing of the Light Duty Shaker, various performance tests should be done to determine if the unit meets specifications. The load sensing function and speed calibration test are only necessary to perform when the problem solver table references them.

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

4.2 HI-POT Test (Mandatory)

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. Press the CONT push button, the HV ON indicator should come "ON".
4. 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).
5. Press the HV OFF push button, the HV ON indicator should go "OFF".
6. Adjust the VOLTAGE CONTROL knob to the "0" position.
7. Press the On/Off rocker switch to the "Off" position.
8. Disconnect black RETURN test probe.
9. 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.

4.3 Production Test

1. Plug in unit, check that the model code number is shown in the speed LED display area and software version 1.05 shown in timer area.

2. Model Selection:

To enter model selection, put the unit in standby mode, press and hold SPEED DOWN and TIME DOWN then press and release STANDBY button.

The model number will show on the speed display.

4 = 120V & 230V (1200 RPM max) **Light Duty Shaker / Light Duty Micro Plate Shakers**

Use TIME UP & TIME DOWN to select model, then press STAND BY to exit.
You cannot select an incubated model when using a non-incubated board and vise-versa.

3. Turn on unit. At start up insure shaker is turning in counter clockwise direction. If not, board is to be replaced.

4. Attach 5 lbs. weight tray and run unit at 1200 rpm for 15 minutes to “break-in” bearings.

5. Check speed with 5 lbs. load with tachometer.

6. Set speed to 500 rpm. Verify count up timer is operational. Set count down timer for 30 seconds and verify that the unit shuts down in 30 seconds. (± 5 seconds). Verify that the unit beeps after the timer goes off.

7. Remove 5 lbs. tray.

8. Verify the LED displays are functioning. All segments lit and stable.

9. Final settings: Set speed to 500 rpm.