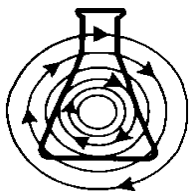




Guide to Operations

C2 Classic Platform Shaker

MANUAL NO: M1244-0051
Revision C
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**CAUTION!**

This equipment *must* be operated as described in this manual. If operational guidelines are not followed, equipment damage and personal injury *can* occur. Please read the entire User's Guide before attempting to use this unit.

Do not use this equipment in a hazardous atmosphere or with hazardous materials for which the equipment was not designed.

New Brunswick Scientific Co., Inc. (NBS) is not responsible for any damage to this equipment that may result from the use of an accessory not manufactured by NBS.

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Disclaimer Notice

New Brunswick Scientific Co., Inc. reserves the right to change information in this document without notice. Updates to information in this document reflect our commitment to continuing product development and improvement.

Manual Conventions



Notes contain essential information that deserves special attention.



CAUTION!

Caution messages appear before procedures which, if caution is not observed, could result in damage to the equipment.



WARNING!

Warning messages alert you to specific procedures or practices which, if not followed correctly, could result in serious personal injury.

Bold

Text in bold face type emphasizes key words or phrases.

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WARRANTY

Every Instrument manufactured by the New Brunswick Scientific Co., Inc. is warranted to be free from defects in material and workmanship. This apparatus, with the exception of glassware, lamps and electrodes (where supplied), is warranted against faulty components and assembly for 2 years in the United States & Canada and for 1 year elsewhere. Our obligation under this warranty is limited to repairing or replacing the instrument or part thereof, which shall, upon our examination, prove to be defective. The warranty period begins at the date of shipment. This warranty does not extend to any NBS products which have been subjected to misuse, neglect, accident or improper installation or application; nor shall it extend to products which have been repaired or altered outside the NBS factory without prior authorization from the New Brunswick Scientific Co., Inc.

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1 OVERVIEW

The C2 Classic Platform Shaker is a portable benchtop shaker that provides horizontal plane rotary motion in a ¾-inch (19 mm) circular orbit. A microprocessor controller with instantaneous digital feedback controls the speed over a range of 50-400 RPM.

The shaker may be operated either continuously or in a timed mode via a programmable timer for shaking periods of 0.1 hour to 99.9 hours.

The C2 is equipped with a visual alarm that is activated when an alarm condition exists as follows:

- The end of a timed run
- Deviations of shaking speed

A wide variety of platforms, which are sold separately, can be used with the C2. Dedicated platforms are available for a variety of flask sizes. Universal platforms, utility trays, utility carriers and test tube racks are also available. The shaker does require a platform for operation.

1.1 Specifications

C2 Classic Shaker	
Speed	50-400 rpm
Control Accuracy	± 2 rpm
Indication	3 Digit LED
Stroke	¾ inch (1.9 cm)
Ambient Operating Environment	5 - 45°C, 20 to 90% relative humidity, non-condensing
Alarms	Visible warning indication when speed deviates more than 5 rpm from setpoint, and when timer has expired.
Timer	0.1 hour to 99.9 hours. Shuts off agitation at end of period. Can be deactivated for continuous operation.
Automatic Restart	Automatic restart after power is restored. Setpoints and operating status are retained in memory during power interruption.
Electrical Requirements	110/120V AC 50/60 Hz, 1320 VA 220/240V AC 50/60 Hz, 1320 VA
Platform	11 inches X 13 inches (28 X 33 cm)
Overall Dimensions	14.5 inches W X 17.5 inches D X 7.4 inches H (37 cm W X 44.5 cm D X 18.8 cm H)
Weight	35 lbs (16 kg) Net, 50 lbs (22.7 kg) Gross

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2 INSPECTION, VERIFICATION & UNPACKING OF EQUIPMENT

2.1 *Inspection of Boxes*

After you receive your order from New Brunswick Scientific, inspect the boxes carefully for any damage that may have occurred during shipping. Report any damage to the carrier and to your local NBS Sales Order Department.

2.2 *Packing List Verification*

Verify on your NBS packing list that you have received the correct materials.

2.3 *Unpacking of Equipment*

Save all packing materials and User's Guide. If any part of your order was damaged during shipping, missing pieces, or fails to operate properly, please fill out the *Customer Satisfaction Form 6300* and return it by fax.

2.4 *Inspection of Equipment*

Verify that you have received the following equipment:

- C2 CLASSIC SHAKER**
100/120V 50/60 Hz (M1244-0002)
220/240V 50/60 Hz (M1244-0003)

- POWER KIT (POWER CORD & FUSE)**
100/120V 50/60 Hz (M1244-0600)
220/240V 50/60 Hz (M1244-0601)

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3 PREPARING THE LOCATION

3.1 *Physical Location*

It is essential that the instrument be situated in an area where there is sufficient space for the shaker and platform to clear walls and obstructions during operation. The surface on which the unit is placed must be smooth, level, and able to support the shaker under full load operating conditions.

3.2 *Environment*

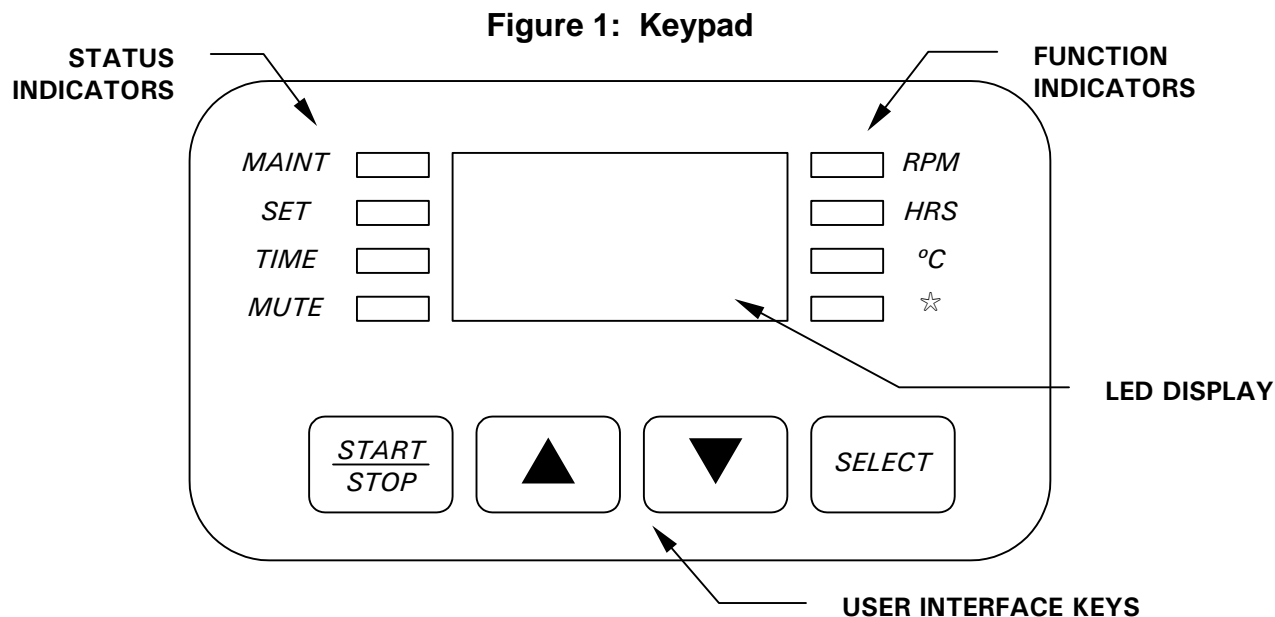
The shaker is designed to operate optimally in the following ambient conditions:

- 5 - 45°C
- 20 to 90% Relative Humidity non-condensing

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4 C2 SHAKER FEATURES

4.1 Keypad



LED DISPLAY:

The digital display on the control panel is a three-digit **LED DISPLAY**. During normal shaker operation the display will indicate:

- Shaker status (on/off)
- Shaking speed
- Setpoints
- Hours remaining (timed run)

USER INTERFACE KEYS:

- **START/STOP** This key is used to start or stop the shaker. It will also activate or stop the timer when a timed run is desired.
- **SELECT** This key is used to change the displayed parameter.
- **▲(UP), ▼(DOWN)** These keys are used to adjust the setpoint of a displayed parameter up or down. They also allow the user to enter the **SET MODE** for setpoint changes.

STATUS INDICATORS:

Four status indicator lights are located to the left of the **LED DISPLAY**. They are:

- **MAINT** Remains lit after 10,000 hours of use. Accumulated running time is internally monitored and may be displayed as a guideline.
- **SET** Indicates that the shaker is in the **SET MODE** and setpoints are being displayed and can be altered.
- **TIME** Indicates that the timer is in operation. The shaker can be programmed to run for a preset time from 0.1 hour to 99.9 hours. The timer can be disengaged without stopping an ongoing run.
- **MUTE** Not applicable

FUNCTION INDICATORS:

Four function indicator lights are located to the right of the **LED DISPLAY**. They indicate the current parameter being displayed.

- **RPM** revolutions per minute
- **HOURS** time remaining
- **°C** not applicable
- ***** not applicable

4.2 Platform Assemblies

The C2 can be used with a wide variety of NBS 11-inch x 13-inch (28 x 33 cm) platforms, which will accept a variety of clamps for flasks test tubes, etc.

A platform is a separate item and is required for operation. Refer to the Replacement Parts and Accessory Information section of this manual for details.

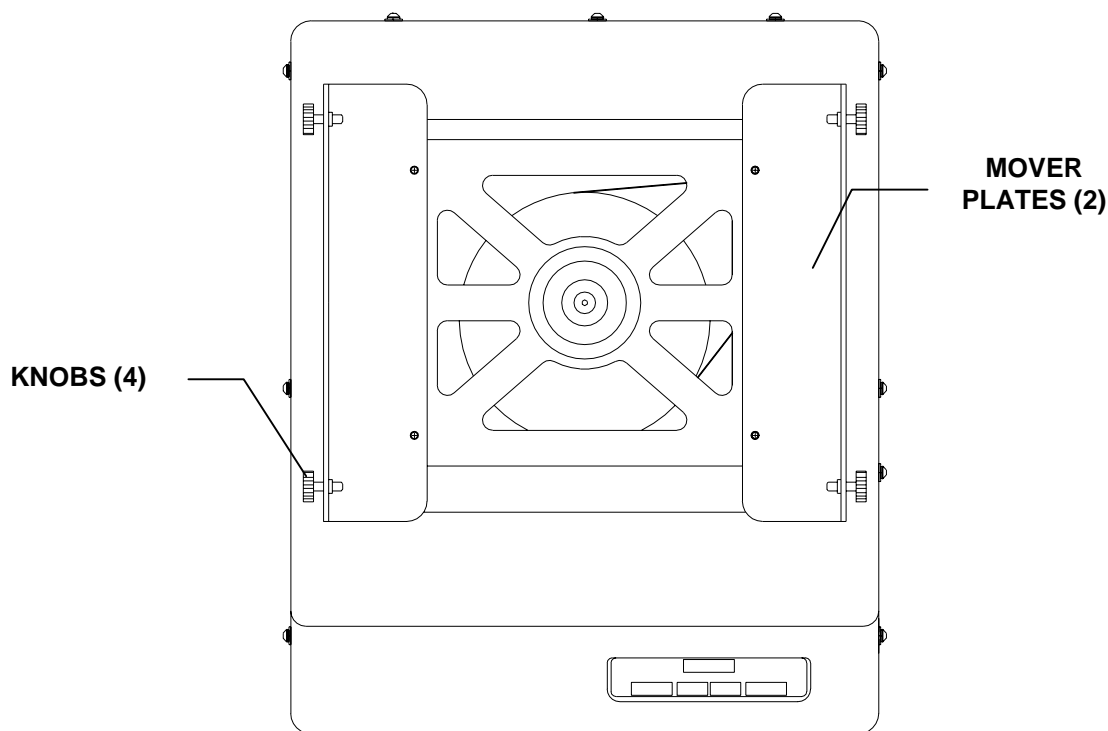
5 GETTING STARTED

5.1 Installation of Platform

A platform is required for operation. To install a platform on the unit:

1. Loosen the four knobs on the left and right **MOVER PLATES**.

Figure 2: Platform Installation





2. Align the four slots in the platform with the four holes in the **MOVER PLATES**, and place the platform on the **MOVER PLATES**.
3. Tighten the knobs to secure the platform.

5.2 Installation of Clamps

Flask clamps purchased for use with universal platforms require installation. Clamps are installed by securing the base of the clamp to the platform with the correct type and number of screws.

For all platforms used on the C2 shaker, use only the screws listed in the table below:

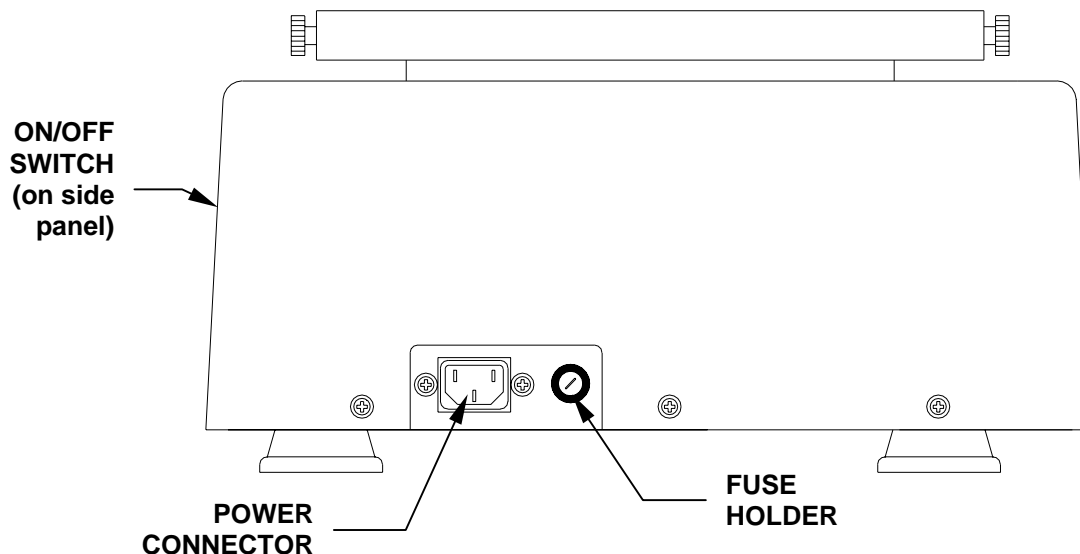
10 - 500 ml Clamp Hardware Application Chart

Description	Part Number	Qty.	Application
 10-24 x 5/16 (7.9 mm) flat Phillips (+) head screw	S2116-3051	1	5/16 inch (7.9 mm) thick aluminum, phenolic and stainless steel platforms. 

5.3 Electrical Connections

Before making electrical connections, verify that the power source voltage matches the voltage on the **ELECTRICAL SPECIFICATION PLATE** and the **ON/OFF SWITCH** is on the **OFF** position (*see Figure 3*). The **ELECTRICAL SPECIFICATION PLATE** is located on the side panel of the unit near the **ON/OFF SWITCH**. Connect the **POWER CORD** to the **POWER CONNECTOR** and the other end to a suitable, grounded receptacle.

Figure 3: C2 Rear Panel



6 OPERATION

6.1 Starting the C2

To initially start the shaker, turn the **ON/OFF SWITCH** on the side of shaker to the **ON** position. If the shaker begins to operate, the **LED DISPLAY** will track the speed as it accelerates to the last entered setpoint. The shaking action may be stopped or started by pressing the **START/STOP KEY**.

6.2 Continuous (Unlimited) Run

1. Press **SELECT** until the **RPM INDICATOR** is illuminated.
2. If the display indicates that the shaker is **OFF**, press the **START/STOP KEY**.
3. Press either **▲** or **▼ KEY** to enter **SET MODE** (the **SET INDICATOR** will illuminate).
4. Set the speed by using the **▲** or **▼ KEY** until the desired setpoint is displayed.
Holding the **▲** or **▼ KEY** will cause the setting to change more rapidly.



NOTE:

The setpoint may be changed during a run without stopping the shaker by following steps 2-4. During speed changes, a visual alarm (flashing **RPM INDICATOR**) will flash until the speed returns to within 5 rpm of the setpoint.

6.3 Checking Any Setpoint

1. Press **SELECT** until the desired indicator is illuminated.
2. Press either **▲** or **▼ KEY** to enter the **SET MODE** and display the current setpoint.



CAUTION!

Holding the **▲** or **▼ KEY** for more than 0.5 seconds causes the speed setpoint to change. Should this occur, resetting will be necessary.

6.4 Timed Functions

The shaker may be programmed to automatically stop after a preset time period of 0.1 hour - 99.9 hours. There must be power to the shaker in order to set the timer. However, a timed run can be initiated while the unit is either shaking or stopped.

To set the timer:

1. Press the **SELECT KEY** until the **HRS INDICATOR** is illuminated.
2. Press either **▲** or **▼ KEY** to enter the **SET MODE** and set between 0.1 - 99.9 hours.
3. While the **SET INDICATOR** is illuminated, press the **START/STOP KEY** to program the time (and start the run). The **TIME INDICATOR** will light and remain on for the duration of the run. At the end of the timed run the display will read **OFF**, and the **TIME INDICATOR** will flash.

To disable the alarm (flashing **TIME INDICATOR**), press the **SELECT KEY** and change to any other function.

To cancel the timer without stopping the shaker:

Repeat steps 1 and 2, then immediately press the **START/STOP KEY**. The **TIME INDICATOR** will cease to flash and the display will read **OFF**.

6.5 Alarm Functions

The shaker has a visible alarm that is activated at the end of a timed run, or if the speed is 5 RPM or more from the setpoint.

6.6 Total Running Time

The control modules of the C2 Shaker totalize the time the shaker has been “**ON**” to track hours of usage. To display the accumulated running time:

1. Press **SELECT** until the **HRS INDICATOR** is illuminated.
2. **Simultaneously** press the **▲** and **▼ KEYS**.

The **SET** and **MAINT INDICATORS** will flash and the accumulated running time will be displayed in hundreds of hours (i.e., “02” equals 200 hours; “102” equals 10,200 hours). This display will continue for 10 seconds and then default to the previous mode readout.

6.7 *Maint Indicator*

After 10,000 hours of operation, the **MAINT INDICATOR** will illuminate. Preventive maintenance is recommended at this point.

To deactivate the MAINT INDICATOR:

1. Press **SELECT** until the **HRS INDICATOR** is illuminated.
2. **Simultaneously** press the **▲** and **▼ KEYS**.
3. Press the **▼ KEY**.

6.8 *Power Failure*

In the event of a power failure, the C2 Classic Platform Shaker is equipped with an automatic restart function.

If the shaker was in operation prior to the power interruption, when it resumes operation, the shaker will return to its last entered setpoint. The **LED DISPLAY** will flash indicating that a power failure has occurred. Press any key to cease the flashing in the display.

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7 PREVENTIVE MAINTENANCE

**WARNING!**

Always turn off the shaker and disconnect the power cord from the power supply before performing maintenance on the unit.

7.1 Cleaning External Surfaces

The unit may be cleaned using a damp cloth or any standard, household or laboratory cleaner to wipe down its outer surfaces. Do not use abrasive or corrosive compounds to clean this instrument, as they may damage the unit and void the warranty.

7.2 Fuse Replacement

The electrical fuse of the unit is housed in the fuse holder on the rear panel of the unit, above the **POWER CORD CONNECTOR**.

To check or replace the fuse:

1. Set the **ON/OFF SWITCH** to **OFF** and disconnect the **POWER CORD** from the power source.
2. Insert a small flat-bladed screwdriver into the fuse holder groove (*see Figure 3, repeated on the following page for reference, and Figure 4*) and turn counter-clockwise until it disengages and the fuse holder springs free.
3. Check the fuse and if it has failed, replace the fuse.

Figure 3: C2 Rear Panel

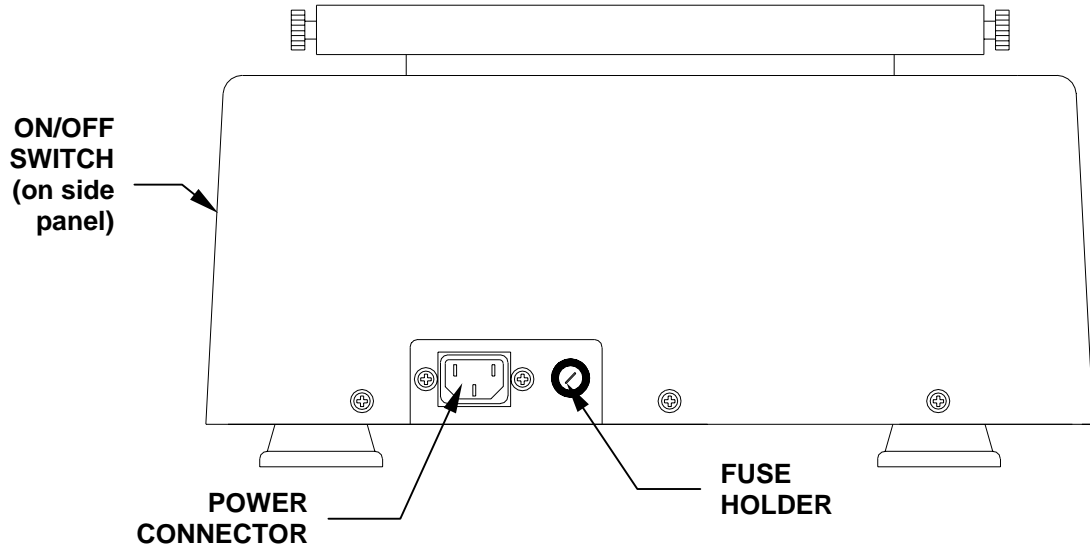
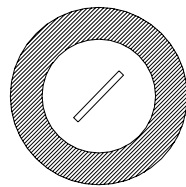


Figure 4: Fuse Holder Detail

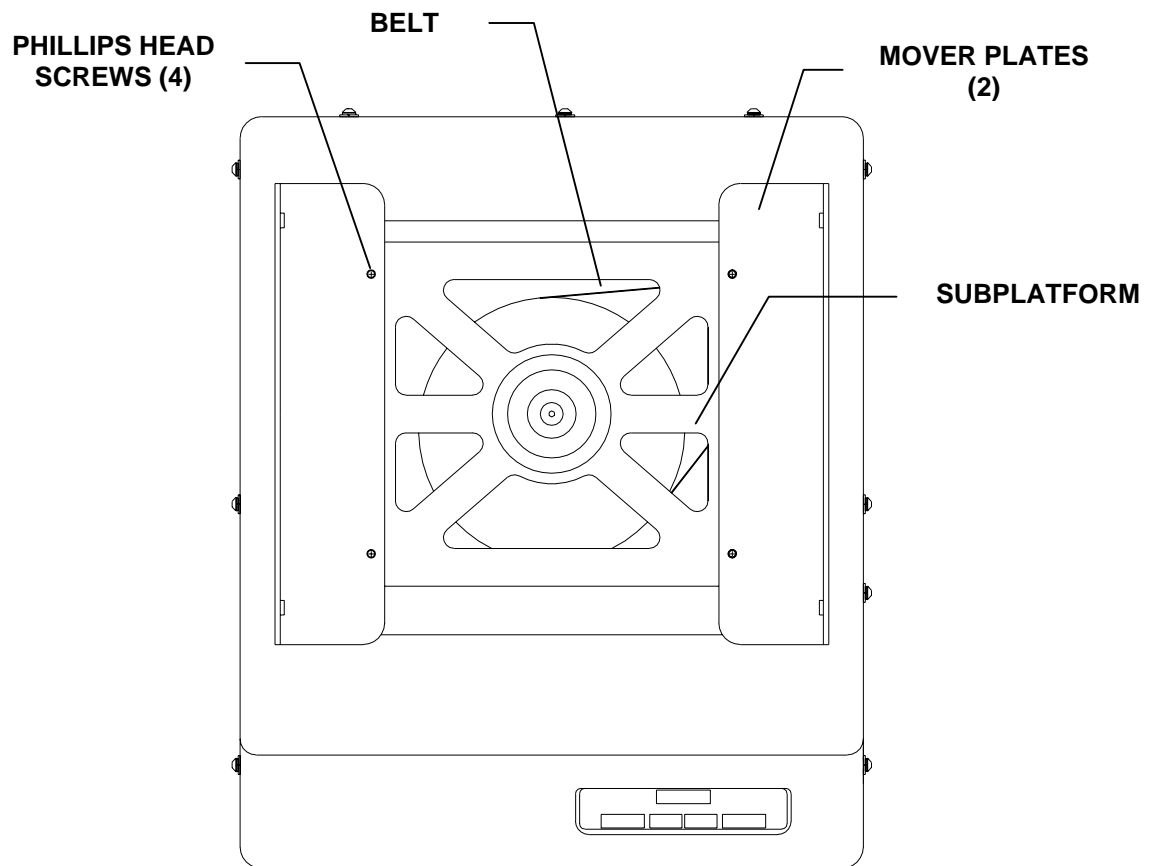


7.3 Belt Replacement

To replace the drive belt of the shaker:

1. Turn off the unit, disconnect the power cord from the power source.
2. Remove the platform if equipped. Set the platform and knobs aside.
3. Remove the Phillips head screws that secure the **MOVER PLATES** to the **SUBPLATFORM**.

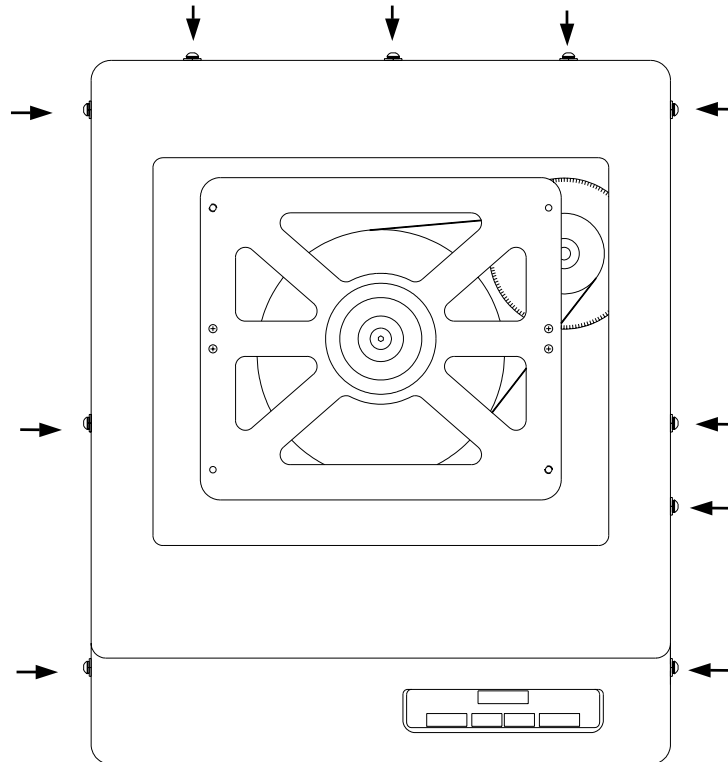
Figure 5: Mover Plate Removal



4. Lift and remove the **MOVER PLATES** from the unit.

5. Remove the Phillips head screws (as indicated in Figure 6 below) that attach the **COVER** to the frame.

Figure 6: Cover Removal



6. Lift and remove the **COVER** from the unit.
7. With reference to Figures 7 & 8 on the following page, loosen and remove the hardware that attaches the **UPPER FLEXURES** to **LOWER MOVER PLATE**.

Figure 7: Top View without Cover

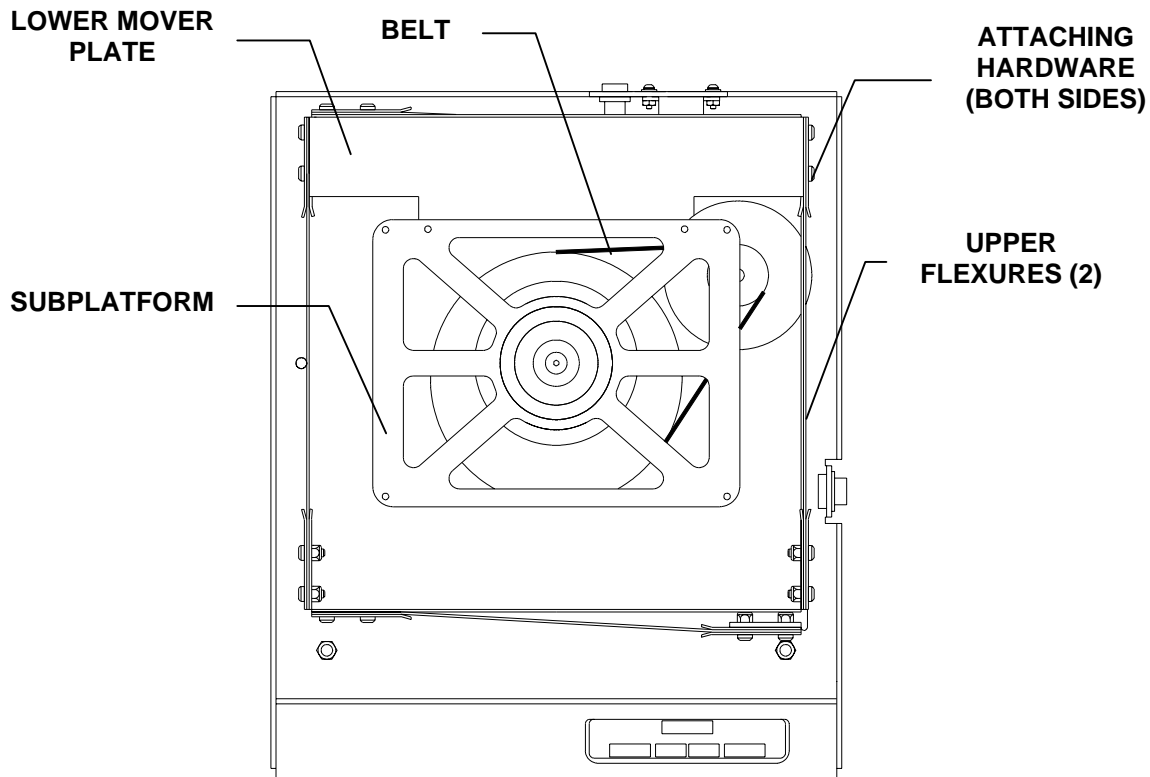
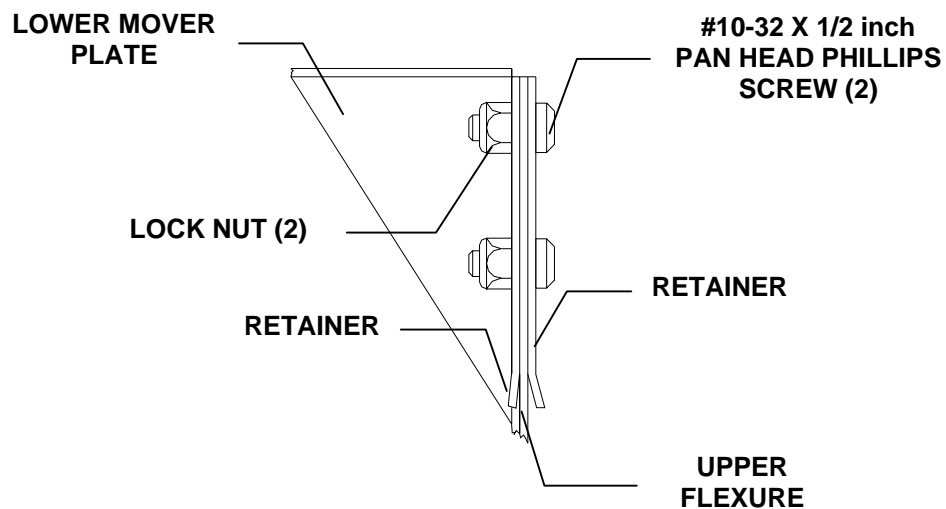
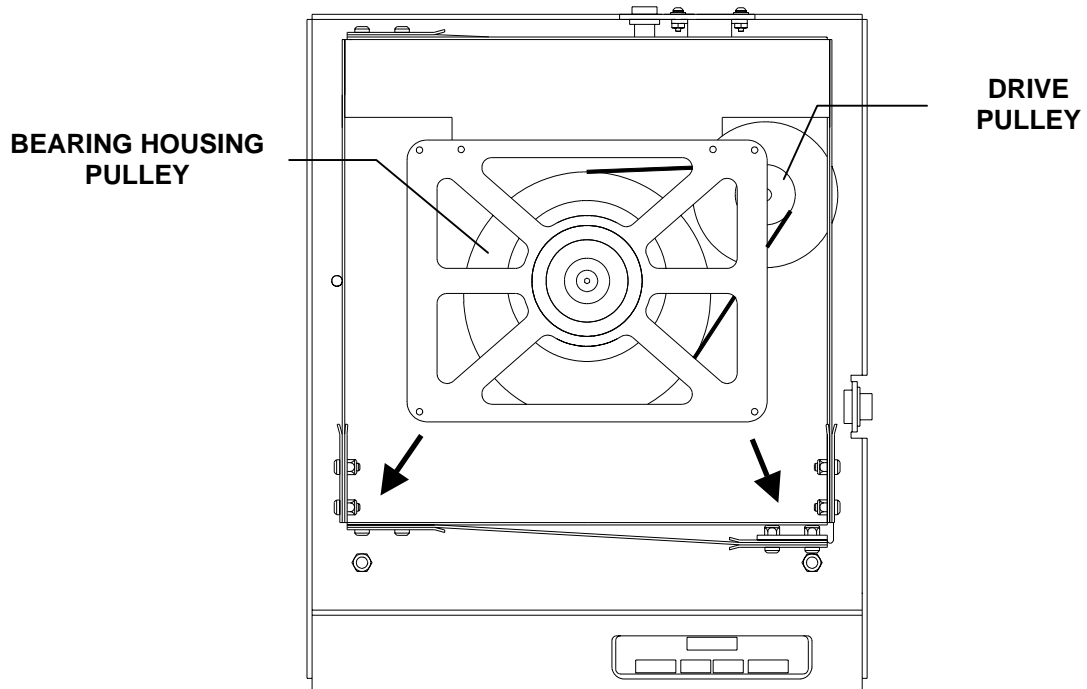


Figure 8: Flexure-Attaching Hardware Detail (reverse view)



8. Using your fingers, reach under the **SUBPLATFORM** and move the belt so that it falls off the drive pulley. Remove the belt from the bearing housing pulley.

Figure 9: Belt Removal



9. Grab the belt from underneath the **SUBPLATFORM**, pull it forward and over one corner of the **SUBPLATFORM**. Repeat for the other corner until the belt clears the **SUBPLATFORM**, but is constrained by the **LOWER MOVER PLATE**.
10. Slide the belt to one of the unattached sides of the **LOWER MOVER PLATE** and pull it through the opening.
11. Slide the belt to the other side of the **LOWER MOVER PLATE**, pull it through the opening, and remove it from the unit.
12. Install the replacement belt in similar fashion.
13. Reattach the **UPPER FLEXURES** to the **LOWER MOVER PLATE**.
14. Reattach the **COVER** to the frame and secure.
15. Reinstall the **MOVER PLATES** and secure.

8 TROUBLESHOOTING

If any problems occur with your shaker, do not attempt to perform any service on the unit other than specified in this manual. Unauthorized servicing may void the warranty. Please contact your NBS Sales Order Department

In any correspondence with NBS, please refer to the Model Number and Serial Number of your unit. This information is on the **ELECTRICAL SPECIFICATION PLATE** located on the side panel of the unit.

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9 REPLACEMENT PARTS AND ACCESSORY INFORMATION

When ordering replacement or accessory parts or requesting service information, please provide the Model Number and Serial Number of your shaker. This information is on the **ELECTRICAL SPECIFICATION PLATE** located on the side panel of the unit.

9.1 Replacement Parts

<i>Part Description</i>	<i>NBS Part Number</i>
V-Belt	R-243
Fuse, Slo Blo® 0.200 A, 250 V	P0380-3830

9.2 Accessories

9.2.1 Dedicated Platforms & Capacities

<i>Accessory Description</i>	<i>Clamps/holders</i>	<i>NBS Part Number</i>
10 ml Erlenmeyer Flasks	60 each	AG2-10
25 ml Erlenmeyer Flasks	32 each	M1190-9919
50 ml Erlenmeyer Flasks	20 each	M1190-9915
125 mL Erlenmeyer Flasks	12 each	M1190-9916
250 ml Erlenmeyer Flasks	8 each	M1190-9917
500 ml Erlenmeyer Flasks	6 each	M1190-9918

9.2.2 Carriers & Test Tube Rack Capacities

<i>Accessory Description</i>	<i>NBS Part Number</i>
Utility Carrier with rubber mat and 2 adjustable bars for securing glassware	AG2-UT
Utility tray with rubber mat for shaking 96-well plates, petri dishes and other labware at low speeds	AG2-00

9.2.3 Universal Platform

The following is a list of flask capacities for Universal Platform number M1001-0240. Flask clamps are ordered separately.

Flask Type	Capacity
10 ml Erlenmeyer Flasks	60 each
25 ml Erlenmeyer Flasks	20 each
50 ml Erlenmeyer Flasks	15 each
125 ml Erlenmeyer Flasks	11 each
250 ml Erlenmeyer Flasks	6 each
500 ml Erlenmeyer Flasks	4 each

9.2.4 Accessory Flask Clamps

Clamp Type	NBS Part Number
10 ml Erlenmeyer Clamp, stainless steel	ACE-10S
25 ml Erlenmeyer Clamp, stainless steel	M1190-9004
50 ml Erlenmeyer Clamp, stainless steel	M1190-9000
125 ml Erlenmeyer Clamp, stainless steel	M1190-9001
250 ml Erlenmeyer Clamp, stainless steel	M1190-9002
500 ml Erlenmeyer Clamp, stainless steel	M1190-9003

10 DRAWINGS

Figure 10: Control Schematic, 100-130 VAC 50/60 Hz

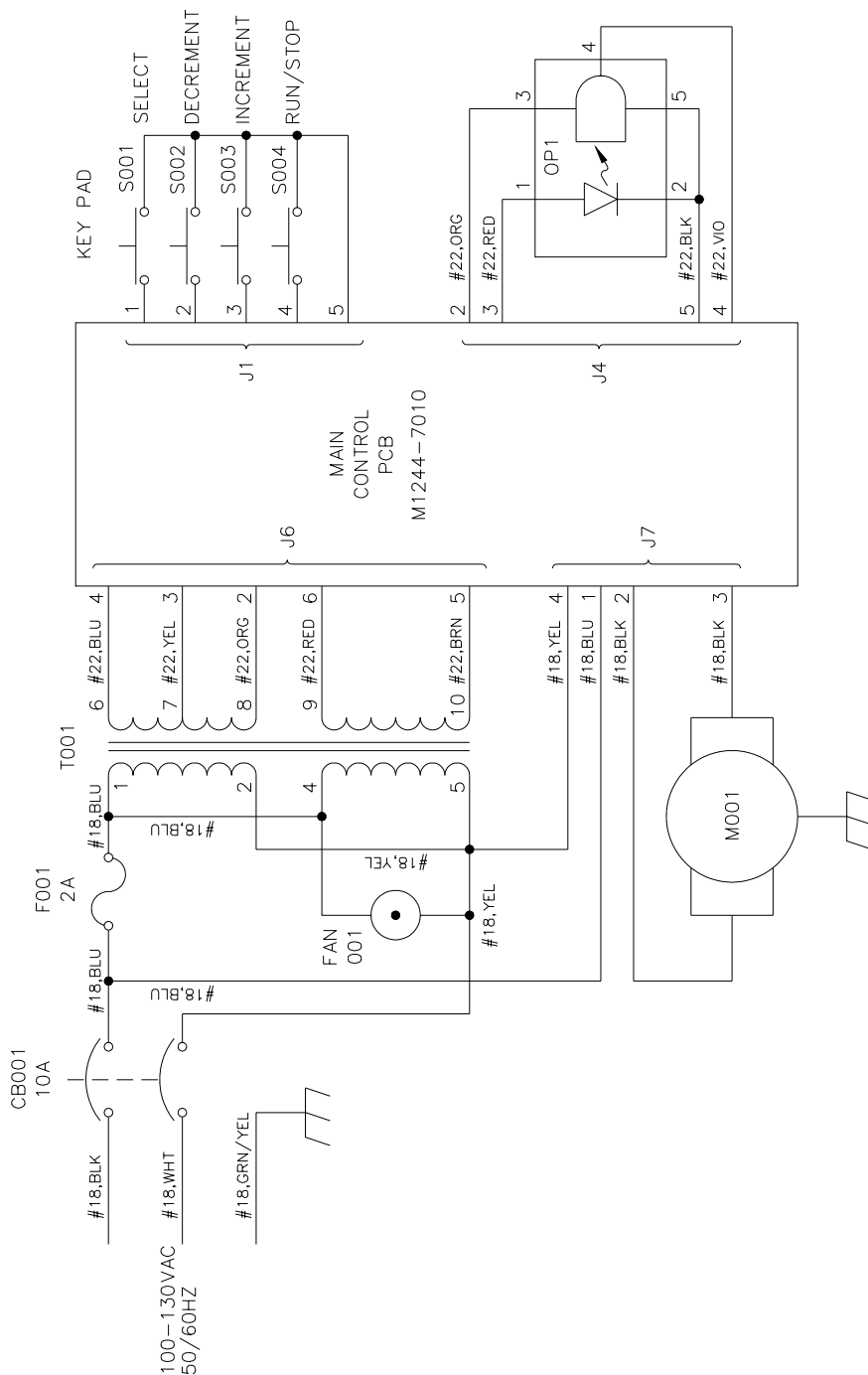
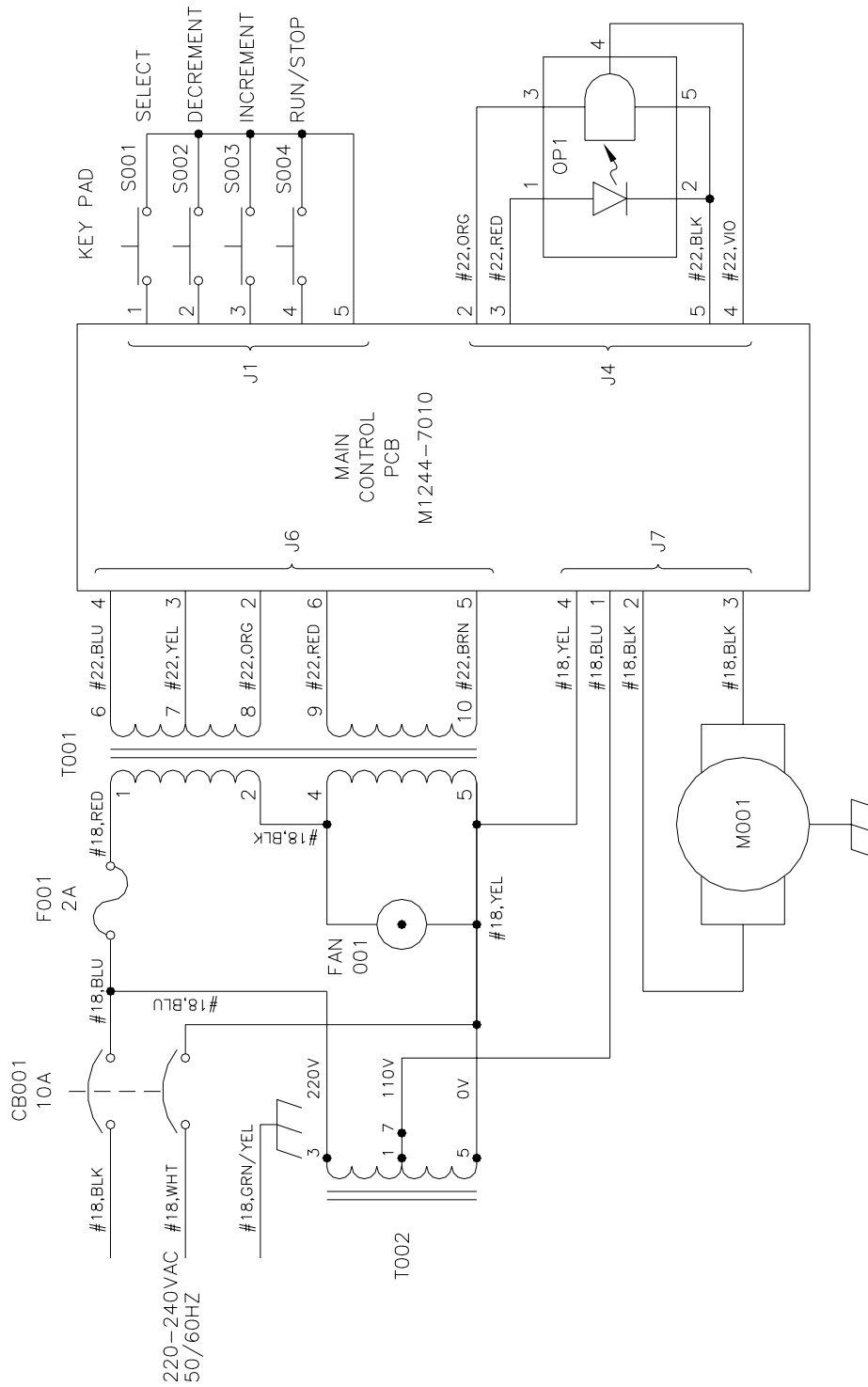


Figure 11: Control Schematic, 200-240 VAC 50/60 Hz



10.1 List of Drawings

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