Guide to Operations

GYROTORY SHAKER
WITH
DIGITAL DISPLAY
MODEL G-10

MANUAL NO.: M1033-0051/M

NEW BRUNSWICK SCIENTIFIC CO., INC.

BOX 4005 . 44 TALMADGE ROAD . EDISON, NJ 08818-4005 . 732-287-1200
TELEPHONE: 800-631-5417 . FAX: 732-287-4222 . TELEX: 4753012 NBSCO
INTERNET: http://www.nbsc.com/ . E-MAIL: bioinfo@nbsc.com

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IMPORTANT NOTICE

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CHAPTER 1
INTRODUCTION

1.1 SCOPE OF MANUAL

This Manual contains Installation, Operation and Maintenance instructions for the NBS Digital Gyrotory Shaker Model G-10, manufactured by New Brunswick Scientific Co., Inc., 44 Talmadge Road, P.O. Box 4005, Edison, New Jersey 08818.

1.2 DESCRIPTION OF THE EQUIPMENT

The Model G-10 is a biological shaking machine designed for continuous operation. The 1" stroke shaker has an adjustable speed range from 40 to 400 RPM and is available with interchangeable shaker platforms of two sizes to accommodate flasks, tubes and other glassware. Machines built to special order with 2" stroke are limited to lower maximum speeds, dependent upon maximum platform loads.

1.3 SUPPLEMENTARY DRAWINGS

Supplementary Drawings supplied with this manual are listed as follows:

Shaker Assembly Drawing
Wiring and Schematic Diagram

CHAPTER 2
INSTALLATION

2.1 INSPECTION

When uncrated, the Gyrotory Shaker should be inspected for any possible damage which may have occurred during transit. Carefully unpack the Shaker and any of the optional equipment ordered with the unit. Report any obvious damage to the Carrier and to the New Brunswick Scientific Co., Inc..

2.2 INSTALLATION PROCEDURE

Remove protective plastic caps from mounting feet and position the unit on a level surface, at a convenient height for loading and observation. The Shaker may be placed on the floor or on a suitable bench. Check the specification plate at rear of unit. Set the Power Switch to OFF position and connect the power cord to a suitable power source.

NOTE:

1. *The Model G10 is furnished with extension mounting brackets at the four corners of the base. Two rubber feet are mounted on each bracket for added traction. Where required, the machine can be anchored permanently by removing one rubber foot on each bracket and inserting mounting bolts or screws through the vacated holes.*

2. *When the Shaker is supplied with platforms that accommodate flasks of 2 liter size or larger, counterweights are factory installed on the Idler and Drive Shafts. When using lighter or heavier loads than shaker is designed to accommodate, excessive creeping may be encountered. To prevent creeping with light loads, remove counterweights, with heavier loads additional counterweights should be added. Additional weights may be purchased from NBS.*

2.3 SHAKER CONTROLS

CONTROLS	FUNCTION
ON/OFF - Switch	Applies power to shaker drive motor.
Low Speed/High Speed - Control	Controls table shaking speed.

CHAPTER 3
OPERATION

3.1 OPERATION PROCEDURES

1. Check that the platform screws are fully tightened before using the apparatus.

2. Depress the locking tab located number under the Speed Control knob and rotate the Speed Control knob for minimum shaking speed. This is done initially to prevent starting the unit at higher shaker speeds than desired for the type of culture used.

> CAUTION:
> WEAR HEAVY PROTECTIVE GLOVES AND EXERCISE CARE WHEN HANDLING GLASSWARE AT ALL TIMES. BE ESPECIALLY CAREFUL WHEN INSERTING FLASKS IN SPRING HOLDERS ON PLATFORMS.

3. Install the flasks or test tubes, evenly, on the platform.

4. Set the ON/OFF switch ON, depress locking tab and adjust the speed control for desired shaking speed.

5. Allow the unit to run for one hour, then re-adjust Speed Control.

NOTE: *During the first hour of operation, the unit will gradually come up to speed. Therefore, it is extremely important to recheck speed after this time period has elapsed.*

6. To shut down the shaker, depress locking tab and rotate the Speed Control to its minimum speed setting, then set the ON/OFF switch to OFF.

CHAPTER 4
MAINTENANCE

4.1 PREVENTIVE MAINTENANCE

Preventive maintenance is performed to keep equipment in proper working order. When periodically performed, preventive maintenance will result in longer life for the equipment and will reduce time lost due to equipment failure.

4.1.1 Cleaning

Remove power from the unit. Use a clean cloth moistened with water for cleaning the cabinet. Do not use steel wool or other abrasives which will mar the finish.

1. Check the fuse or fuses for good contacts.
2. Remove any accumulated dirt from the front, sides, back, underneath and inside the unit.
3. Check that all controls are tight and operate properly.

4.1.2 Main Housing Bearing Lubrication

There are 3, double-row, ball bearings in the upper eccentric shaft housing. They are lifetime sealed and do not require lubrication. There are 4 grease fittings on the lower eccentric shaft housing. These fittings should be lubricated once every three months with Lubriko-MG, M6 Density, high temperature ball bearing grease, manufactured by Master Lubricants Company, Philadelphia, Pa., or equivalent. ***DO NOT OVER LUBRICATE***. The fittings can be reached by removing the flask platform. *See paragraph 4.2.2 for platform removal*. Power should be off when lubricating unit.

4.1.3 Drive Motor Lubrication

The bearings are sealed on the motor and do not require lubrication.

4.2 CORRECTIVE MAINTENANCE

4.2.1 Replacement of Drive Belt

To replace the drive belt, proceed as follows *(see Figure 1)*:

1. Set the power switch to OFF position. Remove the power cord plug from the electrical outlet.
2. Wearing gloves, remove all flasks from the table.
3. Tilt the unit on the rear panel until the base of the unit is exposed and loosen the front locking bolt on the motor mounting plate. Slide the motor mounting plate inward to lessen the tension on the Drive Belt. Remove and replace Drive Belt. Slide motor mounting plate outward to take up slack in belt and tighten bolt. Proper tension is obtained when belt can be deflected 1/2" by hand. Turn unit over, plug in and try operation.

4.2.2 Platform Removal

To remove platform, simply unscrew the 4 retaining screws with the "T" wrench supplied. Make sure the retaining screws are thoroughly tightened when replacing the platform.

4.2.3 Drive Motor Brush Replacement

The drive motor brushes should be replaced when the brushes are worn to 1/4 of an inch. The original brush length is 1 inch. If the unit operates erratically or not at all, check the brushes. The brushes on the motor can be reached by removing the platform. Make sure power is off when working on the unit *(Figure 1)*.

4.2.4 Bearing Replacement

To replace the bearings, proceed as follows *(see Figure 2)*:

1. Remove power from the unit and remove the platform.
2. Remove the drive belt and pulley from the Drive Shaft.
3. Remove the bolts, at the base of the unit, securing the Bearing Housing to the frame, then carefully lift the housing clear of the unit.
4. Remove the three socket head cap screws and washers securing the upper bearing housing to the Idler Shafts *(see Figure 3)*.
5. Carefully remove the Upper Bearing Housing from the 3 shafts.

   <u>NOTE:</u> Do not lose the shims on each of the shafts. They must be replaced when reassembling.

6. Remove the bearing retaining screws from each of the bearings. The bearings may now be removed by inserting a thin rod through the holes provided for in the platform and lightly tapping the bearings out.
7. Insert 3 new B-162 bearings into the Upper Housing and lightly tap them in place. Secure the bearings in place with the screws and washers previously removed. This completes the procedure for bearing replacement in the Upper Bearing Housing.
8. On the Lower Bearing Housing, remove the Retaining Ring from the Drive Shaft (pulley end).
9. The Drive Shaft may now be removed from the platform side of the Lower Bearing Housing.
10. Remove the bearing retaining screws from each of the bearings and using a bearing puller, remove the two exposed bearings from the Lower Bearing Housing on the drive shaft.
11. On each of the Idler Shaft sections, remove the 5/8" set screw on the bottom of the Lower Bearing Housing. Insert a steel pin in through each set screw hole and drive the Idler Shaft out the top with the Upper Bearing.
12. Remove the bearing retaining ring from each of the Idler Shaft holes in the Lower Bearing Housing.
13. Using the bearing puller, remove the lower bearings for both Idler Shafts.
14. On each of the Idler Shafts, remove the retaining ring and slip off the Upper Bearing.
15. On the Lower Bearing Housing, insert two B100 type bearings into the driven shaft hole. Lightly tap the bearing in place. Secure the upper bearing with 3 screws and flat washers. Secure the lower bearing with a H-158 retaining ring. Insert the Driven Shaft from the top of the housing through the bearings.
16. In each of the Idler Shaft holes, insert one B-109 bearing and seat in place at the top.
17. At the top of each Idler Shaft hole, install one H-142 retaining ring for the Upper Bearing.
18. Slip one B-109 bearing over each Idler Shaft and one H-146 retaining ring on the end of each shaft.
19. Insert each Idler Shaft into its respective hole and seat the bearings in the upper portion of the housing. Tap the shafts until the upper bearings are even with the surface of the housing.
20. Secure each of the two bearings with 3 screws and washers previously removed. This completes the installation of Bearings in the Lower Bearing Housing.
21. Make sure the shims are on each shaft, then install the Upper Bearing Housing over the shafts.

22. Secure the Upper Bearing Housing to the three shafts. Use the socket head cap screws and washers, previously removed.
23. Replace the two 5/8" set screws at the bottom of the Bearing Housing. Use a standard pipe dope on the threads. This completes the replacement of bearings. The bearing housing should now be lubricated with a high speed, high temperature ball bearing grease. Use NBS type H-239. ***DO NOT OVER LUBRICATE.***
24. Install the Bearing Housing on the frame of unit. Use the bolts, washers and nuts previously removed. Tighten all hardware securely.
25. At the base of the unit, install the pulley on the drive shaft, hub facing down, then install the "V" belt. If the belt requires a tension adjustment, loosen the bolts on the motor mounting plate, apply tension by pulling on motor plate and tighten bolts.
26. Turn the unit over to its operating position, and install platform.

4.2.5 Calibration for Speed

1. Turn Power OFF.
2. Remove the platform by removing the (4) Allen screws located on top of the platform.
3. Turn Power ON.
4. Turn the speed adjust fully to the left, the shaker should not be shaking.
5. Calibration of the DVM/Converter Assembly - M1013-0500. Instrument needed: Oscilloscope or Stroboscope. With the speed off, adjust R12 to read ZERO on DVM. Turn the speed adjust clockwise to a speed where the shaker is not vibrating too much (300 RPM).
   When using a Stroboscope: Adjust R14 so that the speed read on the display corresponds with the speed read on the Stroboscope (a clockwise rotation of R14 means a speed increase).
   When using an Oscilloscope: Hook the Oscilloscope in between U3 Pin 1 and U3 Pin 12; adjust R14 so that the speed read on the display corresponds with the frequency measured multiplied by 2.5 (again, a clockwise rotation of R14 means a speed increase).
6. Turn OFF the Speed, turn OFF the Power.
7. Replace the Shaker Platform (4 Allen screws).

4.3 REPLACEMENT PARTS

The following Table represents parts to be kept on hand to reduce equipment repair time.

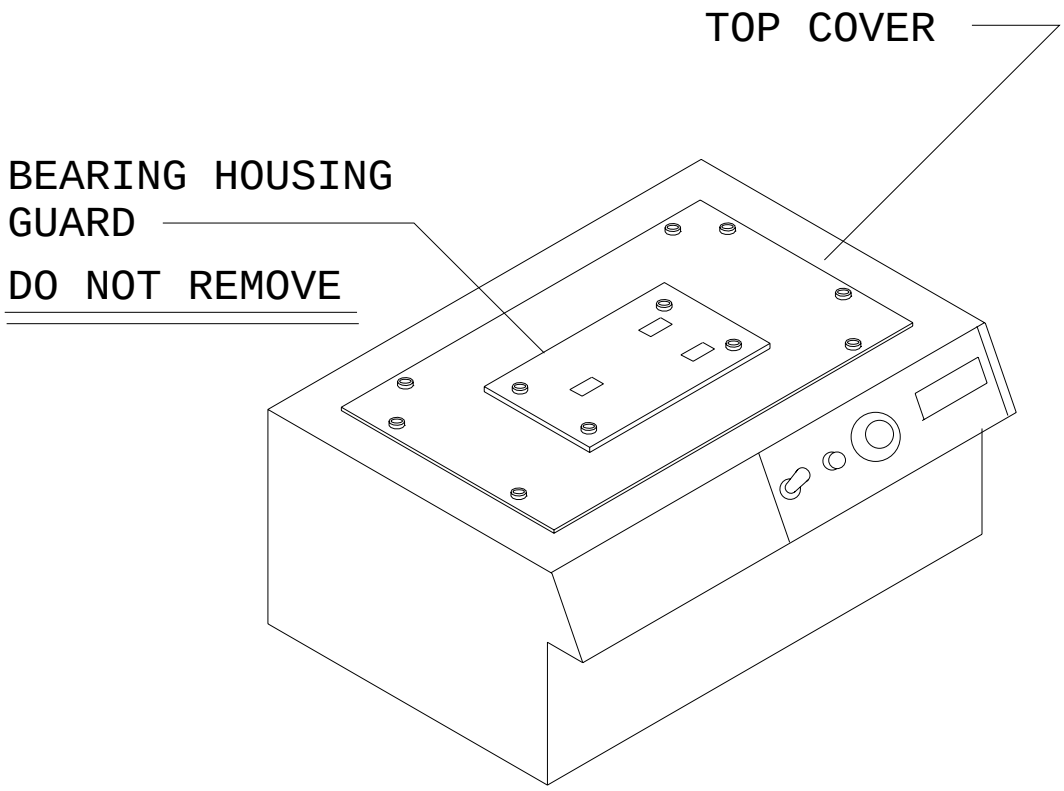
TABLE 1 - REPLACEMENT PARTS LIST

PART NO.	DESCRIPTION	QTY/UNIT
R-457	V-Belt	1
M1033-0250	Motor Pulley	1
M1024-3003	Drive Motor	1
EI-107	Amber Indicator	1
P0460-0153	DC Motor Drive	1
ER-100	Fuse Holder	1
EF-116	Fuse (3 amp 115V units)	1
ES-111	Switch	1
EC-185	Cord Set (115V units)	1
P0380-3441	Fuse (220V-50Hz) 0.1 Amp (mm)	1
P0380-3261	Fuse (220V-50Hz) 2 Amp (mm)	1
P0380-3440	Fuse (120/208/220V-60Hz) 0.1 Amp	1
P0380-3260	Fuse (120/208/220V-60Hz) 2 Amp	1
P0380-3530	Fuse (208/220V-60Hz) 1.6 Amp	1
P0380-3532	Fuse (220V-50Hz) 1.6 Amp (mm)	1
P0420-1040	Transformer	1
P0380-2080	Cord Set (208V only)	1
P0720-2020	Cord Set (230V only)	1
G25-202	Idler Shaft (2" stroke)	2
G25-203	Drive Shaft (2" stroke)	1
G25-197	Idler Shaft (1" stroke)	2
G25-196	Drive Shaft (1" stroke)	1
M1013-0550	Power Supply P.C. Assembly	1
M1013-0500	DVM/Converter Assembly	1
M1033-0420	Optical Switch Assembly	1
P0380-1181	Motor Brush	2

NOTE: *For electrical components, refer to the electrical drawings and bills of material supplied.*

IMPORTANT:

When placing orders for replacement parts of for infomration on service, kindly furnish the serial number of the equipment appearing on the electrical specification plate.


TOP COVER
BEARING HOUSING
GUARD
DO NOT REMOVE