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Guide to Operations

innOva™ 2100/2150

DIGITAL
PLATFORM SHAKER

MANUAL NO.: M1194-0050/K

NEW BRUNSWICK SCIENTIFIC CO., INC.
BOX 4005 . 44 TALMADGE ROAD . EDISON, NJ 08818-4005 . 908-287-1200
TELEPHONE: 800-631-5417 . FAX: 908-287-4222 . TELEX: 4753012 NBSCO
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INNOVA 2100/2150

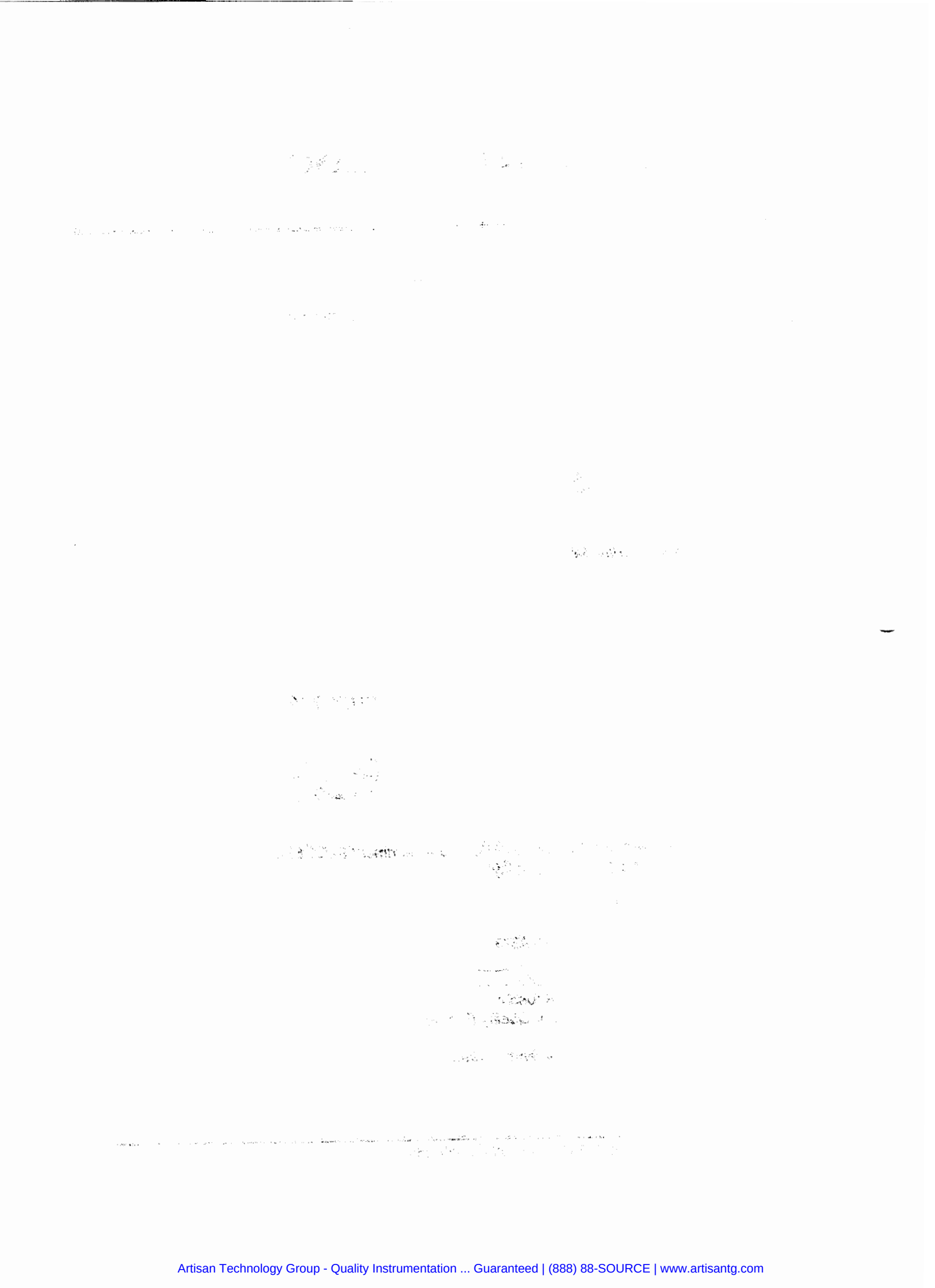
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CERTIFICATE OF COMPLIANCE

NEW BRUNSWICK SCIENTIFIC

17 BASINGSTOKE BUSINESS CENTRE, WINCHESTER ROAD
BASINGSTOKE, HANTS. RG21 1UA ENGLAND.

Telephone International: + 44 1256 844568.
Fax International: + 44 1256 844569.

CERTIFICATE OF COMPLIANCE

This is to certify that the INNOVA model 2100 and 2150 SHAKERS

Model Numbers M1194-0000
M1194-0001
M1194-0002
M1194-0003
M1194-0004
M1194-0005
M1194-0010
M1194-0011
M1194-0012
M1194-0013
M1194-0014
M1194-0015

comply with Directive 89/336/EEC and amendment 92/31/EEC (Electromagnetic Comptibility).
EN 50081-2 : 1994
EN 50082-1 : 1992

Certificate No. 959220-9273

Approved By: .....
G.M.Robson
Director Quality Europe

Dated: 25 September 1995

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WARRANTY

Innova shakers are warranted by New Brunswick Scientific Co., Inc. for two years or 10,000 hours of actual shaker use, whichever comes later. This warranty covers parts and labor for the entire machine with the exception of glassware and its contents. This warranty covers faulty components and assembly, and our obligation under this warranty is limited to repairing or replacing the shaker or part thereof, which shall within two years after date of shipment, or 10,000 hours of operating time, (whichever comes later), prove to be defective after our examination. **This warranty does not cover any loss of time, materials, biological or biochemical by-products caused by any work interruption resulting from shaker failure, nor does it extend to any Innova shaker which has been subjected to misuse, neglect, accident or improper installation or application. In addition, the warranty does not apply to any Innova shaker that has been repaired or altered outside the NBS factory without prior authorization from New Brunswick Scientific Co., Inc..** For a period of two years (or more) after the shipment date the Innova warranty will be in effect as long as the shaker has not been in operation for a total of 10,000 hours.

After 10,000 hours of operating time have elapsed the Innova warranty may still be in effect as long as the two-year minimum warranty period has not been reached. Operating time is based on actual usage of the shaker, as determined by the shaker's internal electronic clock. Any tampering or alteration of the electronic clock will void the 10,000 hour warranty.

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INTRODUCTION

The Innova 2100/2150 Digital Platform Shaker will provide you with reliable and maintenance-free operation which is characteristic of all NBS shakers. The Innova 2100/2150 is among the newest generation of NBS shakers and incorporates a variety of state-of-the-art components and features to permit the precision operation necessary for your exacting scientific experiments.

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HOW TO USE THIS MANUAL

This Manual is intended to provide the user with a complete understanding of how the Innova 2100/2150 Digital Platform Shaker operates, basic component elements, and information about preventative maintenance and service issues. This Manual also includes a complete guide to the installation and operation of the Innova 2100/2150.

The manual is divided into three basic sections. Section I provides an overview of the Innova 2100/2150 and all of its features and options. Section II details the set-up and operation of the instrument. Section III outlines troubleshooting and service procedures which should be utilized by a qualified service engineer.

It is recommended that you completely familiarize yourself with this Manual, prior to actually operating the Innova 2100/2150.

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OVERVIEW

GENERAL DESCRIPTION

The Innova 2100/2150 is a benchtop shaker utilizing a triple eccentric counterbalanced drive to provide horizontal plane rotary motion in a ¾" (19mm) circular orbit. A Proportional/Integral (PI) Microprocessor controller with instantaneous digital feedback controls the speed over a range of 25-500 RPM.

The shaker may be operated either continuously or in a timed mode via a programmable timer for shaking periods of 0.1 hr. to 99.9 hrs.. A temperature/monitoring option is available for the measurement, display and documentation of sample temperature *(see **Options**, this section)*.

The Innova 2100/2150 is equipped with audible and visible alarm which are activated when an alarm condition exists as follows:

- The end of a timed run
- Deviations of shaking speed or temperature outside of tolerance limits

A wide variety of platforms can be used with the Innova 2100/2150. Dedicated platforms are available for a variety of flask sizes. Universal platforms, utility trays and utility carriers are also available *(see **Appendix** for accessories)*.

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OVERVIEW

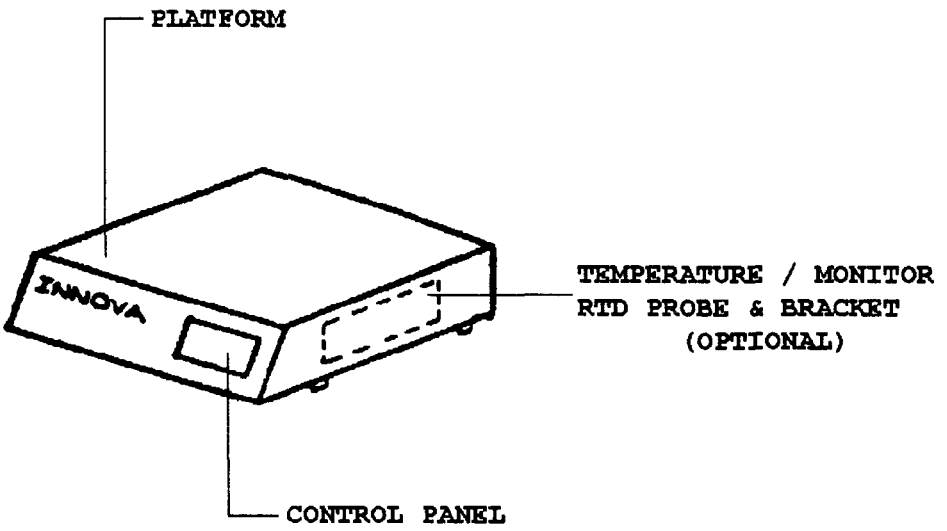


FIGURE 1a
Innova 2100/2150 Overall Front View

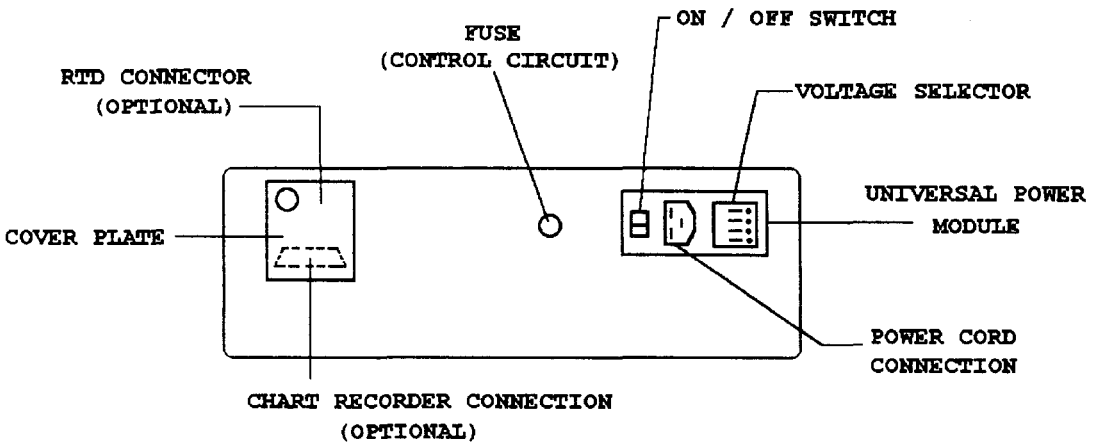


FIGURE 1b
Innova 2100/2150 Overall Rear View

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OVERVIEW

UNIVERSAL POWER MODULE

The power module contains a voltage card and fuse holder which are used to select the appropriate voltage and fusing. This universal power entry system adapts to worldwide power requirements. Voltage and fusing have been set prior to shipment. Innova shakers are available in 100V, 120V, 220V and 240V configurations which accommodate both 50 and 60 Hz frequencies.

WARNING:

IT IS **CRITICAL** TO CHECK THE VOLTAGE BEFORE PLUGGING THE UNIT INTO A POWER SOURCE.

CONFIRM THAT THE VOLTAGE SETTING IS CORRECT BY CHECKING THE VOLTAGE SELECTOR IN THE UNIVERSAL POWR MODULE (FIGURE 1b) AND THE CAUTION LABEL LOCATED OVER THE POWER SWITCH AND POWER CORD CONNECTION.

REFER TO SECTION III: **SERVICE AND MAINTENANCE,** CHANGING VOLTAGES.

CONTROL PANEL

The control panel *(Figure 2)* is located on the front of the instrument and serves as the operator interface. The keypad has 4 keys marked Start/Stop, Δ, ∇ and Select. A three digit LED display provides numeric values as well as some letter codes. There are 4 **function indicator** and 4 **status indicator** lights on the control panel as well. A general description of the display, user interface keys and indicators follows. For operation of the control panel, *see Section II,* ***Operation***.

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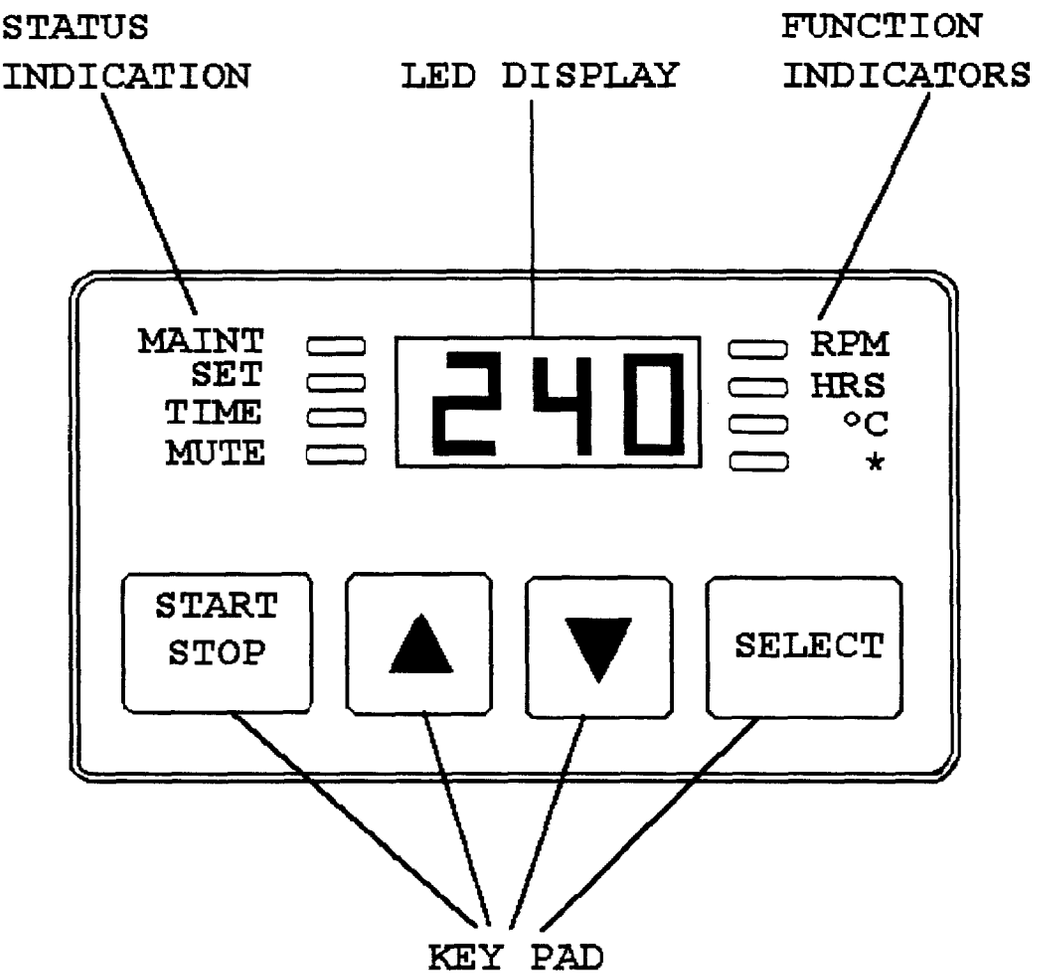


FIGURE 2
INNOVA 2100/2150 CONTROL PANEL

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OVERVIEW

LED DISPLAY

The display on the Innova control panel is a 3 digit LED display. During normal shaker operation the display will indicate:

- Shaker status (on/off)
- Shaking speed
- Setpoints
- Hours remaining (timed run)
- Measured temperature (when temperature/monitor option is installed)

USER INTERFACE KEYS

START/STOP
This key is used to start or stop the shaking motion. It will also activate or stop the timer when a timed run is desired.

SELECT
This key is used to change the displayed parameter. Temperature (°C) cannot be selected unless the temperature/remote monitoring option is installed.

Δ, ∇
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.

INDICATORS

Status Indicators

4 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. Innova shakers can be programmed to run for a preset time from 0.1 hr. to 99.9 hrs.. The timer can be disengaged without stopping an ongoing run.

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Mute: indicates the status of the audible alarm. When the Mute indicator is illuminated the audible alarm device is disabled.

Function Indicators
4 function indicator lights are located to the right of the LED display. The indicate the current parameter being displayed.

RPM: revolutions per minute.
Hours: time remaining.
°C: temperature function will be activated only if the temperature/monitor option is installed.
*: not applicable to the Innova 2100/2150.

PLATFORM ASSEMBLIES

The Innova 2100 can be used with a wide variety of NBS 18" x 18" (46cm x 46cm) platforms which will accept a variety of clamps for flasks, test tubes, etc.. *(see listing in **Appendix**)*.

The Innova 2150 can accommodate a wide variety of NBS 18" x 24" (46cm x 61cm) platforms which will accept a variety of clamps for flasks, test tubes, etc.. *(see listing in **Appendix**)*.

OPTIONS

TEMPERATURE/MONITOR OPTION

A Temperature/Monitor option is available (P/N M1194-9924). The temperature of the liquid in any vessel or ambient temperature can be measured using the RTD electronics-based measuring device supplied with this option. The LED will display the measured temperatures in 0.1°C increments. This option also allows the connection of a chart recorder so that shaking speed and temperature can be documented. The analog output for shaking speed is 0-5V; 1V per 100 RPM. For temperature the output is 0-5V with .05V per °C. The output can also be connected to a data logging computer with an analog data acquisition card.

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CAPACITY UPGRADE OPTION

It is possible to significantly increase the capacity of your Innova 2100 Shaker with an available capacity upgrade package (P/N M1194-9926). This option will convert an Innova 2100 to an Innova 2150 simply and easily. This package consists of appropriate counterweights, outrigger feet, and hardware. Large capacity Innova 2150 platforms **must** be used with the Innova 2150 configuration. A listing of available platforms is provided in the **Appendix**.

QUICK CHANGE PLATFORM OPTION

This accessory enables the user to snap-in platforms without tools or hardware. This is especially handy for those users who change platforms frequently. The kit includes a sub-platform with spring clips, an extra counterweight, and hardware for installation. The option is available for both the Innova 2100 and the Innova 2150.

HEAVY DUTY CONSTRUCTION

TRIPLE ECCENTRIC DRIVE

The Triple Eccentric Drive used in the Innova Shakers employs the same proven technology which has driven New Brunswick Scientific's shakers for over 30 years. This drive mechanism utilizes a counterweight system to stabilize the rotary motion produced during operation. When the work load moves in one direction, opposing forces are generated to stabilize the shaker. This action will help eliminate the problem of "walking" which may occur with less precisely balanced instruments. Vibration is minimized and the life of the unit is extended.

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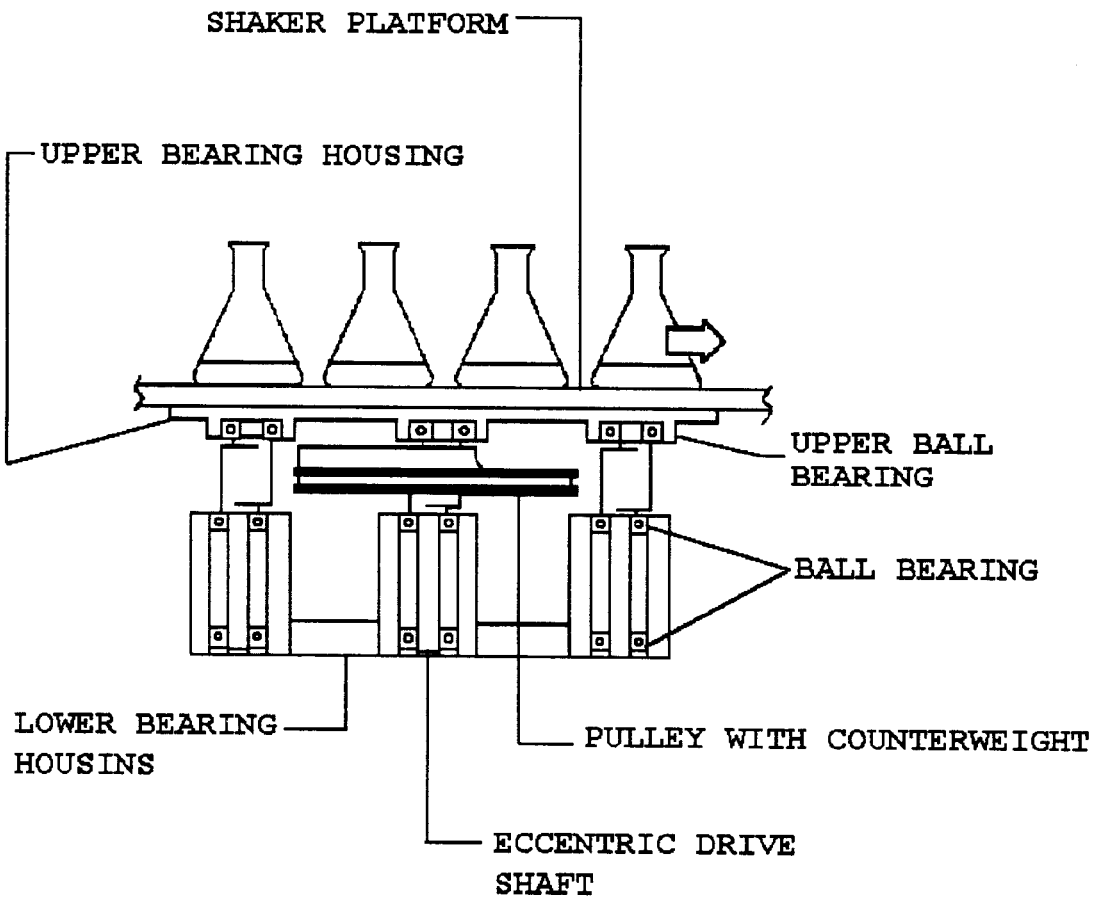
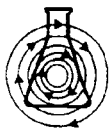


FIGURE 3
Counterbalanced Drive Mechanism

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OVERVIEW

BEARINGS

Innova shakers employ sealed lubricated ball bearings of the highest quality. Sealed bearings minimize the generation of airborne particulates which may be disadvantageous in clean rooms or controlled environment areas. These bearings require no maintenance and have run reliably in New Brunswick Scientific shakers for may years.

MOTOR

The Innova 2100 and 2150 shakers use a 3 phase brushless ball bearing DC motor. This low profile motor provides high torque along with quiet, efficient operation and low maintenance. The motor has a rating of 1/15 horsepower.

ELECTRONIC BOARDS

The main control board for the Innova shaker has the following functions:

- Non-volatile memory for storage of key parameters during power interruption;
- Speed sensing, electronic commutation, and power control for the brushless DC drive motor;
- Maintains an elapsed running time clock;
- Contains firmware for shaker control as well as recognition of an expansion connector for option modules;
- Provides an operator interface via displays, audible alarm, and connection to the keypad module (keypad buttons and display graphics).

The optional temperature module is designed to "piggy-back" onto the main board via an expansion connector. It has the following functions:

- Control of analog power supplies;
- Signal conditioning of RTD sensor readings;
- Provide remote monitoring capabilities by supplying analog outputs for speed and temperature which are compatible with chart recorders and analog data acquisition systems.

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OPERATION

The Innova 2100/2150 is a versatile instrument which can be operated in a continuous fashion or set for a timed run. The following section describes set-up and installation procedures and implementation of the shaker's operating features.

INSTALLATION & SET-UP

UNPACKING

Upon unpacking the unit, inspect it carefully for any apparent damage which may have occurred during transit. Report any damage to the carrier and to the New Brunswick Scientific Co., Inc. Service Department at 1-800-631-5417. Do not discard the crate or packing material.

There are two plastic straps holding the bearing housing in place during shipping. ***These must be removed*** before operation. Also secured with a plastic strap attached to the bearing housing is a plastic bag marked platform screws (Allen head), used for mounting of platform (remove same). Remove the straps once the unit is unpacked and inspected.

VOLTAGE CONFIGURATION

Determine the voltage of your unit by checking the voltage selector and label on the rear of the unit. Confirm that the correct electrical service package is included with the unit by comparing the part numbers on the electrical service package to the table opposite *(also see Section III, **Service and Maintenance**)*.

VOLTAGE CONFIGURATION TABLE

CATALOG # INNOVA 2100	CATALOG # INNOVA 2150	ELECTRICAL SERVICE PACKAGE	MANUAL
M1194-0001 100V 50/60Hz	M1194-0011 100V 50/60Hz	M1191-0300	M1194-0050
M1194-0000 120V 50/60Hz	M1194-0010 120V 50/60Hz	M1191-0300	M1194-0050

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OPERATION

CATALOG # INNOVA 2100	CATALOG # INNOVA 2150	ELECTRICAL SERVICE PACKAGE	MANUAL
M1194-0002 220V 50/60Hz	M1194-0012 220V 50/60Hz	M1191-0310	M1194-0050
M1194-0003 240V 50/60Hz Single Fuse	M1194-0013 240V 50/60Hz Single Fuse	M1191-0310	M1194-0050
M1194-0004 220V 50/60Hz Double Fuse	M1194-0014 220V 50/60Hz Double Fuse	M1191-0320	M1194-0050
M1194-0005 240V 50/60Hz Double Fuse	M1194-0015 240V 50/60Hz Double Fuse	M1191-0320	M1194-0050



NOTE:

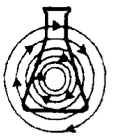
Use of the Innova shakers requires a platform which is a separate item. Please see the accessories list in the manual for a listing of available platforms. The Innova 2100 uses 18" x 18" (46cm x 46cm) platforms. If you have an Innova 2150 or have the capacity upgrade package, consult the accessories list for the appropriate 18" x 24" (46cm x 61cm) platforms.

INSTALLATION OF THE INSTRUMENT

SPACE REQUIREMENTS

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.

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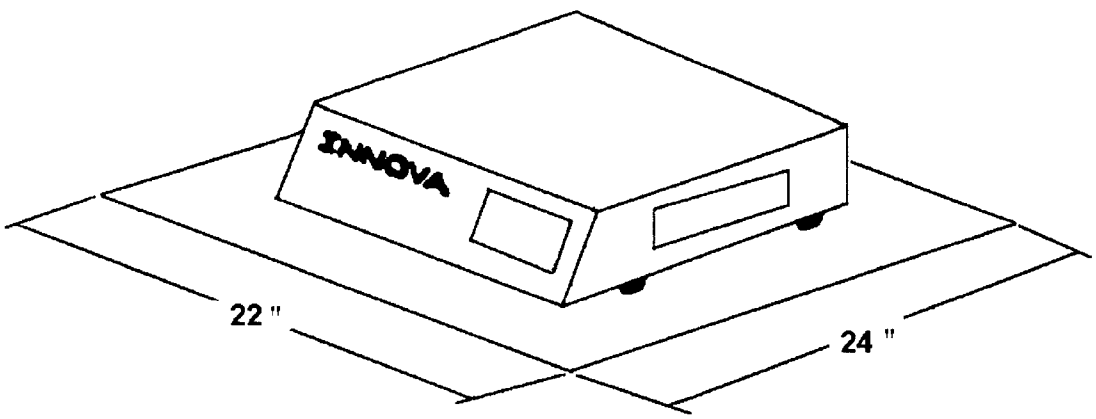


OPERATION

The dimensions of the Innova 2100 including a platform (excluding glassware) are: 19"W x 21 7/8"D x 6 3/8"H (48cm W x 54cm D x 17cm H). The effective surface area required for operation is: 22"W x 24"D
(56cm W x 61cm D)

The dimensions of the Innova 2150 including a platform (excluding glassware) are: 24"W x 21 ¼"D x 6 3/8"H (48cm W x 54cm D x 17cm H). The effective surface area required for operation is: 27"W x 24"D
(69cm W x 61cm D)

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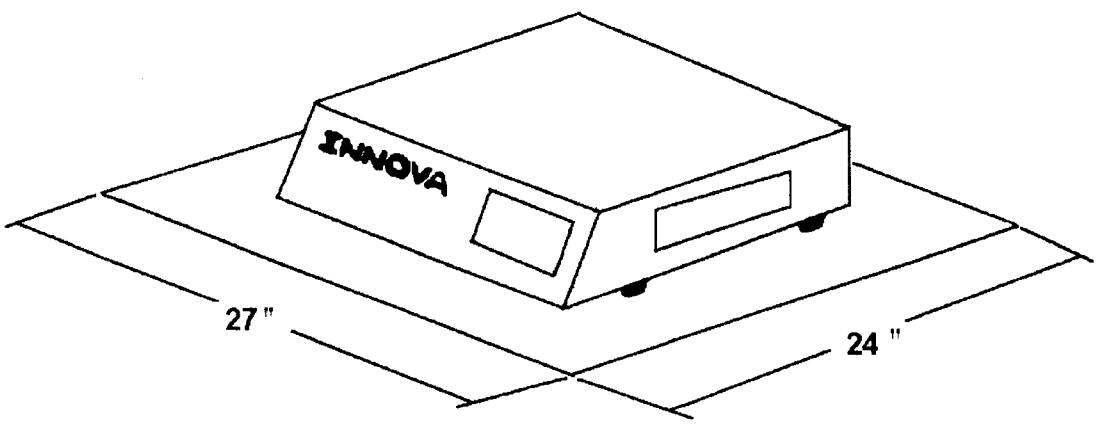


FIGURE 4a & 4b
Footprint Required for
Innova 2100/2150

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OPERATION

ELECTRICAL CONNECTIONS

CAUTION:
BEFORE MAKING ELECTRICAL CONNECTIONS:

1. Check the voltage selector in the power module at the rear of the unit to ensure that it is set to the appropriate voltage. If it is not, refer to "Power Module Assembly" - Voltage changes in Section III of this Manual.
2. Remove the caution label from the Universal Power Module.
3. Make sure the plastic straps are removed from the upper bearing housing.
4. Set the power switch on the back of the unit to the OFF position.

ONLY THEN:

5. Connect the line cord to the Universal Power Module and to a grounded electrical outlet.

CAUTION:
A GROUNDED ELECTRICAL OUTLET IS NECESSARY FOR THE SAFE OPERATION OF THIS INSTRUMENT.

INSTALLATION OF PLATFORM

A platform must be installed on the unit prior to use.

1. Place the platform on the unit. Be sure to use the proper size platform for your particular model shaker.
2. Tighten the 4 platform screws (Allen head) with the 7/32" hex wrench provided to secure the platform.

If the Quick Change Option is installed:

1. Slip the appropriately sized platform between the side guides and push the platform against the rear retainer.
2. Press down on the front edge of the platform. The platform should snap down into place and be retained by the springs. Check that the rear edge of the platform is engaged under the bend of the rear clip.

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OPERATION

STARTING THE INNOVA 2100/2150

To start the instrument turn the ON/OFF switch on the back of shaker to the ON position. If the shaker is running, 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.

CONTINUOUS (UNLIMITED) RUN

1. If the LED displays "OFF" press the Start/Stop key.
2. Press Select until RPM is lit.
3. Press either Δ or ∇ to enter Set mode (set indicator will light).
4. Set the speed by using the Δ or ∇ keys until the desired setpoint is displayed. Holding the Δ/∇ keys will cause the setting to change more rapidly.

The setpoint may be changed during a run without stopping the shaker by following Steps 2-4. During speed changes, the alarm may sound until the speed returns to within 5 RPM of the setpoint.

TO CHECK ANY SETPOINT

1. Press Select until the desired indicator is lit.
2. Press either Δ or ∇ to enter the Set mode and display the current setpoint.

CAUTION:
HOLDING THE Δ or ∇ FOR MORE THAN 0.5 SECONDS CAUSES THE SPEED SETPOINT TO CHANGE. SHOULD THIS OCCUR, RESETTING WILL BE NECESSARY.

TIMED FUNCTIONS

The shaker may be programmed to automatically stop after a preset time period of 0.1 hr. - 99.9 hrs.. 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.

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OPERATION

To set the timer:

1. Press the Select key to light HRS.
2. Press either Δ or ∇ to enter the Set mode and set between 0.1 - 99.9 hrs..
3. While Set light is lit 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", the Time indicator will flash and the audible alarm will sound.

To stop the alarm: 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 go out and the display will read "OFF".

ALARM FUNCTIONS

Innova shakers have an audible alarm which is activated at predetermined times. It may be deactivated in the following way:

1. Press Select to light HRS.
2. **Simultaneously** press the Δ and ∇ keys. The Set and Maint indicators will flash.
3. While the Set and Maint indicators are flashing press the Start/Stop key. The Mute indicator will light to advise that the audible alarm is deactivated.

The alarm may be reactivated by repeating steps 1-3. The Mute indicator will be extinguished when the alarm has been reactivated.



NOTE:

The shaker may be started or stopped by pressing the Start/Stop key. When starting, the unit will automatically return to the last function and speed setting. The audible alarm will be activated until the speed is within 5 RPM of the setpoint. The alarm will ***not*** *sound when the shaker is accelerating immediately following turning on the power.*

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OPERATION

TOTAL RUNNING TIME

The control modules of the Innova Shakers totalize the time the shaker has been "ON" to track hours of usage. To display the accumulated running time:

1. Select HRS using the Select key.
2. Simultaneously press the Δ 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.

After 10,000 hours of operation, the Maint indicator will light. Preventive maintenance is recommended at this point. The light can be deactivated by NBS Service Personnel. Alteration of the internal clock by unauthorized personnel will void the warranty.

TEMPERATURE/MONITOR OPTION

This option consists of an internal electrical interface, a RTD temperature probe, and an analog output for chart recorder or computer. When this option is installed either the ambient temperature or the temperature of any vessel on the shaker platform can be measured with the probe.

1. Remove the probe from its holder and insert it into the vessel to be monitored.
2. Use the Select key to indicate °C.

The °C indicator will only function when the temperature/monitor option is installed.

Since the temperature/monitor option does not provide temperature control, any attempt to enter a temperature setpoint results in "Err" (Error) being displayed.

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RECORDER ADAPTATION

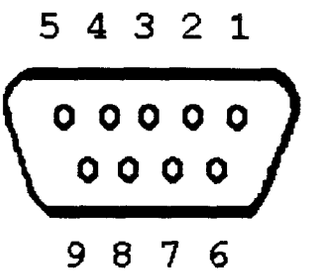
To record speed and temperature a recorder (not supplied) can be used that has the following capabilities:

For speed and temperature, two channels are required. Each channel should have signal conditioning which accepts 0-5 volt input.

The pin out diagram below and scale identifies the application.

A mating connector is required on the recorder cable (not supplied). This is a 9 pin male D subminiature connector:

AMP Amplimite HDP-20 series or equivalent.



(As seen from the rear of the unit.)

PIN #	SIGNAL NAME	SCALE
6 2	SPEED GND	1V = 100 RPM
7 3	TEMPERATURE GND	1V = 20°C

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CLEANING/MAINTENANCE

The Innova Shaker requires no routine maintenance on the part of the user. The Maint indicator light goes on at the end of 10,000 hours of use. At that time contact your local NBS Service Engineer or call the NBS Service Department at 1-800-631-5417. This periodic maintenance will keep your unit in premium condition.

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.

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SERVICE AND MAINTENANCE

The following section describes basic troubleshooting service procedures, and provides instructions to install optional features. These must be performed by a qualified service engineer.

WARNING:
BEFORE PERFORMING ANY SERVICE OR MAINTENANCE ON THE INSTRUMENT TURN THE POWER OFF USING THE ON/OFF SWITCH ON THE REAR OF THE SHAKER AND DISCONNECT THE LINE CORD.

CHANGING FUSES

To replace fuses (without changing the fusing arrangement), (1) Always disconnect the unit from the power source first. (2) Remove the cover/fuse block located on the rear of the unit with a small screwdriver. (3) Remove the old fuse, insert a new one of the same type and replace the cover/fuse block into the power module *(Figure 5)*.

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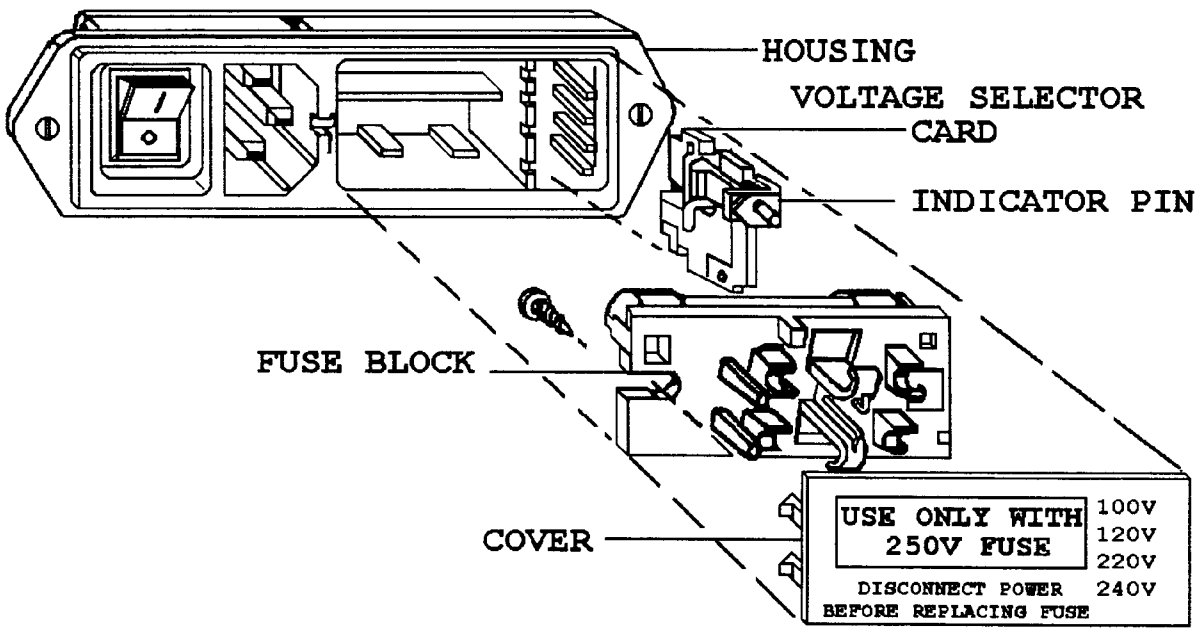


FIGURE 5
Power Module on Innova 2100/2150

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CHANGING VOLTAGES

Innova Shakers are set at the appropriate line voltage with the proper fuses prior to shipment. The power module, however, is a universal power-entry system which can be reset to adapt to worldwide power requirements. If it is necessary to reset the voltage on your shaker, use the following procedure.

1. Disconnect the unit from the power source.
2. Open the cover of the power module, using a small blade screwdriver or the like and remove the cover/fuse block assembly *(see Figure 5)*.
3. Remove the voltage selector card from the housing by pulling the indicator pin straight out *(Figure 5)*.
4. Along each edge of the voltage selector card the voltage options are printed in large numbers - 100, 120, 220, 240 *(Figure 6)*. Place the card in front of you with the desired voltage printed at the bottom.
5. With the card in this position, orient the indicator pin to point up. The voltage has now been changed and the card can be reinserted.

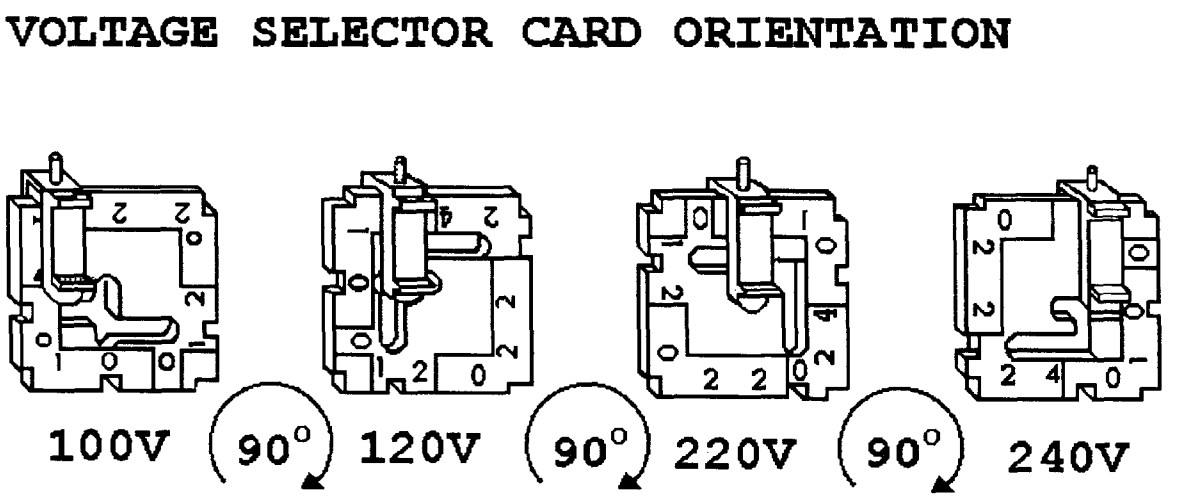


FIGURE 6
Voltage Selector Card Orientation

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6. Hold the voltage selector card so that the indicator pin is facing you and the alignment arrow points left *(Figure 7)*.
7. Replace the card in the voltage selector slot at the right hand end of the power module. Push it until it snaps into place.
8. Check for the correct fusing arrangement *(see Fusing, in the section following)*.

NOTE:

Be sure the pin is facing out and the alignment arrow is pointing to the left.

9. Replace the cover/fuse block assembly.
10. Verify that the indicator pin shows the desired voltage.

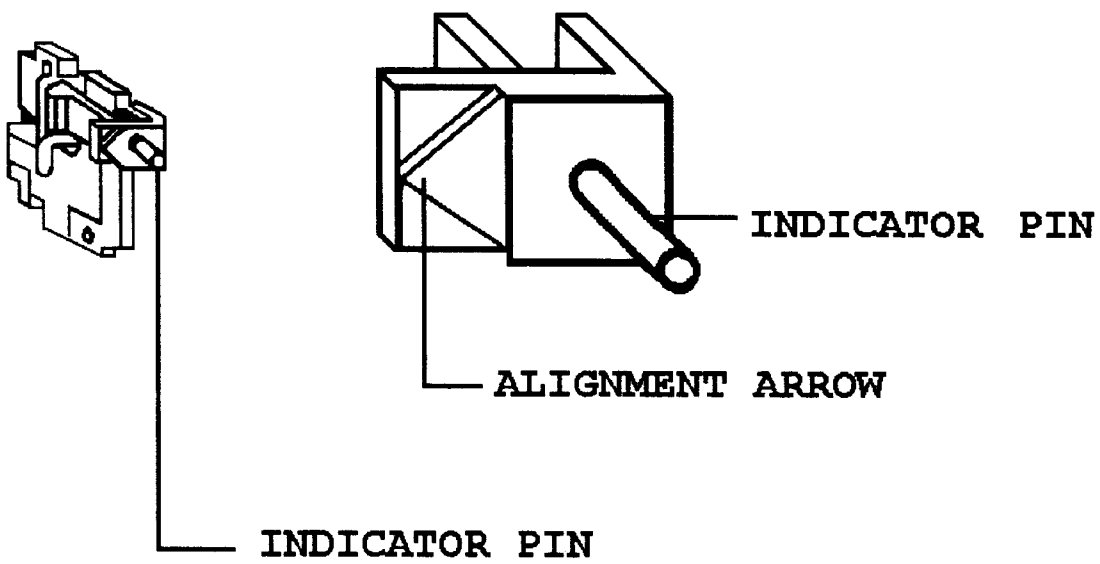


FIGURE 7
Indicator Pin and Alignment Arrow on the Voltage Selector Card

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Fusing

If you are changing the voltage on an Innova Shaker, it may also be necessary to modify the fusing arrangement. If so, please follow the procedure below.

Conversion from single fuse to double fuse

1. Open the cover of the power module using a small blade screwdriver and remove the cover/fuse block assembly *(Figure 8)*.

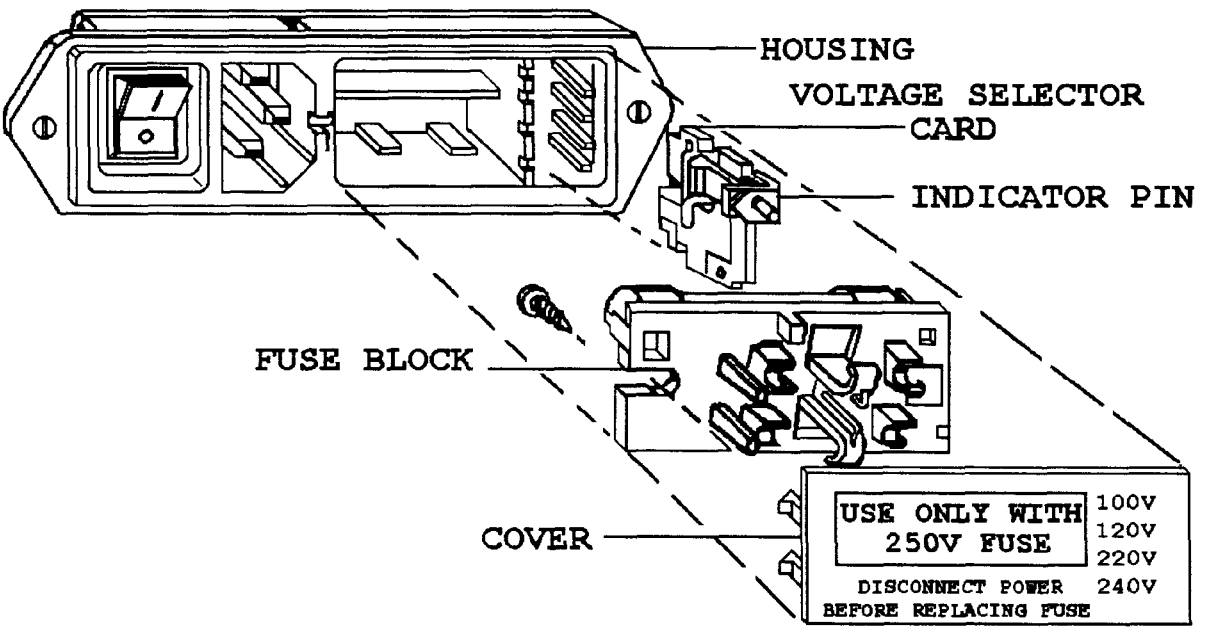


FIGURE 8
Power Module on Innova 2100/2150

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2. Loosen the Phillips screw 2 full turns *(Figure 9)*.

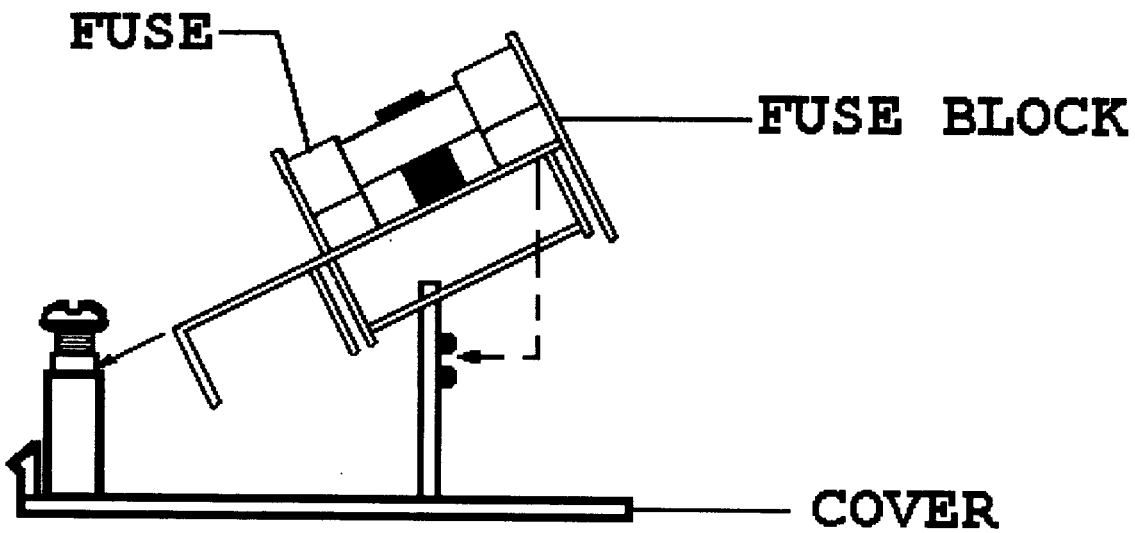
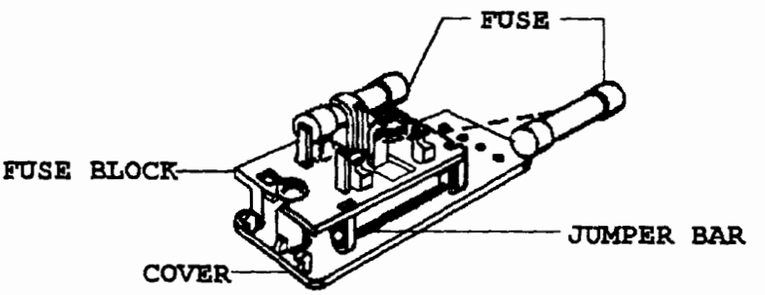


FIGURE 9
Fuse Block/Cover Assembly

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3. Remove the fuse block by sliding it up and away from the screw shaft and lifting it off the pedestal *(Figure 9)*.
4. Invert the fuse block and slide it back onto the Phillips screw and pedestal. Tighten the Phillips screw.
5. Verify the correct fusing arrangement *(Figure 10a, Figure 10b)*.
6. Replace the cover onto the power module.

FIGURE 10a - Double Fusing Arrangement



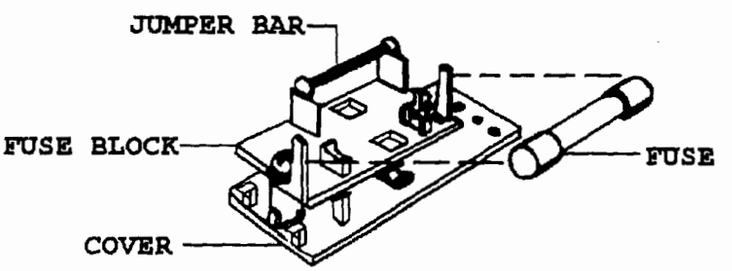


FIGURE 10b - Single Fusing Arrangement

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BELT REPLACEMENT PROCEDURE (Part #P0700-5242)

A kit is provided to aid in the belt replacement of this product. The kit consists of a 7 ½" x 8" (19cm x 20cm) Housing Extractor Plate (Item 1, Figure 11) and (3) each 3/8-16 NC x 1 ¼" long flat head Allen screws (Item 2). These are attached to the bottom of the Innova Shaker. To remove the kit, unscrew the three fasteners with the large Allen key provided.

1. Thread the (3) 1 ¼" long (Item 2) screws into the three threaded holes in the plate until they are flush to the back of the plate.
2. Remove the platform from the Innova shaker by unscrewing the (4) ¼" flat head screws *(Item 5)*.
3. Using the small Allen key, remove the (3) ¼"-20 x ½" long flat head Allen screws (Item 3) that hold the bearings in place on the upper housing. Also remove the (3) countersunk washers (Item 4).
4. Orient the plate on the upper bearing housing so that the (3) 3/8" screws (Item 2) sit in the center of the three bearings.

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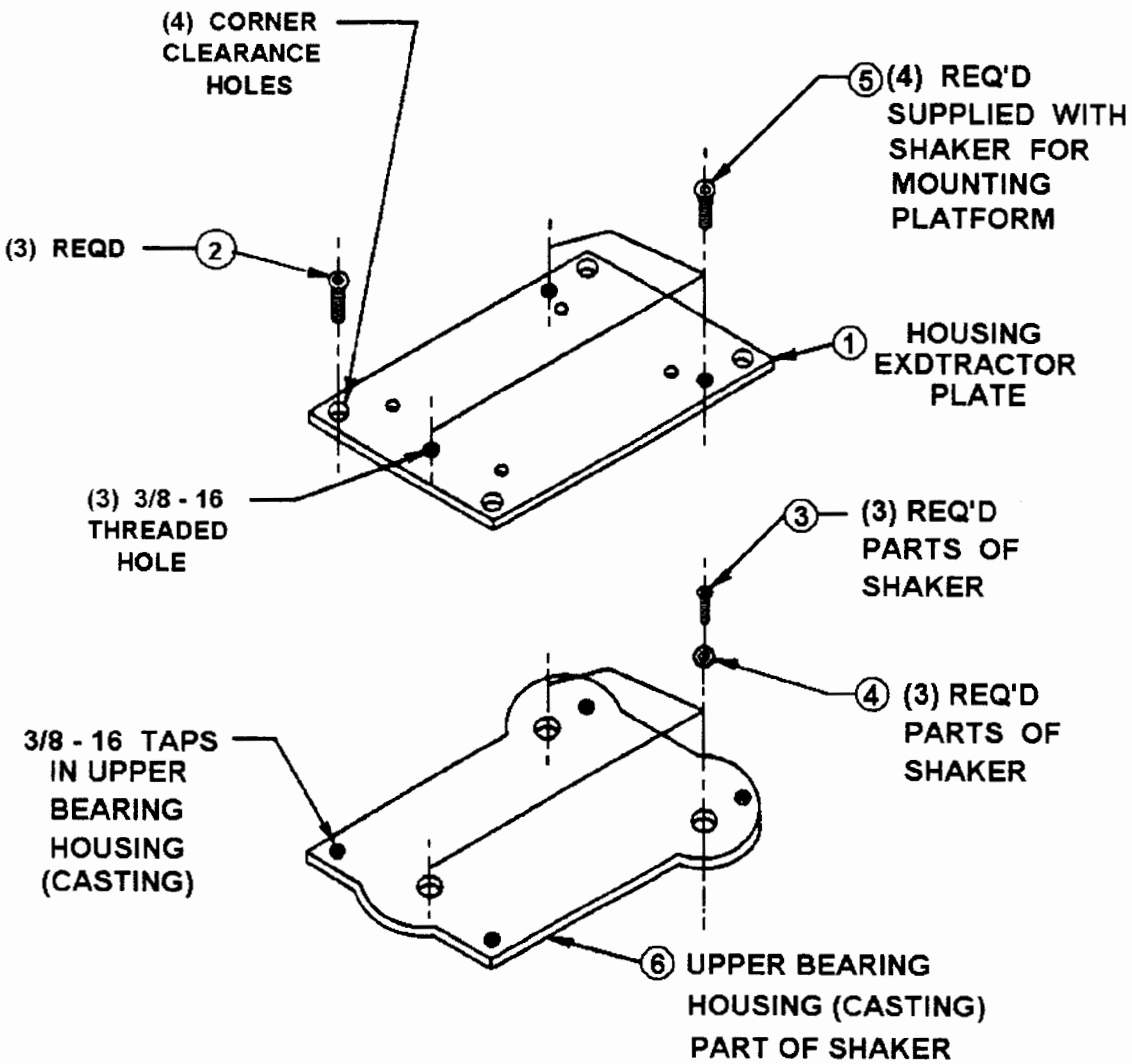


FIGURE 11
Upper Bearing Housing and Extractor Plate Assembly

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5. Utilizing the 4 platform screws (Item 5 from Step 2) mount the plate to the upper housing. Use the small Allen key provided. Tighten the four screws securely *(see Figure 12)*.
6. Using the large Allen key on the (3) 3/8" screws, (Item 2) turn each screw one half turn in sequence until the upper bearing housing is lifted free of the eccentric shafts. Remove the (4) platform screws (Item 5) thus disconnecting the plate from the upper bearing housing *(see Figure 12)*.
7. Remove the old belt (note its position) by rotating the pulley slowly and feeding the belt out with a slight upward pressure on the belt.
8. Install a new belt. Slip the new belt over the main eccentric shaft (shaft with the counterweight).
9. Position the 3 eccentric shafts so that they all face the same direction *(Figure 13)*.
10. Using a soft mallet or the back end of a wooden hammer handle, lightly tap the upper bearing housing near the 3 bearings until there is even engagement of the bearings onto the shafts.
    CAUTION: DO NOT USE METAL TO TAP THE CASTING.

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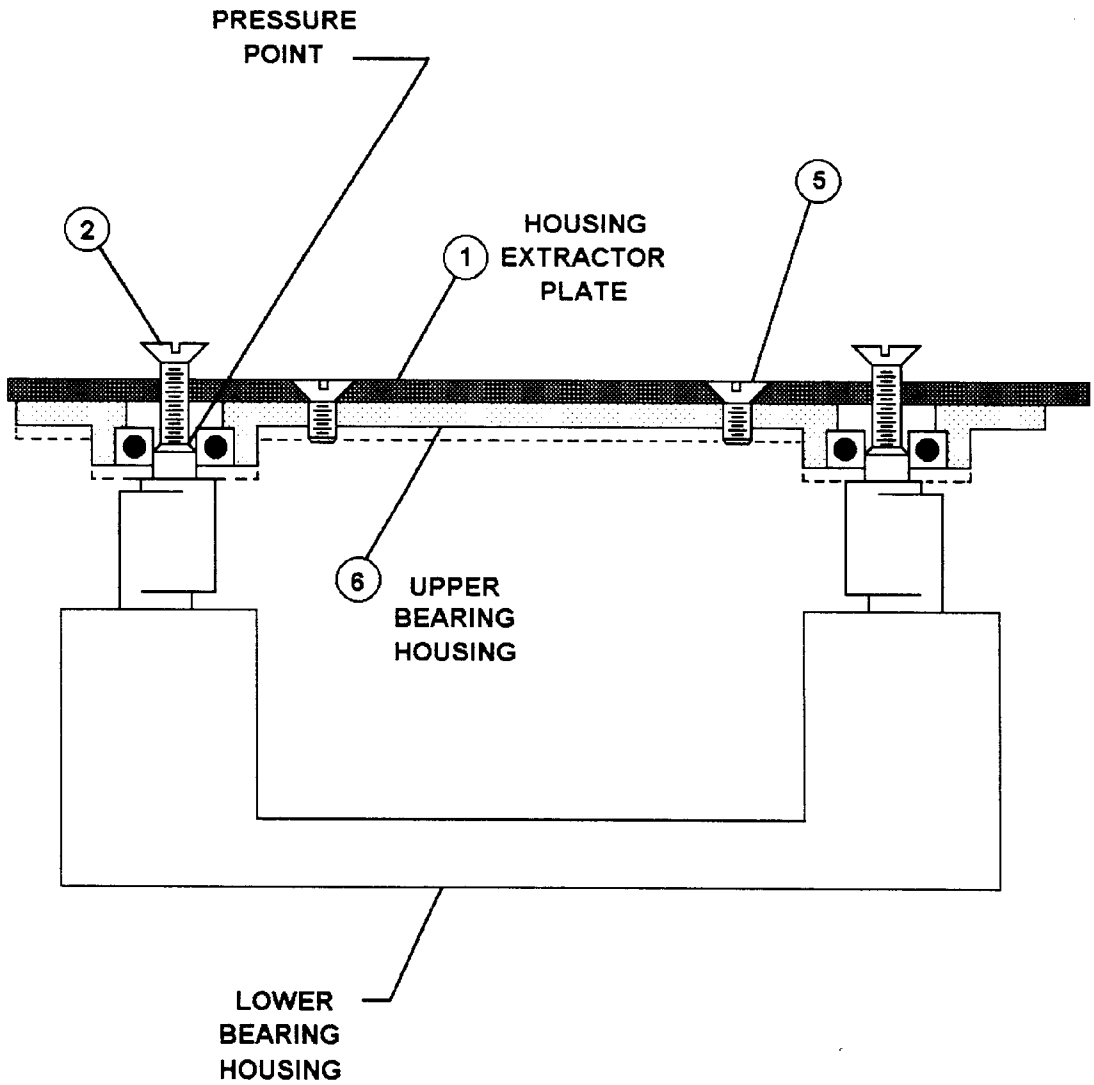


FIGURE 12
Bearing Housing Assemblies with Extractor Plate in Place

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11. Place the 3 washers (Item 4) with countersink face up onto each of the bearings.
12. Replace the (3) ¼-20 x ½" long flat head screws (Item 3) through the washers and engage the eccentric shaft threads. Tighten evenly in sequence and be sure each bearing is fully seated on the shaft.
13. Guide the belt onto the two pulley grooves. Check the belt adjustment by applying finger pressure to the belt midway between the two pulleys. The belt should deflect approximately ¼" (.64cm).

If adjustment of the belt tension is required:

14. Loosen the hex nuts on the motor assembly *(Figure 14)*.
15. Move the motor assembly until the belt is tight.
16. Tighten the hex nuts and recheck the belt tension by exerting pressure on the belt. The belt should deflect approximately ¼" (0.64cm).
17. Replace the platform.

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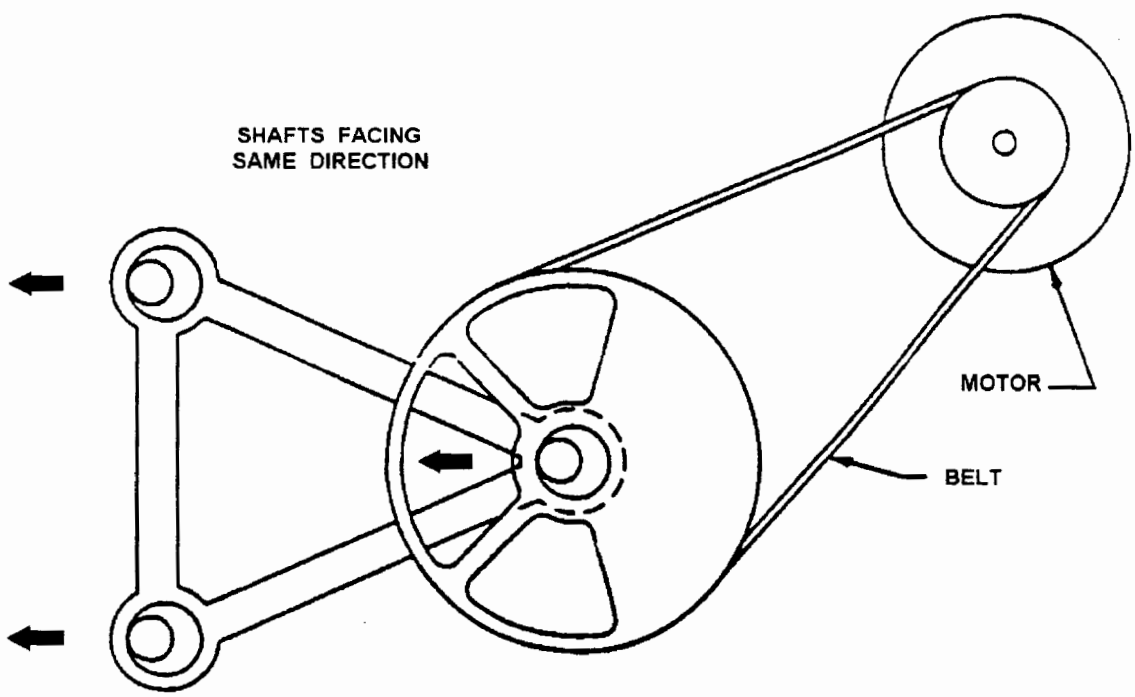


FIGURE 13
Eccentric Shafts and Pulley

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MOTOR ASSEMBLY REPLACEMENT (Part #M1194-6000)

Remove the platform.

1. Remove the 2 hex nuts and washers that retain the motor mounting plate (M1194-9350 from the deck) *(see Figure 14)*. Remove the belt and carefully disconnect the electrical harness connector from the motor assembly.
2. Loosen the set screw that holds the motor pulley in place and remove the pulley *(see Figure 13)*.
3. Remove the (3) 10-32 screws and lockwashers that retain the motor bearing housing to the motor mounting plate. Note the orientation of the electrical connector.
4. Remove the motor assembly.
5. Mount the new motor assembly onto the motor mounting plate with the connector oriented as noted in 3 above. Tighten the (3) 10-32 screws with the lockwashers in place.
6. Replace the motor pulley. ***Finger tighten*** the set screw.
7. Mount the assembly on the deck using the hex nuts and washers removed in step 1 *(see Figure 14)*. Tighten the hex nuts just until they come in contact with the deck.

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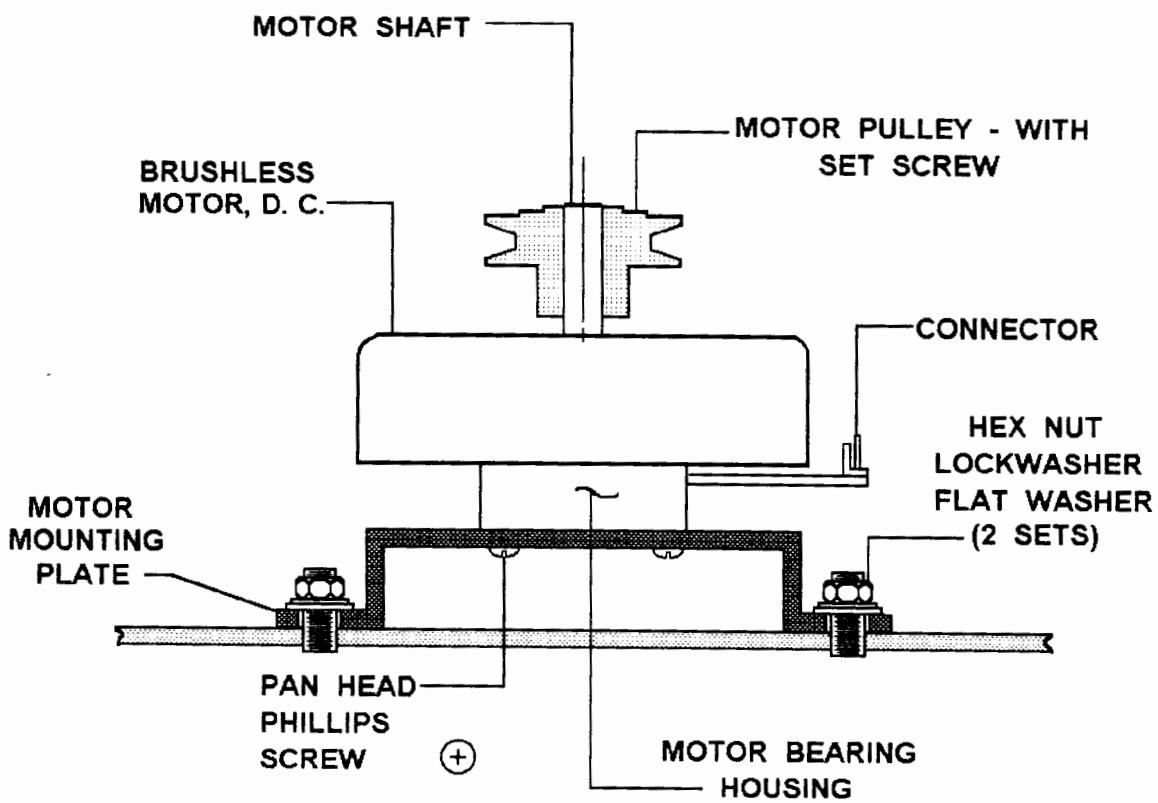


FIGURE 14
Motor Assembly of Innova 2100/2150

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8. Connect the harness connector to the motor assembly with the orientation noted in step 3. The left side of the connector (as you face the motor) ***must*** be flush with the motor connector. The blank pin on the motor connector ***must*** be visible on the right side *(see Figure 15)*. Also, insure the cable is routed to clear all moving parts.
9. Guide the belt into the pulley grooves. Adjust the height of the motor pulley so that the belt is parallel to the base (use a straight edge across the pulleys). Tighten the set screw in the motor pulley.
10. Adjust the belt tension so that there is approximately a ¼" (.64cm) deflection in the belt. *(See Belt Replacement procedure for adjustments)*.

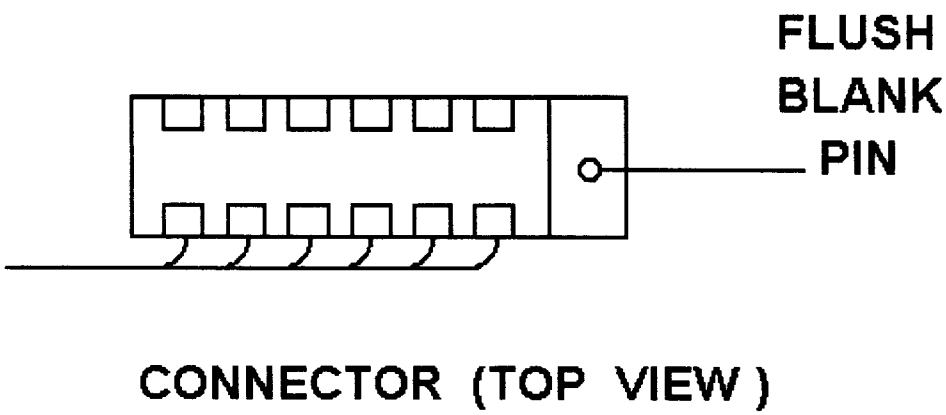


FIGURE 15
Proper Harness Connection

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TEMPERATURE/MONITOR OPTION (Part #M1194-9924)

INTRODUCTION

The temperature/monitor option package is available for the Innova 2100 and 2150 model shakers and provides the following features:

Digital Temperature Readout - The temperature of the liquid in any vessel or ambient temperature may be monitored with an RTD based electronic device and the value displayed on the LED readout on the control panel.

Remote Monitoring - 0-5V analog recorder output for both temperature and speed. Can be used with an external chart recorder or computer which has a data acquisition card.

INSTALLATION

Please determine that the following parts are included in the option package.

Kit M1194-9924 for -2100 Series

Qty.	Description	Part #
1	Temperature Monitor PC Board	M1192-7000
1	RTD Temperature Sensor Assy.	M1194-8000
1	RTD & Recorder Cable Assy.	M1191-8020
1	Bracket Assembly	M1194-5000
1	Mounting Hardware consisting of the following:	
	3 - Hex spacers 6/32 x ½"	P0160-2273
	3 - 6-32 x ¼" Pan head Phillips screws	
	2 - 6-32 x ½" Pan head screws	
	2 - 6-32 x ½" Flat head screws	
	1 - Jack screw kit	P0100-7641
	3 - Nylon washers	P0100-9090
	2 - #6 Flat washers	
	4 - #6 Lock washers	
	2 - 6/32 Hex nuts	
	2 - Cable clamps	EC-157
1	Installation Instructions	TM1194-9424

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To install the option package, proceed as follows:

1. Stop the shaker with the Start/Stop key (if necessary) and turn the unit off using the On/Off switch on the rear panel of the shaker.
2. Remove the line cord from the rear of the shaker.
3. Remove the shaker platform.
4. Remove the five screws which hold the front panel and allow the front panel to lie down on its face *(Figure 16)*.
5. Remove 3 nuts and 3 washers from positions A, B and C on the main control board *(see Figure 16)*.
6. Screw on the 3 hex spacers (P0160-2273) in positions A, B and C *(see Figure 16)*.
7. Align the mating connector on the temperature module PC board with the option connector on the main control board and press down until the connector is seated *(Figure 16)*.
8. Secure the temperature module to the main control board with the three ¼" screws and nylon washers provided.
9. Remove the cover plate at the rear of the shaker *(Figure 1b)*. Retain the mounting hardware.
10. Mount the RTD jack (round connector) with the hardware used to hold the cover plate. Mount the chart recorder connectors with the hardware provided in the jack screw kit (P0100-7641).
11. Carefully route both cables along the lower right side of the shaker and secure with cable clamps and ½" long screws provided.
12. Connect the 4 pin connector coming from the chassis harness assembly to J101 (must cut the plastic strap), *(Figure 16)*.
13. Connect the RTD cable, 6 pin connector to J103 on the temperature control module *(Figure 16)*.
14. Connect the chart recorder cable, 10 pin connector to J104 on the temperature control module *(Figure 16)*.
15. Carefully put the front panel back in place and secure with screws.

CAUTION:
BEFORE TIGHTENING SCREWS MAKE SURE THAT THERE ARE NO WIRES PINCHED BETWEEN THE FRONT PANEL AND THE CHASSIS.

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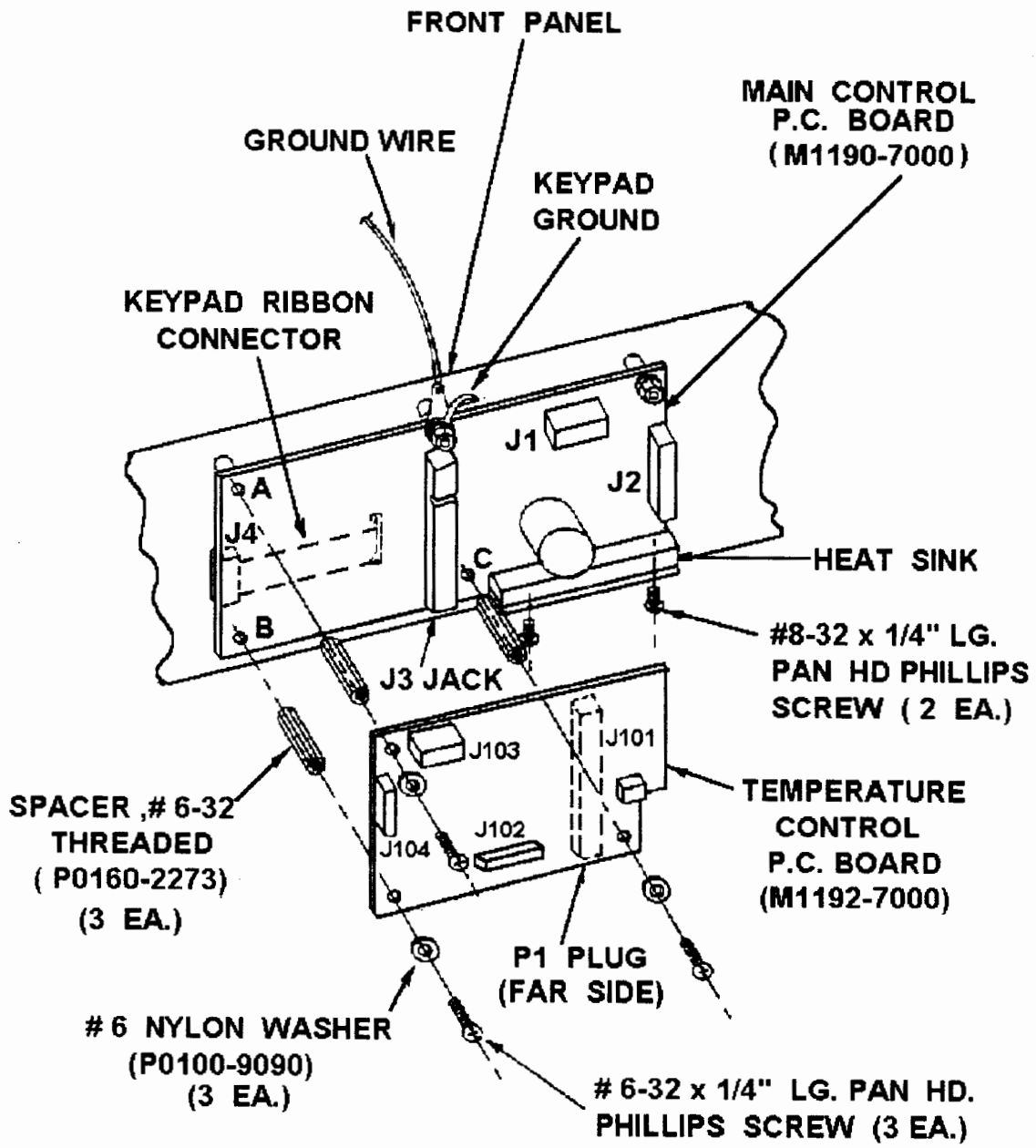


FIGURE 16
Front Panel Assembly of Innova 2100/2150

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16. Place the unit on its side.
17. Mount the RTD bracket assembly (M1194-5000) with the ½" pan head screws provided.
18. Place unit in its normal operating position.
19. Replace the platform.
20. Connect the line cord to back of unit.
21. Refer to **Overview and Operation** sections for temperature monitor and chart recorder functions.

WARNING:
DO NOT ATTEMPT TO CHANGE BOARDS OR ELECTRONIC COMPONENTS UNLESS YOU ARE A QUALIFIED SERVICE TECHNICIAN. INTEGRATED CIRCUITS ARE EXTREMELY SUSCEPTIBLE TO DAMAGE FROM ELECTROSTATIC DISCHARGE. READ AND FOLLOW THE PRECAUTIONS IN SECTION BELOW BEFORE YOU BEGIN.

ESD PRECAUTIONS

1. Do not remove components from their antistatic packaging until you are ready to insert them into their sockets or install the board.
2. Before handling components or boards, touch an unpainted portion of the system unit chassis for a few seconds.
3. Wear a wrist grounding strap, available from most electronic component stores.

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CAPACITY UPGRADE OPTION (Part #M1194-9926)

Conversion of an Innova 2100 (18" x 18" [46cm x 46cm] platform) to an Innova 2150 (18" x 24" [46cm x 61cm] platform) must be performed by a qualified service engineer.

PARTS LIST

The following parts are required to perform the capacity upgrade and are included in the option package.

Check parts in the M1194-9926 kit:

1 ea. Counterweight (M1194-9301)
2 ea. Counterweight (M1194-9302)
2 ea. ¼-20 x 1 ¾" long Phillips pan head screws and 2 each lockwashers
Outrigger set of 4:
1 ea. Left front
1 ea. Right front
1 ea. Left rear
1 ea. Right rear
8 ea. ¼-20 x ¾" long Phillips pan head screws

INSTALLATION

1. Turn the power off using the On/Off switch on the rear of the unit and disconnect the line cord.
2. Remove the platform from the upper housing if one is in place.
3. Rotate the pulley so that the heavy section is to the extreme right position *(see Figure 17)*.
4. Slip the counterweights under the pulley. Mount (2) M1194-9302 first then (1) M1194-9301 (with tapped holes). Attach with (2) ¼"-20 x 1 ¾" long screws and lockwashers. Be sure lockwasher is under screwhead and the screws are securely tightened *(see Figure 17)*.
5. Replace the platform.

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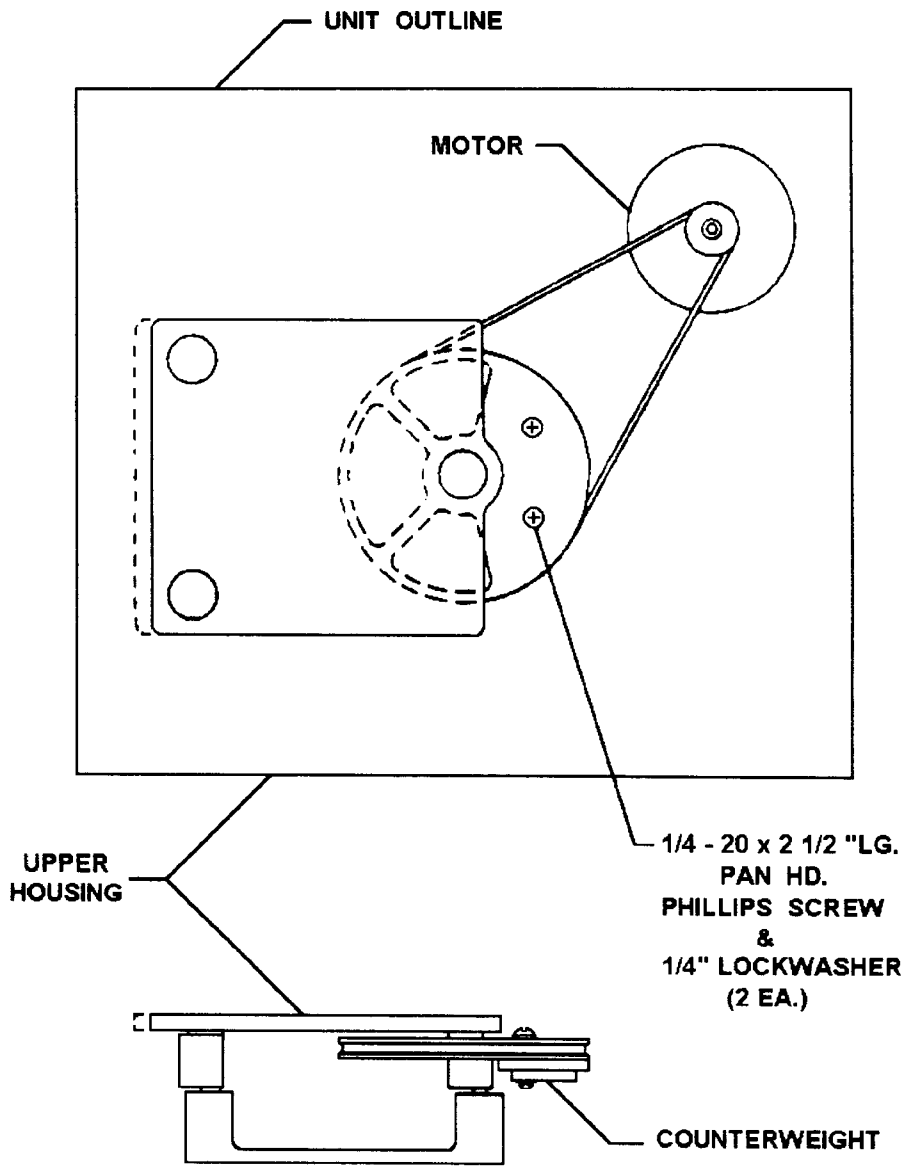


FIGURE 17
Counterweight and Pulley Assembly on Innova 2100/2150

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High loads and speed require the extra stability provided by the outrigger kit. To mount the Outriggers:

1. Lay a soft cloth or cardboard adjacent to the unit. Set the unit on its side being careful to protect the finish of the shaker.
2. Remove all the rubber feet by unscrewing each screw in the middle of the foot. These are no longer needed for the outrigger addition.
3. Mount the four outriggers with the 8 ea. ¼" x ¾" long screws. Be sure to mount each plate as shown in Fig. 18 and adjust so that there is clearance to remove the front control for servicing.

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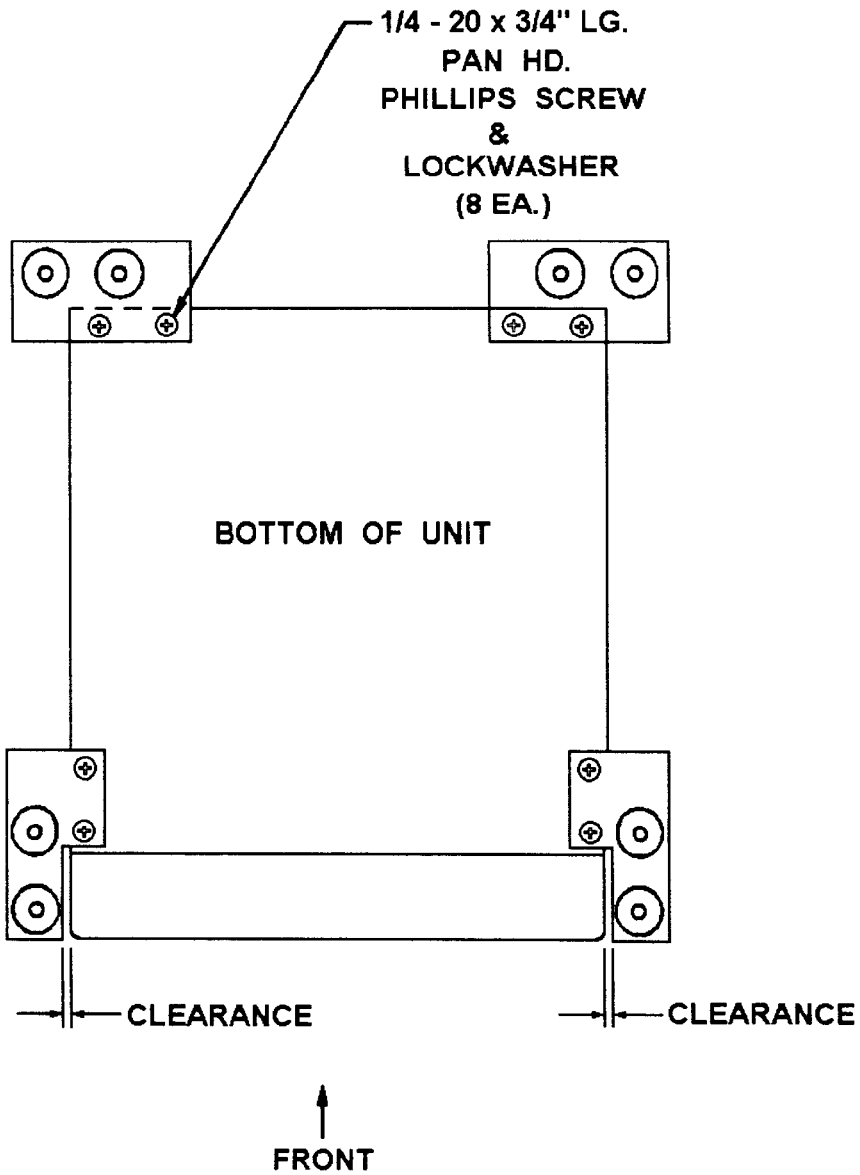


FIGURE 18
Outrigger Feet on Innova 2100/2150

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QUICK CHANGE PLATFORM OPTION - INNOVA 2100 (Part #M1192-9901)

The Easy Loading Platform Kit enables the user to change or mount the series of 18" x 18" (46cm x 46cm) platforms without the use of tools or hardware. Maximum speeds should be limited to 400 RPM when this kit is installed.

PARTS

The following parts are required for this upgrade and are included in the kit.

1 ea.	Plastic subplatform with springs, retainers and friction pads attached
1 ea.	Counterweight with tapped holes
2 ea.	¼-20 x 1 ½" long pan head Phillips screws and lockwashers
4 ea.	¼-20 x ¾" long Allen socket flat head screws
1 ea.	Allen key wrench

INSTALLATION

1. Turn the power off using the power switch on the rear of the unit and disconnect the line cord.
2. Check the parts in the M1192-9901 kit.
3. Remove the existing platform if one is on the machine.
4. Rotate the pulley so that the heavy section is in the extreme right position *(see Figure 19)*.
5. Slip the counterweight under the pulley. Mount with the (2) ¼" x 1 ½" long screws and lockwashers supplied *(see Figure 17)*. Be sure the lockwasher is under the screw head and the screws are securely tightened.
6. Mount the subplatform with the 4 flat head screws keeping the side with the 2 springs to the front of the machine. Tighten the screws securely.
7. Slip any 18" x 18" (46cm x 46cm) platform between the side guides, push the platform to the rear retainer and press down on the front edge of the platform. It should snap down into place and be retained by the springs. Check that the rear edge of the platform is engaged under the bend of the rear clip.
8. Plug in the power cord, switch on the power and the unit is ready for operation.

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REMOVAL OF THE QUICK CHANGE PLATFORM

1. Stop the machine by pressing the Start/Stop membrane switch.
2. Face the machine squarely.
3. Put your index fingers under each front corner of the platform. Note that there is a relief in these corners on the subplatform. With your thumbs, press the two corner springs toward your body and with an upward pressure with index fingers, lift the platform from its retained position.

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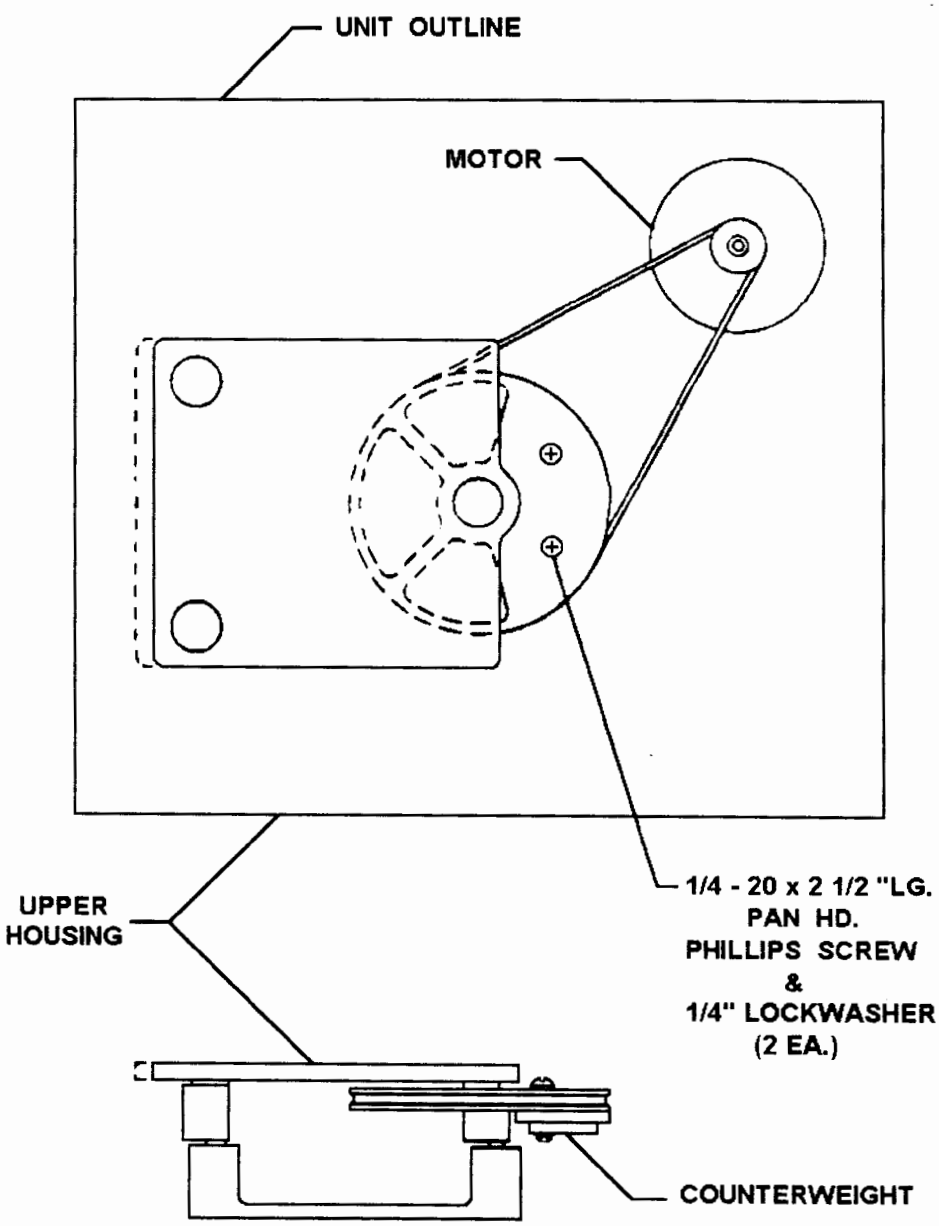


FIGURE 19
Counterweight and Pulley Assembly on Innova 2100/2150

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QUICK CHANGE PLATFORM OPTION - INNOVA 2150 (Part #M1194-9927)

The Easy Loading Platform Kit enables user to change or mount the series of 18" x 24" (46cm x 61cm) platforms without the use of tools or hardware. The maximum speeds should be limited to 400 RPM when this kit is installed.

The following parts are required to make this upgrade or change and are included in the kit.

PARTS

1 ea.	Plastic subplatform with springs, retainers and friction pads attached
1 ea.	Counterweight with clearance holes
2 ea.	¼-20 x 1 ¾" long pan head Phillips screws and lockwashers
4 ea.	¼-20 ¾" long Allen socket flat head screws.
1 ea.	Allen key wrench

INSTALLATION

1. Turn the power off using the power switch and disconnect the line cord.
2. Check the parts in the M1194-9927 kit.
3. Remove the existing platform if one is on the machine.
4. Rotate the pulley so that the heavy section is in the extreme right position *(see Figure 17)*.
5. Slip the set of counterweights under the pulley keeping the part with the clearance holes on top and the one with the tapped holes below. Mount with the (2) ¼" x 1 ¾" long Pan head screws and lockwashers supplied *(see Figure 17)*. Be sure the lockwasher is under the screw head and the screws are securely tightened.
6. Mount the subplatform with the 4 flat head screws keeping the side with the 2 springs to the front of the machine. Tighten the screws securely.
7. Slip any 18" x 24" (46cm x 61cm) platform between the side guides, push the platform to the rear retainer and press down on the front edge of the platform. It should snap down into place and be retained by the springs. Check that the rear edge of the platform is engaged under the bend of the rear clip.
8. Plug in the power cord, switch on the power and the unit is ready for operation.

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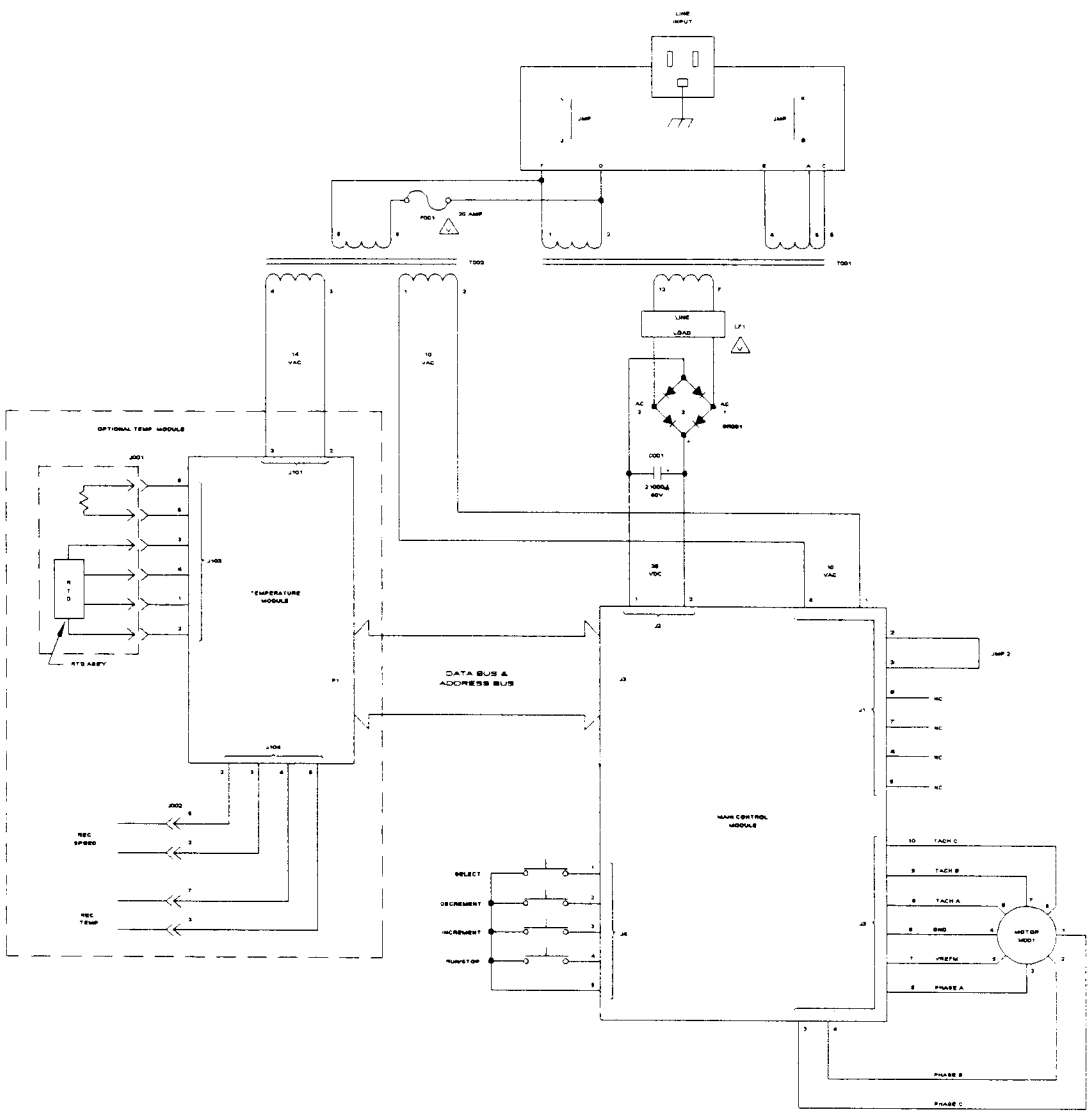
Removal of the Quick Change Platform:

1. Stop the machine by pressing the Start/Stop membrane switch.
2. Face the machine squarely.
3. Put your index fingers under each front corner of the platform. Note that there is a relief in these corners on the subplatform. With your thumbs, press the two corner springs toward your body and with an upward pressure with index fingers, lift the platform from its retained position.

MAINT INDICATOR

After the shaker has been operating for 10,000 hours accumulated running time, the Maint indicator light on the control panel will light. It can be turned off only by a NBS Service Engineer. This indicates that a routine maintenance check is recommended. A regular schedule of routine maintenance is an excellent way to keep your valuable equipment performing optimally for years of reliable service.

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APPENDIX

INNOVA ORDERING INFORMATION

INNOVA 2100

Gyrotory Platform Shaker with microprocessor control and low profile design. It will hold 18" x 18" (46cm x 46cm) platforms and run 25-500 RPM in a ¾" (19mm) orbit.

Catalog No.	Electrical Service		
M1194-0001	100V	50/60Hz	Single Fuse
M1194-0000	120V	50/60Hz	Single Fuse
M1194-0002	220V	50/60Hz	Single Fuse
M1194-0004	220V	50/60Hz	Double Fuse
M1194-0003	240V	50/60Hz	Single Fuse
M1194-0005	240V	50/60Hz	Double Fuse

INCREASED CAPACITY OPTION

Capacity upgrade for a 2100 to a 2150. This consists of counterweighting, hardware and outrigger feet for 18" x 24" (46cm x 61cm) platforms. Platforms 18" x 24" (46cm x 61cm) must be purchased separately. This option must be installed by a qualified service engineer.

Catalog No.	
M1194-9926	Increased Capacity Option for conversion of an Innova 2100 to Innova 2150

INNOVA 2100 INTERCHANGEABLE PLATFORMS

	18"x18" (Approx. 46cm x 46cm) Platform Size*	
Catalog No.	Clamps	Size of Glassware
M1194-9909	XX	Utility Carrier
M1194-9910	XX	Utility Tray
M1194-9900	XX	Universal Platform
M1194-9903	64	50mL Erlenmeyer Flask
M1194-9904	34	125mL Erlenmeyer Flask
M1194-9905	25	250/300mL Erlenmeyer Flask
M1194-9906	16	500mL Erlenmeyer Flask
M1194-9907	9	1L Erlenmeyer Flask
M1194-9908	5	2L Erlenmeyer Flask

*All above platforms constructed of phenolic composite

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INNOVA 2150

Gyrotory Platform Shaker with microprocessor control and low profile design, and counter-weighting and balancing for a 18" x 24" (46cm x 61cm) platform. It has a speed range of 25-500 RPM in a ¾" (19mm) orbit.

Catalog No.	Electrical Service
M1194-0011	100V 50/60Hz Single Fuse
M1194-0010	120V 50/60Hz Single Fuse
M1194-0012	220V 50/60Hz Single Fuse
M1194-0014	220V 50/60Hz Double Fuse
M1194-0013	240V 50/60Hz Single Fuse
M1194-0015	240V 50/60Hz Double Fuse

INNOVA 2150 PLATFORMS

Catalog No.	18"x24" (Approx. 46cm x 61cm) Platform Size*	
	Clamps	Size of Glassware
M1194-9921	XX	Utility Carrier
M1194-9922	XX	Utility Tray
M1194-9912	XX	Universal Platform
M1194-9915	80	50mL Erlenmeyer Flask
M1194-9916	48	125mL Erlenmeyer Flask
M1194-9917	35	250/300mL Erlenmeyer Flask
M1194-9918	20	500mL Erlenmeyer Flask
M1194-9919	12	1L Erlenmeyer Flask
M1194-9920	8	2L Erlenmeyer Flask

*All above platforms constructed of phenolic composite

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APPENDIX

TEMPERATURE/MONITORING OPTION

Temperature/Monitor option for either a 2100 or a 2150 to measure and display temperature of samples, and record it on a remote chart recorder or computer. It consists of an internal electrical interface, RTD temperature probe, and analog output for chart recorder or computer. The package **DOES NOT** include a chart recorder. The package must be installed by a qualified service engineer.

M1194-9924 Temperature Monitoring Kit

EASY-LOAD PLATFORM OPTION

Quick-change platform option for either an Innova 2100 or 2150. This easy-load accessory enables the user to snap-in platforms without tools or hardware. The kit includes a sub-platform with spring clips, an extra counterweight and hardware. The kit **DOES NOT** include a platform. Once installed speeds of 25-400 RPM are recommended. The package must be installed by a qualified service engineer.

M1192-9901 Innova 2100/4000 Easy-Loading Kit
M1194-9927 Innova 2150 Easy-Loading Kit

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APPENDIX

ACCESSORY FLASK CLAMPS*

CATALOG NO.	DESCRIPTION
ACE-105	10mL Erlenmeyer Clamp
ACE-255	25mL Erlenmeyer Clamp
ACE-505	50mL Erlenmeyer Clamp
ACE-125S	125mL Erlenmeyer Clamp
ACE-250S	250mL Erlenmeyer Clamp
ACE-500S	500mL Erlenmeyer Clamp
ACE-1000S	1.0L Erlenmeyer Clamp
ACE-2000S	2.0L Erlenmeyer Clamp
ACE-4000S	4.0L Erlenmeyer Clamp
ACE-6000S	6.0L Erlenmeyer Clamp
ACFE-2800S	2800mL Fernback Flask Clamp
ACSB-500S	500mL Media Bottle Clamp
ACSB-1000S	1.0L Media Bottle Clamp

*All above clamps constructed of stainless steel

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APPENDIX

SERVICE PARTS LIST

INNOVA SHAKER MODEL 2100/2150

PART NO.	DESCRIPTION	QTY.
P0380-3830	.200A Fuse	1
P0380-3532	1.6A 5mm x 20mm Fuse	1
P0380-3530	1.6A 3AG Fuse	1
P0420-1610	10VA Transformer	1
M1191-5300	130VA Transformer Assembly	1
P0320-0350	2100uF Capacitor	1
P0460-4091	Diode Bridge	1
P0360-4040	130V Varistor	2
M1195-4000	Med. Motor Assembly	1
M1190-9940	Main Control P.C.B.	1
M1190-5000	Membrane Sw. Panel	1
P0460-2200	Power Entry Module	1
P0720-2053	Power Cord 120V 10A	1
P0720-2021	Power Cord 220V	1
P0180-0102	Bearing, Sealed Upper	3
P0180-0101	Bearing, Shield Lower	8
P0700-5242	Belt	1
M1194-6330	Bearing Housing Assembly	1
M1194-8000	Stainless Steel RTD Assy. (optional)	1
M1194-0050	Innova 2100/2150 Operations Manual	1

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APPENDIX

INNOVA 2100 - SHAKER SPECIFICATIONS

SHAKING

Speed:	25-500 RPM
Motion:	¾" (19mm) circular orbit
Indication:	LED digital electronic display, 1 RPM increments
Setpoint and Control:	Digital adjustment with PI microprocessor control and instantaneous visual feedback
Accuracy:	± 1 RPM (see note)

DRIVE

Triple eccentric counterbalanced ball bearing drive.

TIMER

Programmable shaking periods from 0.1 hr. to 99.9 hrs. by a digital timer that shuts off at the end of period and energizes status light.

Timer counts down and digital display indicates remaining time. Can be deactivated for continuous operation. Additionally, unit will display total accumulated running time for service information.

OPERATING AMBIENT

0°-60°C, 90% humidity, non-condensing

SELF-DIAGNOSTIC STATUS

Warning signal (audible and visible) indicates when shaking speed deviates more than 5 RPM from setpoint and when timer operation has expired. Audible alarm can be deactivated/ activated by the operator.

REMOTE MONITORING

(Optional) Chart recorder output for speed 0-5V; 1V per 100 RPM. Accuracy ± 25mV.

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APPENDIX

TEMPERATURE MONITOR

(Optional) RTD digital temperature monitor displays individual flask or ambient temperature in 0.1°C increments. Chart recorder output provided.

AUTOMATIC RESTART

Unit will automatically restart after undesired power interruption. Setpoints are maintained by non-volatile memory. Interruption is indicated by flashing LED display.

MOTOR

1/15 HP, 3 phase brushless ball bearing D.C. motor.

ELECTRICAL SERVICE

100V, 120V, 220V, 240V. All voltages 50/60Hz. 80VA Universal power entry system adapts to U.S. or International requirements.

ELECTRICAL PROTECTION

Main fuse(s) in power entry module. Control circuits provided with separate fuse.

DIMENSIONS

19"W x 21 7/8"D x 6 3/8"H (48cm x 54cm x 18cm).

CABINET CONSTRUCTION

Heavy gauge steel, phosphate coated and texture painted cabinet.

WEIGHT

Net: 76 lbs (35 kg)
Gross: 120 lbs Est. (55 kg)

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PLATFORM DIMENSIONS

18" x 18" (46cm x 46cm)

NOTE:

At 25-400 RPM the unit will perform to specifications with up to ± 10% line voltage fluctuation. At 401-500 RPM the line voltage cannot b lower than 5% of the rated voltage to attain speed accuracy.

The Innova 2100 can be upgraded to a larger capacity platform with a kit that converts this shaker to an Innova 2150. This kit can be installed in the field.

INNOVA 2150 - SHAKER SPECIFICATIONS

SHAKING

Speed:	25-500 RPM
Motion:	¾" (19mm) circular orbit LED digital electronic display, 1 RPM increments.
Setpoint and Control:	Digital adjustment with PID microprocessor control and instantaneous visual feedback.
Accuracy:	± 1 RPM (see note)

DRIVE

Triple eccentric counterbalanced ball bearing drive.

TIMER

Programmable shaking periods from 0.1 hr. to 99.9 hrs. by a digital timer that shuts off at the end of period and energizes status light.

Timer counts down and digital display indicates remaining time. Can be deactivated for continuous operation. Additionally, unit will display total accumulated running time for service information.

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OPERATING AMBIENT

0°-60°C, 90% humidity, non-condensing

SELF-DIAGNOSTIC STATUS

Warning signal (audible and visible) indicates when shaking speed deviates more than 5 RPM from setpoint and when timer operation has expired. Audible alarm can be deactivated/ activated by the operator.

REMOTE MONITORING

(Optional) Chart recorder output for speed 0-5V; 1V per 100 RPM. Accuracy ± 25mV.

TEMPERATURE MONITOR

(Optional) RTD digital temperature monitor displays individual flask or ambient temperature in 0.1°C increments. Chart recorder output provided.

AUTOMATIC RESTART

Unit will automatically restart after undesired power interruption. Setpoints are maintained by non-volatile memory. Interruption is indicated by flashing LED display.

MOTOR

1/15 HP, 3 phase brushless ball bearing D.C. motor.

ELECTRICAL SERVICE

100V, 120V, 220V, 240V. All voltages 50/60Hz 80VA Universal power entry system adapts to U.S. or International requirements.

ELECTRICAL PROTECTION

Main fuse(s) in power entry module. Control circuits provided with separate fuse.

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APPENDIX

DIMENSIONS

24"W x 21 ¼"D x 6 3/8"H (48cm x 54cm x 17cm).

CABINET CONSTRUCTION

Heavy gauge steel, phosphate coated and texture painted cabinet.

WEIGHT

Net: 80 lbs (35 kg)
Gross: 125 lbs (47 kg) Est.

PLATFORM DIMENSIONS

18" x 24" (46cm x 61cm)

NOTE:

At 25-400 RPM the unit will perform to specifications with up to ± 10% line voltage fluctuation. At 401-500 RPM the line voltage cannot be lower than 5% of the rated voltage to attain speed accuracy.

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CLAMP MOUNTING HARDWARE KIT

HARDWARE FOR 10mL TO 500mL CLAMPS

NBS flask clamps are used on a variety of shaker platforms. Flat head screws of different lengths and thread pitch are used to secure the clamp. The table below identifies the proper screw for your shaker application by reference to the head style.



10-24 x 5/8 (15.87mm) flat Phillips (+) head screw - part #S2116-3101 Qty. (1) - used on all shakers with a 3/4" (19.05mm) thick wood platform.



10-24 x 5/16 (7.9mm) flat Phillips (+) head screw - part #S2116-3051 Qty. (1) - used on all shakers with a 5/16" (7.9mm) thick aluminum and phenolic platforms.



10-32 x 5/16 (7.9mm) flat slotted (-) head screw - part #S2117-3050 Qty. (1) - used on all stainless steel platforms.

HARDWARE FOR 1 LITER TO 6 LITER CLAMPS

NBS flask clamps are used on a variety of shaker platforms. Flat head screws of different lengths and thread pitch are used to secure the clamp. The table below identifies the proper screw for your shaker application by reference to the head style.



10-24 x 5/8 (15.97mm) flat Phillips (+) head screw - part #S2116-3101 Qty. (5) - used on all shakers with a 3/4" (19.05mm) thick wood platform.



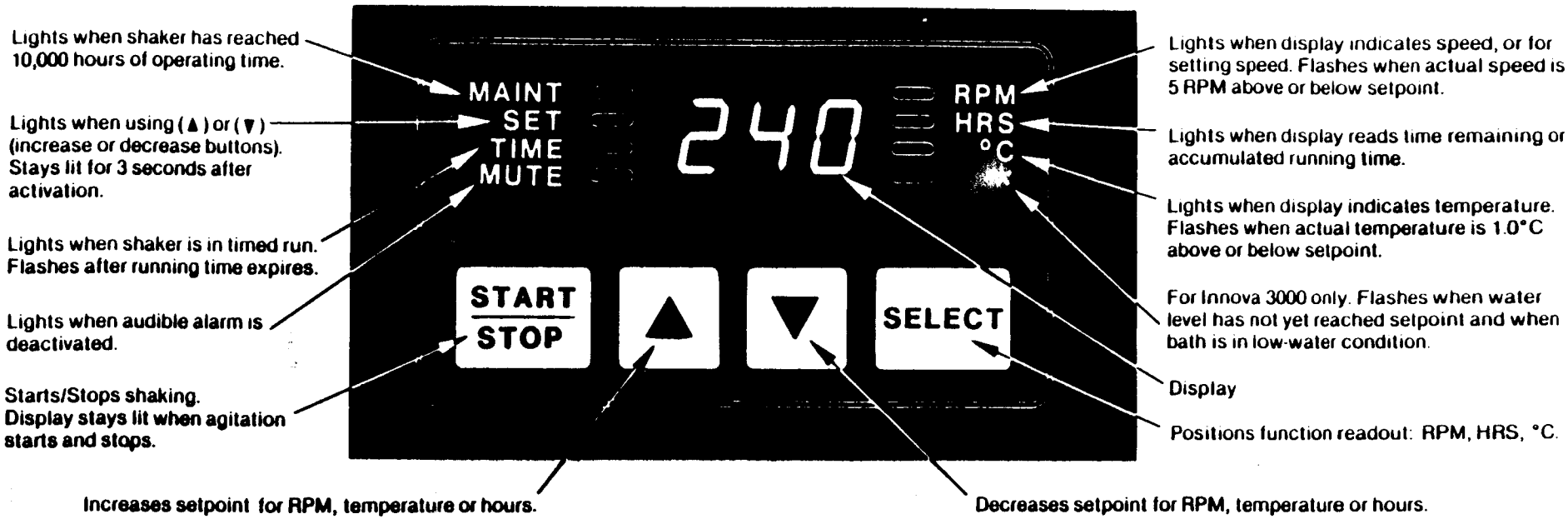
10-24 x 5/16 (7.9mm) flat Phillips (+) head screw - part #S2116-3051 Qty. (5) - used on all shakers with a 5/16" (7.9mm) thick aluminum and phenolic platforms.



10-32 x 5/16 (7.9mm) flat slotted (-) head screw - part #S2117-3050 Qty. (5) - used on all stainless steel platforms.

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INNOVA™ SHAKER OPERATING INSTRUCTIONS



NOTES

1. Flashing display indicates power interruption. Press any key momentarily to deactivate.

2. To acknowledge any audible alarm: Press SELECT. Stays off until next alarm condition.

3. Timed run: Press SELECT until "HRS" lights. Press (▲) or (▼) to set any time from 0.1-99.9 hours. While "SET" light remains lit press START/STOP. "TIME" indicator will light. Display will show time remaining. To cancel: Press SELECT until "HRS" lights. Press (▲) or (▼). Then press START/STOP. The "TIME" indicator goes out. Display reads "OFF". To readjust running time while "TIME" indicator is lit, press (▲) or (▼) to set new desired time.

4. To deactivate all audible alarms: press SELECT to light up "HRS". Then press (▲) or (▼) **simultaneously**. And then press START/STOP. The "MUTE" indicator will light.

5. To reactivate audible alarm, follow same procedure as #4 above. This time "MUTE" indicator light will go out.

6. To determine total number of operating hours accumulated: Follow same procedure as in #4 above. Read display in hundreds of hours, i.e., 02 = 200 hours, 102 = 10,200 hours.

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