



Guide to Operations

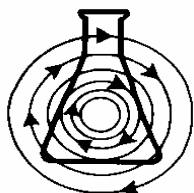
innova[™] 4200

Incubator Shaker

MANUAL No. M1233-0053

Revision N

November 14, 2007



NEW BRUNSWICK SCIENTIFIC CO., INC.

BOX 4005 • 44 TALMADGE ROAD • EDISON, NJ 08818-4005

Telephone: 1-732-287-1200 • 1-800-631-5417

Fax: 732-287-4222 • Telex: 4753012 NBSCO

Internet: <http://www.nbsc.com> • E-mail: bioinfo@nbsc.com

INTERNATIONAL OFFICES:

BELGIUM

New Brunswick Scientific NV-SA
Stationsstraat 180/4
3110 Rotselaar
België/Belgique
Tel: 32 (0)16 56 28 31
Fax: 32 (0)16 57 27 53
E-mail: sales@nbsnv-sa.be

CHINA

New Brunswick Scientific Co., Inc.
A903, 904 Yin Hai Building
No. 250, Cao Xi Road
Shanghai 200235, P.R. China
Tel: 86 21 6484 5955 or 5966
Fax: 86 21 6484 5933
E-mail: nbschc@online.sh.cn

FRANCE

New Brunswick Scientific SARL
12-14, Rond Point des Champs Elysées
75008 Paris
France
Tel: 33 (0)1 5353 1511
Fax: 33 (0)1 5353 1557
E-mail: sales@nbssarl.fr

GERMANY

New Brunswick Scientific GmbH
In Der Au 14
D-72622 Nürtingen
Deutschland
Tel: 49 (0)7022 932490
Fax: 49 (0)7022 32486
E-mail: sales@nbsgmbh.de

THE NETHERLANDS

New Brunswick Scientific BV
Kerkenbos 1101, 6546 BC Nijmegen
P.O Box 6826, 6503 GH Nijmegen
Nederland
Tel: 31 (0)24 3717 600
Fax: 31 (0)24 3717 640
E-mail: sales@nbsbv.nl

UNITED KINGDOM

New Brunswick Scientific (UK) Ltd.
17 Alban Park
St. Albans, Herts. AL4 0JJ
United Kingdom
Tel: 44 (0)1727 853855 or 0800 581331
Fax: 44 (0)1727 835666
E-mail: bioinfo@nbsuk.co.uk
Web: www.nbsuk.co.uk

**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.

Copyright Notice

New Brunswick Scientific Company, Inc.
Box 4005 44 Talmadge Road
Edison, New Jersey 08818-4005

© Copyright 2007 New Brunswick Scientific Co., Inc.

All Rights Reserved.

Reproduction, adaptation, or translation without prior written permission from New Brunswick Scientific is prohibited.

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



NOTE:

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 boldface type emphasizes key words or phrases.



This particular *Warning* message, whether found in the manual or on the unit, means **HOT SURFACE**—and therefore represents a potential danger to touch.



CRUSH WARNING!

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



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, prove to be defective after 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. 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 the 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 clock will void the 10,000-hour warranty.

TABLE OF CONTENTS

1	OVERVIEW.....	9
2	SPECIFICATIONS.....	10
3	INSPECTION & VERIFICATION	12
3.1	INSPECTION OF BOXES.....	12
3.2	PACKING LIST VERIFICATION	12
4	PREPARING THE LOCATION.....	13
4.1	PHYSICAL LOCATION.....	13
4.2	ENVIRONMENT	13
4.3	UNPACKING OF EQUIPMENT	13
4.4	INSPECTION OF EQUIPMENT.....	13
5	INNOVA 4200 FEATURES	14
5.1	KEYPAD FEATURES	14
5.2	LOCKING CABINET	15
6	GETTING STARTED	18
6.1	SETTING FREQUENCY	18
6.2	STANDARD PLATFORM INSTALLATION	19
6.3	QUICK CHANGE ACCESSORY PLATFORM INSTALLATION.....	19
6.4	INSTALLATION OF CLAMPS	19
6.4.1	<i>Clamp Hardware Application Charts.....</i>	<i>20</i>
6.5	MAKING ELECTRICAL CONNECTIONS	21
7	INNOVA 4200 OPERATION	22
7.1	CONTINUOUS RUN OPERATION	22
7.2	TEMPERATURE	23
7.3	TEMPERATURE OFFSET CALIBRATION.....	24
7.4	TIMED RUN OPERATION	25
7.5	ALARM FUNCTIONS.....	25
7.6	TOTAL RUNNING TIME	26
7.7	USING THE INNOVA 4200 AS A QUIESCENT INCUBATOR	26
7.8	REDUCING DEHYDRATION.....	27
7.9	AIR DEFLECTOR INSTALLATION	28
7.10	GASSING CULTURES IN THE INNOVA 4200.....	29
7.11	ACCESSORY RECORDER CONNECTOR.....	29
7.12	USING ANCILLARY EQUIPMENT WITH THE INNOVA 4200	30
7.12.1	<i>Electrical Moisture-Proof Plug.....</i>	<i>31</i>
8	PREVENTIVE MAINTENANCE.....	33
8.1	DISABLING THE MAINT LIGHT.....	33
8.2	CLEANING PROCEDURES	33
9	SERVICE PROCEDURES	35
9.1	MOTOR BELT REPLACEMENT	35
9.2	FULL MOTOR ASSEMBLY REPLACEMENT	36
9.3	PARTIAL MOTOR ASSEMBLY REPLACEMENT.....	38
9.4	REMOVING THE RECIRCULATING FAN	39

9.5	BEARING HOUSING REPLACEMENT	39
9.6	LIGHT REPLACEMENT.....	41
9.7	TEMPERATURE SENSOR ADJUSTMENT	43
9.8	CONTROL BOARD REPLACEMENT.....	44
9.8.1	<i>ESD Precautions</i>	44
9.8.2	<i>Replacing the Temperature Control Board</i>	44
9.8.3	<i>Replacing the Main Control Board</i>	46
10	TROUBLESHOOTING	48
10.1	TROUBLESHOOTING GUIDE	48
10.2	FUSE REPLACEMENT	48
11	REPLACEMENT PARTS & ACCESSORY INFORMATION.....	50
11.1	REPLACEMENT PARTS DESCRIPTIONS & PART NUMBERS.....	50
11.2	ACCESSORY DESCRIPTIONS & PART NUMBERS	50
11.2.1	<i>Quick Change Platform Kit</i>	50
11.2.2	<i>Accessory Platforms</i>	51
11.2.3	<i>Accessory Clamps</i>	51
11.2.4	<i>Accessory Test Tube Racks</i>	52
11.2.5	<i>Optional Accessory Kits</i>	52
11.3	CLAMP HARDWARE KITS	52
12	DRAWINGS.....	54
12.1	SCHEMATICS	54
12.2	INDEX OF DRAWINGS.....	57
13	INDEX.....	58

1 OVERVIEW

New Brunswick Scientific's Innova 4200 Incubator Biological Shaker is a very versatile shaker for the biological research laboratory. The Innova 4200 provides a temperature-controlled environment that can be equipped with various accessories to adapt it for the culture of microorganisms, cell culture and hybridization.

Automatic features include an interlock door that shuts off the shaker when the door is open, chamber temperature shutoff, and overload/unbalanced sensor that automatically limits the speed of the shaker when an unbalanced or overloaded condition is detected. Audible and visual alarms alert the user when the temperature or speed is out of range.

Microprocessor controller with feedback controls the temperature and speed of the shaker. Temperature and speed setpoints are entered and changed using the membrane switch keypad. Setpoints and the actual values are displayed on the 3/8" (9.5 mm) bright LED display. The shaker operates continuously, or in a timed mode via a programmable timer for shaking periods of 0.1 hr–99.9 hrs. An audible and visual alarm indicates the end of a timed cycle. The triple eccentric drive is counterbalanced and provides horizontal plane rotary motion in 3/4" (19 mm) circular motion. A 1" (25.4 mm) model is also available.

The Innova 4200 has a (0–5 Volt) analog chart recorder outputs for speed or temperature.

The 4200 is stackable (up to two units), and accommodates routine laboratory accessories like Rollers, Magnetic Stirrers, Rockers, and Shakers. A wide variety of platforms and accessories are available for the Innova 4200.

2 SPECIFICATIONS

<i>Innova 4200 Incubator Shaker</i>		
Cabinet	construction	Heavy gauge stainless steel
	door	26 3/8"H x 22"W (670 mm x 559 mm)
	double paned glass window	19 1/4"H x 11 3/8"W (489 mm x 289 mm)
	fluorescent light	13 watt—provides illumination inside chamber
	shelves	2 Stainless Steel 20"W x 20"L (508 mm x 508 mm)—adjustable—(1/2" (12.7 mm) centers)
	internal AC receptacle	200W AC—waterproof w/ mating connector—can be used w/ magnetic stirrer, spinner flask, rocker, roller & shakers
Dimensions	platform	18"W x 18"L (457 mm x 457 mm)
	overall†	24.4"W x 28.7"L x 36.4"H (620 mm x 729 mm x 925 mm)
	chamber	20 1/2"W x 20 1/2"L x 24.8"H (520 mm x 520 mm x 630 mm)
Electrical	1200 Watts—120/100/200/240V—50/60Hz	
Indicator	3 digit LED	
Recorder Output	Two 0-5 Volt—tracks temperature & speed w/ optional recorder	
Shaking	alarm	Audible & visible indicates when speed deviates ± 5 rpm—audible alarm can be deactivated
	control	± 1 rpm—acceleration control minimizes splashing caused by sudden starts and stops
	display	1 rpm increments
	drive	Triple-eccentric counterbalanced drive w/ 9 sealed for life, ball bearings
	motion	3/4" (19 mm) circular—standard 1" (25.4) optional
	motor	1/15 HP, 3-phase solid-state, brushless ball bearing DC motor
	range	25–400 rpm, 25-300 rpm for stacked unit
	timer	Programmable shaking continuous \rightarrow 99.9 hours—setable in 0.1 hr. increments—alarm sounds at end of shaking period
Safety	automatic restart	Setpoints & operating status retained by non-volatile memory—auto restart after power is restored
	door interlock	Shaker shuts off when door is open
	unbalanced/ overload sensor	Limits speed automatically when unbalanced or overload condition is detected
	chamber temperature	Heater shuts off if temperature exceeds operating range

† 51.2 (130 cm) front to back w/ door open

Innova 4200 Incubator Shaker		
Options	stacking kit	Provides stacking for up to (2) Innova 4200 shakers
Temperature	alarms	Audible & Visual—when temperature deviates > 1.0°C—audible alarm can be deactivated
	ambient	15–35°C/Humidity—up to 90% non-condensing
	control	±0.1°C
	heaters	Resistance w/ high temperature safety cutoff
	range	5°C above ambient to 75°C (50 Hz units) or 80°C (60 Hz units)
Weight	uniformity	±.3°C NOM.
	net	275 lb. (125 kg.)
	gross	335 lb. (152 kg.)



CAUTION!

Do not set the temperature above:

- 75°C for 50 Hz units
- 80°C for 60 Hz units.

3 INSPECTION & VERIFICATION

3.1 *Inspection of Boxes*

After you have received 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 or local NBS distributor.

3.2 *Packing List Verification*

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

4 PREPARING THE LOCATION

4.1 *Physical Location*

The surface where you place the Innova 4200 should be smooth, level, and sturdy, and must be able to accommodate 300-400 lbs. for single units, or 600 lbs. for stacked units. The feet can be adjusted for necessary leveling. Loosen the locking nuts on the threaded studs attached to the feet of the shaker. Retighten when you have achieved the correct level for your shaker.

4.2 *Environment*

The Innova 4200 operates properly under the following conditions:

- ambient operating temperature range 15°C–35°C
- relative humidity up to 90% non-condensing
- main voltage fluctuation not to exceed 10 %
- indoor use only



WARNING!

The Innova 4200 is very heavy and may require special equipment to transport. Never try to lift or move the unit by yourself.

4.3 *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 Service Form 6300* and return by fax. This form can be found in the envelope that contains the warranty card.

4.4 *Inspection of Equipment*

Verify against the packing list that you have received everything you ordered. If anything is missing, contact your NBS sales representative right away.

5 INNOVA 4200 FEATURES

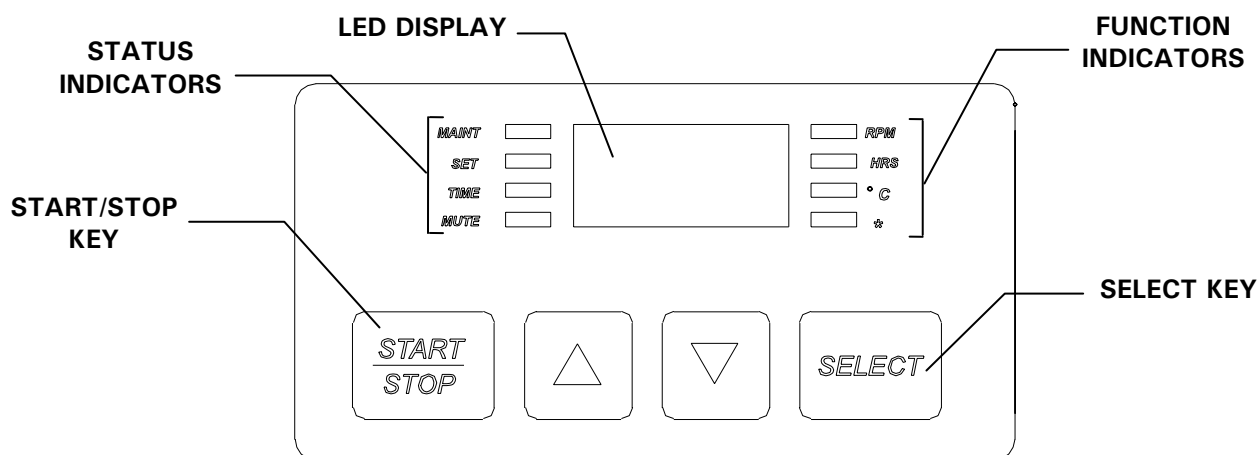
5.1 Keypad Features

- **LED DISPLAY** 3 digit LED display shows shaker **ON/OFF** status, speed, setpoints, hours remaining & measured temperature
- **START/STOP KEY** Start/stops the shaking motion—activates or stops the timer when a timed run is desired
- **SELECT KEY** Allows users to enter the **SET MODE** for setpoint changes
- **▲ KEY** Adjust setpoint of a displayed parameter *up*
- **▼ KEY** Adjust setpoint of a displayed parameter *down*
- **STATUS INDICATORS** 4 indicator lights—located to the left of the LED display—displays status for the following:
 - MAINT** Remains lit after 10,000 hours of use—Accumulated running time is internally monitored and may be displayed as a guideline. Refer to Section 8.1 on disabling.
 - SET** Indicates that the shaker is in the **SET MODE** and Setpoints are displayed and can be altered
 - TIME** Indicates that the timer is in operation (programmable to run for pre-set time from 0.1 hour to 99.9 hours without stopping an ongoing run). The timer can be disengaged or reset
 - MUTE** Indicates the status of the audible alarm. When **MUTE** indicator is illuminated, the audible alarm device is disabled

- **FUNCTION INDICATORS** 4 indicator lights—located to the right of the LED display—displays the following parameters:

RPM	Revolutions per minute
HOURS	Time remaining in cycle
°C	Temperature of chamber
*	Not used at this time

Figure 1: Keypad Detail



5.2 Locking Cabinet

The Innova 4200 is equipped with a locking cabinet door to keep the contents of the chamber secure. A set of two keys are shipped with the unit. The lock is located on the door handle.

Figure 2: Innova 4200 Front Panel

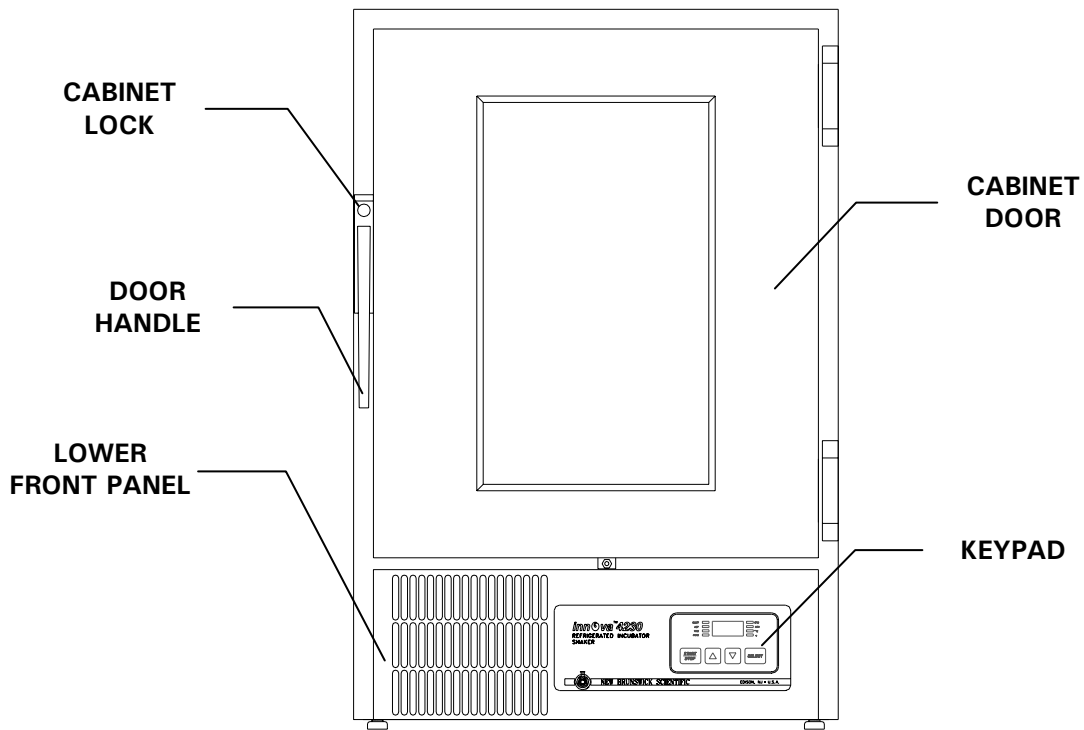


Figure 3: Innova 4200 Side Panel

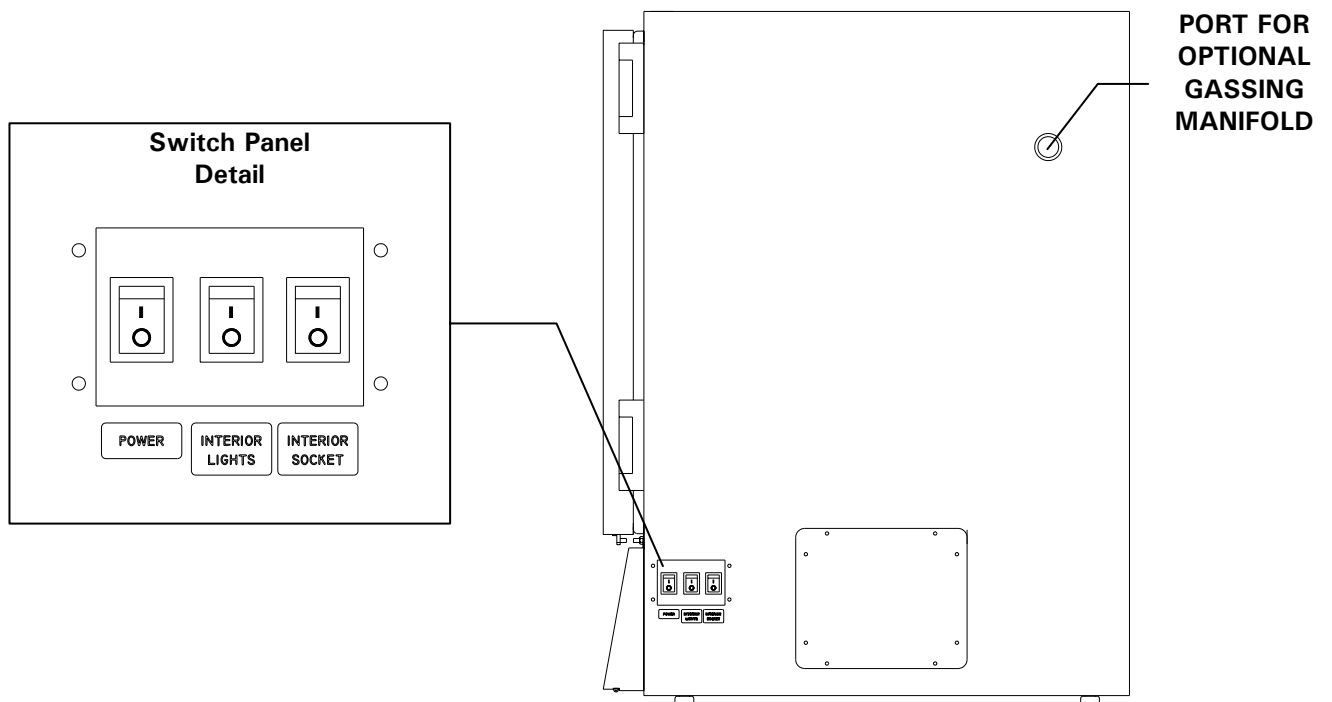
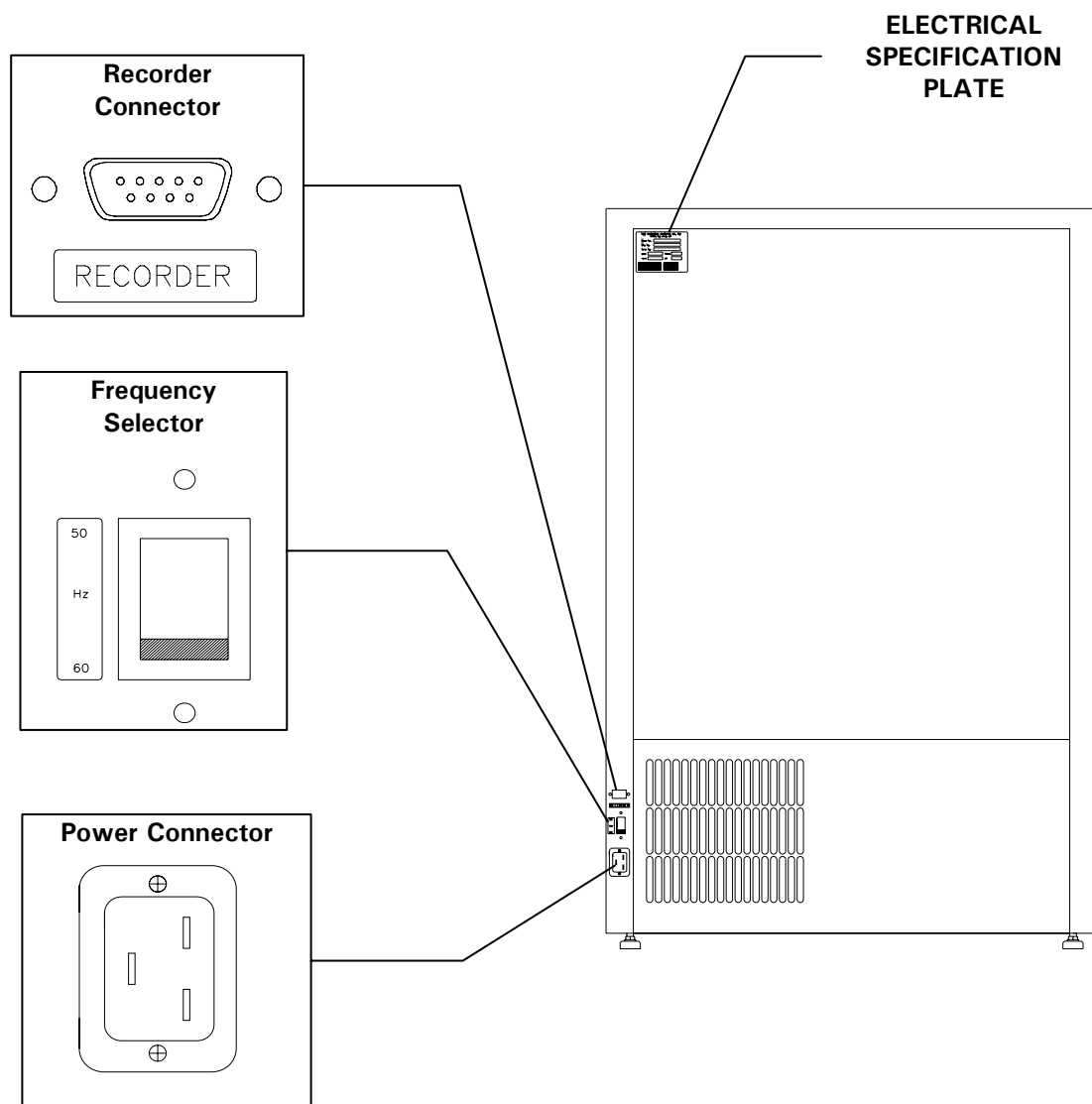


Figure 4: Innova 4200 Rear Panel

6 GETTING STARTED



WARNING!

Always verify the voltage of the Innova 4200 before plugging it in.

6.1 Setting Frequency

The Innova 4200 is set to the appropriate frequency prior to shipment. The **FREQUENCY SWITCH** is on the back panel of the shaker (*see Figure 4*). If you need to reset the frequency prior to operation, perform the following steps:

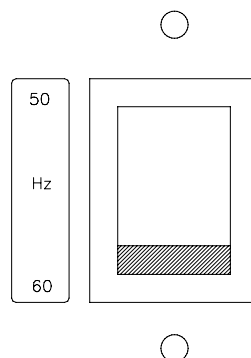


CAUTION!

If the Innova 4200 is being operated in Europe, CE Labeling requires that the following procedure be performed only by a qualified Electrical or Service Engineer.

1. Verify that the shaker is disconnected from the power source.
2. Slide the small red switch up for 50 Hz (*see Figure 5 below*).
3. Slide the small red switch down for 60 Hz.

Figure 5: Frequency Selector Switch



6.2 Standard Platform Installation

NOTE:

There are two small plastic straps that hold the bearing housing in place for shipping. Be sure to remove the straps from the unit.

Before you operate the shaker, a platform *must* be attached. Platforms are purchased separately. To attach a platform perform the following steps:

1. Open the door of the shaker.
2. Remove the four **HEX SCREWS** from the subplatform of the bearing housing with the **HEX KEY** (supplied).
3. Place the platform on the upper bearing housing and align the holes in the platform over the holes in the upper bearing housing.
4. Place the **HEX SCREWS** in the four holes. Tighten with the **HEX KEY**. This secures the platform to the shaker.

6.3 Quick Change Accessory Platform Installation

1. Open the door of the shaker.
2. Place the **QUICK CHANGE PLATFORM** on the shaker.
3. Place the four platform **HEX SCREWS** in the four holes on the platform and tighten with the **HEX WRENCH** (provided).
4. Slide the **FLASK PLATFORM** in between the side guides on the inside of the **QUICK CHANGE PLATFORM**.
5. Push the platform all the way to the back of the shaker.
6. Press down on the front of the platform. The platform snaps into place.
7. Close the shaker door.

6.4 Installation Of Clamps

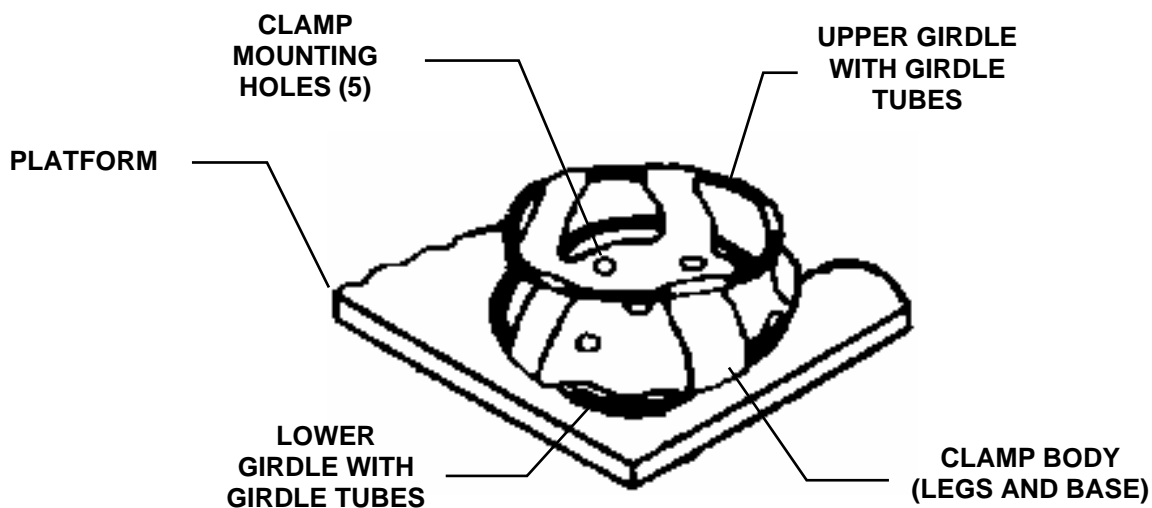
Flask clamps purchased for use with universal platforms require installation. Clamps are installed by securing the base of the clamp to the platform with the correct type and number of screws (*refer to clamp hardware application charts in Section 6.4.1*). All clamps are shipped complete with hardware.

Clamps for 2- to 6-liter flasks are shipped with an additional girdle to keep the flasks in place. To install 2- to 6-liter clamps, follow these steps:

1. Place clamp on platform, secure in place with correct type of screws (*refer to clamp hardware application charts in Section 6.4.1*).
2. Place the loose girdle around the upper portion of clamp body so that it is held in place by the legs of the clamp (*see Figure 6 below*).

3. Insert the flask into the clamp.

Figure 6: 2- to 6-Liter Flask Clamp Installation









NOTE:

The above also applies to 2800 ml Fernbach Flask Clamps.








6.4.1 Clamp Hardware Application Charts

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 tables below identify the proper screw for your shaker application by reference to the head style.

10 to 500 ml Clamp Hardware Application Chart

	Description	Part Number	Qty.	Application
	10-24 x 5/8 (15.87 mm) flat Phillips (+) head screw	S2116-3101	1	3/4" (19.05 mm) thick wood platform 
	10-24 x 5/16 (7.9 mm) flat Phillips (+) head screw	S2116-3051	1	5/16" (7.9 mm) thick aluminum, phenolic and stainless steel platforms. 
	10-32 x 5/16 (7.9 mm) flat slotted (-) head screw	S2117-3050	1	all stainless steel platforms 

1- to 6-Liter Clamp Hardware Application Chart

	Description	Part Number	Qty.	Application
	10-24 x 5/8 (15.87 mm) flat Phillips (+) head screw	S2116-3101	5	3/4" (19.05 mm) thick wood platform 
	10-24 x 5/16 (7.9 mm) flat Phillips (+) head screw	S2116-3051	5	5/16" (7.9 mm) thick aluminum, phenolic and stainless steel platforms.  
	10-32 x 5/16 (7.9 mm) flat slotted (-) head screw	S2117-3050	5	all stainless steel platforms 

6.5 Making Electrical Connections



WARNING!

Before you make electrical connections, verify the voltage, frequency and electrical specifications for your equipment.



WARNING!

The internal AC socket cover **MUST** always cover the socket when not in use. Verify the power is off before you attach or detach the cover.

To make the proper electrical connection, follow these steps:

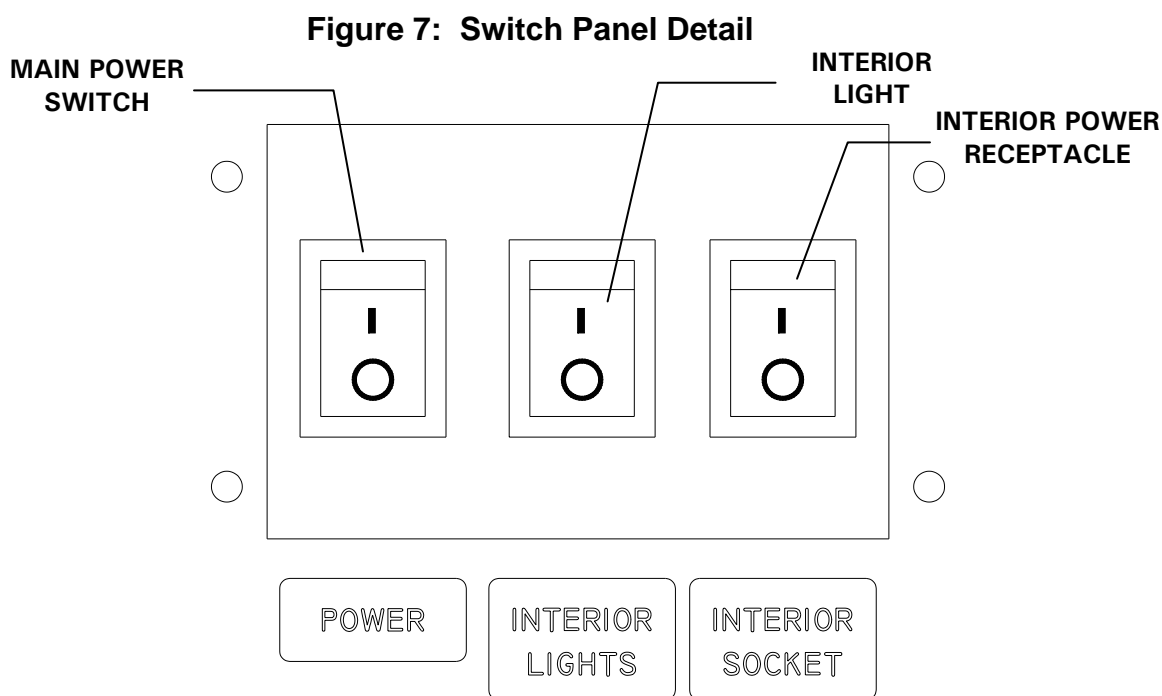
1. Verify that the **FREQUENCY SWITCH** is set to the correct frequency for your shaker model (*see Section 6.1 above*).
2. Plug the socket end of the **POWER CORD** securely into the **POWER CONNECTOR** on the back panel of the Innova 4200 (*See Figure 4*).
3. Plug the pronged end of the **POWER CORD** into a **grounded** power strip or wall outlet.
4. Verify that the necessary platforms are properly installed and secured (*see Sections 6.2 & 6.3 above*).

7 INNOVA 4200 OPERATION

7.1 Continuous Run Operation

To set a continuous run for the Innova 4200 shaker, perform the following steps:

1. Press the **ON/OFF MAIN POWER SWITCH** to **ON**. The switch is on the right side of the shaker (See Figures 3 & 7).
2. If you want light inside the chamber, press the **ON/OFF LIGHT SWITCH** to **ON**. The **LED DISPLAY** flashes.



3. Press the **SELECT KEY** until the **RPM FUNCTION INDICATOR** illuminates. The word **OFF** appears in the **LED DISPLAY**.

 **NOTE:**

Holding down the Δ or ∇ key for five or more seconds will cause speed, time or temperature setpoints to change.

4. Use the Δ (up) **KEY** or the ∇ (down) **KEY** to set the **RPM** value.

 **NOTE:**

Maximum speed for the Innova 4200 is 400 rpm. For stacked units, the maximum speed is 300 rpm.

When you use Δ (up) and ∇ (down) **KEYS**, the **SET** light on the left side of the **LED DISPLAY** illuminates. This is to alert you that the shaker is in the **SET MODE** of that particular function.

You can change the setpoint during a run without stopping the shaker:

1. Press the **START/STOP KEY**.
2. Press the **SELECT KEY** until the **RPM FUNCTION INDICATOR** illuminates.
3. Use the Δ (up) or ∇ (down) **KEY** to set the **RPM** value.

 **NOTE:**

During the speed change, the alarm flashes until the speed returns to within 5 rpm of the setpoint.

7.2 Temperature

This control consists of an internal electrical interface and an **RTD** temperature probe. To set the temperature setpoint:

1. Press the **SELECT KEY** until the **°C. FUNCTION INDICATOR** illuminates.
2. Use the Δ (up) **KEY** or the ∇ (down) **KEY**, and set the temperature value.

 **NOTE:**

The temperature can be set from 5°C above ambient to 75.0°C (50 Hz units) or 80°C (60 Hz units).

Use the Δ (up) KEY or the ∇ (down) KEY, to increase or decrease the setpoint.

The temperature alarm activates if the temperature is more than 1.0°C higher or lower than the temperature setpoint. The alarm will automatically deactivate as the unit achieves the set temperature.

If desired, the temperature control system may be shut off during set-up for special investigations:

1. To deactivate the temperature control system press and hold the ∇ (down) **KEY** until the setpoint is at 4.0°C.
2. Holding the ∇ (down) **KEY**, press the **START/STOP KEY**.
3. The temperature setpoint display shows **OFF** and the heater will be deactivated.

To reactivate the temperature controller, press the Δ (up) **KEY** until the desired temperature setpoint is displayed.

 **NOTE:**

You can start or stop the shaker by pressing the START/STOP KEY. When starting, the unit will automatically return to the last function and setting. The alarm will be activated until the speed is within 5 rpm or the temperature is within 1.0°C of the setpoint. The alarm will not sound when the shaker is accelerating or the temperature is changing to satisfy a new setpoint.

7.3 Temperature Offset Calibration

The temperature probe and the temperature controller are calibrated together at the factory. The temperature probe measures the temperature of the air at the probe's location, near the heat exchanger return vent. The controller uses the probe input to adjust air temperature, up or down, to match the temperature setpoint.

Depending on various conditions within the chamber, such as flask placement and size, the heat produced by growing organisms, heat losses due to liquid evaporation from flasks, etc., the display temperature may differ from temperatures within the flasks themselves.

If you wish to have the temperature display (“Indicated Temperature”) match the temperature at a given point, or match the average of a series of points within the chamber (“Actual Temperature”), proceed as follows:

1. Let the unit equilibrate at or near the desired temperature. Record the Indicated Temperature.
2. Record the Actual Temperature.
3. Calculate the temperature correction value: Actual Temperature – Indicated Temperature = Temperature Correction Value.
4. Press the **SELECT KEY** until the function **°C INDICATOR** illuminates.
5. Simultaneously press the Δ (up) and ∇ (down) **KEYS**. The **SET** and **MAINT INDICATORS** will light.
6. While the **SET** and **MAINT INDICATORS** are illuminated, use the Δ or ∇ **KEY** to set the display to the calculated Temperature Correction Value.

 **NOTE:**

The °C light will pulse rapidly for a short duration to indicate it is not operating in the factory default mode. It will pulse for a longer duration and less rapidly (with a frequency of approximately one second) to indicate temperature is more than one degree above or below setpoint.

To return to the factory calibration:

1. Press the **SELECT KEY** until the **°C FUNCTION INDICATOR** illuminates.
2. Simultaneously press the **Δ** and **∇** KEYS. The **SET** and **MAINT INDICATORS** will light.
3. While the **SET** and **MAINT INDICATORS** are illuminated, press the **START/STOP KEY**.

7.4 Timed Run Operation

You can program the shaker to automatically stop after a preset time period of 0.1 hour–99.9 hours. A timed run can be programmed while the unit is either shaking or stopped, but there *must* be power to the unit. To set the **TIMER** function, perform the following steps:

1. Press the **SELECT KEY** until the **HRS FUNCTION INDICATOR** illuminates.
2. Use the **Δ** (up) **KEY** or the **∇** (down) **KEY**, and set the time value.
3. To start the timer operation, press the **Δ** (up) **KEY** or the **∇** (down) **KEY**. The **SET FUNCTION INDICATOR** illuminates. While the **SET INDICATOR** is lit, press the **START/STOP KEY**.

The **TIME INDICATOR** remains lit for the duration of the timed run. At the end of the run the **LED DISPLAY** will display **OFF**. The **TIME STATUS INDICATOR** flashes and the audible alarm sounds (if it is enabled), and the shaker will cease operation.

To *change timer setpoint* during a timed run without stopping the shaker, perform the following steps:

1. Press the **SELECT KEY** until the **HRS FUNCTION INDICATOR** illuminates.
2. Use the **Δ** (up) **KEY** or the **∇** (down) **KEY**, and reset the time value.
3. To *cancel the timer* without stopping the shaker:
4. Press the **SELECT KEY** until the **HRS FUNCTION INDICATOR** illuminates.
5. Use the **Δ** (up) **KEY** or the **∇** (down) **KEY**, until the **SET STATUS INDICATOR** is lit.
6. While the **SET STATUS INDICATOR** is lit press the **START/STOP KEY**.
7. The **TIME STATUS INDICATOR** will go out and the **LED DISPLAY** displays **OFF**.

7.5 Alarm Functions

The Innova 4200 has an audible alarm that is set to activate at predetermined times. To deactivate the alarm, perform the following steps:

1. Press the **SELECT KEY** until the **HRS FUNCTION INDICATOR** illuminates.
2. Simultaneously press the **Δ** (up) **KEY** and the **∇** (down) **KEY**.
3. The **SET** and **MAINT STATUS INDICATORS** will flash.

4. While the **SET** and **MAINT STATUS INDICATORS** flash, press the **START/STOP KEY**. The **MUTE STATUS INDICATOR** illuminates to advise that the audible alarm is *deactivated*.

To *reactivate* the alarm:

1. Press the **SELECT KEY** until the **HRS FUNCTION INDICATOR** illuminates.
2. Simultaneously press the Δ (up) **KEY** and the ∇ (down) **KEY**.
3. The **SET** and **MAINT STATUS INDICATORS** flash.
4. While the **SET** and **MAINT STATUS INDICATORS** flash, press the **START/STOP KEY**. The **MUTE STATUS INDICATOR** goes out when the alarm has been reactivated.

7.6 Total Running Time

The control module of the Innova 4200 totals the time the shaker has been **ON** to track hours of usage. To display the accumulated running time perform the following steps:

1. Press the **SELECT KEY** until the **HRS FUNCTION INDICATOR** illuminates.
2. Simultaneously press the Δ (up) **KEY** and the ∇ (down) **KEYS** and hold for a few seconds.

The **SET** and **MAINT STATUS INDICATORS** flash, and the accumulated running time displays in hundreds of hours (i.e., “02” equals 200 hours; “102” equals 10,200 hours). The display stays for 10 seconds and then defaults to the previous mode readout.

NOTE:

After 10,000 hours of operation, the MAINT STATUS INDICATOR illuminates. See Section 8.1 to disable the maintenance indicator light.

7.7 Using the Innova 4200 as a Quiescent Incubator

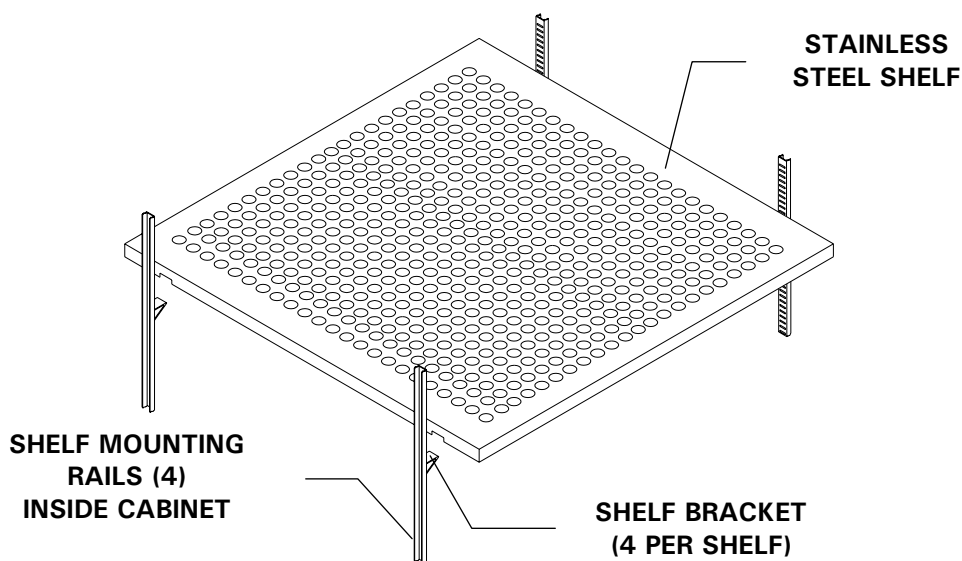
The two stainless steel shelves can be used to incubate quiescent cultures. You should make sure that your cultures would not be susceptible to very slight vibrations that can occur when the shaker is running. If this is a concern, the culture should be tested prior to use.

To install the shelves, perform the following:

1. Verify that the **ON/OFF POWER** switch is **OFF**.
2. Open the cabinet door. Remove any equipment or platforms from the cabinet interior that may interfere or obstruct mounting a shelf.

3. There are four shelf mounting rails located on the side walls of the cabinet (*see Figure 8 below*). Once the desired shelf height is selected, insert one shelf bracket into the each of the shelf mounting rails, so that the flat side of the bracket is facing up. Ensure that each bracket is at the same level before installing the shelf.

Figure 8: Shelf Detail



4. Place the shelf on top of the brackets. Verify that the brackets are positioned inside the cutouts on each side of shelf, and the shelf and brackets are securely in place before mounting any equipment on the shelf.
5. Repeat steps if it is desired add another shelf to the cabinet.

7.8 Reducing Dehydration

Storing cultures in the 4200 for extended periods may dehydrate cultures. Cultures grown on agar or liquid cultures using very small volumes are most susceptible.

Dehydration in the chamber can be limited in several ways:

- Install the air deflector provided to protect Petri dish cultures from direct exposure to air currents. (See Section 7.9 below).
- Place a container of water inside the chamber to rehydrate the air.
- Seal the cultures if possible before they are placed in the chamber.
- Limit the incubation time.

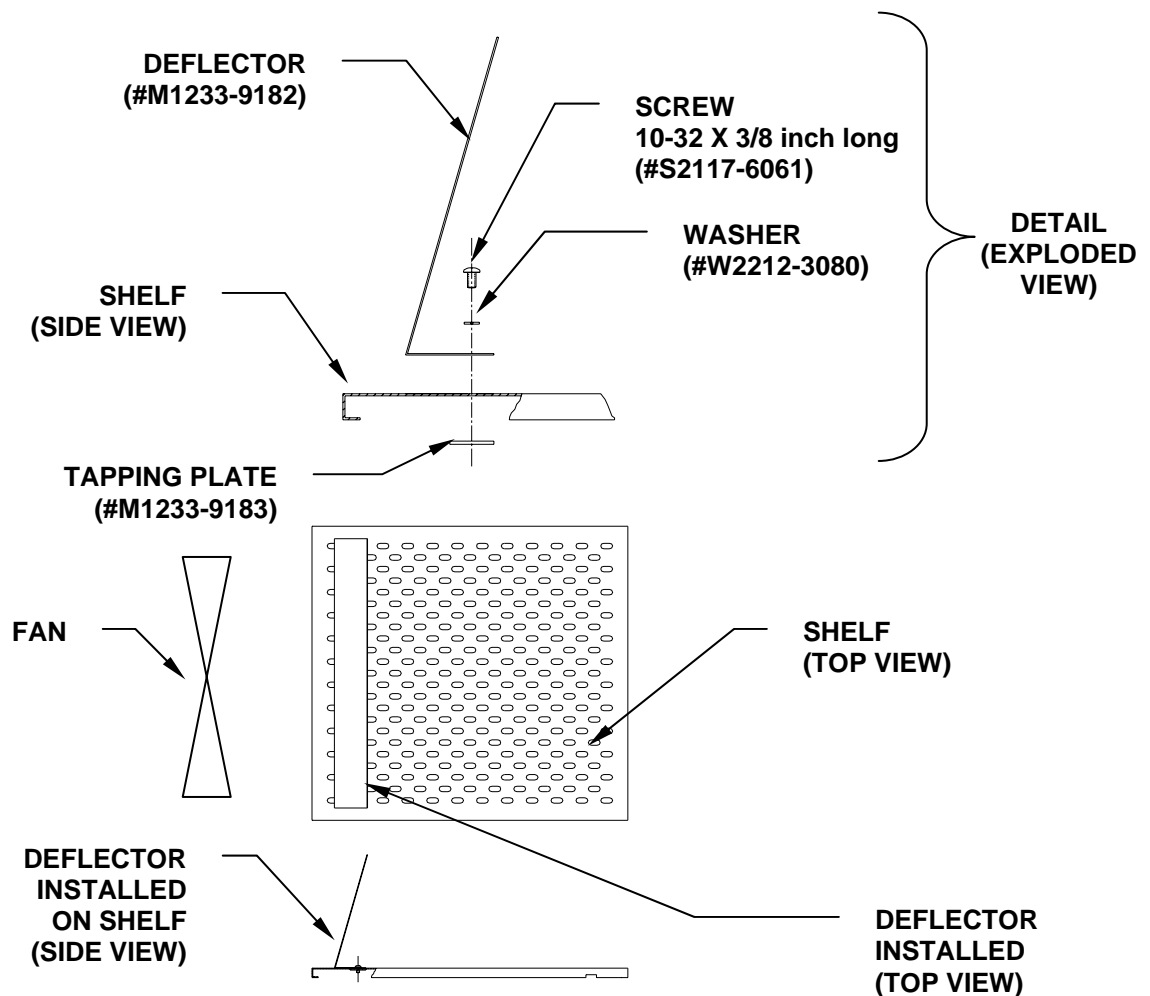
7.9 Air Deflector Installation

An air deflector kit (M1233-9994) is provided for installation on a shelf, particularly if you are using Petri dishes. The deflector acts as a barrier to the direct air currents generated by the fan, sending the air to the roof of the chamber. This keeps the Petri dishes, or other items placed on the shelves, from drying out.

To install the air deflector on the shelf:

1. With reference to Figure 9 below, stand the deflector on the fan side of the shelf.
2. Using the screws and washers provided, mount the deflector base to the shelf and the tapping plate underneath for support.

Figure 9: Air Deflector Installation



7.10 Gassing Cultures in the Innova 4200

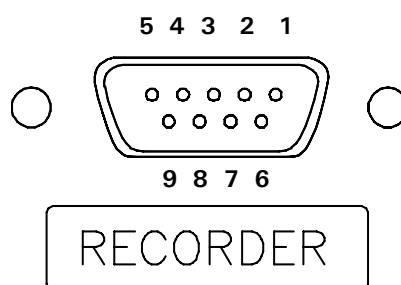
There is an optional gassing manifold (M1233-0291) available for the 4200. The gassing manifold is installed in the gassing port on the right hand side of the unit. Instructions on how to install the gassing manifold are included with the manifold.

7.11 Accessory Recorder Connector

To record speed and temperature, an accessory recorder can be installed on the back panel of the shaker (*see Figure 4*). The recorder should have the following capabilities:

- Two channels, required for Speed and Temperature. Each channel should have signal conditioning which accepts 0-5 volt input.
- The pin-out diagram and scale below identifies the application.
A mating connector is required on the recorder cable (not supplied).
(This is a 9-pin male D subminiature connector—AMP Amplimate HDP-20 series or equivalent.)

Figure 10: Detail of 9-Pin Recorder Connector



Pin Number	Signal Name	Scale
6	Speed	1V = 100 RPM
2	Ground	
7	Temperature	1V = 20°C
3	Ground	

**WARNING!**

The following sections are **ONLY** for qualified Electrical & Service Engineers, who will *always* disconnect the power cord before performing *any* service on the shaker.

7.12 Using Ancillary Equipment with the Innova 4200

The Innova 4200 has a special internal AC socket that is used to power ancillary equipment such as magnetic stirrers, rockers, rollers and small shakers.

In most cases, the equipment used will be light duty rockers or rollers. However, if heavier equipment is desired, the operator should verify that the stainless steel shelves supplied can support the load.

In addition, be sure to verify that the equipment operating inside the Innova 4200 does not affect the stability of the unit. This is accomplished by operating the particular piece of equipment under the expected load and speed conditions. If the Innova 4200 vibrates, limit the load and/or speed conditions for the operation of the ancillary equipment.

If the Innova 4200 is intended to be used as a shaker at the same time, both shaker and ancillary equipment should be run under expected load and speed conditions. If the unit vibrates, the shaker speed and/or the load should be reduced, or the Innova 4200 should not be used as a shaker at the same time the ancillary device is in operation.

 **NOTE:**

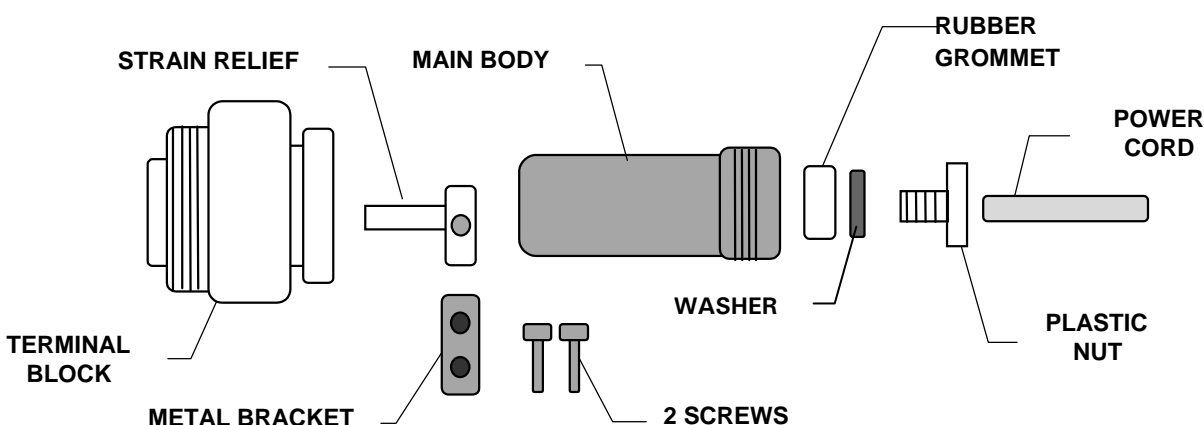
It has been found that an Innova 2050 orbital shaker weighing 35 lb. (15.9 kg) could be operated inside the Innova 4200 at 250 rpm while the Innova 4200 is shaking at 250 rpm.

The outlet is located inside the shaker chamber on the upper right side. **It is important to note that this AC supply is the same as the main supply of your 4200.** If your unit operates off a 115 volt supply, then any ancillary equipment you plug into the internal socket must also operate at 115 volts.

7.12.1 Electrical Moisture-Proof Plug

The AC socket (see *Figure 11 below*), with cover and mating plug (supplied) is designed to be used in humid environments. To use the socket, you have to connect the special male plug (supplied K0380–0871 with the unit) to the equipment that you use in the Innova 4200. If your equipment has a detachable power cord, you may want to obtain a different power cord to be used solely with the Innova 4200 shaker.

Figure 11: Electrical Moisture-Proof Plug



WARNING!

The internal AC circuit supplied is fused at 200 Watts. **DO NOT** connect other equipment that requires more power.



WARNING!

The protective cover attached to the internal AC socket **MUST** always cover the socket when the socket is not being used. Verify the power is off before you attach or detach the cover.

To assemble the moisture-proof plug:

1. Connect the **POWER CORD** to the electrical plug. Slide the **POWER CORD** through the **PLASTIC NUT**, **WASHER**, **RUBBER GROMMET** and the **MAIN BODY** (see *Figure 11 above*).

2. Connect the hot wire to *terminal 1*.
3. Connect the neutral wire to *terminal 3*.
4. Connect the ground wire to the *ground terminal* on the **TERMINAL BLOCK**.
5. Attach the **STRAIN RELIEF** to the **TERMINAL BLOCK**. Slide the two legs into the slots in the **TERMINAL BLOCK**.
6. Use the **METAL BRACKET**, captivate the wires and secure with the **TWO SCREWS**.
7. Screw the **MAIN BODY** onto the **TERMINAL BLOCK**.
8. Push the **RUBBER GROMMET** into the end of the **MAIN BODY**.
9. Push the **WASHER** on.
10. Screw the **PLASTIC NUT** onto the **MAIN BODY** and tighten. Ensure a tight seal by hand tightening the **RUBBER GROMMET** to compress the **POWER CORD**. Securely tightening the **PLASTIC NUT** to the **MAIN BODY** also provides a water seal for the plug.
11. Connect the **POWER CORD** to the ancillary equipment if applicable.
12. Turn off all the power switches.
13. Remove the cover to the internal socket. The socket is on the upper right side, inside the shaker chamber.
14. Plug the **ELECTRICAL PLUG** into the internal socket, and secure the plug in place by hand tightening the knurled knob.

 **NOTE:**

The socket is keyed so that it will only go in when oriented properly.

15. Use the knurled knob and tighten the plug finger tight to obtain a good seal.

Your ancillary equipment operates whenever the main power switch and AC switch are powered on.

 **NOTE:**

Use of ancillary equipment in the Innova 4200 may affect the operating temperature range of the Innova 4200. This is due to the additional heat generated by the ancillary equipment used.

8 PREVENTIVE MAINTENANCE

The Innova 4200 shaker requires no routine *mechanical* maintenance by the user. After the shaker has operated for more than 10,000 hours, the **MAINT INDICATOR** on the control panel illuminates. This means that the shaker requires a routine maintenance check.

Preventive Maintenance keeps your equipment in proper working condition. When periodically performed, maintenance results in a longer life of your equipment and reduces time lost due to equipment failure. We suggest that you perform the maintenance procedures outlined in the following pages.

8.1 *Disabling the MAINT Light*

Perform the following steps to shut the **MAINT STATUS INDICATOR** off:

1. Press the **SELECT KEY** until the **HRS FUNCTION INDICATOR** illuminates.
2. Simultaneously press the Δ (up) **KEY** and the ∇ (down) **KEYS** and hold for a few seconds. The **MAINT STATUS INDICATOR** flashes.
3. Press the ∇ (down) **KEY**. The **MAINT** light goes off.



WARNING!

Always disconnect power cord before performing *any* maintenance on the shaker.

Do not immerse the shaker in water or any liquids.

Do not use a cleaning fluid that is corrosive or flammable on or around the shaker.

8.2 *Cleaning Procedures*

Clean the outside surfaces of the Innova 4200 with a damp cloth or any standard laboratory cleaner. Do not use scouring compounds, gritty cloths, leaded or ethylene gasolines, or solvents such as alcohol, acetone, or carbon tetrachloride. These types of cleansers can damage the shaker and void the warranty.

Perform the following techniques to clean the Innova 4200:

1. Set the **ON/OFF POWER** Switch to **OFF**.

2. Disconnect the **POWER CORD** from the electrical outlet.
3. Use a cloth dampened with mild detergent and water to wipe the exterior and interior of the shaker.
4. Rinse the cloth in clean water, then wipe the exterior and interior of the shaker.
5. Clean the viewing window with standard laboratory glass cleaner.
6. Reconnect the **POWER CORD** to the electrical outlet.

9 SERVICE PROCEDURES

*The following sections describes basic service procedures and troubleshooting for the Innova 4200. A **qualified Service Engineer** must perform the following procedures.*

9.1 Motor Belt Replacement

**WARNING!**

Only a qualified Service Engineer may perform this procedure.

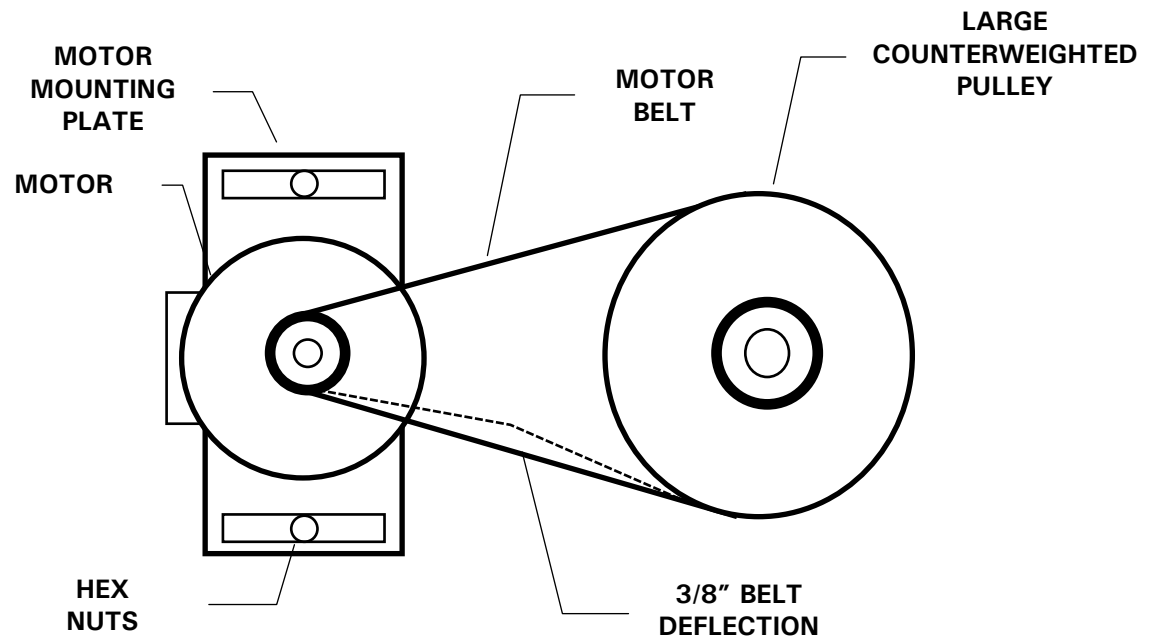
**WARNING!**

Always keep fingers clear of the belt and the pulley.

The **MOTOR BELT** for the Innova 4200 is behind the front panel of the shaker. To replace the **MOTOR BELT**, perform the following steps:

1. Set the **ON/OFF POWER** Switch to **OFF**.
2. Disconnect the **POWER CORD** from the electrical outlet.
3. Before you can gain access to the front panel, open the door of the shaker. The door *must* be open all the way.
4. Use a Phillips (+) head screwdriver and unscrew the three screws that attach the hinged front panel to the housing. Gently lay down the front panel.
5. As you look into the shaker, the **MOTOR ASSEMBLY** is on the left side (*see Figure 12 below*).
6. Use the **HEX WRENCH** and loosen the two **HEX NUTS** on the **MOTOR MOUNTING PLATE**.
7. Gently slide the **MOTOR MOUNTING PLATE** toward the back of the shaker. This loosens the **MOTOR BELT** from the **MOTOR PULLEY** and the **LARGE COUNTER-WEIGHTED PULLEY**. When you move the **MOTOR MOUNTING PLATE** back, the **MOTOR BELT** falls from both belt tracks.
8. Remove the old belt.

Figure 12: Motor Belt Replacement



9. Place the new **MOTOR BELT** around the **MOTOR PULLEY**. With your other hand, guide the **MOTOR BELT** around the **LARGE COUNTERWEIGHTED PULLEY**.
10. Move the **MOTOR MOUNTING PLATE** forward, until you feel a slight resistance.
11. Verify that the **MOTOR BELT** has a slight pressure near the center.
Recommended deflection is 3/8 inch (9.5 mm).
12. Tighten the two **HEX NUTS** on the **MOTOR MOUNTING PLATE**.
13. Lift up hinged front panel and replace the three screws. Use a Phillips (+) head screwdriver to tighten the screws.
14. Close the door of the shaker.
15. Reconnect the **POWER CORD** to the electrical outlet.

9.2 Full Motor Assembly Replacement



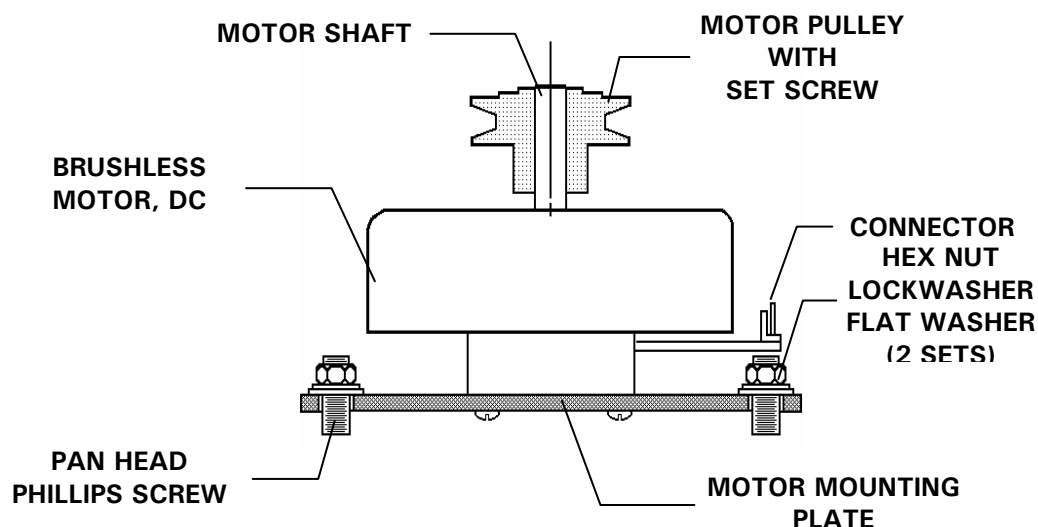
WARNING!

Only a qualified Service Engineer may perform this procedure.

1. Set the **ON/OFF POWER** Switch to **OFF**.
2. Disconnect the **POWER CORD** from the electrical outlet.
3. Before you can gain access to the front panel, open the door of the shaker. The door *must* be open all the way.

4. Use a Phillips (+) head screwdriver to unscrew the three screws that attach the hinged front panel to the housing. Gently lay down the front panel.
5. As you look into the shaker, the **MOTOR ASSEMBLY** is on the left side.
6. Lift up the **WHITE CONNECTOR** from the **MOTOR BASE** and disconnect.
7. Unscrew the **NUT** from **SMALL SCREW STUD** to the right of the **MOTOR MOUNTING PLATE** (see *Figure 13 below*).
8. Remove the one **GREEN** and the **TWO GREEN/YELLOW GROUND WIRES**.
9. Use a **HEX WRENCH** and loosen the two **HEX NUTS** on the **MOTOR MOUNTING PLATE**.

Figure 13: Motor Replacement



10. Gently slide the **MOTOR MOUNTING PLATE** toward the back of the shaker. This loosens the **MOTOR BELT** from the **MOTOR PULLEY** and the **LARGE COUNTER-WEIGHTED PULLEY**. When you move the **MOTOR MOUNTING PLATE** back, the **MOTOR BELT** falls from both belt tracks.
11. Remove **MOTOR BELT** and set aside.
12. Continue to loosen and remove the two **HEX NUTS** and **WASHERS** from the **MOTOR MOUNTING PLATE**.
13. Tilt the **MOUNTING PLATE** backwards. Unscrew the **NUT** on the right, and remove the **GREEN/YELLOW GROUND WIRE** from underneath the **PLATE**.
14. Remove the old **MOTOR** and the **MOTOR MOUNTING PLATE**.
15. Tilt the new **MOTOR** upside down and place the **GREEN/YELLOW WIRE** over the **SMALL SCREW STUD**.
16. Tighten the **NUT**.
17. Align the **MOTOR PLATE** over the holes on the **SHAKER BASE** and verify that the **MOTOR PLATE** sits smoothly over the holes.
18. Replace and slightly tighten the two **HEX NUTS** and **WASHERS** on the **MOTOR MOUNTING PLATE**.

19. Place the **MOTOR BELT** around the **MOTOR PULLEY**. With your other hand, guide the **MOTOR BELT** around the **LARGE COUNTERWEIGHTED PULLEY**.
20. Adjust the **MOTOR PULLEY** height so that the belt is level as related to the **DRIVE PULLEY**.
21. Move the **MOTOR MOUNTING PLATE** forward, until you feel a slight resistance.
22. Verify that the **MOTOR BELT** has a slight pressure near the center.
Recommended deflection is 3/8 inch (9.5 mm).
23. Tighten the two **HEX NUTS** on the **MOTOR MOUNTING PLATE**.
24. Replace the two **GREEN/YELLOW GROUND WIRES** over the **SMALL SCREW STUD** to the right of the **MOTOR MOUNTING PLATE**.
25. Then replace the **GREEN GROUND WIRE**.
26. Tighten the **NUT** to the **SMALL SCREW STUD**.
27. Reconnect the **WHITE CONNECTOR** on the **MOTOR BASE** and verify that you properly position the pins.
28. Lift up hinged front panel and replace the three screws. Use a Phillips (+) head screwdriver and tighten the screws.
29. Close the door of the shaker.
30. Reconnect the **POWER CORD** to the electrical outlet.

9.3 Partial Motor Assembly Replacement



WARNING!

Only a qualified Service Engineer may perform this procedure.

1. Unscrew the three Phillips (+) head screws and separate the **MOTOR** from the **PLATE** (see *Figure 13 above*).
2. Loosen the **PULLEY SET SCREW** and remove the **PULLEY** from the **SHAFT**. Save the **PULLEY**.
3. Mount the new **MOTOR** to the **MOTOR PLATE** with the three Phillips (+) head screws.
4. Replace the pulley. Screw the set screw to the shaft flat. Do not tighten.
5. Position this assembly back onto the shaker. Replace the two **HEX NUTS** with hardware. Do not tighten.
6. Replace the belt. Adjust the **MOTOR PULLEY** height so that the belt is level as related to the drive pulley. Tighten the set screw.
7. Adjust the belt tension by tightening the two **HEX NUTS**.

9.4 Removing the Recirculating Fan

**WARNING!**

Only a qualified Service Engineer may perform this procedure.

1. Disconnect the **POWER CORD** from the electrical outlet.
2. Open the door of the shaker and remove all shelving.
3. Unscrew the three screws that secure the fan mounting plate assembly.
4. Remove the wires from the fan.

**WARNING!**

Fan blades are extremely sharp and can cause serious injury. Handle with **EXTREME CARE!**

5. Remove the fan mounting plate assembly.

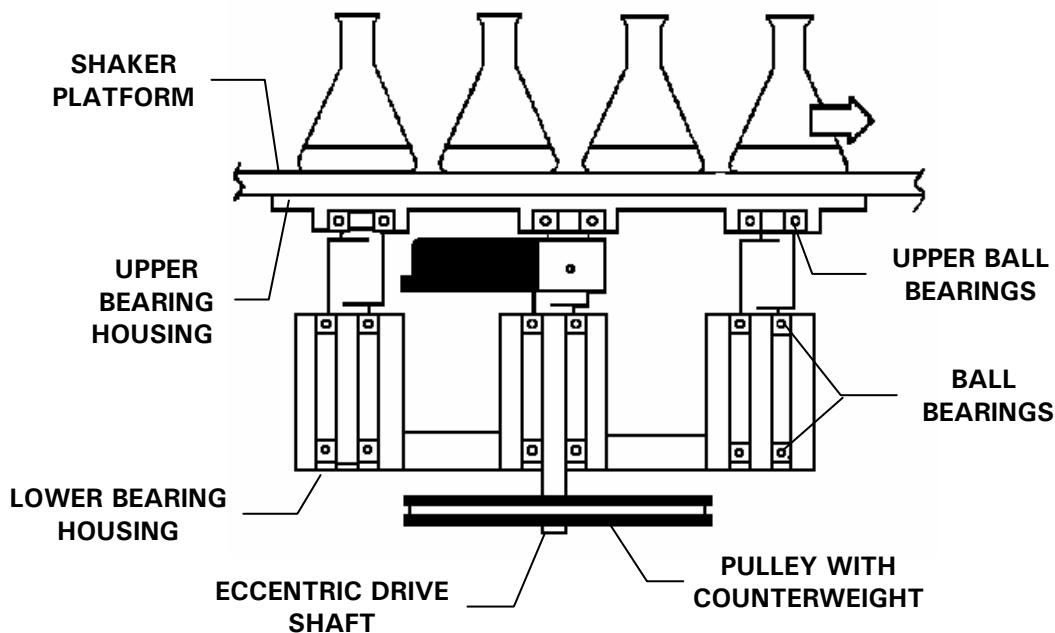
9.5 Bearing Housing Replacement

**WARNING!**

Only a qualified Service Engineer may perform this procedure.

1. Set the **ON/OFF POWER** Switch to **OFF**.
2. Disconnect the **POWER CORD** from the electrical outlet.
3. Before you can gain access to the front panel, open the door of the shaker. The door *must* be open all the way.
4. Use a Phillips (+) head screwdriver to unscrew the three screws that attach the hinged front panel to the housing. Gently lay down the front panel.
5. Unscrew the eight Phillips (+) head screws from the small panel on the left side of the shaker (*see Figure 3*).
6. Remove all shelving from the inside of the shaker.
7. Use the **HEX KEY** and remove the four **HEX SCREWS** from the center of the shaker platform. Set platform aside.
8. Remove the four **NUTS** that are on the **STUD SCREWS** securing the **BEARING HOUSING** (*see Figure 14 below*).
9. Use a **HEX WRENCH** to loosen the two **HEX NUTS** on the **MOTOR MOUNTING PLATE**.

Figure 14: Bearing Housing Replacement



10. Gently slide the **MOTOR MOUNTING PLATE** toward the back of the shaker. This loosens the **MOTOR BELT** from the **MOTOR PULLEY** and the **LARGE COUNTERWEIGHTED PULLEY**. When you move the **MOTOR MOUNTING PLATE** back, the **MOTOR BELT** falls from both belt tracks.
11. Remove **MOTOR BELT** and set aside.
12. Use an **ALLEN KEY** to remove the **ALLEN SCREW** from the **LARGE BEARING HOUSING PULLEY**.
13. Remove the **LARGE BEARING HOUSING PULLEY** from the **BEARING HOUSING SHAFT**.
14. Remove the **BEARING HOUSING**.
15. Place the new **BEARING HOUSING** inside the shaker.
16. Replace and tighten the four **NUTS** to the **STUD SCREWS**.
17. Replace the **LARGE BEARING HOUSING PULLEY** onto the **BEARING HOUSING SHAFT**. Replace the **ALLEN SCREW** and tighten.
18. Set the set screw to the shaft flat. Do not tighten.
19. Place the **MOTOR BELT** around the **MOTOR PULLEY**.
20. Guide the **MOTOR BELT** around the **LARGE BEARING HOUSING PULLEY**. Move the **MOTOR MOUNTING PLATE** forward, until you feel a slight resistance.
21. Adjust the belt so that the belt is level as related to the **MOTOR PULLEY**.
22. Verify that the **MOTOR BELT** has a slight pressure near the center.
Recommended deflection is 3/8 inch (9.5 mm).
23. Tighten the two **HEX NUTS** on the **MOTOR MOUNTING PLATE** when tension is correct.

24. Replace and tighten the four **NUTS** that are on the **STUD SCREWS** to secure the **BEARING HOUSING**.
25. Replace the shaker platform. Replace the four **HEX SCREWS** into the center of the platform and tighten with the **HEX KEY**.
26. Replace all shelving.
27. Replace the small panel and on the left side of the shaker. Replace the eight Phillips (+) head screws and tighten with a Phillips (+) head screwdriver.
28. Lift up hinged front panel and replace the three screws. Use a Phillips (+) head screwdriver to tighten the screws.
29. Close the door of the shaker.
30. Reconnect the **POWER CORD** to the electrical outlet.

9.6 Light Replacement



WARNING!

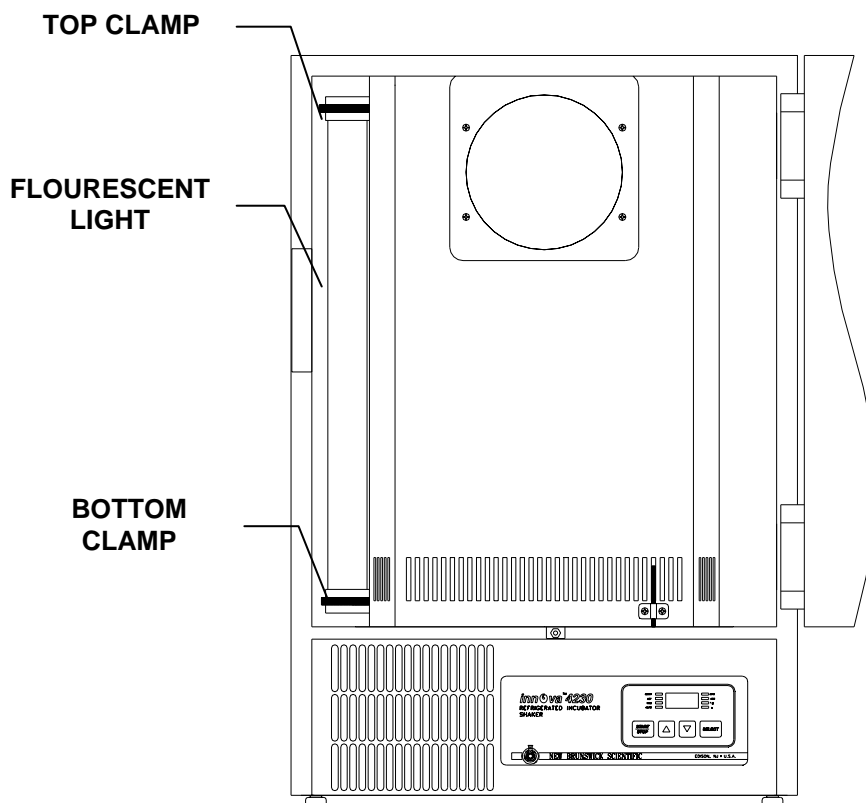
Only a qualified Service Engineer may perform this procedure.

The fluorescent light for the shaker is on the back, left wall of the cabinet. Two clips hold the light in place; one clip is on the top and the other is on the bottom. Four wires connect the light to the **TERMINAL BLOCK**.

To replace the light in the Innova 4200:

1. Set the **ON/OFF POWER SWITCH** to **OFF**.
2. Disconnect the **POWER CORD** from the electrical outlet.
3. Remove all the shelving from the inside cabinet.
4. Open the door of the shaker. Use a Phillips (+) head screwdriver to unscrew the three screws that attach the hinged front panel to the housing. Gently lay down the front panel.

Figure 15: Light Replacement



 **NOTE:**

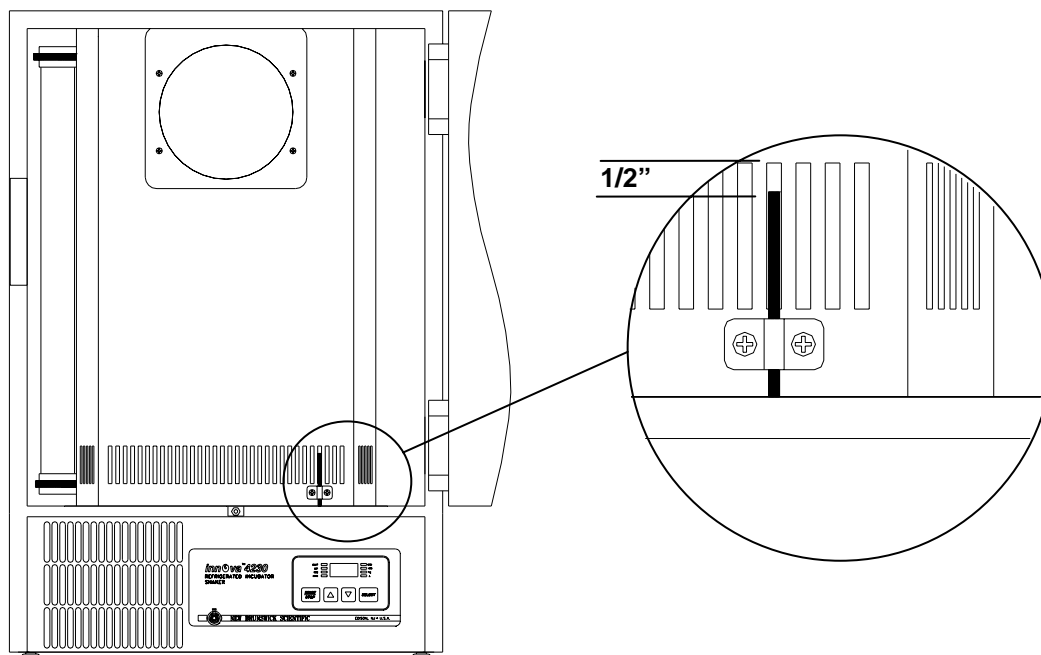
Make a note of the wiring locations and the color of the wires before you disconnect wires from the terminal block. Refer to your notes when you reconnect the wires to the terminal block.

5. Remove the top four wires that connect the **LIGHT WIRES** to the **TERMINAL BLOCK**. The **TERMINAL BLOCK** is on the left, side wall of the shaker.
6. Place one hand on the light and the other near the **TOP CLAMP** (*see Figure 15 above*). Carefully, but with some force push the light to the left. The light will unclamp from the **TOP CLAMP**. Do the same for the **BOTTOM CLAMP**.
7. Carefully pull the light forward and guide the unconnected wires out through the **RUBBER GROMMET** on the bottom of the shaker.
8. Carefully push and clamp the new light to the **TOP** and **BOTTOM CLAMPS**.
9. Feed the unconnected wires back through the **RUBBER GROMMET** on the bottom of the shaker.
10. Connect the top four wires to the **TERMINAL BLOCK** as removed.
11. Lift up hinged front panel and replace the three screws. Use a Phillips (+) head screwdriver to tighten the screws.
12. Replace and secure all shelving. Close shaker door and plug the **POWER CORD** into the electrical outlet.

9.7 Temperature Sensor Adjustment

The temperature sensor is located in the bottom right of the center panel of the back wall. It is held in place by a bracket and can be adjusted vertically. The sensor should be adjusted so that there is a ½ inch gap between the tip of the sensor and the top of the slot that it rests in front of.

Figure 16: Temperature Sensor Adjustment



To adjust the temperature sensor:

1. Set the **ON /OFF POWER SWITCH** to **OFF**.
2. Disconnect the **POWER CORD** from the electrical outlet.
3. Remove all the shelving from the inside cabinet.
4. *If the sensor and bracket have been removed*, set the sensor, sensor bracket and mounting screws in place, but do not secure.
5. *If the sensor is still in place*, loosen the sensor bracket screws to allow the sensor to move. Adjust the sensor so that the gap between the tip of the sensor and the top of the slot is ½ inch (*see Figure 16 above*). Secure the sensor bracket screws in place.

9.8 Control Board Replacement



WARNING!

Do not attempt to change boards or electronic components unless you are a qualified Service Engineer.

Integrated Circuits are extremely sensitive and susceptible to damage from electrostatic discharge. Read and follow the following ESD Precautions before replacing any boards.

9.8.1 ESD Precautions

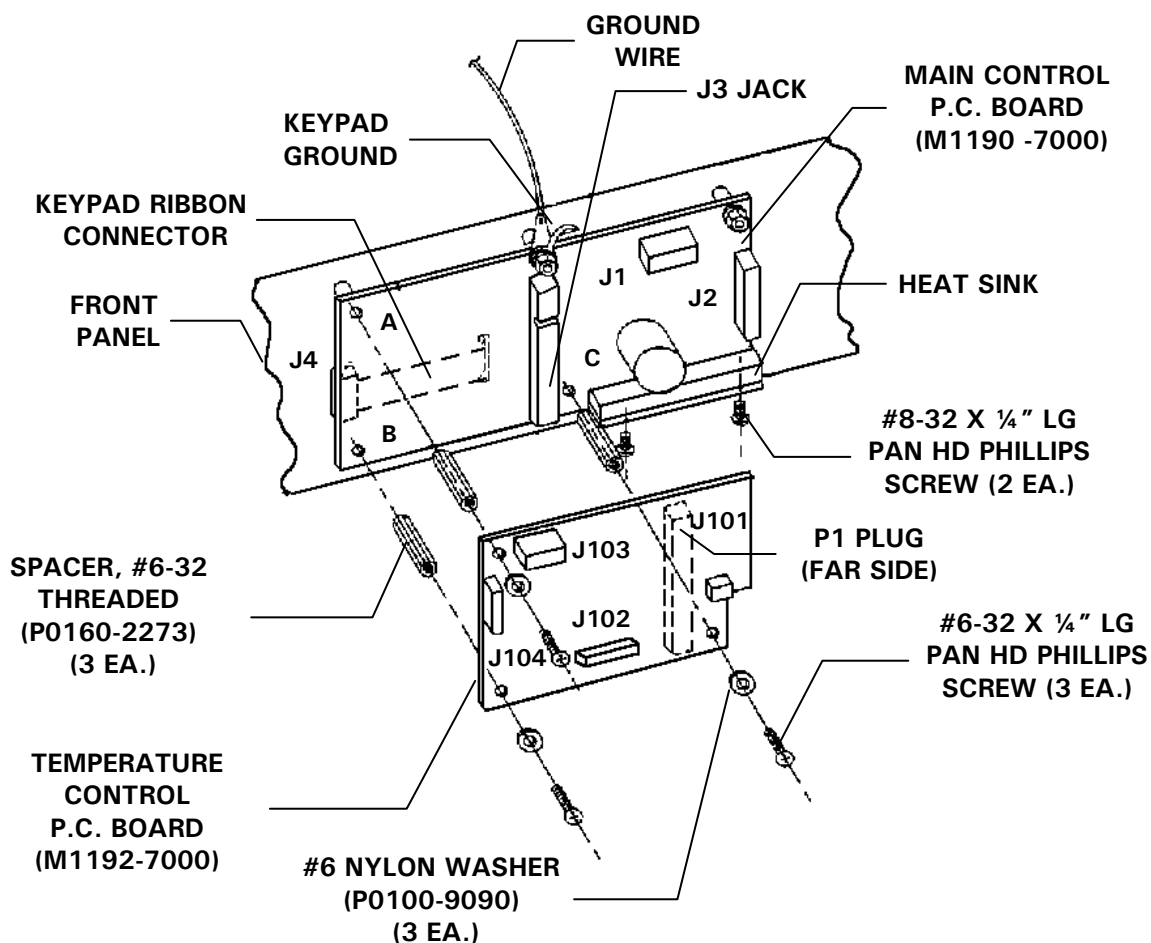
- Do not remove components from their antistatic packaging until you are ready to insert into sockets or install boards.
- Before handling components or boards, touch an unpainted portion of the system unit chassis for a few seconds.
- Wear a grounding wrist strap while working on components. The wrist strap *must* be connected to a grounded work station. Wrist straps are available at most electronic component stores.

9.8.2 Replacing the Temperature Control Board

To replace the **TEMPERATURE CONTROL BOARD**:

1. Set the **ON/OFF POWER** Switch to **OFF**.
2. Disconnect the **POWER CORD** from the electrical outlet.
3. Before you can gain access to the front panel, open the door of the shaker. The door must be open all the way.
4. Use a Phillips (+) head screwdriver to unscrew the three screws that attach the hinged front panel to the housing. Gently lay down the front panel.

Figure 17: Temperature Control Board Replacement



5. As you look down at the inside of the panel, the **TEMPERATURE CONTROL BOARD** is on the right side of the panel. The **TEMPERATURE CONTROL BOARD** lies on top of the **MAIN CONTROL BOARD** (see Figure 17 above). Disconnect the harness wires from connectors **J101**, **J102**, **J103** and **J104**.

NOTE:

As you disconnect the wires, take note of how the wires are positioned.

6. Use a Phillips (+) head screwdriver to unscrew the three screws. Remove the screws and then remove the nylon washers.
7. Use caution as you disconnect the **TEMPERATURE CONTROL BOARD** from the **MAIN CONTROL BOARD**. Apply force perpendicular to the plane of the board. *Do not* lift from one end.

8. Ensure that the board-to-board connectors are properly positioned. Snap the new **TEMPERATURE CONTROL BOARD** onto the **MAIN CONTROL BOARD**. Verify that no pins are visible and the board is secure.
9. Replace the three nylon washers. Replace the three ¼ inch screws. Use a Phillips (+) head screwdriver to tighten the screws.
10. On the **TEMPERATURE CONTROL BOARD**, reconnect the harness wires to connectors **J101**, **J102**, **J103** and **J104**. Ensure that all connectors are properly positioned and secure. Verify that no pins are visible.
11. Lift up hinged front panel and replace the three screws. Use a Phillips (+) head screwdriver to tighten the screws.
12. Close the door of the shaker.
13. Reconnect the **POWER CORD** to the electrical outlet.

9.8.3 Replacing the Main Control Board

To replace the **MAIN CONTROL BOARD**:

1. Set the **ON/OFF POWER** Switch to **OFF**.
2. Disconnect the **POWER CORD** from the electrical outlet.
3. Before you can gain access to the front panel, open the door of the shaker. The door *must* be open all the way.
4. Use a Phillips (+) head screwdriver to unscrew the three screws that attach the hinged front panel to the housing. Gently lay down the front panel.

As you look down, the **MAIN CONTROL BOARD** of the Innova 4200 is on the right side of the panel. The **TEMPERATURE CONTROL BOARD** lies on top of the **MAIN CONTROL BOARD** (see *Figure 17* above). You must remove the **TEMPERATURE CONTROL BOARD** before you can remove the **MAIN CONTROL BOARD**.

5. Disconnect the harness wires from **CONNECTORS J101**, **J102**, **J103** and **J104** on the **TEMPERATURE CONTROL BOARD**.
6. Use a Phillips (+) head screwdriver to unscrew the three screws. Remove the screws and then remove the nylon washers.
7. Use caution, and disconnect the **TEMPERATURE CONTROL BOARD** from the **MAIN CONTROL BOARD**. Apply force perpendicular to the plane of the board. *Do not* lift from one end. Set the **TEMPERATURE CONTROL BOARD** aside.
8. On the **MAIN CONTROL BOARD**, disconnect the harness wires from **CONNECTORS J1** and **J2**.
9. Remove the five **HEX SPACERS** and the five 5/16 inch **HEX NUTS**.
10. Remove the **GREEN GROUND WIRE**.
11. Remove the **KEY PAD GROUND LEAD**.
12. Remove two screws that fasten the **HEAT SINK** to the front panel.
13. Lift the board slightly and disconnect the **KEY PAD RIBBON CONNECTOR** from **J4**.

14. Apply heat sink compound to the **HEAT SINK BRACKET**.
15. Position the gray insulator on the solder side of the new main control board and reconnect the **KEY PAD RIBBON CONNECTOR** to the **J4 CONNECTOR**.
16. Verify that the five ¼ inch **SPACERS** are lined up with the **MOUNTING STUDS**. Set the new **MAIN CONTROL BOARD** in place.
17. Tighten the two screws to the **HEAT SINK BRACKET**.
18. Reconnect the **KEY PAD GROUND LEAD**.
19. Reconnect the **GROUND WIRE**.
20. Reconnect the harness wires to **CONNECTORS J1** and **J2**. Ensure that all connectors are properly positioned and secure. Verify that no pins are visible.
21. Ensure that the board-to-board connectors are properly positioned. Snap the **TEMPERATURE CONTROL BOARD** onto the **MAIN CONTROL BOARD**. Verify that no pins are visible and the board is secure.
22. Replace the nylon washers. Replace the three ¼ inch screws. Use a Phillips (+) head screwdriver to tighten screws.
23. On the **TEMPERATURE CONTROL BOARD**, reconnect the harness wires to connectors **J101**, **J102**, **J103** and **J104**. Ensure that all connectors are properly positioned and secure. Verify that no pins are visible.
24. Lift up hinged front panel and replace the three screws. Use a Phillips (+) head screwdriver to tighten the screws.
25. Close the door of the shaker.
26. Reconnect the **POWER CORD** to the electrical outlet.

10 TROUBLESHOOTING

If any problems occur with your Innova 4200, do not attempt to perform any service on the shaker. Unauthorized servicing may void the warranty. Please contact your local NBS Service Department or local NBS distributor.

In any correspondence with NBS, please refer to the Model Number, Manufacturing Part Number and Serial Number of your shaker. This information is on the **ELECTRICAL SPECIFICATION PLATE** on the side of the Innova 4200.

10.1 Troubleshooting Guide

Symptom	Possible Cause	Solution
LED Display does not illuminate	Power cord not connected	Verify power cord is plugged into power source
	No power supplied to power source	Verify power source is active
	Fuse may need replacement	Verify fuse voltage/Verify fuse is good
	Motor may need replacement	Call local NBS Service Department or contact your local NBS distributor
LED reads ACC	Motor not operating properly	Call local NBS Service Department or contact your local NBS distributor
LED reads ERR	Temperature Probe not making proper contact	Call local NBS Service Department or contact your local NBS distributor
Shaker does not move	Fuse may need replacement	Verify fuse voltage/Verify fuse is good
	Motor may need replacement	Call local NBS Service Department or contact your local NBS distributor

10.2 Fuse Replacement



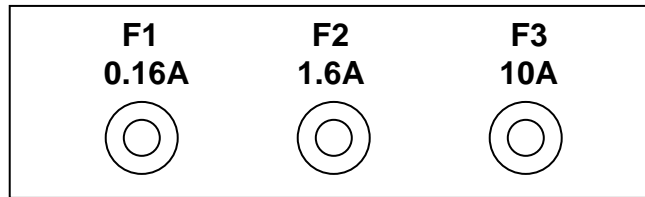
CAUTION!

The following procedure must be performed only by a qualified Electrical or Service Engineer.

There are two fuses for the Innova 4200. They are located behind the front panel. To replace a fuse:

1. Set the **ON/OFF POWER** Switch to **OFF**.
2. Disconnect the **POWER CORD** from the electrical outlet.
3. Before you can gain access to the front panel, open the door of the shaker. The door *must* be open all the way.
4. Use a Phillips (+) head screwdriver to unscrew the three screws that attach the hinged front panel to the housing. Gently lay down the front panel.

Figure 18: Fuse Replacement



5. Gently twist the black cap until the fuse pops out.
6. Remove the bad fuse and replace it with a new fuse.
7. Replace the black cap and twist until tight.
8. Lift up hinged front panel and replace the three screws. Use a Phillips (+) head screwdriver and tighten the screws.
9. Close the door of the shaker.
10. Reconnect the **POWER CORD** to the electrical outlet.

11 REPLACEMENT PARTS & ACCESSORY INFORMATION

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

11.1 Replacement Parts Descriptions & Part Numbers

Spare Part Description	Quantity	NBS Part Number
Air Deflector Kit	1	M1233-9994
Bearing Housing Assembly 1" stroke	1	M1233-6330
Bearing Housing Assembly 3/4" stroke	1	M1233-6331
Belt	1	P0700-5242
Bridge Rectifier	1	P0460-4091
Door Gasket	1	M1233-9500
Evaporator	1	K0620-1360
Fan, .75" Dia., 5 or 7 Blade	1	P0620-2561
Filter	1	M1233-9501
Fluorescent Lamp	1	K0300-0160
Ballast Tray	1	K0420-0170
Fuse 1.6 AMP SloBlo-Electronics/F2	1	P0380-3532
Fuse 0.16 AMP FastBlo-Electronics/F1	1	P0380-3710
Heater-250 Watt	1	P0620-1380
Motor	1	M1195-4001
Moisture Proof Plug	1	K0380-0871
PCB Assy. Main Control	1	M1190-9940
PCB Assy. Temperature Control	1	M1192-7000
RTD Assembly	1	M1195-8001
Solid State Relay	1	P0400-3011
Switch Actuator	1	P0400-1538
Starter Fluorescent Light	1	P0400-1430

11.2 Accessory Descriptions & Part Numbers

11.2.1 Quick Change Platform Kit

The Quick Change Platform Kit allows you to snap the platform in with no tools. The kit includes a sub-platform, spring clips, a counterweight and hardware.

Accessory Description	NBS Part Number
Quick Change Platform Kit	M1192-9901

11.2.2 Accessory Platforms

The following table lists *accessory platforms* for the Innova 4200.

Accessory Description	Clamps	NBS Part Number
Universal Platform *	–	M1250-9902
Utility Carrier	–	M1194-9909
Utility Tray	–	M1194-9910
50 ml Erlenmeyer Flask	64	M1194-9903
125 ml Erlenmeyer Flask	34	M1194-9904
250 ml Erlenmeyer Flask	25	M1194-9905
500 ml Erlenmeyer Flask	16	M1194-9906
1 Liter Erlenmeyer Flask	9	M1194-9907
2 Liter Erlenmeyer Flask	5	M1194-9908
4 Liter Erlenmeyer	4	M1233-9930
6 Liter Erlenmeyer Flask	2	M1233-9931
2800 ml Fernbach Flask	4	M1233-9932

*Flask clamps must be ordered separately

11.2.3 Accessory Clamps

The following table lists *accessory clamps* for the Innova 4200:

Accessory Description	NBS Part Number
10 ml Erlenmeyer Clamp	ACE-10S
25 ml Erlenmeyer Clamp	M1190-9004
50 ml Erlenmeyer Clamp	M1190-9000
125 ml Erlenmeyer Clamp	M1190-9001
250 ml Erlenmeyer Clamp	M1190-9002
500 ml Erlenmeyer Clamp	M1190-9003
1 L Erlenmeyer Clamp	ACE-1000S
2 L Erlenmeyer Clamp	ACE-2000S
4 L Erlenmeyer Clamp	ACE-4000S
6 L Erlenmeyer Clamp	ACE-6000S
2800 ml Fernbach Flask Clamp	ACFE-2800S
500 ml Media Bottle Clamp	ACSB-500S
1 L Media Bottle Clamp	ACSB-1000S

11.2.4 Accessory Test Tube Racks

The following table lists *accessory test tube racks* for the Innova 4200:†

Accessory Description	Tube Capacity	NBS Part Number
Test Tube Rack–13 mm	48	TTR–111
Test Tube Rack–20 mm	33	TTR–121
Test Tube Rack–25 mm	21	TTR–122
Adjustable Angle Slant Rack	15	TTR–199
Test Tube Rack 30 mm for 50 ml Centrifuge Tubes	15	TTR–208
Angle Test Tube Rack Holder for 4–5" W (12.7 cm) X15" L (38 cm)		TTR–210

† Test Tube Rack requires Universal Platform.

NOTE:

The adjustable angle slant rack can hold test tubes 30 mm and smaller. Clips can be adjusted for different test tube sizes by tightening or loosening the screw in the middle of the clip.

11.2.5 Optional Accessory Kits








The following table lists *optional accessories* for the Innova 4200:

Accessory Description	Voltage of Unit	NBS Part Number
Gassing Manifold Kit	All	M1233–0291
Stacking Kit	All	M1233–9992
Spare Parts Kit	All	M1233–6002








11.3 Clamp Hardware Kits

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 following tables below identify the proper screw for your shaker application by reference to the head style.

Hardware for 10 ml to 500 ml Clamps:

<i>Description</i>	<i>Part Number</i>	<i>Qty.</i>	<i>Application</i>
 10-24 x 5/8 (15.87 mm) flat Phillips (+) head screw	S2116-3101	1	3/4" (19.05 mm) thick wood platform 
 10-24 x 5/16 (7.9 mm) flat Phillips (+) head screw	S2116-3051	1	5/16" (7.9 mm) thick aluminum, phenolic and stainless steel platforms.  
 10-32 x 5/16 (7.9 mm) flat slotted (-) head screw	S2117-3050	1	all stainless steel platforms 

Hardware for 1-Liter to 6-Liter Clamps:

<i>Description</i>	<i>Part Number</i>	<i>Qty.</i>	<i>Application</i>
 10-24 x 5/8 (15.87 mm) flat Phillips (+) head screw	S2116-3101	5	3/4" (19.05 mm) thick wood platform 
 10-24 x 5/16 (7.9 mm) flat Phillips (+) head screw	S2116-3051	5	5/16" (7.9 mm) thick aluminum, phenolic and stainless steel platforms.  
 10-32 x 5/16 (7.9 mm) flat slotted (-) head screw	S2117-3050	5	all stainless steel platforms 

(This chart includes 2800 ml Fernbach flasks.)

12 DRAWINGS

12.1 Schematics

Figure 19: Electrical Schematic, Overview

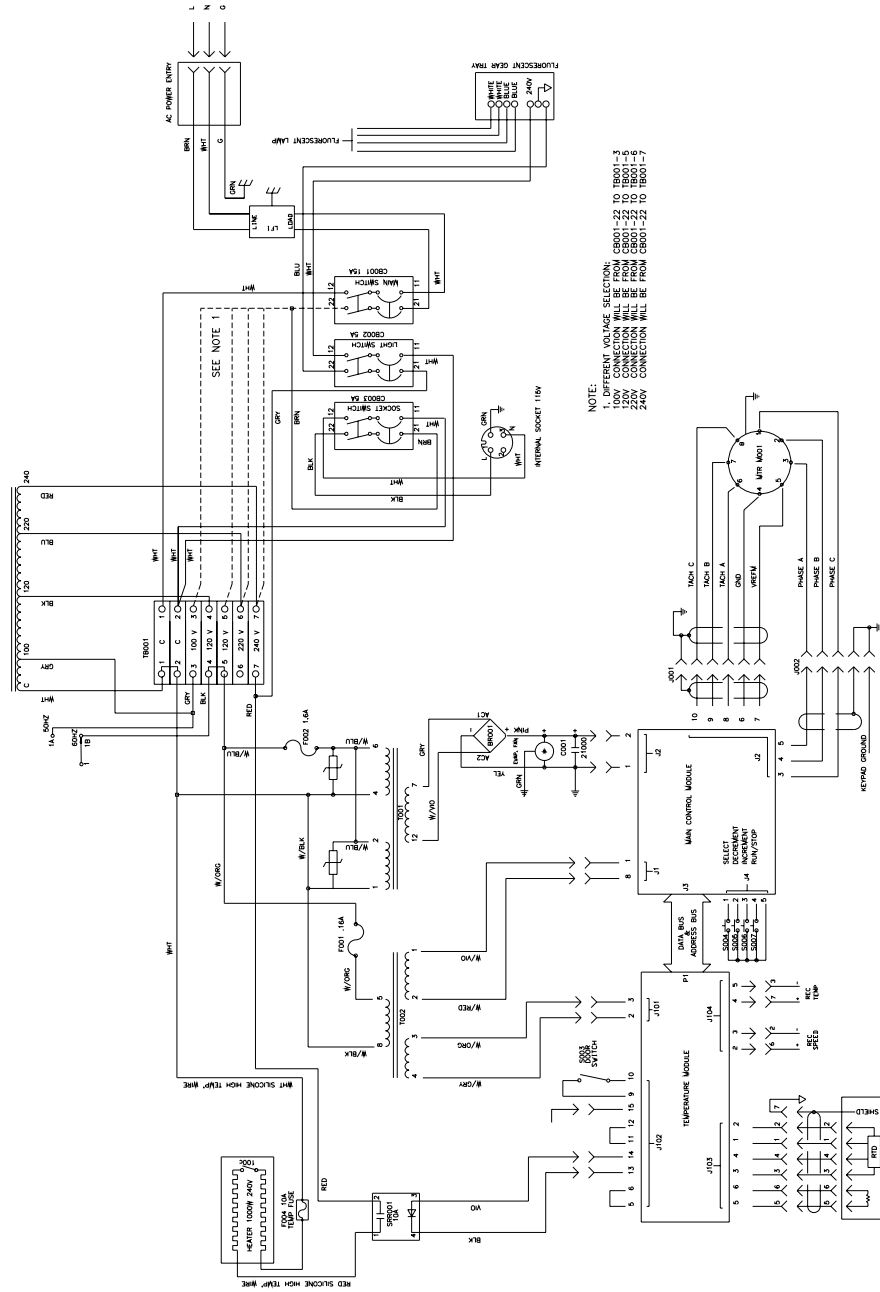


Figure 20: Schematic for Optional Photosynthetic Light Bank, Overview

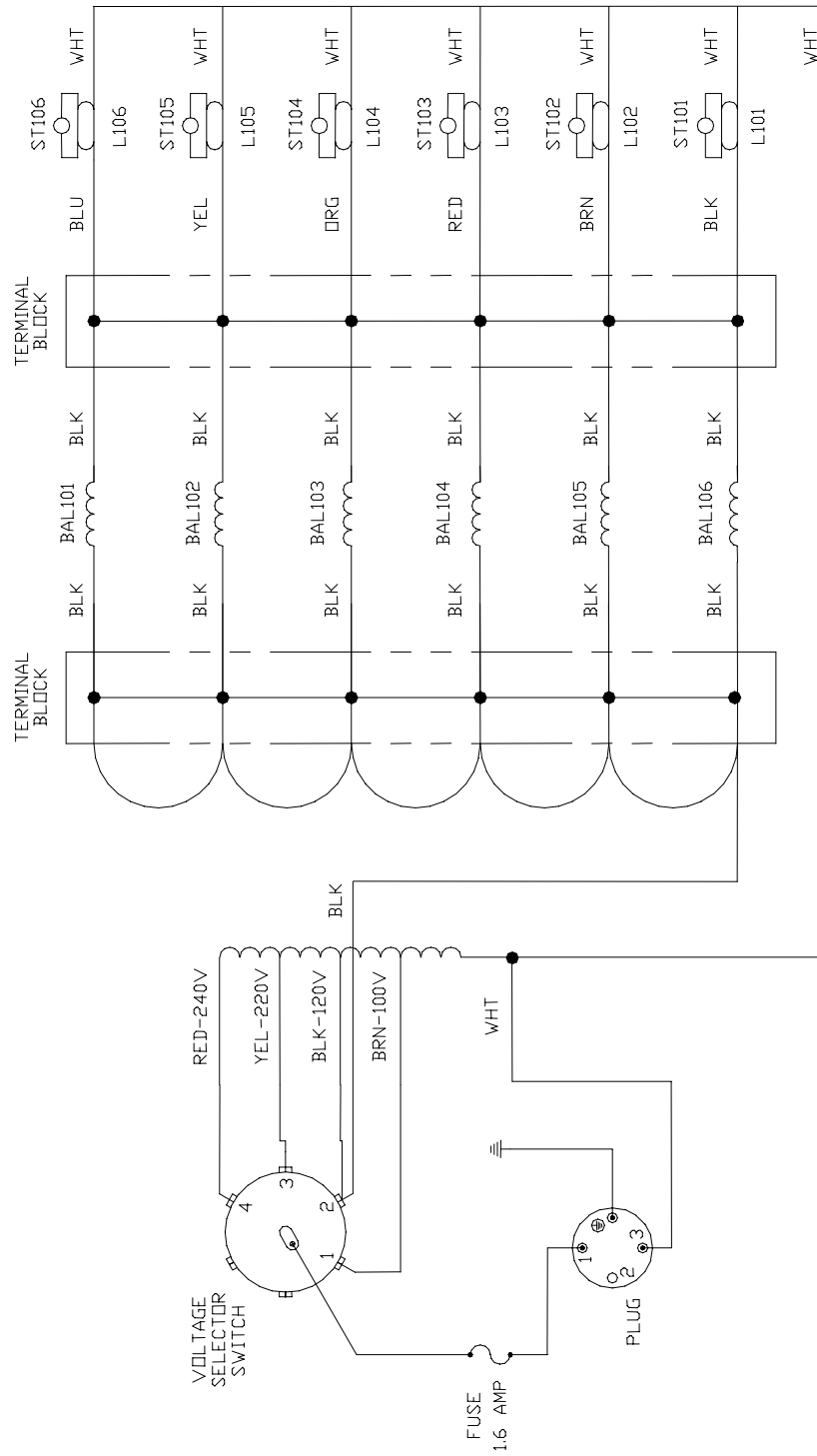
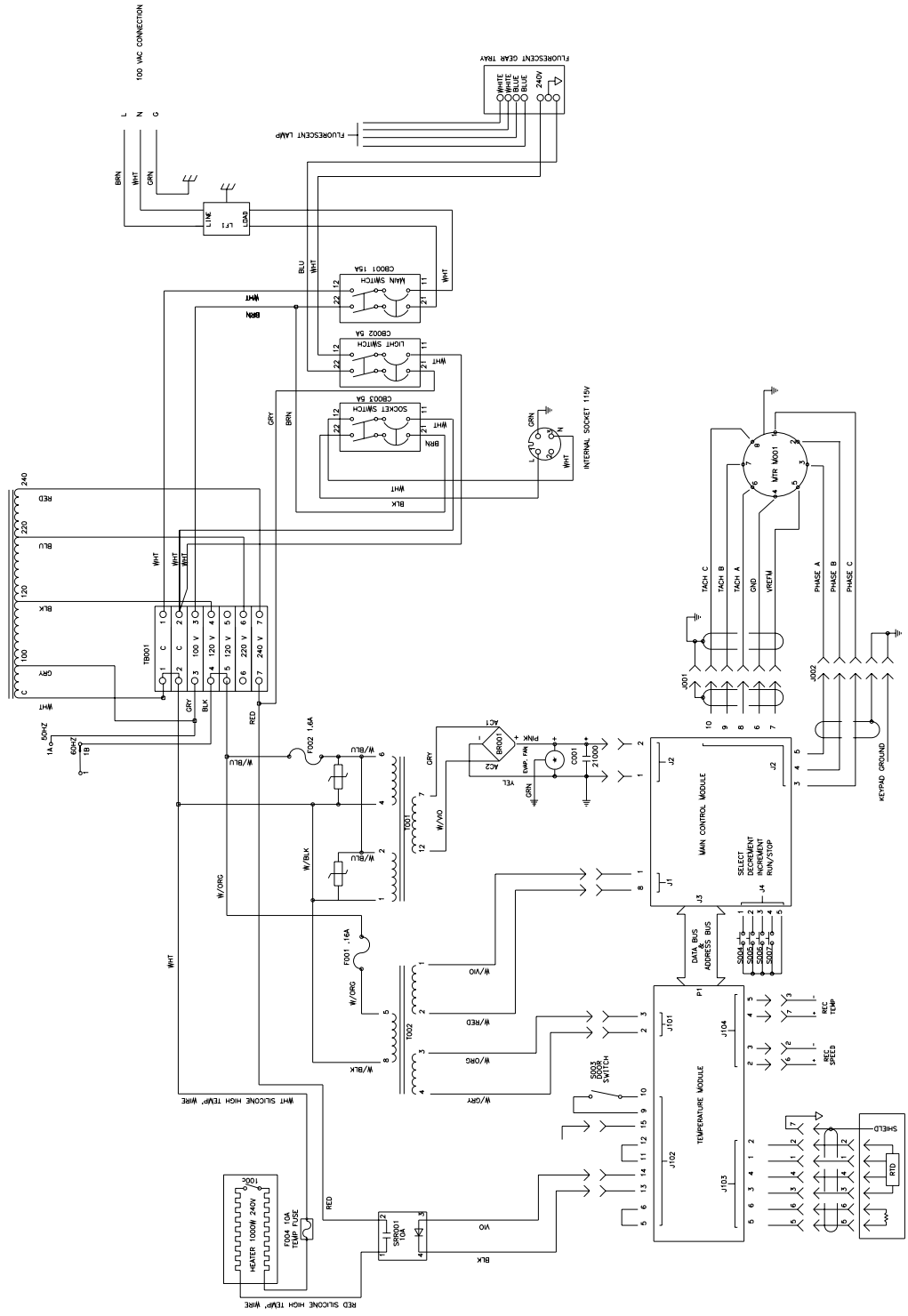


Figure 21: 100V Power Schematic, Overview



12.2 Index of Drawings

Figure Number	Description	Page
1	Keypad Detail	15
2	Front Panel	16
3	Side Panel	16
4	Rear Panel	17
5	Frequency Selector Switch	18
6	2- to 6-Liter Flask Clamp Installation	20
7	Switch Panel Detail	22
8	Shelf Detail	27
9	Air Deflector Installation	28
10	Detail of 9-Pin Recorder Connector	29
11	Electrical Moisture-Proof Plug	31
12	Motor Belt Replacement	36
13	Motor Replacement	37
14	Bearing Housing Replacement	40
15	Light Replacement	42
16	Temperature Sensor Adjustment	43
17	Temperature Control Board Replacement	45
18	Fuse Replacement	49
19	Electrical Schematic	54
20	Schematic for Optional Photosynthetic Light Bank	55
21	100V Power Schematic	56

13 INDEX

A

- Accessories
 - Description, 50
 - Part Numbers, 50
- Actual Temperature, 24
- Air Deflector
 - Installation of, 28
- Alarm Functions, 25
- Ancillary Equipment
 - Using with Innova 4200, 30

C

- CAUTION
 - Symbol for, 5
- Clamp Hardware
 - Application Chart, 53
- Clamps
 - Installation, 20
 - Part Numbers for, 51
- Cleaning Procedures, 33
- Copyright Notice, 5

D

- Dehydration In The Chamber, 27
- Disclaimer Notice, 5
- Drawings
 - Index of, 57

E

- Equipment
 - Inspection Of, 13
 - Unpacking Of, 13
- ESD Precautions, 44

F

- Fan Replacement
 - recirculating fan, 39
- Features
 - function indicators, 14
 - led display, 14
 - select key, 14
 - start/stop key, 14
 - status indicators, 14
- Frequency
 - Setting the, 18
- Function Indicators

- °C, 15
- hours, 15
- rpm, 15

G

- Gassing cultures, 29

I

- Incubation, 26
- Index of Drawings, 57
- Indicated Temperature, 24
- Inspection
 - of boxes, 12
- Installation
 - Platform Clamps, 20
- International Offices
 - List of, 3

L

- Location
 - Environment, 13
 - Physical, 13

M

- Main Control Board Replacement, 46
- Maintenance
 - Cleaning Procedures, 33
 - Total Running Time, 26
- Maintenance Light
 - Disabling The, 33
- Manual Conventions, 5

N

- NOTE
 - Symbol for, 5

O

- Operating Procedures
 - alarm functions, 25
 - Continuous Run, 22
 - Maintenance Light, 33
 - Temperature, 23
 - Timed Run, 25
 - Total Running Time, 26
- Optional Kits
 - Part Numbers for, 52

Overview, 9

P

Platform

Clamp Installation Chart, 20

Platform Installation

Quick Change, 19

Standard, 19

Platforms

Part Numbers for, 51

R

Recirculating Fan Replacement, 39

Recorder Connector, 29

Replacement Parts

Descriptions, 50

Part Numbers, 50

S

Service Procedures, 35

Main Control Board Replacement, 46

recirculating fan replacement, 39

Temperature Control Board Replacement, 44

Temperature Sensor Adjustment, 43

Shelf, Installation, 27

Specifications, 10

Status Indicators

maint, 14

mute, 14

set, 14

time, 14

T

Temperature Control Board Replacement, 44

Temperature Correction Value, 24

Temperature Offset Calibration, 24

Temperature Sensor Adjustment, 43

Test Tube Racks

Part Numbers for, 52

Troubleshooting

Guide, 48

W

WARNING

Symbol for, 5

Warranty, 6