New Brunswick
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Guide to Operations

Innova® 42/42R
Benchtop and Stackable
Incubator Shakers

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CAUTION!

This equipment *must* be operated as described in this manual. If operational guidelines are not followed, equipment damage and personal injury *can* occur.

Please read the entire User's Guide before attempting to use this shaker.

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

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

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 <u>regarding heavy objects</u> which, if not followed correctly, could result in serious personal injury .**
	***Biohazard*-related messages.**

WARRANTY

New Brunswick Scientific's equipment is protected by a comprehensive warranty. The warranty covers faulty components and assembly, and our obligation under this warranty is limited to repairing or replacing the instrument or part thereof, which shall prove to be defective after our examination.

The NBS warranty does not cover loss of time or materials, such as the loss of biological or biochemical by-products caused by any work interruption resulting from equipment failure; it does not extend to equipment that has been subject to misuse, neglect, accident or improper installation or application; nor does it cover any machine that has been repaired or altered by anyone other than an authorized NBS factory-trained service representative, without prior approval from your local NBS sales office.

Expendable items such as bearings and seals, lamps, probes, sensors including incubator sensors, glass, filters, etc., are not covered.

The warranty begins on the date the equipment ships and extends through the period indicated in the chart below:

Instrument		Parts Warranty	Labor Warranty
Shakers	Innova®	3 years	2 years
	I Series	2 years	2 years
	Excella® & C-76	2 years	2 years
	Accessories[1]	1 year	1 year
CO_2 Incubators	Incubators	2 years	2 years
	Accessories[2]	1 year	1 year
Freezers	ULT Freezers	5 years; Vacuum insulation panels: 12 years	2 years
	Accessories[3]	1 year	1 year
Fermentors, Bioreactors & all other NBS equipment		1 year	1 year

1 Chart recorders, photosynthetic light banks, etc.
2 Stacking stand, casters, shelves, etc.
3 Chart recorders, CO_2/LN_2 back-up systems, etc.

Warranty Registration

To register your warranty with NBS, complete the online form at www.nbsc.com under the **How Can We Help?** tab, or use the warranty card enclosed with your equipment.

Extended Warranty Option

A variety of service plans are offered to help minimize downtime from unexpected malfunctions in equipment operation. Speak to your NBS sales representative for more information.

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1 OVERVIEW

The Innova 42/42R Benchtop Incubator Shakers are benchtop or floor stackable orbital shakers that utilize a triple eccentric counter-balanced drive mechanism. They provide horizontal plane rotary motion in either a ¾-inch (1.9 cm) or a 1-inch (2.54 cm) diameter circular orbit, depending on the model. A Proportional/Integral (PI) microprocessor controller with instantaneous digital feedback controls the speed over the entire speed range.

The Innova 42R provides temperature control from 20ºC below ambient (with a minimum setpoint of 4ºC) to 80ºC, and the Innova 42 from 5ºC above ambient to 80ºC. Naturally, both these ranges depend on relative humidity and other ambient factors, as well as the options installed in the unit. Ambient temperature is measured at one meter from the exterior of the unit.

Erlenmeyer flasks (up to 6 liters in size), and a wide variety of tubes and plates can be accommodated using the New Brunswick Scientific shaker accessories described in Section 8.7.

The Innova 42/42R may be operated in the following ways:

- **Continuously:** at a set speed and temperature, until user intervention.
- **In a timed mode:** run at a set speed, time and temperature for a period of up to 99.9 hours, after which the shaker automatically shuts off.
- **Via the shaker's programmable controller:** run through multiple temperature and speed changes for an extended period of time.
- **Via computer through an RS-232 interface.**

For safe operation, the Innova 42/42R shakers are designed with a safety switch that automatically stops the shaker mechanism when the door is opened.

The Innova 42/42R is equipped with visual and audible alarms that alert the user to the following conditions:

- The end of a timed run
- Deviations from speed setpoint
- Deviations from temperature setpoint
- Power failure
- Door open

To accommodate customer needs, a wide variety of platforms can be used with the Innova 42/42R:

- Universal platforms are the most flexible, providing hole patterns for flask clamps, test tube racks and other accessories.
- Dedicated platforms are supplied with flask clamps attached; they are designed solely and expressly for this purpose.
- Test tube racks, microplate holders, and test tube rack holders are also available (a universal platform is needed for all test tube racks and holders).

For further information on these accessories, see Section 8.7.

2 INSPECTION & UNPACKING OF EQUIPMENT

2.1 Inspection of Boxes

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

2.2 Packing List Verification

Verify against your NBS packing list that you have received all of the correct materials.

2.3 Unpacking of Equipment

WARNING!

Do not attempt to lift the Innova 42/42R by yourself. Always ask for assistance or use a lifter or other suitable equipment when raising or handling the unit.

Upon unpacking the unit, inspect it carefully for any damage that may have occurred during transit. Report any apparent damage to the carrier and to your New Brunswick Scientific sales representative. Save the crate and packing materials.

NOTE:

Use of the Innova 42/42R Shakers requires a platform, which is a separate item. ***See the Available Platforms list in Section 8.7.1.***

2.4 Out of Box Concerns

If any part of your order was damaged during shipping, is missing, or fails to operate, fill out the "Customer Feedback" online at www.nbsc.com/CustomerFeedback.aspx or call New Brunswick Scientific's or your distributor's service department.

2.5 Warranty Registration

Please complete and return your warranty card or register electronically at our Website: www.nbsc.com

3 PREPARING THE LOCATION

3.1 Physical Location

> ***WARNING!***
> **Do not attempt to lift the Innova 42/42R by yourself. Always ask for assistance or use a lifter or other suitable equipment when raising or handling the unit.**

The surface where you place the Innova 42/42R should be smooth, level and sturdy, and must be able to accommodate 300 pounds.

3.2 Environment

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

- 10º to 35°C
- 20 to 80% Relative Humidity (non-condensing)

3.3 Electrical Requirements

The Innova 42/42R can be equipped to run on:

- 100 Volts, 50/60 Hz, 1500 VA maximum
- 120 Volts, 60 Hz, 1500 VA maximum
- 230 Volts, 50 Hz, 1500 VA maximum

In all cases, voltage variations must not exceed ±10%.

3.4 Space Requirements

It is essential that the shaker be situated in an area where there is sufficient space for the unit and its service lines (*see Figure 1*).

The dimensions of the Innova 42/42R are:

Width	25.00 inches	63.50 cm
Depth	29.33 inches	74.49 cm
Height	32.22 inches	81.84 cm

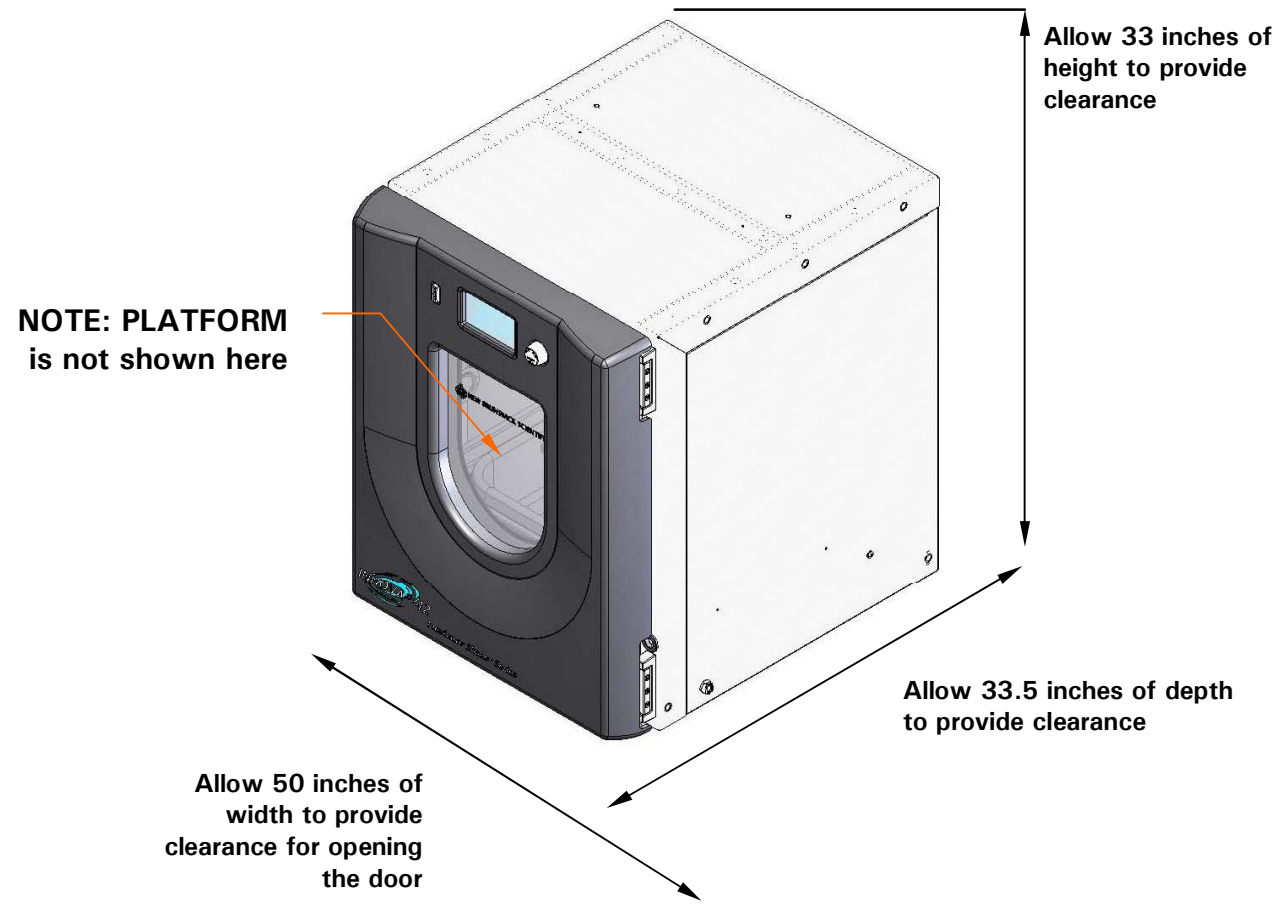
The effective surface area required for operation is:

Width	29 inches	74 cm
Depth	33.5 inches	85 cm

NOTE:

Be sure to allow at least four inches (10 cm) around shaker for ventilation, access to power cord (rear panel), and access to power switch and RS-232 port (right side).

Figure 1: Space Requirements



4 INSTALLATION

4.1 Platform Installation

A platform must be installed on the unit prior to use. See Section 6.2 for detailed instructions.

NOTE:

The platform is recommended for speeds up to 400 RPM. For reference, see the Load/Speed graphs provided in Appendix D, Section 14.

4.2 Flask Clamp Installation

Flask clamps purchased for use with universal platforms (*see Section 8.7.1*) require installation. Clamps are installed by securing the base of the clamp to the platform with the correct type and number of screws. All clamps are shipped complete with hardware.

NOTE:

The Innova 42 and 42R platforms require 10-24 x 5/16-inch Phillips-head screws (which are supplied) to fasten flask clamps.

Clamps for 2 liter flasks or larger are shipped with an additional girdle to keep the flasks in place. The girdle is an assembly of springs and sections of rubber tubing. One girdle is already in place on the clamp, the other is packed separately. To install these double girdle clamps:

1. Place the clamp on the platform, aligning its mounting holes with holes on the platform. Secure the clamp in place using the flat Phillips head screws provided (#S2116-3051, 10-24 x 5/16-inch). *Use Figure 2b to help you identify the proper screws, as three different types of screws are shipped with the clamps*.
2. With the first girdle in place, as delivered, on the upper part of the clamp body (*see Figure 2a*), insert an empty flask into the clamp.
3. After making sure the sections of tubing are located between the clamp legs, roll the first girdle down the legs of the clamp as far as it can go. The tubing sections will rest against the platform, and the springs will be under the clamp base.
4. Place the second girdle around the upper portion of clamp body (just as the first girdle was initially). Make sure that its spring sections rest against the clamp legs, while its rubber tubing sections sit against the flask, in between the clamp legs.

Figure 2a: Double Girdle Clamp Installation

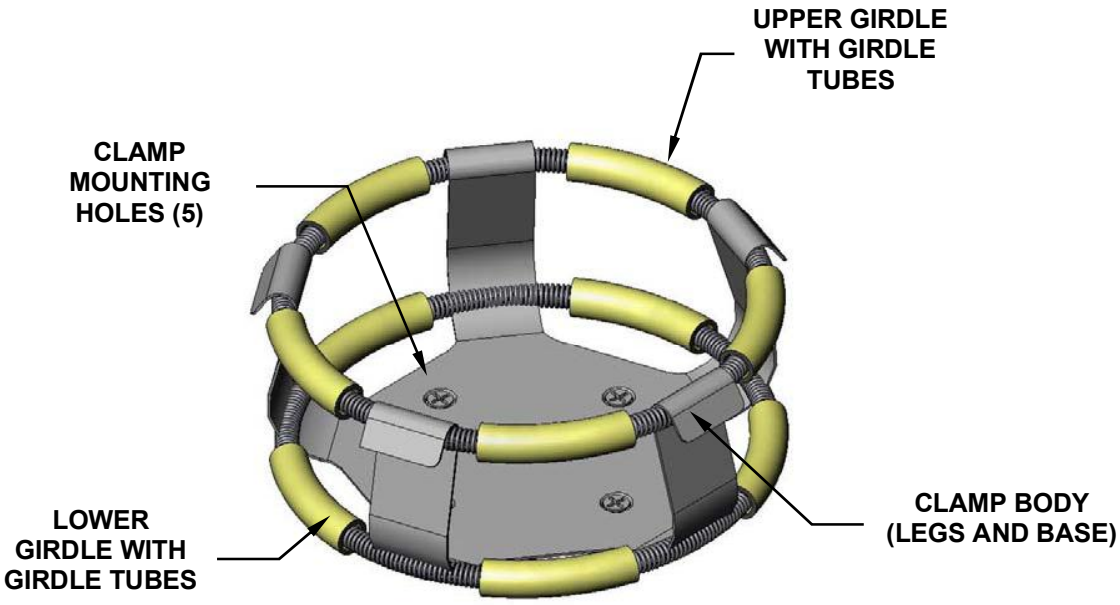


Figure 2b: Clamp Fastener

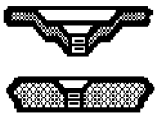
NOTE:

The upper girdle secures the flask within the clamp, and the bottom girdle keeps the flask from spinning.

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 table identifies the proper screw for your shaker application by reference to the head style. Select the appropriate screws and set the others aside.

Table 1: Clamp Hardware Application Chart

No matter what size the clamp, use these screws to fasten them to your platform:

Description	*Part Number*	*Qty.*	*Application*
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. 

NOTE:

One-liter and larger flask clamps are fastened with 5 screws.

4.3 Electrical Connections

CAUTION!

Before making electrical connections, be sure to check the following:

1. If you have not already done so, check that the voltage and frequency of your unit are compatible with your electric supply.
2. Remove the caution label from the rear of the unit.
3. Set the circuit breaker on the right side of the unit to the OFF position.

ONLY THEN:

4. Plug the power cord into a grounded electrical outlet.

CAUTION!

A grounded electrical outlet is necessary for the safe operation of this instrument.

4.4 Optional Culture Drawer

If you plan to use the optional culture drawer, it would be a good idea to install it before stacking units. Please refer to Section 5.18 for installation instructions.

4.5 Stacking Instructions

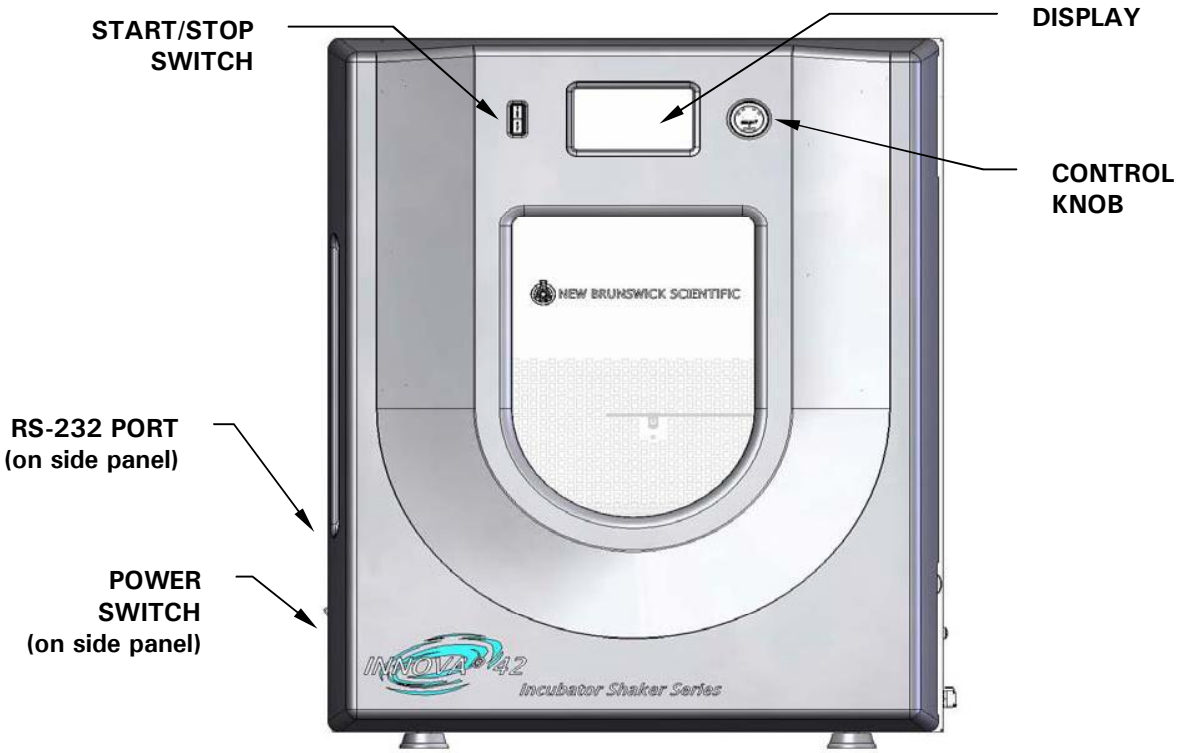
Instructions for stacking two Innova 42/42R shakers or a 42/42R with an Innova 4200/4230 shaker are downloadable from our website (www.nbsc.com) under the Operating Manuals section.

For stacking two Innova 42/42R shakers see T/M1335-0910.
For stacking an Innova 4200/4230 on an Innova 42/42R shaker see T/M1335-0810.

5 FEATURES

5.1 Controls

Figure 4: Front Panel (detail)



- **START/STOP SWITCH** — This switch is used to start or stop the shaker agitation. It will also activate the timer when a timed run is desired. If the unit is stopped and restarted, the timer automatically returns to the beginning of a run.
- **CONTROL KNOB** — This knob is multifunctional. It is used to change screens, and to select and change operating conditions.
- **RS-232 PORT** — See Section 5.8 for details.
- **POWER SWITCH** — This rocker switch is a circuit breaker that turns power on and off to the entire Innova 42/42R.

NOTE:

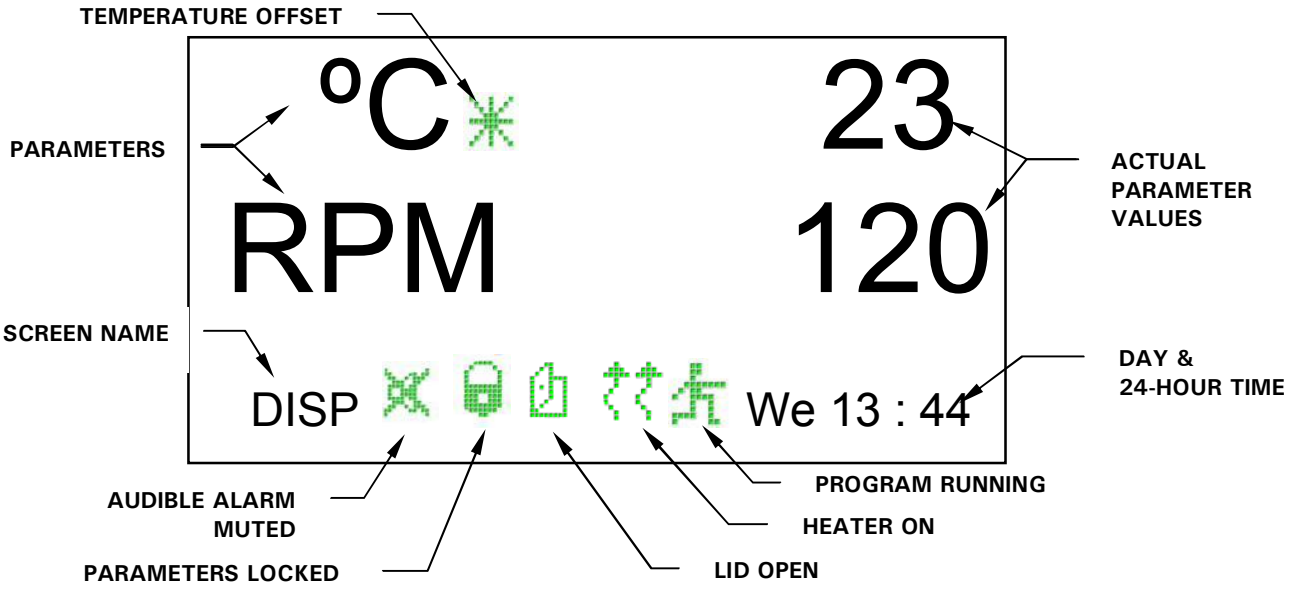
In addition to the power switch, the power cord is also used to conduct power or to break the power circuit to the shaker. Whenever power to the shaker may be a hazard (during cleaning, maintenance or service work), be sure to disconnect the power cord from the electrical outlet.

5.2 LCD Display

When the unit is powered up, using the Power Switch located on the front panel (*see Figure 4*), the initial display screen will remain for a short time while the system boots up.

Then the main screen, called **DISP** for Display, appears (*see Figure 4a*). This screen will indicate the same parameters that were in effect when the power was turned off.

Figure 4a: Display Screen



- For an explanation of the icons on the display screen, see Section 5.4.
- Turning the Control Knob will highlight functions and/or values that can be changed.

For more information on working in the Display Screen, see Section 6.7.1.

5.3 Changing Screens

You can change screens displayed by highlighting the screen name field in the lower left corner, pressing the Control Knob in until it clicks, rotating the Knob left or right (which also makes clicking sounds) to the desired screen and clicking the Control Knob in again. Table 1a describes the various screens:

Table 1a: Screens

Screen Name	*Meaning*	*Features/Modes*
DISP	Display	Shows two user-selectable parameters* and actual values.
SUMM	Summary	Shows all parameters*, setpoints and actual values.
SET	Set-Up	Set day of week, set time, enable or mute alarm, lock or unlock operating parameters
LAMP	Lamps	**Internal chamber light:** ON (always on); OFF (always off); AUTO (default mode), light goes on and stays on when lid is open, shuts off 15 seconds after lid is closed, and goes on for 15 seconds when Control Knob is moved. ¤**Photosynthetic lights (GRO)**: ON, OFF, [1]NONE ¤**UV Light (UV)**: ON, OFF, [1]NONE
COMM	Communication (RS-232)	SET: set baud rate OFF disables RS-232 MONITOR: PC commands shaker to read setpoints and actual values on a schedule determined by PC software. Parameters are unlocked and can be changed by program or manually. SLAVE: PC controls shaker and logs data. TALK: Shaker sends setpoint and actual data to PC at one-minute intervals.
CAL	Calibration	Allows user to enter a temperature offset. Self-calibrates the speed sensor.
PROG	Program	Allows user to set up 1- 4 programs, each with 1-15 steps.

* see Table 2, Display Screen Parameters ¤ Optional [1]Not installed

Table 2: Display Screen Parameters

Parameter Name	*Meaning*
RPM	Shaking speed, in revolutions/minute
ºC	Chamber temperature, in degrees Celsius
HRS	Programmed time remaining, in hours
¤ %RH	Relative Humidity, in percent.
¤ UV	Status of Ultraviolet germicidal lamp
¤ GRO	Status of Photosynthetic growth lamps

¤ Optional

5.4 Display Icons

There are six icons that help identify operating conditions. Five of these icons are located at the bottom of the display, and they are visible, when applicable, in any screen you are viewing, except the Program subscreens. The sixth appears, when applicable, next to ºC whenever the temperature is onscreen.

Table 3: Display Icons

Icon	*Explanation*
	This icon appears when audible alarms are muted.
	This icon appears when the possibility to make manual or programmed parameter changes is disabled (locked). This is controlled by settings on the SET screen. See Section 6.7.3
	This icon appears when the shaker lid is open.
	This icon appears when the Heater is on. See Section 5.10.
	This icon appears when a user-defined Program is running. See Section 6.8.5.
	This icon appears to the right of ºC if the Temperature Offset feature is being used. See Section 6.10.

5.5 Alarms

If an alarm condition exists, the field in the lower right corner will alternate the Day and Time with characters indicating the nature of the alarm condition, accompanied by an audible alarm (unless muted):

Table 4: Alarms

Indication	*Description*
TEMP	The temperature deviates more than 61ºC from setpoint after achieving control temperature range. After door is opened, alarm will be disabled for 5 minutes while chamber recovers to setpoint.
SPEED	The speed deviates more than 65 RPM from setpoint after achieving operating speed setpoint. After door is opened, alarm will be disabled for 5 minutes while chamber recovers to setpoint.
POWER	Indicates unit is powering up (both at normal power-up and after power interruption); will flash until the Control Knob is moved.
HRS	Indicates when timed run is completed.

5.6 Door Operation

When the door is opened, the following will happen:

- Heater turns off
- Shaker stops
- Interior light goes on and, when it is in **AUTO** mode, will remain on for 15 seconds after the lid is closed
- UV germicidal lamp (if so equipped) turns off

5.7 Spill Containment

The Innova 42/42R is equipped with a spill diverter (sub platform) and one-piece plastic liner to protect the drive mechanism from accidental spills and/or broken glassware. This pan can also be used as a water reservoir to humidify the chamber and to reduce evaporation. An optional factory-installed humidity monitor is also available.

The reservoir can be drained through the quick-connect valve on the right side of the unit.

5.8 Software Interfaces

The RS-232 port is located below the Power Switch on the right side of the base (*see Figure 1*). It can be used to interface a computer to the shaker for control of operating conditions or data logging applications (*see Section 11*).

The customer is responsible for securing the proper driver to interface with the RS-232.

5.9 Interior Light(s)

When the **LAMP** screen is in its default **AUTO** mode, the interior ("chamber") light is activated for 15 seconds whenever you turn the Control Knob. It will automatically shut off after 15 seconds of Control Knob inactivity.

The chamber light will also go on when the lid is open.

In addition, you can set the chamber light to be continuously **ON** or **OFF** by selecting either mode in the **LAMP** screen.

There are two additional light options for refrigerated units only: interior photosynthetic growth lamps (*see Section 5.16*) and a germicidal UV lamp located outside the chamber but in the airflow path *(see Section 5.15*).

5.10 Heater

The chamber temperature is sensed by a 1000 ohm platinum RTD. A xxx W heater is controlled using pulse width modulation on a 2.5-second duty cycle. This cycle time is fast enough to prevent noticeable changes in air temperature due to the cycling.

Whenever the heater is on, the Heater On icon  will appear in the display. The heater automatically stops running when the door is opened.

5.11 Refrigeration (42R Only)

The refrigeration system in the Innova 42R is a variable-capacity system carefully designed with self-checks to maintain the setpoint, to balance pressure within the system, and to keep the evaporator from freezing.

When the shaker is powered up, there is a four-minute time delay prior to compressor start-up.

5.12 Service Accessibility

In the unlikely event that your Innova 42/42R should need service, all electronic boards, refrigeration and heating components are easily accessible **to an authorized service technician**.

5.13 Optional Remote Alarm

The Innova 42/42R can be equipped with a factory-installed remote alarm component (NBS part number M1320-8029). When it is hooked up to your relay and receiving equipment, this device will send notification of an alarm condition to the remote location you choose.

5.14 Optional Gassing Manifold Kit

This option is factory-installed. The manifold delivers gas into the chamber via as many as 12 ports. The manifold can be adapted to the desired tubing configuration by adding or subtracting ports or by temporarily clamping off unused tubes. You may elect to use splitters (barbed Y-connectors) after the manifold to increase the number of flasks you can serve.

You determine the appropriate gas flow rate using a pressure regulator (which you supply) on the gas supply.

CAUTION!

- **Never use the gas manifold with flammable gases.**
- **Regulate the gas supply & never exceed 15 PSIG inlet pressure to the manifold.**

50 feet of 1/16-inch (ID) sterilizable silicone tubing is supplied with the kit. Filters may be needed: 0.22µ syringe filters (which you supply) can be fitted to the individual manifold ports to maintain a sterile barrier.

5.15 Optional Germicidal UV Lamp

WARNING!

Never try to operate the UV Germicidal Lamp while the shaker lid is open.

This option, a germicidal ultraviolet lamp, is placed inside the Service Compartment, outside the chamber to help reduce the risk of contamination. The lamp is identified on the display screen as **UV**.

The UV germicidal lamp is factory-installed and available on refrigerated units only. Operation instructions are provided with this option.

5.16 Optional Photosynthetic Lamps

This factory-installed option, available on refrigerated units only, provides six photosynthetic growth lamps inside the chamber. They can be turned on and off manually, by the easily set programmable timer, or by computer. These lamps are identified on the display screen as **GRO**. The replacement bulb part number is P0300-0221.

The recommended operating temperature when using this option is 15 - 37ºC; the maximum operating temperature is 70ºC.

NOTE:

When the GRO lights are on, the unit cannot achieve a chamber temperature *lower* than 13.5°C below ambient.

Specifications:

Bulb type & model:	T8 fluorescent
Lumens @ 25°C:	325
Color Rendering Index (RI):	66

To complement this option, water can be added to the spill pan in order to elevate the humidity level in the chamber. *See Section 6.4 for instructions.*

5.17 Optional Humidity Monitor

This optional factory-installed accessory allows you to monitor relative humidity levels in the chamber throughout your run. When the humidity sensor is present in the chamber, **maximum shaker temperature is automatically limited to 60°C.**

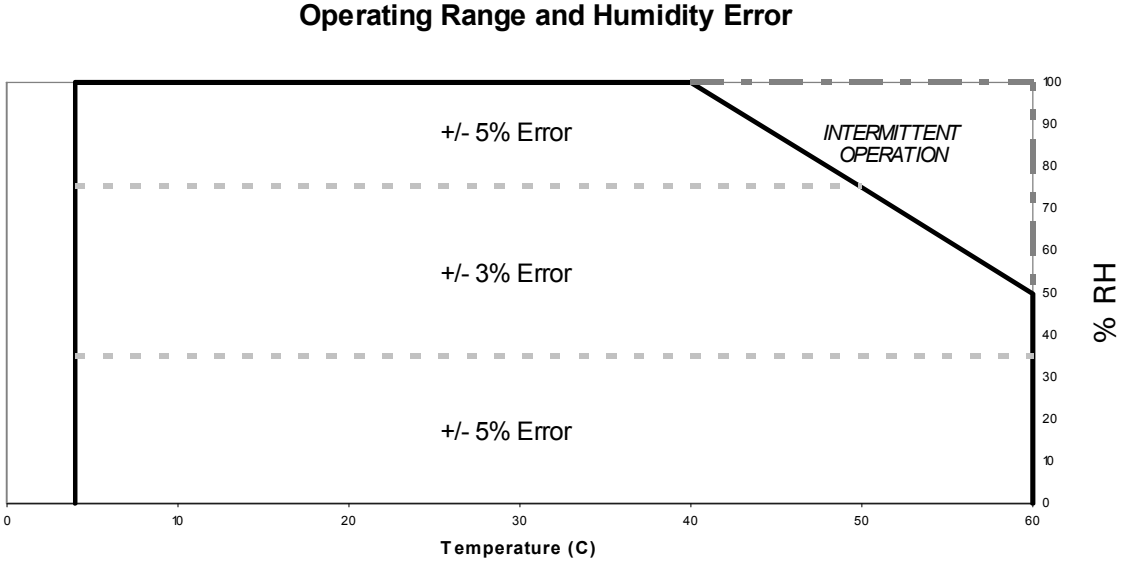
Specifications:

Humidity Operating Range:	0 to 100% RH
Temperature Operating Range:	4 to 60ºC
Accuracy:	See Figure 5: *Operating Range & Error Graph*, on the following page
Hysteresis:	± 1.5% RH
Recovery Time after Saturation:	10 seconds
Long Term Stability:	0.5% RH per year

CAUTION!

Operating the Innova 42/42R with humidity sensor at temperatures above 60ºC can result in *permanent damage* to the sensor.

Figure 5: Humidity Sensor Operating Range & Error Graph



5.18 Optional Culture Drawer

The Innova 42/42R can be equipped with a culture drawer that the user installs inside at the top of the cabinet. The culture drawer is designed to reduce sample dessication. This convenient feature allows you to easily access plates, T-flasks and other samples that need incubation but do not need shaking.

NOTES:

When the culture drawer is in place, the largest flask you can place on the platform beneath it is 2L.

The culture drawer must be installed at the top of the cabinet for best results. Installing it in a lower position will block air flow and significantly disrupt temperature uniformity.

To install the culture drawer:

1. Install the four shelf clips (packaged with the standard shelf) into the rails inside the chamber as you would for the standard shelf. These clips must be at the same height on the rails and near the top of the chamber

2. Ensure that there is enough clearance to install the Culture Drawer into the chamber.

3. Unwrap the Culture Drawer and gently insert it into the chamber, ensuring that the handle faces outside the chamber.

4. Ease the Culture Drawer into position so that it rests on each of the four shelf clips and is well supported.

5. Pull it out and push it in to test its stability.

Your new Culture Drawer is ready for use.

6 OPERATION

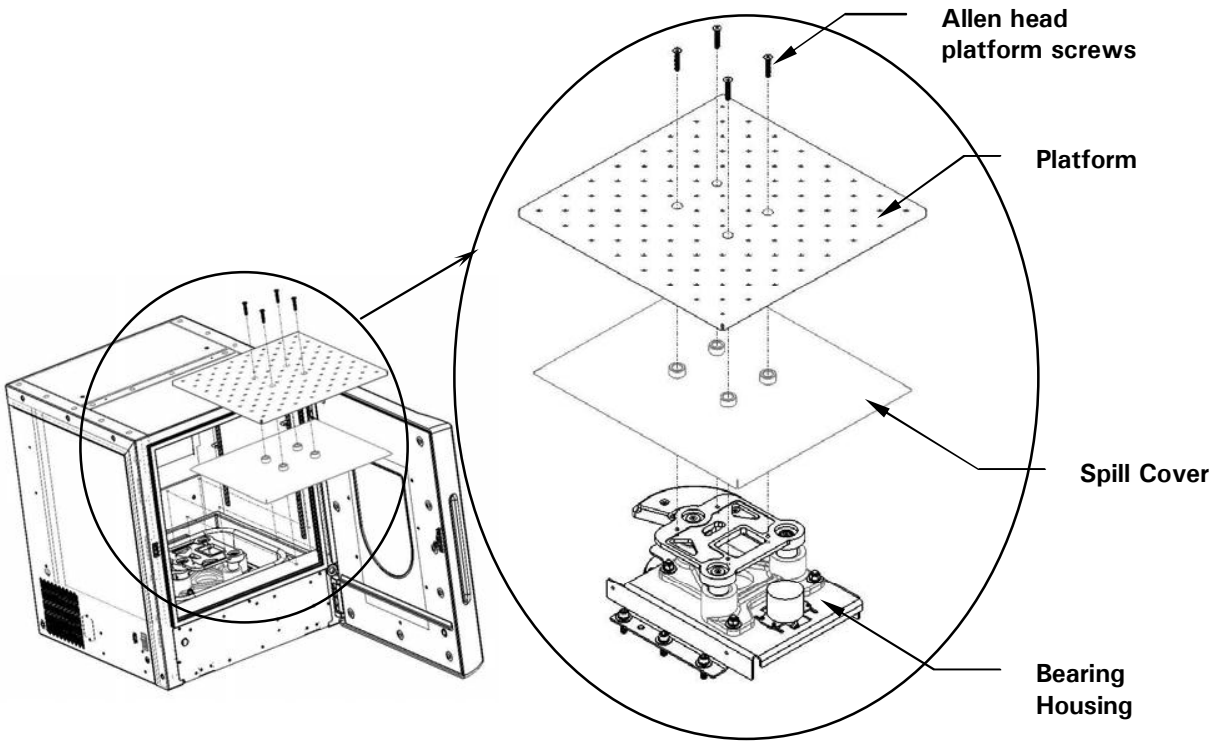
6.1 Platform Assemblies

The Innova 42/42R can be used with a variety of NBS platforms that will accept a wide range of clamps for flasks, test tubes, etc. A platform, which is required for operation, is a separate item, not included with the shaker assembly. Refer to Section 8.7.1 for details on available platforms and platform accessories.

6.2 Installation of Platform

Prior to use, a spill cover and platform must be installed on the unit. The shaker is shipped with 4 Allen head platform screws installed in the bearing housing (*see Figure 6 below, which also shows the spill cover that you must install*). Set the power to OFF and unplug the unit. Remove the platform screws, then use them to install the spill cover (sometimes also referred to as a drip tray) and platform over the bearing housing:

Figure 6: Installing Platform & Spill Cover



6.3 Safety Precautions

Before operating the shaker, verify that anyone involved with its operation has been instructed in both general safety practices for laboratories and specific safety practices for this apparatus.

The user is also responsible for following local guidelines for handling hazardous waste and biohazardous materials that may be generated from the use of this equipment.

If service should be required on a unit that is going to be returned to an NBS facility, it must be completely decontaminated and cleaned prior to its return, and a Returned Material Safety Sheet must be filled out to certify that you have complied. See Section 12, *Product Returns*.

It is the responsibility of the user to carry out appropriate decontamination procedures if hazardous material is spilled on or inside the equipment. Before using any cleaning or decontamination method other than those suggested by the manufacturer, users should check with New Brunswick Scientific that the proposed method would not damage the equipment.

This equipment is **not** "explosion-proof" and should never be used with flammable substances or used to grow organisms that produce flammable by-products.

CAUTION!

To prevent damage to the shaker and its contents, never run the shaker without a platform.

6.4 Filling the Water Reservoir

If you choose to use the spill pan as a water reservoir to reduce evaporation and to raise the humidity level in the chamber:

1. Open the lid and temporarily remove the platform.
2. Make sure that the drain check valve is closed.

NOTE:

As you add water, do not allow the water to splash or flow into the recessed middle of the pan, where the bearing housing assembly is mounted. Pour water *very slowly* into the shallow area beyond the edge of the spill cover to protect the bearing housing.

3. Accessing the pan/reservoir from the left, the right or in front of the spill cover, **slowly** fill the reservoir with no more than 2 liters of distilled water. A long, narrow watering can or a flexible hose will make it easier to access the pan while protecting the bearing housing from accidental overflow.

At a 37°C setpoint, the chamber loses approximately 50 mL/hr from the pan.
At a 25°C setpoint, and placed in a 25°C room, the chamber achieves a relative humidity equilibrium that is approximately 15% above the ambient humidity.

6.5 Draining the Water Reservoir

To drain water from the water reservoir/spill pan:
1. Attach the quick-connect drain fitting, direct it to a container or drain, and allow the water to gravity drain.
2. When the reservoir is empty, detach the fitting.

The spill pan/water reservoir drain is located in the front, on the left, under the humidity tray.

6.6 Starting the Shaker

To initially start the shaker, close the door and turn the power switch (located on the righthand side of the unit) to the **ON (I)** position. The display will come on (first showing only **New Brunswick Scientific**, then briefly displaying the model number, **42** or **42R**, and the stroke, **¾ inch** or **1 inch**, and then quickly moving into the Display screen), and the audible alarm will sound. If you turn the Control Knob, the audible alarm will stop. For details on muting and activating the alarm, see Section 6.9.

When the shaker begins to operate, the LCD display will track the speed as it accelerates to the last entered setpoint. The shaking action may be started or stopped by pressing the Start/Stop button on the front panel.

NOTE:

The shaker will not operate if the door is open. This is indicated by the "door open" icon appearing in the bottom line of the display (see Figure 4a or Table 3).

6.7 Using the LCD Screens

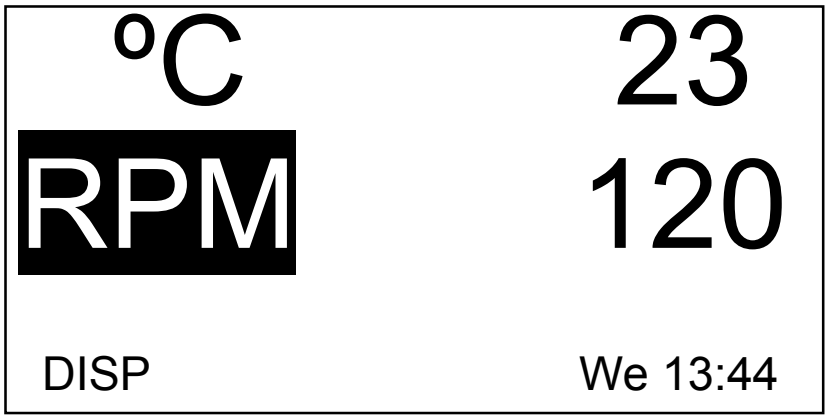
6.7.1 Display Screen

When you turn the power on, this is the first screen to appear after the company title screen. The default display parameters are temperature (**°C**) and shaking speed (**RPM**).

You can change the displayed parameters. **To replace a parameter**:

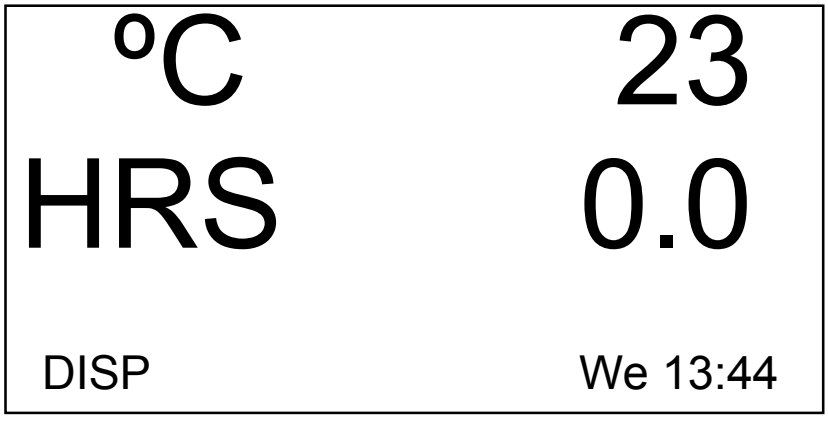
1. Using the Control Knob, highlight the parameter that you wish to replace. For this example, we will replace **RPM** (*see Figure 7*).

Figure 7: Changing Display Parameter



2. Click the Control Knob in. **RPM** will flash.
3. Turn the Knob until the desired parameter appears in the highlighted field. For this example, we will select **HRS**.
4. Click the Knob in, to set and save the parameter (*see Figure 8*).

Figure 8: Changed Display Parameter



NOTE:

If you highlight an item, change it, but do not save your selection, after a few seconds the screen will revert to its previous setting.

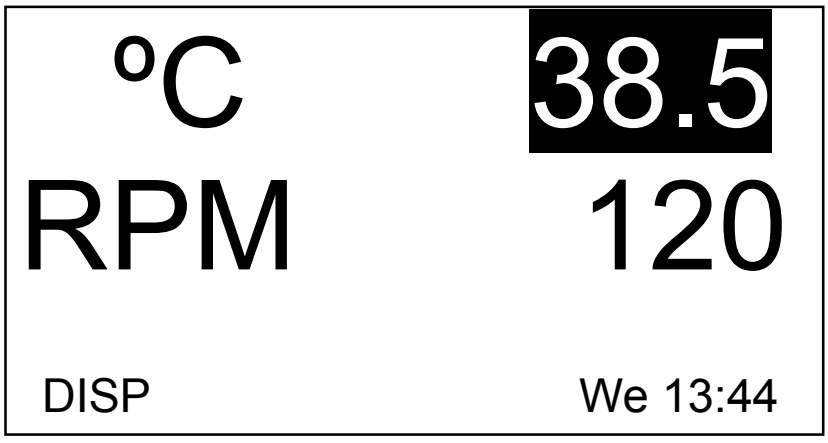
You can also use this screen to verify a setpoint, even though the values displayed here are actual (current) values. **To view a setpoint**:

1. Use the Control Knob to highlight the value (in this example, we will view the temperature setpoint, so we will highlight the current **°C**, which is **23**).
2. Click the Knob in to display the current setpoint, which will flash.

At this point you can modify the setpoint or click the Knob in again to return to the normal display, which will be the actual temperature.
To modify a setpoint in this screen:

1. Use the Control Knob to highlight the current value (we will continue to use the temperature as our example, so we will select **23**).
2. Click the Knob in to display the current setpoint (in this example, **38.5**—*see Figure 9*), which will flash.

Figure 9: Changing Setpoint



3. Turn or spin the Knob to reset the setpoint (in this example, turn the Knob left to decrease the setpoint to **37.0**).

NOTE:

If you turn the Control Knob slowly, one click left or right will change the setpoint by an increment of one tenth of a degree Celsius (0.1ºC). If you spin the Knob, the value will change by larger increments.

4. Click the Knob in to set and save this new setpoint.

NOTE:

If you highlight an item, change it, but do not save your selection, after a few seconds the screen will revert to its previous setting.

5. The display will automatically return to the actual value.

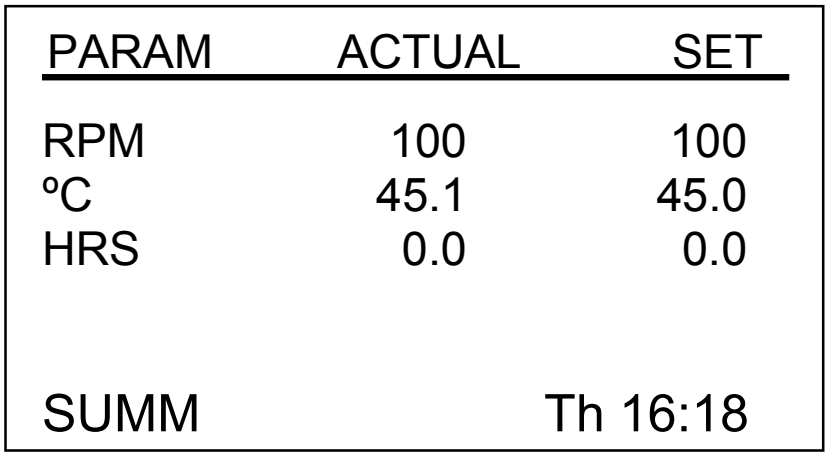
To move out of this screen and into the next:

1. Use the Control Knob to highlight **DISP**, then click the Knob in. **DISP** begins to flash.
2. Turn the Knob to the right until the next screen, Summary (**SUMM**), appears. If you turn too far and enter another screen, just turn the Knob back to the left to recapture the **SUMM** screen.
3. Click the Knob in to select the screen and to work in it.

6.7.2 Summary Screen

In this screen (*see Figure 10*), you can see both the current **ACTUAL** readings and the **SET**points for shaking speed (**RPM**), chamber temperature (**°C**), and elapsed time in a programmed run (**HRS**).

Figure 10: Summary Screen



NOTE:

The current day (Su, Mo, Tu, We, Th, Fr or Sa) and time always remains visible in the lower righthand corner.

The only elements you can modify in this screen are setpoints. **To change setpoints in this screen**:

1. Turn the Knob until the desired setpoint is highlighted, then click the Knob in. The setpoint will begin to flash.
2. Turn the Knob to the right to increase the number, or to the left to decrease it. One click left or right will increase the setpoint by an increment of one (one whole unit or one tenth unit, depending on the parameter). Move the Knob more rapidly (you can spin it) to change the value by larger increments.
3. Click the Knob in to set and save the new value.

NOTE:

If you highlight an item, change it, but do not save your selection, after a few seconds the screen will revert to its previous setting.

4. Repeat the above steps to change any or all of the other setpoints.

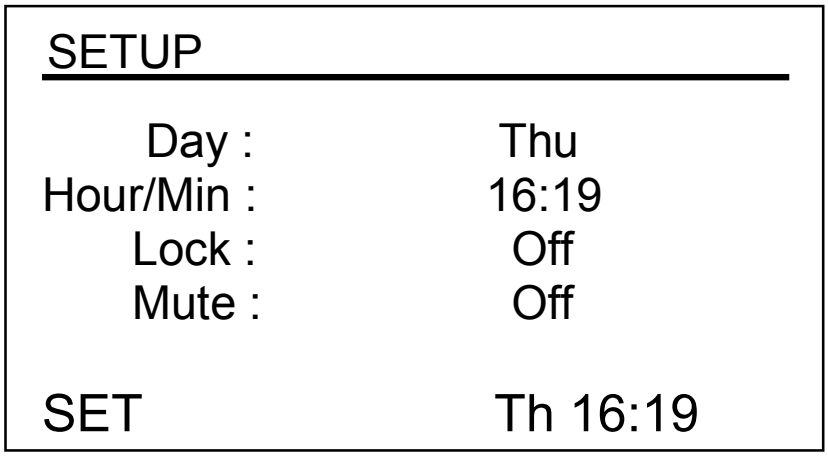
To move out of this screen and into the next:

1. Use the Control Knob to highlight **SUMM**, then click the Knob in. **SUMM** begins to flash.
2. Turn the Knob to the right until the next screen, Setup (**SET**), appears. If you turn too far and enter another screen, just turn the Knob back to the left to recapture the **SET** screen.
3. Click the Knob in to select the screen and to work in it.

6.7.3 Setup Screen

Here you can set the day of the week and the time (on a 24-hour clock). This screen also allows you to lock all of your settings from further changes, and to mute or enable the audible alarm.

Figure 11: Setup Screen



To change the day:

1. Turn the knob to highlight the day (**Thu** in the sample screen above), then click inward once. The day will flash.
2. Turn the knob left or right to select the day of choice: Sun, Mon, Tue, Wed, Thu, Fri or Sat.
3. Click the knob in to set and save your choice.

NOTE:

If you highlight an item, change it, but do not save your selection, after a few seconds the screen will revert to its previous setting.

To change the time (**Hour/Min**):

1. Turn the knob to highlight the time (**16:19** in the sample screen above), then click inward once. The time will flash.
2. Turn the knob left or right to change the time. Left moves backward, right moves forward in time. One click right or left changes by one minute; spin the knob to move more rapidly.
3. Click the knob once inward to set and save your choice.

To lock the settings:

1. Turn the knob to highlight **Lock**, then click inward once. The current status (**Off** in the sample screen above) will flash.
2. Turn the knob in either direction; the only other choice is **On**. Click once inward to select and save **On**, or continue turning to return to **Off**.
3. When you set **Lock** to **On**, the  icon will appear at the bottom of the screen. This icon will remain on display through all main display screens until you turn the locking function off.

To mute the audible alarm:

1. Turn the knob to highlight **Mute**, then click inward once. The current status (**Off** in the sample screen above) will flash.
2. Turn the knob in either direction; the only other choice is **On**. Click once inward to select and save **On**, or continue turning to return to **Off**.
3. When you set **Mute** to **On**, the  icon will appear at the bottom of the screen. This icon will remain on display through all screens until you turn the muting function off.

To move out of this screen and into the next:

1. Use the Control Knob to highlight **SET**, then click the Knob in. **SET** begins to flash.
2. Turn the Knob to the right until the next screen, RS-232 (**RS232**), appears. If you turn too far and enter another screen, just turn the Knob back to the left to recapture the **RS232** screen.
3. Click the Knob in to select the screen and to work in it.

6.7.4 Lamps Screen

In this screen (*see Figure 12*), you can turn the chamber light (**Chamber**), the optional UV germicidal ("decontamination") lamp (**UV Decont**) and the optional photosynthetic growth lamps (**Growth**) on and off.

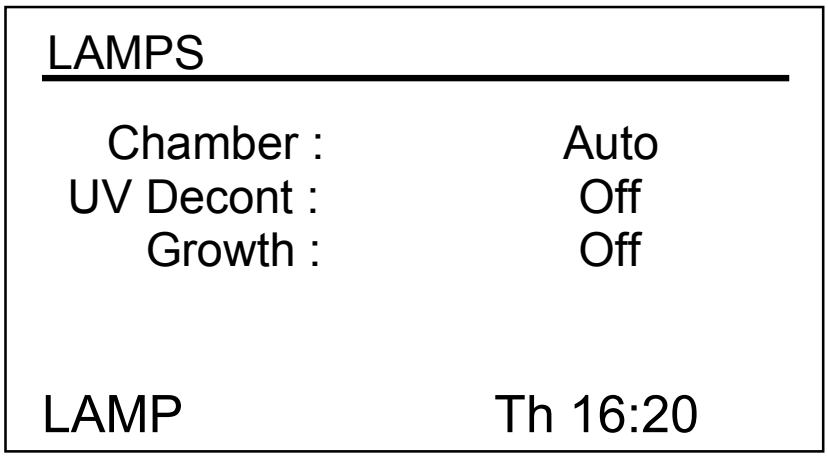
On means the light is always on, and **Off** means the light is always off, unless you add additional programming.

There is an additional mode for the chamber light: **Auto**. In **Auto** mode, the light will go on every time you activate the control knob or open the lid. This is the default mode.

NOTE:

The Lamps screen, shown below, will always indicate Chamber **light mode. If the shaker is not equipped with the optional UV germicidal lamp and/or photosynthetic growth lamps,** UV Decont **and/or** Growth **will say** None**.**

Figure 12: Lamps Screen



To change the mode setting for any of the lamps:

1. Turn the Control Knob to highlight the setting for the lamp of choice, then click the knob in. The current setting will flash (in the sample screen, we will use the **Chamber** light as an example.
2. Turn the Knob left or right until the desired mode setting appears (**Auto** in this example).
3. Click the Knob in to save the new setting.

NOTE:

If you highlight an item, change it, but do not save your selection, after a few seconds the screen will revert to its previous setting.

To move out of this screen and into the next:

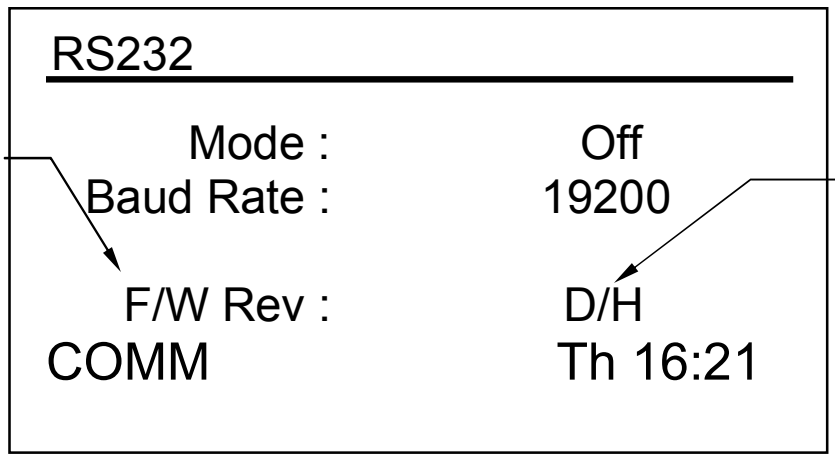
1. Use the Control Knob to highlight **LAMP**, then click the Knob in. **LAMP** begins to flash.
2. Turn the Knob to the right until the next screen, RS232 (**COMM**), appears. If you turn too far and enter another screen, just turn the Knob back to the left to recapture the **COMM** screen.
3. Click the Knob in to select the screen and to work in it.

6.7.5 RS232 Screen

New Brunswick Scientific's BioCommand® SFI Track and Trend software is available to trend and archive data from as many as 32 shakers, CO_2 incubators, and/or freezers, simultaneously. This PC-based software works with any OPC-compliant equipment with an RS-232 or RS-485 port. For details, speak with your NBS sales representative.

This screen (*see Figure 13*) is used only if you have connected a personal computer to the RS-232 port (*see Section 5.8*). Here you can select the RS-232 port's **Mode** and the **Baud Rate** appropriate to your PC.

Figure 13: RS232 Screen



FirmWare Revison level (this line is for information only)

In this sample screen, the Display is at Revision D and the FirmWare Control Board at Revision H.

To change the Communication Mode:

1. Turn the Control Knob to highlight the current setting (**Off** in the sample screen above), then click the Knob in. The current setting will flash.
2. Turn the Control Knob left or right until the desired mode setting appears (*see Table 5: Communication Mode*):

Table 5: Communication Mode

Mode	Application
Off	The RS-232 port is not open to communication in either direction.
Slave	The shaker can be fully controlled from the computer.
Talk	The shaker sends current value reports to the computer once per minute.
Monit [Monitor]	The shaker responds only to "Report Requests".

3. Click the Control Knob inward once to save the new setting.

NOTE:

If you highlight an item, change it, but do not save your selection, after a few seconds the screen will revert to its previous setting.

To change the Baud Rate:

1. Turn the Control Knob to highlight the current setting (**19200** in the sample screen above), then click the knob inward once. The current setting will flash.
2. Turn the Control Knob left or right until the desired setting appears: 9600, 19200 or 38400. The setting you choose should match the baud rate of your computer.
3. Click the Control Knob inward once to save the new setting.

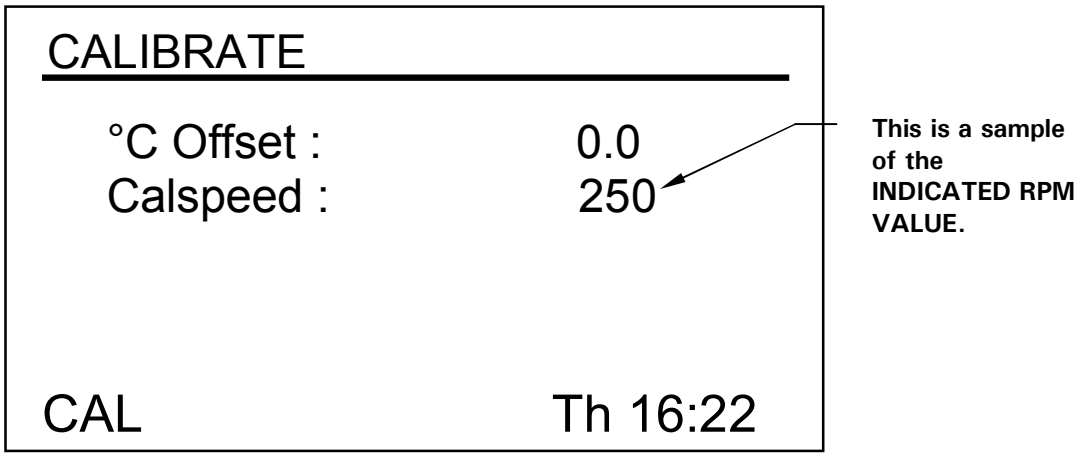
To move out of this screen and into the next:

1. Use the Control Knob to highlight **COMM**, then click the Knob in. **COMM** begins to flash.
2. Turn the Knob to the right until the next screen, Calibrate (**CAL**), appears. If you turn too far and enter another screen, just turn the Knob back to the left to recapture the **CAL** screen.
3. Click the Knob in to select the screen and to work in it.

6.7.6 Calibrate Screen

Use this screen (*see Figure 14*) to create a temperature offset and to calibrate the shaking speed (*for details, see Sections 6.10, Temperature Offset Calibration, and 6.11, Using Calspeed*).

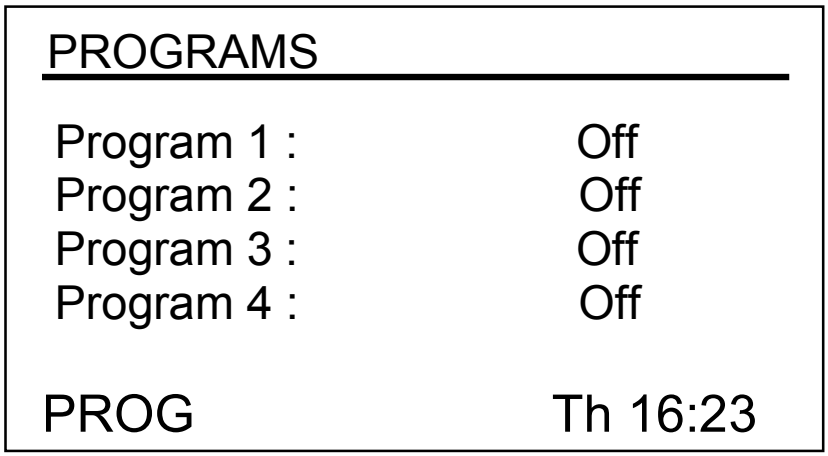
Figure 14: Calibrate Screen



6.7.7 Programs Screen

Use this screen (*see Figure 15*) to set as many as four operating programs for the shaker. Each program can have as many as 15 steps. *See Section 6.8 below for complete details.*

Figure 15: Programs Screen



6.8 Programming the Shaker

6.8.1 Timer Only

By setting an **HRS** setpoint in the **DISP** or **SUMM** screen, the shaker may be set to automatically stop after a preset time period of 0.1 to 99.9 hours.

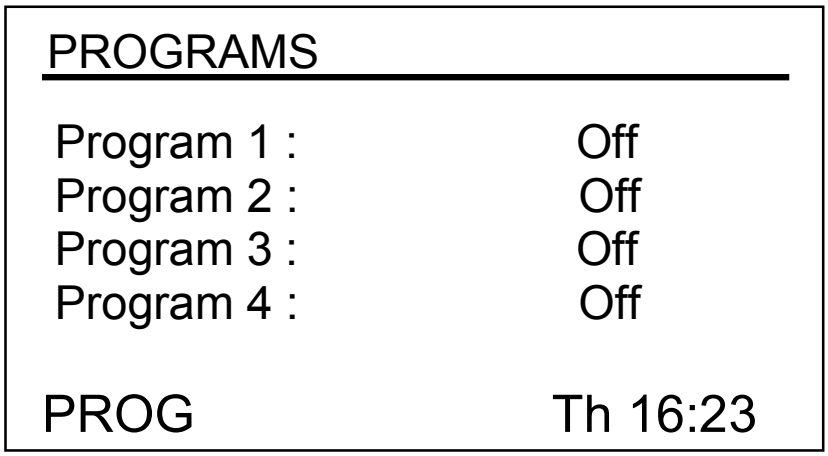
If the time is set to 0.0, the shaker will operate continuously until either the door is opened or the Start/Stop button is pushed.

6.8.2 Programmed Steps

The resident software for the Innova 42/42R can store up to four programs, each having as many as 15 steps. *Each step* can be programmed in one-minute increments, for total periods of one minute up to 99 hours 59 minutes each.

To enter the programming mode, use the Control Knob to select the **PROG** screen (*see Figure 15, repeated below*). At this point, you can **Run** a program, **Edit** a program, generate a **New** program or turn a program **Off**. **Off** is the default mode.

Figure 15: Programs Screen



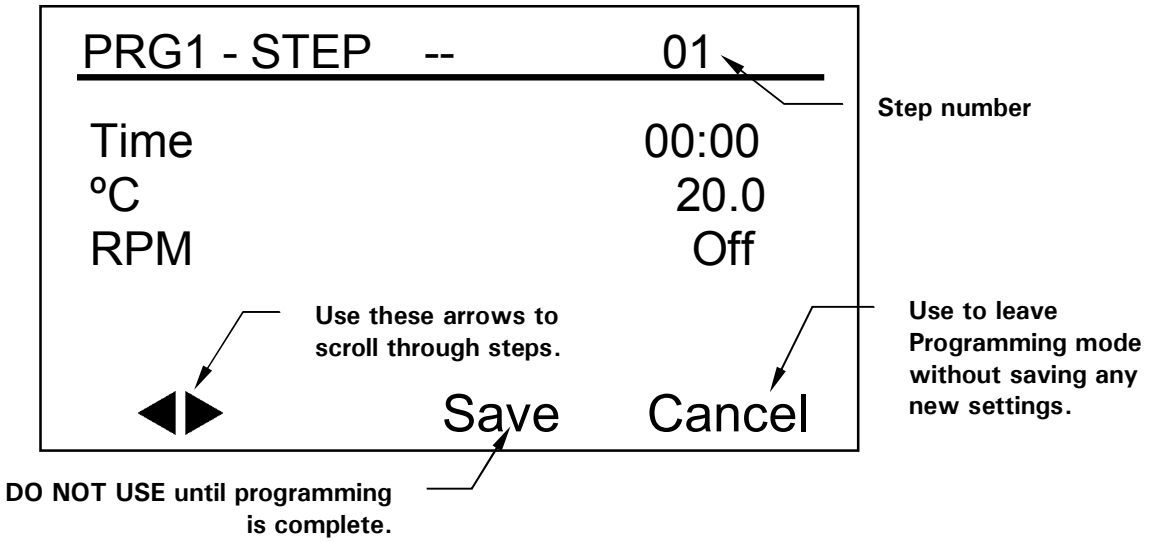
6.8.3 Creating a Program

To write a **New** program:

1. Use the Control Knob to highlight the mode of Program 1 (in our sample screen, Figure 15, it is **Off**), then click the Knob in. The selected field begins to flash.

2. Turn the Knob until the field says **New**. Click the Knob in to select this mode. The screen for Program 1 - Step 1 will open (*see Figure 16*):

Figure 16: Program 1 – Step 1



NOTE:

If your shaker is not equipped with these optional features, "UV" and "GRO" will appear with the word "Off" in this screen but will not be programmable.

3. Turn the Knob to highlight the Time setting (00:00 in the sample screen above), then click the Knob in. The field will flash.

4. Turn the Knob until the desired running **duration** for this step (from 00:01, which means one minute, to 99:59) appears, then click the Knob in to save the setting. We will set Step 1 time to eight hours for this example (*see Figure 17*).

5. Turn the Knob to highlight the **°C** temperature setting (**20.0** in the sample screen above), then click the Knob in. The field will flash.

6. To set the temperature desired (**°C** from 4.0 to 80.0) for the time period you have set, turn the Knob (left to decrease, right to increase). When the desired value appears, click the Knob in to save the setting. We will set Step 1 temperature to 37.0ºC (*see Figure 17*).

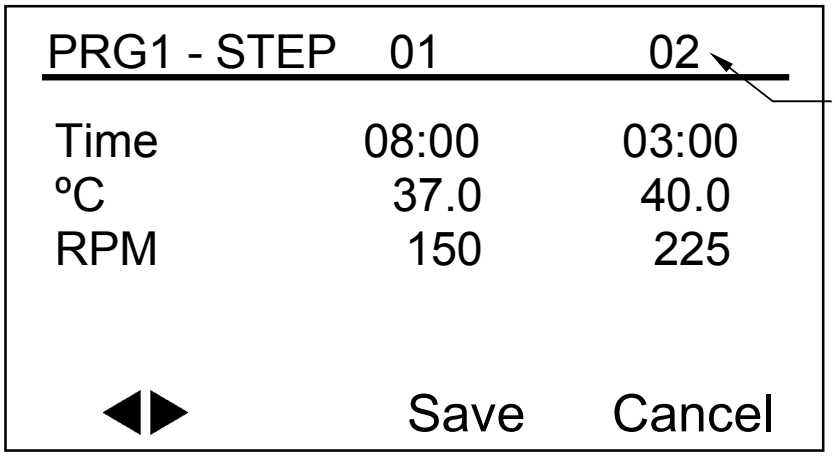
7. Turn the Knob to highlight the **RPM** setting (**Off** in the sample screen above), then click the Knob in. The field will flash.

8. Turn the Knob to select the desired shaking speed (25 to 400 RPM) for this time period, then click the Knob in to save the setting. We will set Step 1 speed to 150 RPM (*see Figure 17*).

NOTE: DO NOT select "Save" yet!

9. To program Step 2 (*see sample screen in Figure 17*): use the Control Knob to highlight the arrows at the bottom left of the screen. Click the Knob to make the arrows flash, then turn the Knob to the right until Step 2 appears. Click the Knob in to work in this screen, and repeat Steps 3-10.

Figure 17: Program 1 – Step 2



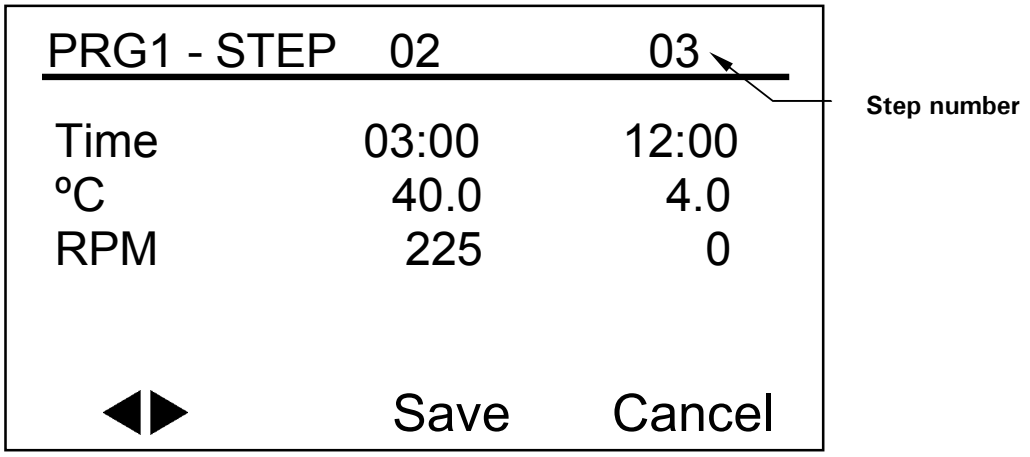
Whatever step is shown on the right-hand side of the display is settable (*in Figure 17, it is Step 2*). To scroll between steps, select the arrows (*bottom left*), then turn the Control Knob clockwise or counterclockwise, then select the desired step.

NOTE:

The time entered for each step is <u>for that step only</u>; it is not cumulative (i.e., the elapsed time from the start of the program).

10. Continue to program as many as 15 steps in the same manner. For our sample program, we have only three steps (*see Figure 18 on the following page*).

Figure 18: Program 1 – Step 3



The three-step program we have illustrated is designed to start incubating cultures at 37ºC and hold that temperature for eight hours, shaking at 150 RPM. After eight hours, Step 2 engages, increasing the temperature setpoint to 40ºC for a temperature induction, holding that temperature for three hours and increasing the shaking speed to 225 RPM. After this interval, the temperature will be cooled to 4ºC and held at that temperature for twelve hours; no shaking will occur during this period, as the speed is set to 0 RPM.

Please note that temperature reductions, even at temperatures above ambient (going from 40º to 30ºC, for example), require refrigeration to be effective.

To save the entire program:

1. Once all your steps are set, use the Control Knob to highlight **Save** at the bottom of the screen, then click the Knob in. The field will flash.
2. Click the Knob in again to save the program. The display will read **Process Running – Saving Profile** for a few seconds, then return to the main Programs (**PROG**) screen.

If you wish, you can set Programs 2, 3 and 4 and save them in the same manner.

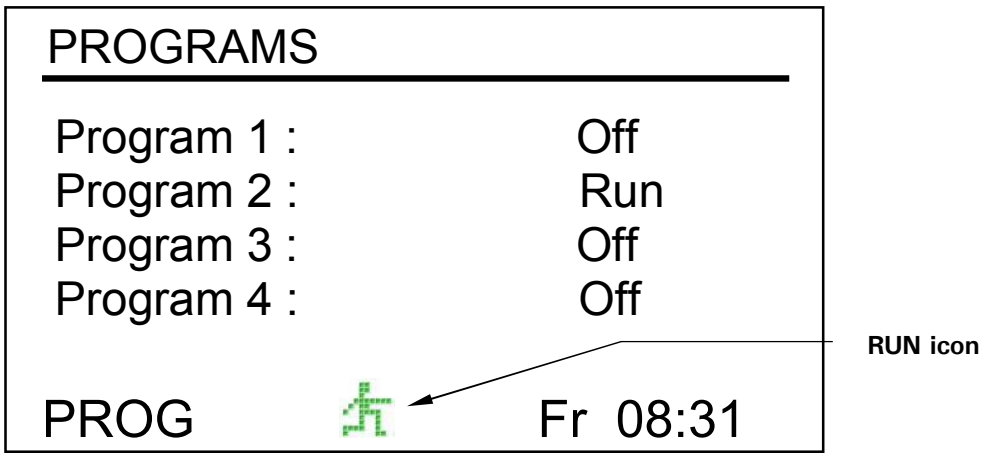
6.8.4 Editing a Program

Use the Edit function to open a program you have already created and saved, in order to modify your settings following the same procedures.

6.8.5 Running a Program

Use the Run fuction to turn a specific program on. Naturally, only one program can run at a time. When you change the mode to **Run**, the screen will show the **Run** icon:

Figure 19: Programs Screen – Running



To stop a program: You can abort a run any time by changing the program's function to **Off**.

6.9 Muting the Audible Alarm

The Innova 42/42R shakers have an audible alarm that is activated under predetermined conditions (*see Table 4*). It may be muted in the following way:

1. Turn the Control Knob until the **SET** screen is highlighted on the display. Click the Knob in to work in this screen.
2. Turn the Knob to highlight the **Mute** mode (**On**), then click the Knob in. The field will flash.
3. Turn the Knob to change the setting to **Off**, then click the Knob to save this selection.

To reactivate the audible alarm at any time, repeat steps 1-3, reversing "off" and "on".

6.10 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 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. You can calculate the correction value for this offset and program the shaker to display a corrected temperature.

6.10.1 Calculating the Offset Value

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, then record the Indicated Temperature.
2. Now record the Actual Temperature.
3. Calculate the temperature correction value using this formula:
   Actual Temperature – Indicated Temperature = Temperature Offset Value.
4. To set the Temperature Calibration Offset, follow the procedure outlined in Section 6.10.2 below.

6.10.2 Setting the Offset

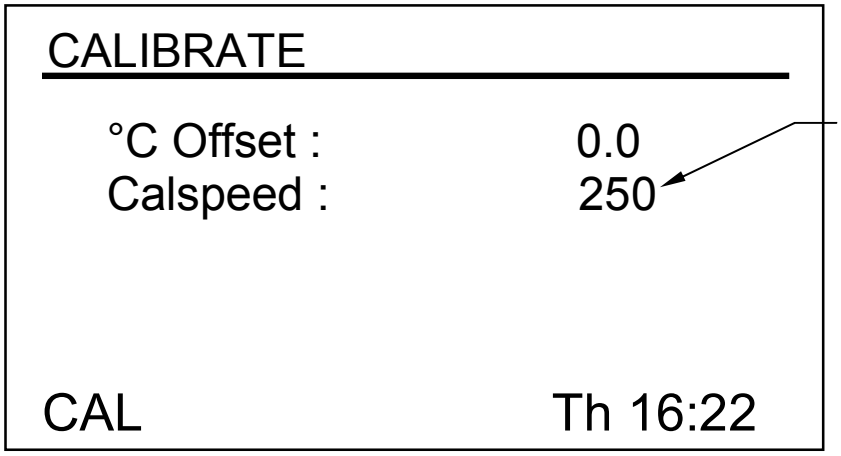
To set the temperature calibration **Offset**:

1. Use the Control Knob to enter the **CAL** screen (*see Figure 14, repeated below*).
2. Turn the Control Knob to highlight the current setting (**0.0** in the sample screen above), then click the Knob in. The current setting will flash.
3. Turn the Knob (left for negative settings or right for positive settings) to display the desired setting. As you turn the Knob, each click represents one tenth of a degree Celsius (0.1ºC).
4. When you reach the desired setting, click the Control Knob in to save the new value.
5. When the Temperature Offset is set to any value other than 0, the  icon will appear next to ºC in the **DISP** and **SUMM** screens.

NOTE:

If you highlight an item, change it, but do not save your selection, after a few seconds the screen will revert to its previous setting.

Figure 14: Calibrate Screen



6.11 Using Calspeed

The **Calspeed** function, which is set in the **CAL** screen (*see Figure 14 above*), is used to calibrate the speed of the shaking mechanism. Calibrated at the factory, speed does not need to be recalibrated until a major operating component (e.g., drive belt) is changed.

NOTE:

Prior to calibrating the speed, make sure that the platform is properly secured to the subplatform, and any flasks present are secured.

When the shaker is running, the **CAL** screen shows the indicated RPM value. If you wish to calibrate the speed, set the speed to a value that can be measured— a setpoint of 250 RPM works well. The use of a strobe is recommended for accuracy. If, after measuring the actual speed, you wish to adjust the indicated value:

1. Click the Control Knob in.
2. Set the new value.
3. Click the Knob in again to save the setting.
4. Turn the shaker **OFF**, wait a few seconds, then turn the shaker back **ON**.
5. Recheck the speed using a strobe.

6.12 Power Interruption

In the event of a power failure, the Innova 42/42R Shakers are equipped with an **automatic restart** function. The shaker's non-volatile memory retains all stored information.

If the shaker was in operation prior to the power interruption, the shaker will begin to operate at its last entered setpoints. The alarm/POWER display will flash, indicating that a power interruption has occurred. Turn the Control Knob in any direction to acknowledge the visual alarm. The flashing will stop.

7 MAINTENANCE

WARNING!
When cleaning the unit, always turn off the shaker and disconnect the power cord from the power supply.

7.1 Routine Maintenance

No routine maintenance schedule is required for the Innova 42 and 42R.

To ensure that your shaker retains its attractive appearance, an occasional cleaning, using a cloth with conventional household (non-abrasive) cleaner is recommended (*see Section 7.2 below for more details*).

We also suggest that the area around the shaker be vacuumed or swept to remove dust and other debris, ensuring proper air flow in and around the shaker.

7.2 Cleaning External & Internal Surfaces

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

If Biohazard decontamination is required, see Section 7.3 below.

7.3 Biohazard Decontamination

It is the responsibility of the user to carry out appropriate decontamination procedures if hazardous material is spilled on or inside the equipment. Before using any cleaning or decontamination method other than those suggested by the manufacturer, users should check with New Brunswick Scientific that the proposed method would not damage the equipment.

Commercially available household bleach solutions, when diluted at a 1:10 ratio, are effective in routine decontamination of the instrument. The method for decontaminating a spill depends upon the nature of the spill.

Spills involving fresh cultures or samples known to have low concentrations of biomass should be flooded with decontamination solution and soaked for 5 min before cleanup. Spills involving samples with high concentrations of biomass, or involving organic matter, or occurring in areas warmer than room ambient temperature, should be exposed to decontamination solution for *at least one hour* before cleanup.

WARNING!

Personnel involved in the cleanup of any spill should wear gloves, safety glasses, and a laboratory coat or gown during the cleanup process. Respiratory protection should be considered for spills where aerosolization is suspected.

8 SERVICE & ACCESSORIES

8.1 Troubleshooting

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

In any correspondence with NBS, please refer to the model number and serial number of your unit. This information is on the electrical specification plate, located on the rear panel of the unit, above the power connector.

There are some problems, however, that you can investigate and correct yourself. Refer to the following Troubleshooting Guide:

Symptom(s)	Probable Cause(s) & Solution(s)
Shaker does not run.	Power cord is not plugged in and/or power switch is off: plug in power cord (to working electric outlet), and turn on power switch.
	Door is open—look for Open Door icon on display: close door firmly.
	On/Off switch is not working: call for service.
	If you recently replaced a fuse, it may not have been seated properly: remove and reinstall the fuse carefully.
	Shaking speed has been set to Zero by program running (look for Run icon in display) or by computer interface: reset shaking speed.
	Defective main board: call for service
	Defective display controller board: call for service.
	Jammed shaking mechanism: call for service
	Defective motor: call for service
	Drive belt out of alignment or worn: call for service.
Shaker runs slowly and/or no speed indication.	If you recently replaced a fuse, it may not have been seated properly: remove and reinstall the fuse carefully.
	Incorrect speed calibration: recalibrate shaking speed.
	Defective main board: call for service.
	Defective motor: call for service.
	Drive belt out of alignment or worn: call for service.

...continued...

Symptom(s)	Probable Cause(s) & Solution(s)
Shaker does not run at set speed.	Shaker is running in Program mode (look for Run icon in display).
	Shaker speed has been changed by RS-232 command/ computer interface.
	Shaker is overloaded and/or you are using baffled flasks: remove some contents & balance load.
	Defective motor: call for service.
	Drive belt out of alignment or worn: call for service.
	Check speed calibration.
Operating noise	Load out of balance: unload all contents, then reload.
	Loose component(s) in platform, subplatform and/or drive assembly: call for service.
Incubator does not reach set temperature.	Shaker running in Program mode: Run icon in display.
	Temperature setpoint changed by RS-232/computer interface command.
	Heater fuse blown: replace.
	Compressor fuse blown: replace.
	Compressor over-pressure switch activated: call for service.
	Ambient temperature too high or too low: cool or heat the room as needed.
	Defective heater: call for service.
	Defective refrigeration system: call for service.
	Incorrect temperature indication (*see below*).
Incorrect temperature indication.	Temperature Offset has been programmed: Offset icon in display.
	Defective RTD assembly: call for service.
	Defective main board: call for service.

8.2 Product Returns

Should you need to return your Innova 42/42R to NBS for any reason, first contact Customer Service to obtain a Returned Material Authorization (RMA) number. This number must appear on the outside of the shipping container, otherwise NBS Receiving will refuse to accept the shipment.

In addition, you must also certify that the instrument being returned has been thoroughly cleaned and decontaminated. **A form for this purpose is provided in Section 12** of this manual; it can also be downloaded from our website (www.nbsc.com). A copy of this completed Return Authorization and Decontamination Certificate must be attached to the outside of the container, with a second copy packed inside with the instrument.

8.3 Opening the Service Compartment

> ***WARNING!***
> **Before opening the Service Compartment, always turn off the shaker and disconnect the power cord from the power supply.**

The Service Compartment contains the shaker's electronic and temperature control components. Normally, this compartment should be accessed **by authorized service technicians only.** You may, from time to time, need to remove the access panel in order to replace fuses (*see Section 8.4 below*).

8.4 Fuse Replacement

> ***WARNING!***
> **When replacing fuses, always turn off the shaker and disconnect the power cord from the power supply.**

There are four fuses located behind the front bezel panel. To access these fuses:

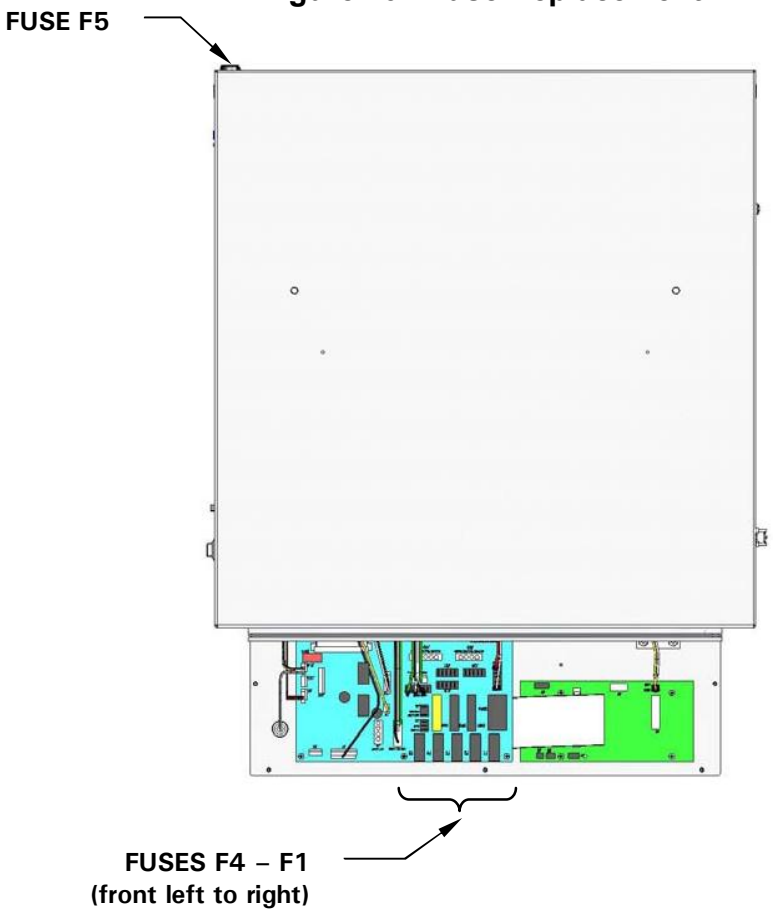
1. Turn the power off and unplug the shaker. Open the cover of the shaker.
2. Remove the four fasteners that hold the front panel in place (*see Figure 4*), setting them aside for reuse.
3. Open the front panel, allowing it to lay flat.
4. The fuses are located on the PC board (*see Figure 20*), which you will find on the right side of the base weldment.
5. Fuses are numbered 1 through 4 (*see Table 6*); access the fuse you wish to replace by using a coin or a blade screwdriver to turn and release the spring-loaded cap.
6. Replace the fuse with a new one of the same type and rating (*see Table 6*).

There is a fifth, internal outlet, fuse on the back of the unit (*see Figure 20 & Table 6*). Follow Steps 5 & 6 above to replace it.

Table 6: Fuses

Fuse Holder Number	Function	Type & Rating
F1	Heater	Slo Blo® 6.3A
F2	Grow Lamp	Slo Blo® 3.15A
F3	UV Lamp	Slo Blo® 3.15A
F4	Compressor	Slo Blo® 10A
F5	Internal Outlet	Slo Blo® 0.5A (230V) Slo Blo® 0.75A (120V) Slo Blo® 1A (100V)

Figure 20: Fuse Replacement



WARNING!
The following procedures are provided <u>for your information only</u>.
Do not attempt to perform these service interventions yourself unless you are an authorized service technician.

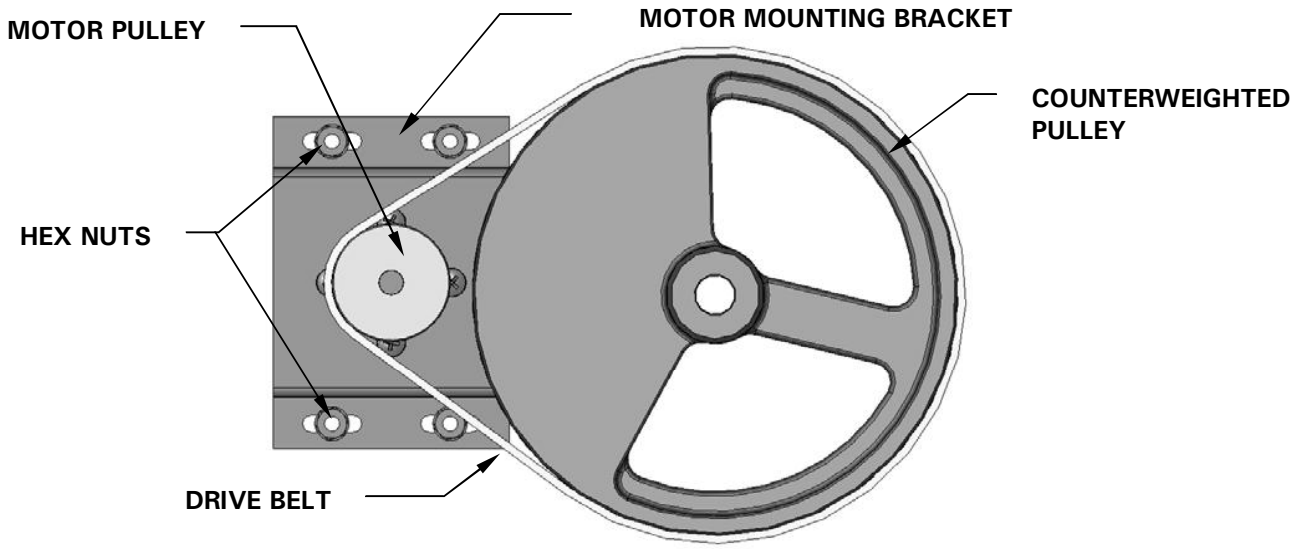
8.5 Belt Replacement or Adjustment

To gain access to the drive belt, your service technician will follow these steps with reference to Figure 21 on the following page:

WARNING!
***Always* keep fingers clear of the drive belt and pulley.**

1. Set the ON/OFF power switch to OFF.
2. Disconnect the power cord from the electrical outlet.
3. Open the cover of the shaker to gain access to the front panel.
4. Use a Phillips head (+) screwdriver to remove the two screws that attach the hinged front panel to the housing. Gently lay down the front panel and set aside the screws for reuse. Also remove the lefthand side access cover. Looking into the shaker, the motor assembly is on the left side.
5. Use the hex wrench to loosen the four hex nuts on the motor mounting bracket.

Figure 21: Drive Belt Replacement



6. Gently slide the motor mounting bracket toward the righthand side of the shaker. This loosens the drive belt from the motor pulley and the large counterweighted pulley. Moving the motor mounting bracket forward will cause the belt to fall from both belt tracks.
7. Remove the old belt.
8. With one hand, place the new belt around the motor pulley, and with the other hand guide the belt around the large counterweighted pulley.
9. Move the motor mounting bracket back, until there is a slight resistance.
10. Verify that the drive belt has a slight pressure near the center. The recommended deflection is 3/8 inch (9.5 mm).
11. Use the hex wrench to tighten the four hex nuts on the motor mounting bracket.
12. Reinstall the hinged front panel with the two screws previously set aside. Use a Phillips (+) head screwdriver to tighten the screws.
13. Close the cover of the shaker.
14. Reconnect the power cord to the electrical outlet.

8.6 Replacement Parts

NBS offers a spare parts kit, part number M1335-6000, that contains commonly needed replacement parts for your Innova 42/42R shaker: one motor drive poly-V belt, two light bulbs and various fuses.

8.7 Accessories

When ordering accessories, you may be asked to provide the model number and serial number of your shaker. This information is on the electrical specification plate, located on the rear panel of the unit.

8.7.1 Platforms

Table 7: Available Platforms

Description	*Capacity*	*NBS Part No.*
Universal Platform	see Table 8	M1250-9902
125 mL Erlenmeyer flask Dedicated Platform*	34	M1194-9904
250 mL Erlenmeyer flask Dedicated Platform*	25	M1194-9905
500 mL Erlenmeyer flask Dedicated Platform*	16	M1194-9906
1L Erlenmeyer flask Dedicated Platform*	9	M1194-9907
2L Erlenmeyer flask Dedicated Platform*	5	M1194-9908
2.8L Fernbach flask Dedicated Platform*	4	M1194-9932
Utility carrier with cushioned crossbars	--	M1194-9909
Utility tray with non-skid rubber surface	--	M1194-9910
Sticky pad platform	--	M1250-9903

*dedicated platforms include flask clamps

Should you decide in favor of the Universal Platform, following is a list of that particular platform's flask capacity, according to flask size:

Table 8: Universal Platform Flask Capacities

Flask Type	*Capacity**
50 ml Erlenmeyer Flasks	45
125 ml Erlenmeyer Flasks	21
250 ml Erlenmeyer Flasks	18
500 ml Erlenmeyer Flasks	14
1 L Erlenmeyer Flasks	8
2 L Erlenmeyer Flasks	5
2.8 L Fernbach Flasks	4
3 L Erlenmeyer Flasks	4
4 L Erlenmeyer Flasks	4
5 L Erlenmeyer Flasks	4
6 L Erlenmeyer Flasks	2

*Clamps for Universal Platform are sold separately.

8.7.2 Flask Clamps for Universal Platforms

The following clamps, according to flask size, are available for use with the Universal Platform:

Table 9: Flask Clamps

Clamp Size	*Part Number*
10 ml Erlenmeyer Flask	ACE-10S
25 ml Erlenmeyer Flask	M1190-9004
50 ml Erlenmeyer Flask	M1190-9000
125 ml Erlenmeyer Flask	M1190-9001
250 ml Erlenmeyer Flask	M1190-9002
500 ml Erlenmeyer Flask	M1190-9003
1 L Erlenmeyer Flask	ACE-1000S
2 L Erlenmeyer Flask	ACE-2000S
2.8 L Fernbach Flask	ACSB-2800S
3 L Erlenmeyer Flask	ACE-3000S
4 L Erlenmeyer Flask	ACE-4000S
5 L Erlenmeyer Flask	ACE-5000S
6 L Erlenmeyer Flask	ACE-6000S

8.7.3 Replacement Clamp Hardware

NBS flask clamps come complete with mounting screws. Additional screws are available separately in packs of 25 (NBS part number S2116-3051P).

8.7.4 Test Tube Racks & Other Accessories

Table 10: Racks & Trays

Accessory Description		*NBS Part Number*	*Platform Capacity*
Adjustable angle Test Tube Rack for tubes 8 – 11 mm diameter	80 tube capacity	M1289-0100	7
	60 tube capacity	M1289-0010	9
	48 tube capacity	M1289-0001	9
Adjustable angle Test Tube Rack for tubes 12 - 15 mm diameter	60 tube capacity	M1289-0200	7
	44 tube capacity	M1289-0020	9
	34 tube capacity	M1289-0002	9
Adjustable angle Test Tube Rack for tubes 15 –18 mm diameter	42 tube capacity	M1289-0300	7
	31 tube capacity	M1289-0030	9
	24 tube capacity	M1289-0003	9
Adjustable angle Test Tube Rack for tubes 18 – 21 mm diameter	30 tube capacity	M1289-0400	7
	23 tube capacity	M1289-0040	9
	18 tube capacity	M1289-0004	9

…continued…

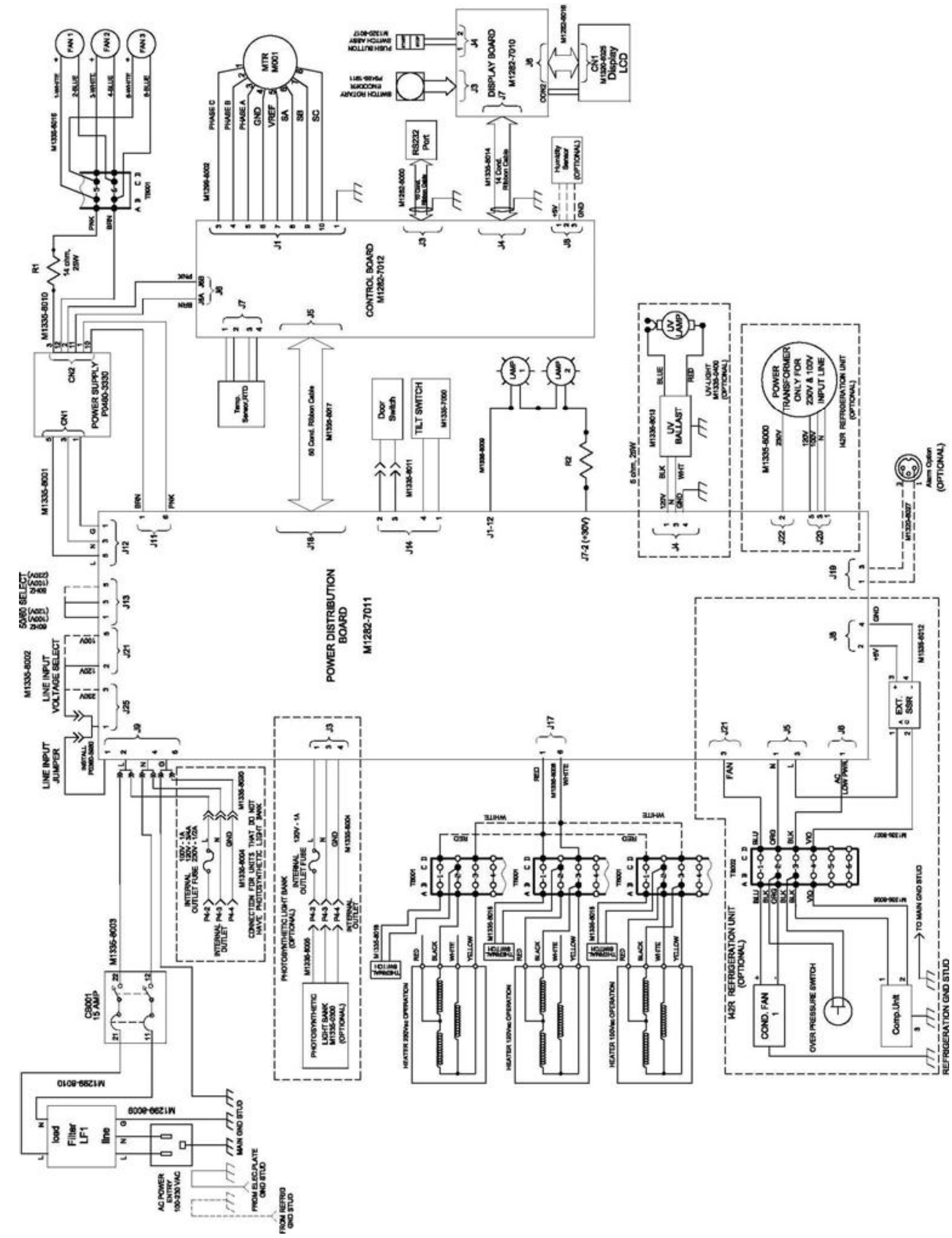
Accessory Description		*NBS Part Number*	*Platform Capacity*
Adjustable angle Test Tube Rack for tubes 22 – 26 mm diameter	22 tube capacity	M1289-0500	7
	16 tube capacity	M1289-0050	9
	13 tube capacity	M1289-0005	9
Adjustable angle Test Tube Rack for tubes 26 - 30 mm diameter	20 tube capacity	M1289-0600	7
	16 tube capacity	M1289-0060	9
	12 tube capacity	M1289-0006	9
Microplate holder rack (stacked)	3 deep well or 9 standard	M1289-0700	16
Microplate holder rack (single layer)	5 deep well or standard	TTR-221	4
Angled Test Tube Rack Holder* for user-supplied test tube racks that are 4-5 in. (10-13 mm) wide and up to 15 in. (38 mm) long.		TTR-210	4
Angled Test Tube Rack Spacer Bar* for use with TTR-210 to accommodate test tubes racks that are less than 5 in. (13 mm) wide.		TTR-215	NA

* Universal Platform Required

9 DRAWINGS & TABLES

9.1 Schematics

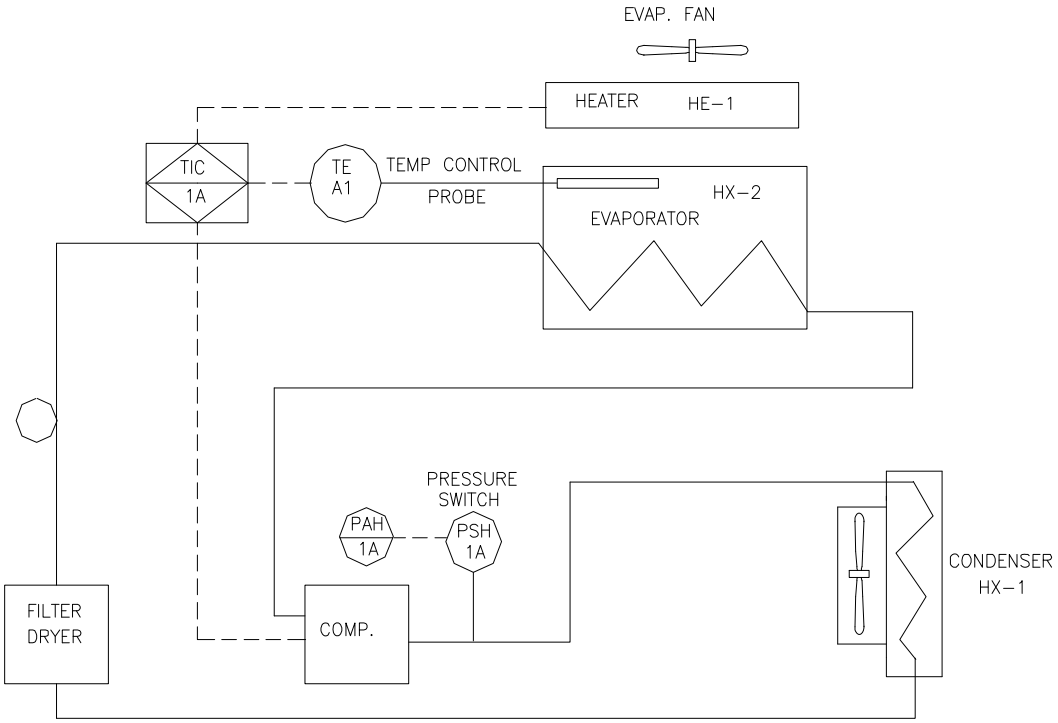
Figure 22: Control Schematics



NOTE:

See your NBS representative for a larger view of this drawing.

Figure 23: Refrigeration Schematic



9.2 List of Drawings

9.3 List of Tables

10 SPECIFICATIONS

These specifications assume a **maximum load of 34 pounds (15.5 kg)**, including platforms, clamps, glassware and contents.

Innova 42 & 42R Incubator Shaker		
SHAKING		
Speed	25-400 rpm with either ¾-inch (1.9 cm) or 1-inch (2.54 cm) stroke and using double-girdle clamps for flasks over 2L (*see Section 4.2*).	
Control Accuracy	± 1 rpm	
Indication	Displayed in 1 rpm increments	
Stroke/Orbit	¾-inch (1.9 cm) or 1-inch (2.54 cm)	
TEMPERATURE		
Range (42)[1]	5ºC above ambient temperature to 80°C	
Range (42R)[1]	20ºC below ambient temperature (minimum 4ºC) to 80°C	
Control Accuracy	± 0.1°C at 37°C	
Indication	Displayed in 0.1°C increments	
Heater	Long-life, low-watt density resistance-type heater with high temperature thermostat	
ALARMS	Visible and audible warning indication when speed deviates more than 5 rpm or temperature more than 1°C from setpoints, and when timer has expired. Audible alarm can be muted.	
LCD DISPLAY	240 x 128 backlit	
RS-232	Remote control, remote monitoring, remote data logging	
SETPOINT RETENTION	All setpoints and operating status are retained in non-volatile memory	
AUTOMATIC RESTART	Automatic restart after power is restored, indicated by flashing display	
DRIVE	Triple-eccentric counterbalanced drive with nine permanently lubricated ball bearings	
DRIVE MOTOR	Solid-state brushless DC motor.	
SAFETY	Drive Interrupt shuts off power to Shaker when door opens. Acceleration/deceleration circuit prevents sudden starts and stops, minimizing both splashing and mechanical damage. Independent mechanical sensing switch also shuts the motor off in unbalanced condition.	
ELECTRICAL REQUIREMENTS	100 Volts, 50/60 Hz 120 Volts, 60 Hz 230 Volts, 50 Hz	1500 VA per shaker
FUSES	**Behind Electrical Panel:** 3.15A glass tube, slow-blowing 6.3A glass tube, slow-blowing 10.0A glass tube, slow-blowing	**Next to Outlet:** 0.5A glass tube, slow-blowing 0.75A glass tube, slow-blowing 1.0A glass tube, slow-blowing
ETL REGULATORY STANDARDS	UL 61010A-1 UL 61010A-2-010	CAN/CSA-C22.2 No. 1010.1 CAN/CSA-C22.2 No. 1010.2.010
CE REGULATORY STANDARDS	See Declaration of Conformity, Section 10.1.	

[1] depending on ambient factors, such as relative humidity, and options installed

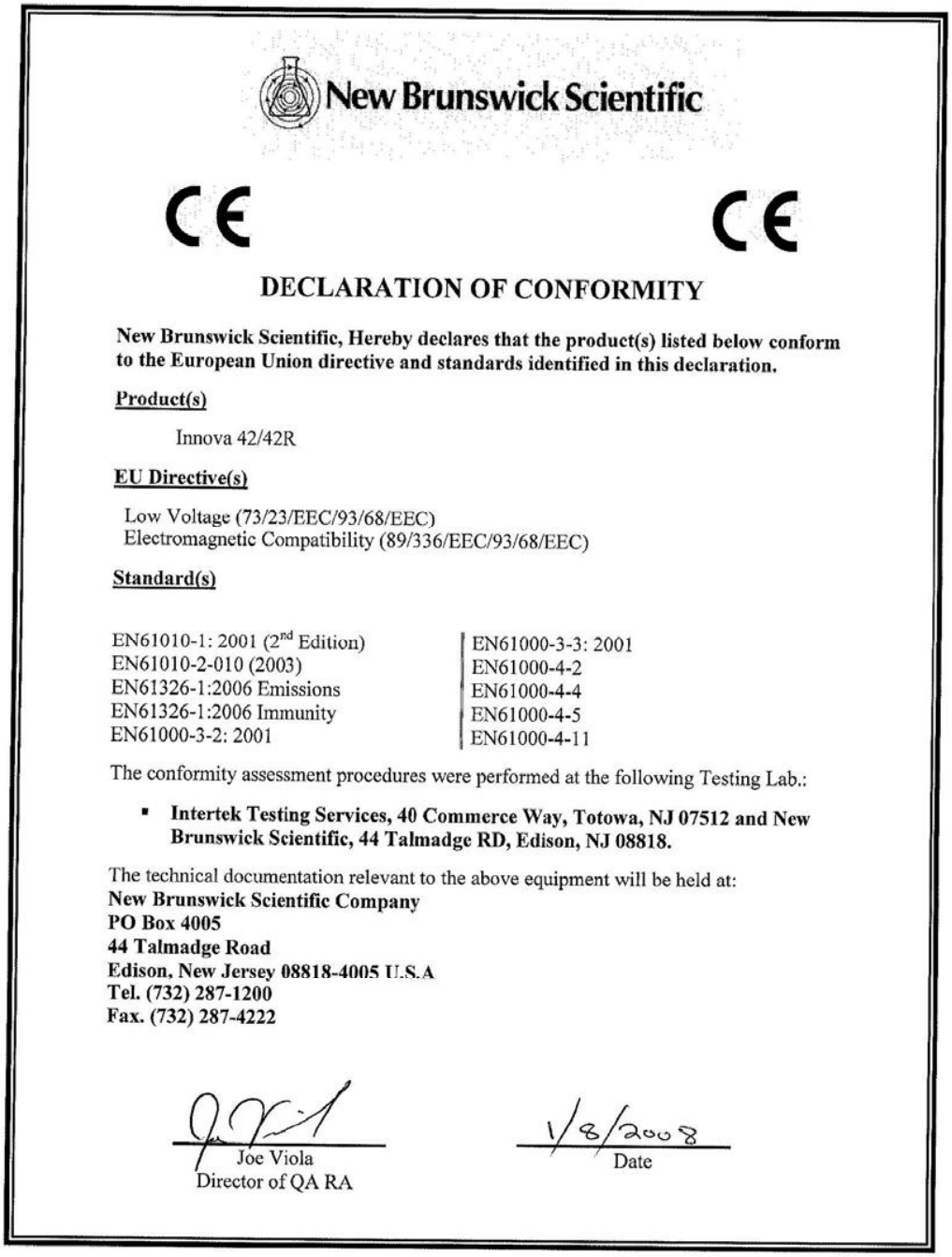
…continued…

Innova 42 & 42R Incubator Shaker	
DIMENSIONS **Width** **Width with door open** **Depth (Front to Back)** **Height**	 25 inches (63.5 cm) 50 inches (127 cm) 29.7 inches (75.4 cm) 32.22 inches (81.84 cm)
CHAMBER DIMENSIONS	20.3 inches deep x 20.375 inches wide x 18.77 inches high (51.5 cm deep x 51.7 cm wide x 47.7 cm high) from top of platform
PLATFORM	Aluminum, 18" X 18" (46 X 46 cm). Select universal or dedicated styles.
NET WEIGHT **42** **42R**	 216 lbs (98 kg) 266 lbs (121 kg)

10.1 Certifications

The Innova 42 and 42R have been tested to ETL standards, to comply with UL and CAN/CSA electrical safety standards (see "ETL Regulatory Standards" in the specifications table).

As attested in the *CE Declaration of Conformity* reproduced on the following page, the Innova 42 and 42R also conform to the appropriate CE standards (see also "CE Regulatory Standards" in the specifications table).



New Brunswick Scientific

CE CE

DECLARATION OF CONFORMITY

New Brunswick Scientific, Hereby declares that the product(s) listed below conform to the European Union directive and standards identified in this declaration.

Product(s)

Innova 42/42R

EU Directive(s)

Low Voltage (73/23/EEC/93/68/EEC)
Electromagnetic Compatibility (89/336/EEC/93/68/EEC)

Standard(s)

EN61010-1: 2001 (2nd Edition)	EN61000-3-3: 2001
EN61010-2-010 (2003)	EN61000-4-2
EN61326-1:2006 Emissions	EN61000-4-4
EN61326-1:2006 Immunity	EN61000-4-5
EN61000-3-2: 2001	EN61000-4-11

The conformity assessment procedures were performed at the following Testing Lab.:

- **Intertek Testing Services, 40 Commerce Way, Totowa, NJ 07512 and New Brunswick Scientific, 44 Talmadge RD, Edison, NJ 08818.**

The technical documentation relevant to the above equipment will be held at:
New Brunswick Scientific Company
PO Box 4005
44 Talmadge Road
Edison, New Jersey 08818-4005 U.S.A
Tel. (732) 287-1200
Fax. (732) 287-4222

Joe Viola
Director of QA RA

1/8/2008
Date

11 APPENDIX A: REMOTE PROGRAMMING

11.1 Setting Up with HyperTerminal

You can use the Microsoft® HyperTerminal program on your personal computer to communicate with your shaker:

1. Before you set up HyperTerminal, be sure to check the **Mode** and **Baud Rate** parameter settings (*see Section 6.7.4*).
2. While you are in the RS232 screen (*see Figure 13*), set the **Mode** parameter to **Slave**, and select the appropriate **Baud Rate**. The default setting, as you see in your screen, is 19200; your other choices are 9600 or 38400.
3. Connect the RS-232 cable between your computer and the shaker's RS-232 port.
4. Start HyperTerminal, and follow the steps for Setting a New Connection. When prompted, select the COM port you will be using, then set the COM parameters (see Table 11 below):

Table 11: COM Parameters for HyperTerminal

Baud Rate	Enter the setting on your shaker (see Step 2 above)
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	None

5. To be sure that you have established a connection with your shaker, turn the shaker **OFF**, open the HyperTerminal connection, then turn the shaker back **ON**. Once a connection has been made, the shaker will send an **OK** to HyperTerminal.
6. You may wish to send a trial command to the shaker (*see Sample Test below*). We suggest that you enable *Caps Lock* on your computer, because all commands must be sent as capital letters.

Sample Test:

1. To request the current setpoint, type **RS** at the terminal. When you type **R**, you should see the **R** on the computer display. This is an echo character, sent back by the

Innova 42/42R. When you type the S, you should see the echo **S** displayed at the computer.

2. Use the ↵**Enter** key to send the carriage return control character. This will move the cursor back over the first character.
3. **RS** is a Request command, so your shaker will send back the data corresponding to the command.

11.2 Overview of Command Sets

Using an optional RS-232 interface, the user has the capability to control various functions of the Innova 42/42R shakers by computer. A detailed command set follows this introduction.

The serial interface uses an echo character protocol that is implemented to indicate that a valid character has been received by the shaker. For every character sent by the user computer, the Innova 42/42R will return a matching character. This echo character should be read by the computer and compared to the character that was sent.

NOTE:

When you are sending a command, do not allow the pause between any two characters of your message to last longer than 10 seconds. If it takes any longer, the shaker's serial port will reset itself.

In the following example, the **Master** (your computer) will command (the **C** in **CS**) the shaker (**Slave**) to set its speed to **150 RPM**:

Master sends:	Innova 42/42R responds:
CS<*Space*>**150**<*CR*>	**CS**<*Space*>**150**<*CR*>

In the next example, the **Master** (your computer) will request that the shaker (**Slave**) report (the **R** in **RV**) the actual parameters:

Master sends:	Innova 42/42R responds:
RV<*CR*>	First the echo: **RV**<*CR*>
	Then the report: <**Arg1**><*Tab*><**Arg2**><*Tab*><**Arg3**>...<**Arg7**><*CR*><*LF*>

NOTE:

On power-up, even if the shaker is not set in Slave mode at the time, the shaker will always send these four characters: OK <*CR*> <*LF*>. Before starting any communications, be sure to clear the computer's receive buffer.

This is the command set format:
<**Command**><*Space*><**Arg1**><*Space*><**Argn**…><*Terminator*>

Most Commands are defined as two capital characters using standard ASCII format (see the command sets provided below).

If a command has additional arguments, the ASCII space control character separates each argument. The command is terminated using the ASCII carriage return control character; an optional line feed control character may also be included but must follow the carriage return character.

When a command is sent that returns data, the characters returned are in ASCII format. Each additional argument returned will be separated by the ASCII space or tab control character; refer to the selected command for the actual format. Data returned is terminated with a carriage return line feed control character sequence.

Section 11.3 provides an Index to the 2-character command codes.

Sections 11.4-0 provide command sets for your use for Set Commands, Profile Control Commands, Report Request Commands and Set/Get Date & Time.

11.3 Index to Command Codes

Command Code	Meaning
CS	Command Speed
CT	Command Temperature
PC	Clear Profile
PM	Profile Mode
PR	Read Profile Step in Memory
PS	Profile Stop/Start
PW	Write Profile Step to Memory
RI	Report Software Version
RP	Report Parameter List
RS	Report Setpoint Values
RV	Report Measured Values
=D	Set Date and Time
?D	Get Date and Time

11.4 Set Commands

Code	Meaning	Format
CS	Command Speed	**CS**<*Space*><**Arg1**><*CR*> where **Arg1**= Agitation setpoint (####)
CT	Command Temperature	**CT**<*Space*><**Arg1**><*CR*> where **Arg1**= Temperature setpoint (###.#)

11.5 Profile Control Commands

Code	Meaning	Format
PC	Clear Profile (clears profile step)	**PC**<*Space*><**Arg1**><*Space*><**Arg2**><*CR*> where **Arg1**= Profile number (range 1 to 4) and **Arg2**=Step number (range 1 to 15) **NOTE:** If **Arg2** is not included, all 15 steps of the selected profile will be cleared.
PM	Profile Mode (returns status of current profile run/hold mode)	**PM**<*CR*> There are no parameters to this command. Return data format: <**Arg1**><*Space*><**Arg2**><*Space*><**Arg3**><*CR*> where **Arg1**=Run/hold status (0 = end, 1 = run), **Arg2**=Profile number and **Arg3**=Step number **NOTE:** If a profile has not been selected to run, a 0 will be returned for Profile number and Step number.
PR	Read Profile step in memory	**PR**<*Space*><**Arg1**><*Space*><**Arg2**><*CR*> where **Arg1**= Profile number (range 1 to 4) and **Arg2**=Step number (range 1 to 15) Return data format: <**Arg1**><*Space*><**Arg2**><*Space*><**Arg3**><*Space*>...<*CR*><*LF*> where **Arg1**=Profile number (range 1 to 4), **Arg2**=Step number, **Arg3**=Temperature setpoint, **Arg4**=Agitation setpoint, **Arg5**=CO2 setpoint (future option, reads 0.0), **Arg6**=Step hours, and **Arg7**=Step minutes

...continued...

Code	Meaning	Format
PS	Profile Stop/ Start (stops or starts a program profile)	**PS**<*CR*> With no other parameters, any profile currently running will be stopped. **PS**<**Arg1**><*Space*><**Arg2**><*CR*> where **Arg1**=Profile number (range 1 to 4), and **Arg2**=Step number (range 1 to 15). **NOTE:** If **Arg2** is not included, the profile will start in Step 1.
PW	Write Profile step to memory	**PW**<*Space*><**Arg1**><*Space*><**Arg2**><*Space*><**Arg3**> <*Space*> ...<*CR*> where **Arg1**=Profile number (range 1 to 4), **Arg2**=Step number (range 1 to 15), **Arg3**=Temperature setpoint, **Arg4**=Agitation setpoint, **Arg5**=CO2 setpoint (future option); Enter 0.0, **Arg6**=Step hours (range 0 to 99), and **Arg7**=Step minutes (range 0 to 59)

11.6 Report Request Commands

Code	Meaning	Format
RI	Report Software Version	**RI**<*CR*> Return data format: <**Arg1**><*Tab*><**Arg2**><*CR*><*LF*> where **Arg1**=Display module software version, and **Arg2**=Control module software version
RP	Report Parameter List (ASCII text header)	**RP**<*CR*> Return data format: <**Arg1**><*Tab*><**Arg2**><*Tab*><**Arg3**>...<**Arg6**><*CR*><*LF*> where **Arg1**="Shaker Speed", **Arg2**="Temperature", and **Arg3**="% CO2 Concentration"

...continued...

Code	Meaning	Format

RV	Report Measured Values	**RV**<*CR*> **RS**<*CR*> Return data format: <**Arg1**><*Tab*><**Arg2**><*Tab*><**Arg3**>...<**Arg6**><*CR*><*LF*> where **Arg1**= Shaker Speed, **Arg2**=Temperature, and **Arg3**=% CO2 Concentration (future option, reads 0.0)
RS	Report Setpoint Values	

11.7 Set/Get Date & Time

Code	Meaning	Format
=D	Set Date & Time	**=D**<*Space*><**Arg2**><*Space*><**Arg3**><*Space*>...<**Arg7**><*CR*>
?D	Get Date & Time	**?D**<*CR*> Return data format: <**Arg1**><*Tab*><**Arg2**><*Tab*><**Arg3**><*Tab*>...<**Arg7**><*CR*><*LF*> where **Arg1**=Hours (range 0-23), **Arg2**=Minutes (range 0-59), **Arg3**=Seconds (range 0-59), **Arg4**=Year (range 00-99), **Arg5**=Month (range 01-12), **Arg6**=Date (range 1-31), **Arg7**=Day (range 1-7; 1=Monday, 2=Tuesday...7=Sunday)

For example, this command:

=D<*Space*><**01**><*Space*><**30**><*Space*><**00**><*Space*><**04**><*Space*><**07**>
<*Space*><**04**><*Space*><**07**><*CR*>

will set the real date and time on your shaker to:

1:30:00 am, 2004, July 4, Sunday.

12 APPENDIX B: PRODUCT RETURNS

12.1 Return Procedure

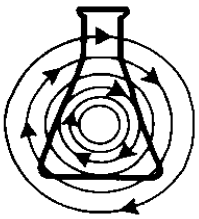
As explained in Section 8.2, should you need to return your Innova 42/42R to NBS for any reason, first contact Customer Service to obtain a Returned Material Authorization (RMA) number. This number must appear on the outside of the shipping container, otherwise NBS Receiving will refuse to accept the shipment.

In addition, you must also certify that the instrument being returned has been thoroughly cleaned and decontaminated. A form for this purpose is provided on the following page; you can photocopy it and fill it out by hand. It can also be downloaded from our website (www.nbsc.com), if you prefer to fill it out electronically.

A copy of the completed Return Authorization and Decontamination Certificate must be attached to the outside of the container, with a second copy packed inside with the instrument.

12.2 Return Authorization and Decontamination Certificate

A sample form for you to copy and fill out is provided on the following page.



New Brunswick Scientific Return Authorization and Decontamination Certificate

Contact New Brunswick Scientific for an RMA number prior to returning any equipment, then complete this form and attach it to the outside container of the equipment being returned to our facility. In addition, please enclose a completed, duplicate copy of this form with the returned item.

Returned Material Authorization (RMA) Number _____

Equipment being returned: Model Number _____Serial Number_____

Reason for its return:

_____

_____

This equipment (check all that apply):

New Product
☐ Never used

Biohazards
☐ Not used
☐ Used, but decontaminated with
_____

Hazardous Chemicals
☐ Not used
☐ Used, but decontaminated with
_____

Radioactive Materials
☐ Not used
☐ Used, but decontaminated with
_____

I certify that the equipment described above has been thoroughly cleaned and decontaminated of all chemical, biological and radioactive contaminants and also certify that the returned unit is safe for unprotected human contact.

By: _____ _____
Signature Print name

Title: _____ Date: _____

Company: _____

Address: _____
_____
_____

Phone: _____ Fax: _____ email: _____

Form 2847

13 APPENDIX C: INTERNAL AC SOCKET

13.1 Using Ancillary Equipment with the Innova 42/42R

The Innova 42/42R has a special internal AC socket, rated at 100W, that is used to power ancillary equipment such as magnetic stirrers, rockers, rollers or 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 42/42R 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 42/42R vibrates, limit the load and/or speed conditions for the operation of the ancillary equipment.

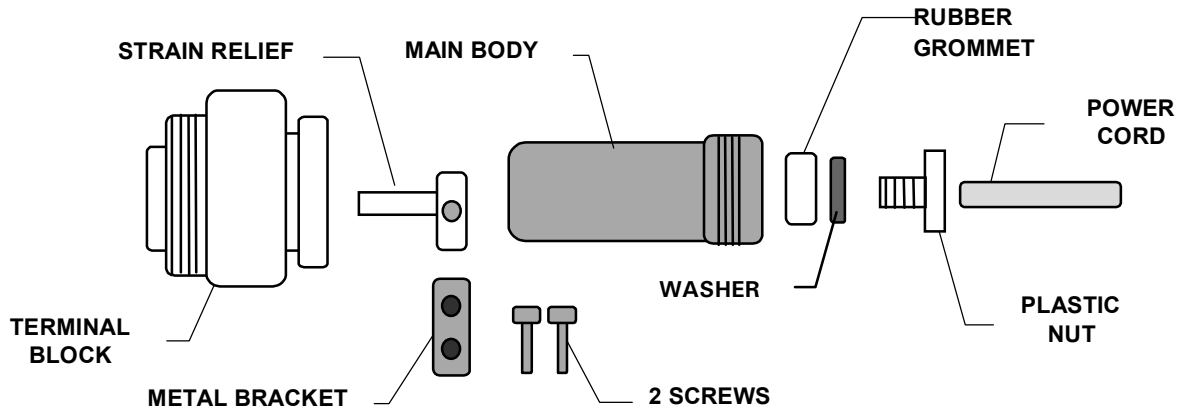
If the Innova 42/42R is intended to be used as a shaker at the same time, both shaker and ancillary equipment should be run under expected load and speed conditions. If the unit vibrates, the shaker speed and/or the load should be reduced, or the Innova 42/42R should not be used as a shaker at the same time the ancillary device is in operation.

The outlet is located inside the shaker chamber on the upper left side**. It is important to note that this AC supply is the same as the main supply of your 42/42R.** If your unit operates off a 120 volt supply, then any ancillary equipment you plug into the internal socket must also operate at 120 volts.

13.1.1 Electrical Moisure-Proof Plug

The AC socket (*see Figure 24 on the following page*), 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 with the unit) to the equipment that you use in the Innova 42/42R. If your equipment has a detachable power cord, you may want to obtain a different power cord to be used solely with the Innova 42/42R shaker.

Figure 24: Internal AC Moistureproof Plug



WARNING!
The following procedure is to be performed ONLY by an authorized service technician.

WARNING!
The internal AC circuit supplied is fused at 100 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 24 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, capture 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 is powered on.

NOTE:

Use of ancillary equipment in the Innova 42/42R may affect the operating temperature range of the Innova 42/42R. This is due to the additional heat generated by the ancillary equipment used.

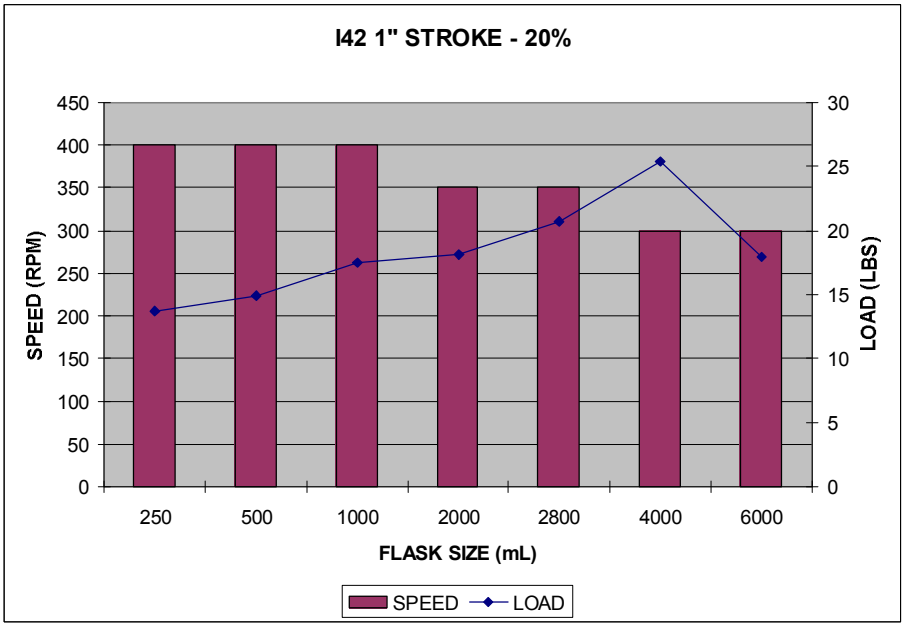
NOTE:

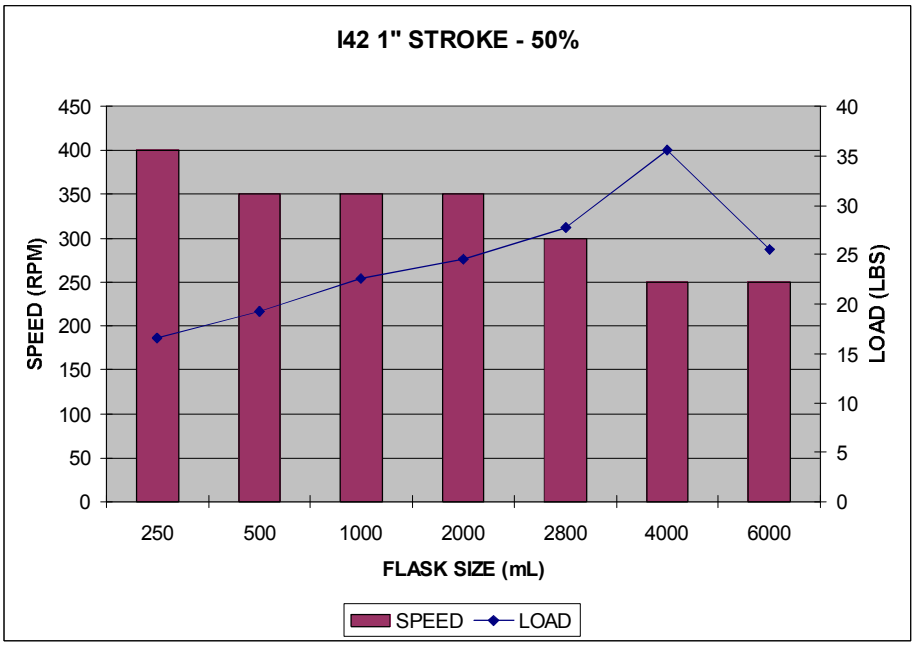
The internal AC socket is also used for the factory-installed optional photosynthetic lamps. If this option is installed on your shaker(s), the internal socket cannot be used for other equipment.

14 APPENDIX D: LOAD/SPEED GRAPHS

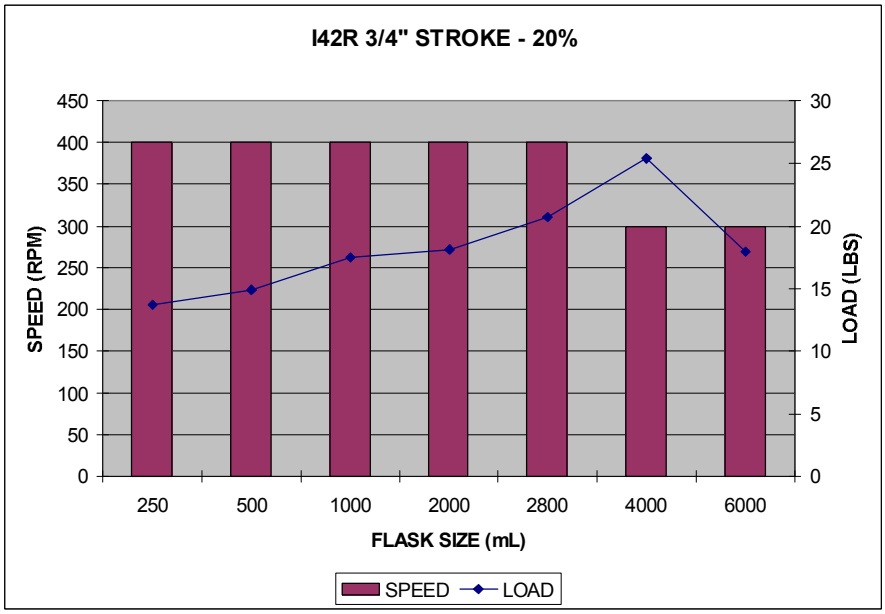
In the following graphs, **20%** and **50%** indicate level to which flasks were filled. These are *sample* load/speed runs provided for your information.

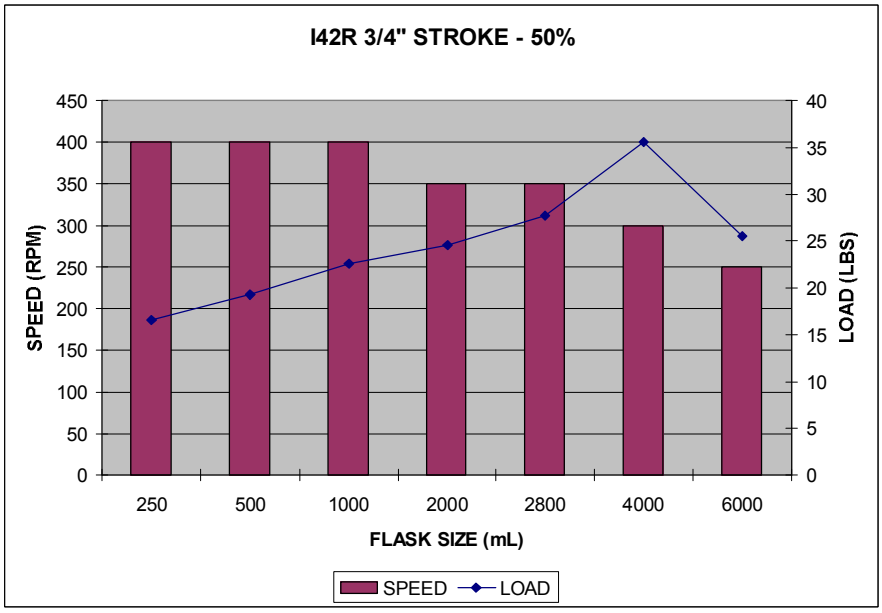
14.1 Innova 42 with 1-inch Stroke



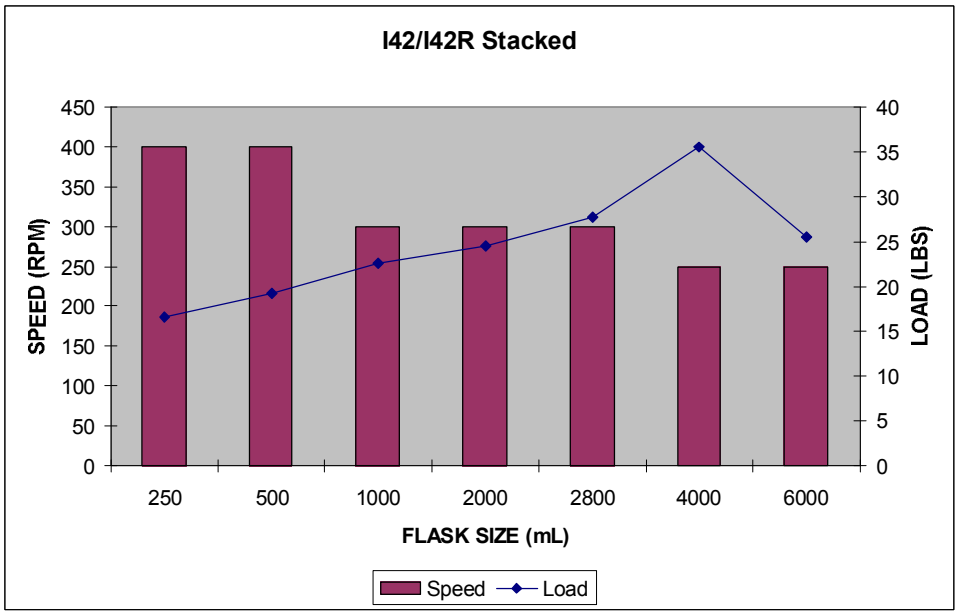


14.2 Innova 42R with 3/4-inch Stroke





14.3 Innova 42 & 42R Stacked



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