



New Brunswick Innova[®] 40/40R Shaker

Operating Manual
M1299-0051
Revision C

eppendorf

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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 Operating Manual before attempting to use this unit.

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

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

Disclaimer Notice

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

Manual Conventions



NOTE:

Notes contain essential information that deserves special attention.



CAUTION!

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



WARNING!

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

Bold

Text in boldface type emphasizes key words or phrases.



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



CRUSH WARNING!

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



Biohazard-related messages.

Warranty

New Brunswick 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 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 factory-trained service representative, without prior written approval from your local New Brunswick sales office or distributor.

Expendable items such as bearings and seals, lamps, probes, sensors, glass, filters, single-use vessels, etc., are not covered.

The warranty begins on the date the equipment ships from New Brunswick or an authorized distributor 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 New Brunswick equipment		1 year	1 year

1 Photosynthetic light banks, etc.

2 Stacking stand, casters, shelves, etc.

3 Chart recorders, CO₂/LN₂ back-up systems, etc.

Warranty registration

To register your warranty, complete the online form at www.nbsc.com/warranty.

Extended warranty option

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

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1 OVERVIEW

The Innova 40/40R Benchtop Incubator Shakers are portable orbital shakers that utilize a triple eccentric counter-balanced drive mechanism. They provide horizontal plane rotary motion in either a $\frac{3}{4}$ -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 40R provides temperature control from 15° C below ambient (with a minimum setpoint of 4° C) to 80° C, and the Innova 40 from 5° C above ambient to 80° C. 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 3 liters in size), 2.8-liter Fernbach flasks, and a wide variety of tubes and plates can be accommodated using the New Brunswick shaker accessories described in Section 8.7.

The Innova 40/40R 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 40/40R shakers are designed with a safety switch that automatically stops the shaker mechanism when the lid is opened.

The Innova 40/40R 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
Lid (hood) open

To accommodate customer needs, a wide variety of platforms can be used with the Innova 40/40R:

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, inspect the boxes carefully for any damage that may have occurred during shipping. Report any damage immediately to the carrier and to your local New Brunswick Customer Service Department.

2.2 *Packing List Verification*

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

2.3 *Unpacking of Equipment*



WARNING!

Do not attempt to lift the Innova 40/40R 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 sales office. Save the crate and packing materials.



NOTE:

Use of the Innova 40/40R 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 pieces, or fails to operate properly, please fill out the **Customer Issues and Feedback form** conveniently located online at www.nbsc.com/feedback

3 PREPARING THE LOCATION

3.1 *Physical Location*

**WARNING!**

Do not attempt to lift the Innova 40/40R 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 40/40R should be smooth, level and sturdy, and must be able to accommodate 200 pounds.

3.2 *Environment*

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

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

3.3 *Electrical Requirements*

The Innova 40/40R 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 $\pm 10\%$.

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 40/40R are:

Width	22 inches	55.9 cm
Depth	30 inches	76.2 cm
Height	24 1/16 inches	61 cm
Height with lid open	40 inches	102 cm

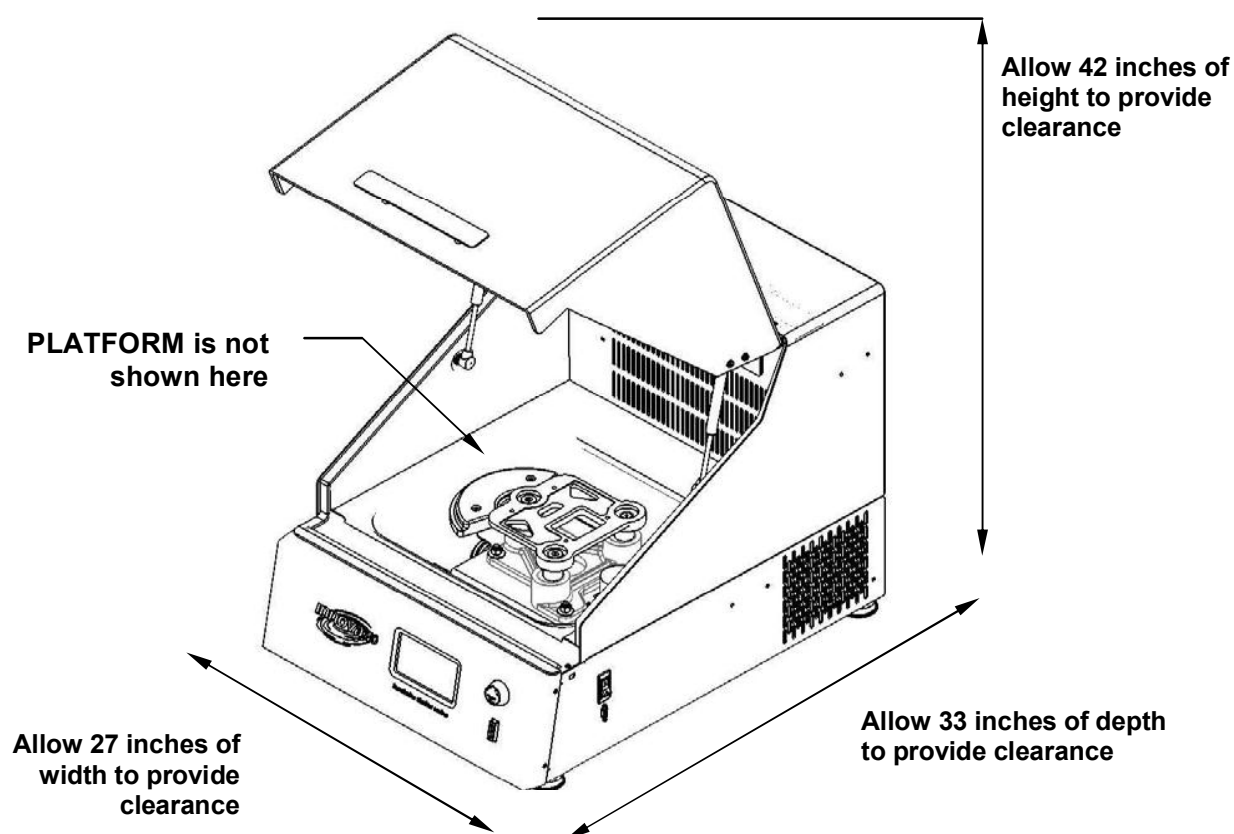
The effective surface area required for operation is:

Width	24 inches	61 cm
Depth	30 inches	76.2 cm

 **NOTE:**

Be sure to allow at least three inches (7.6 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.

1. Set the power switch in the off position. Open the cover.
2. The unit is shipped with the platform screws installed in the top plate of the bearing housing. These screws must be removed before a platform can be installed. Using the 5/32-inch hex wrench provided, loosen and remove the platform screws from the bearing housing.
3. Place the platform on the on the top plate of the bearing housing.
4. Reinstall and secure the four Allen head (+) platform screws with the 5/32-inch hex wrench provided to secure the platform.



NOTE:

The platform is recommended for speeds up to 500 RPM.

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 40 and 40R platforms require 10-24 x 5/16-inch Phillips-head screws (which are supplied) to fasten flask clamps.

Clamps for 2- and 2.8-liter flasks 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:

5. 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.*
6. 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.
7. 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.
8. 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

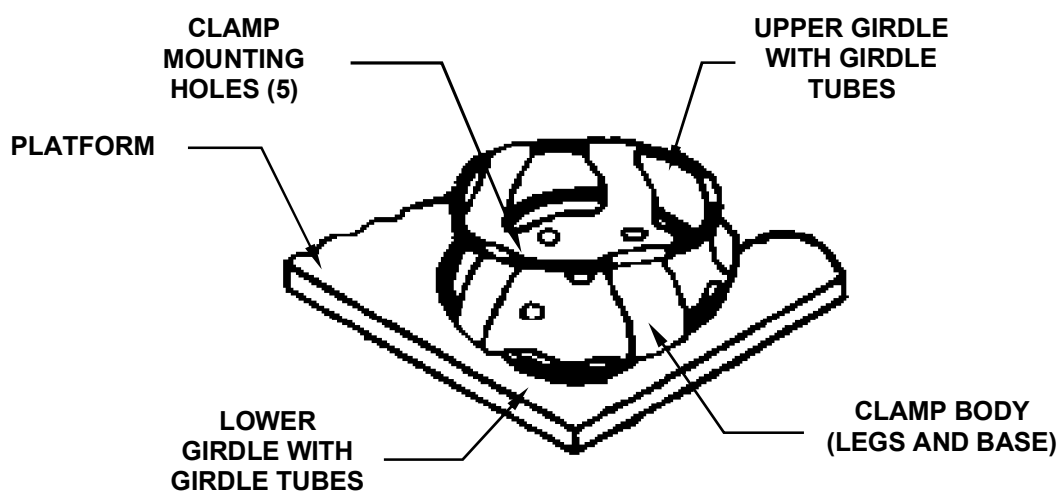


Figure 2b: Clamp Fastener


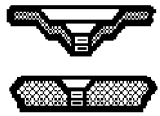
**NOTE:**

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

New Brunswick 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.

Clamp Hardware Application Chart

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

<i>Description</i>	<i>Part Number</i>	<i>Qty.</i>	<i>Application</i>
 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:

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



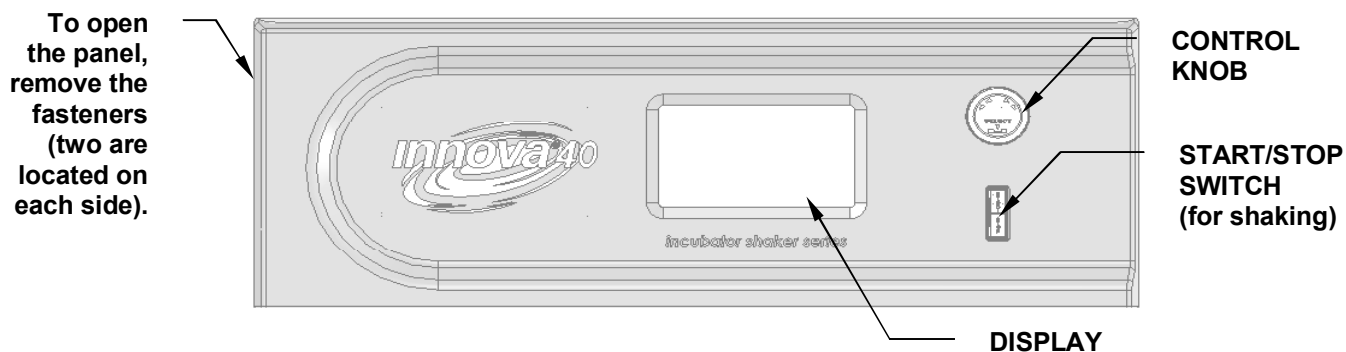
CAUTION!

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

5 FEATURES

5.1 Controls

Figure 3: 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 5.7 for details.
- POWER SWITCH** This rocker switch is a circuit breaker that turns power on and off to the entire Innova 40/40R.

NOTE:

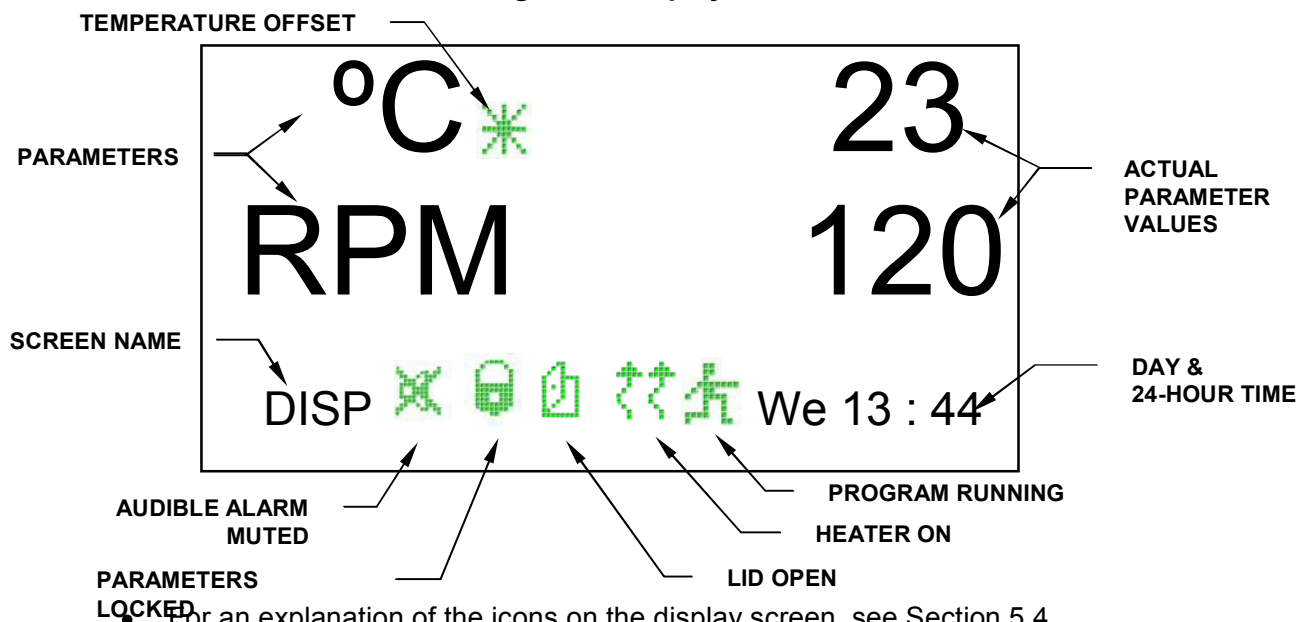
In addition to the power switch, the power cord is also used to conduct power or to break the power circuit to the shaker. Whenever power to the shaker may be a hazard (during cleaning, maintenance or service work), be sure to disconnect the power cord from the electrical outlet.

5.2 LCD Display

When the unit is powered up, using the Power Switch located on the front panel (see Figure 3), 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 4). This screen will indicate the same parameters that were in effect when the power was turned off.

Figure 4: 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 6.5.1.

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 1 describes the various screens:

Table 1: 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

* see Table 2, Display Screen Parameters

...continued...

Screen Name	Meaning	Features/Modes
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. Allows user to calibrate speed.
PROG	Program	Allows user to set up 1- 4 programs, each with 1-15 steps.

Table 2: Display Screen Parameters







Parameter Name	Meaning
RPM	Shaking speed, in revolutions/minute
°C	Chamber temperature, in degrees Celsius
HRS	Programmed time remaining, in hours

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 °C whenever the temperature is onscreen.

Table 3 (on the following page) explains the icons and their meaning.

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 SETUP screen. See Section 6.5.3
	This icon appears when the shaker lid is open.
	This icon appears when the Heater is on. See Section 5.8.
	This icon appears when a user-defined Program is running. See Section 6.6.
	This icon appears to the right of °C if the Temperature Offset feature is being used. See Section 6.8.

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 61°C from setpoint after achieving control temperature range. After lid 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 lid 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 Spill Containment

The Innova 40/40R is equipped with a one-piece plastic liner to protect the electronics and temperature controls. An optional drip pan (part number M1250-9906) is recommended to protect the drive mechanism in case of accidental spills and/or broken glassware.


5.7 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.

5.8 Heater

The chamber temperature is sensed by a 1000 ohm platinum RTD. A 750W 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 lid is opened.

5.9 *Refrigeration (40R Only)*

The refrigeration system in the Innova 40R 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.

5.10 *Service Accessibility*

In the unlikely event that your Innova 40/40R should need service, all electronic boards, refrigeration and heating components are easily accessible **to an authorized service technician**.

5.11 *Remote Alarm Option*

The Innova 40/40R can be equipped with a factory-installed remote alarm component (New Brunswick 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.

6 OPERATION

6.1 Platform Assemblies

The Innova 40/40R can be used with a variety of New Brunswick 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.

See Section 4.1 for platform installation instructions.

6.2 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 a New Brunswick 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 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.

6.3 *Opening the Lid*

Open the lid by grasping the handle and lifting the lid up. When you close the lid, make sure it closes snugly.

6.4 *Starting the Shaker*

To initially start the shaker, close the lid 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, **40** or **40R**, and the stroke, $\frac{3}{4}$ 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 6.7.

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 lid is open. This is indicated by the “lid open” icon appearing in the bottom line of the display (see Figure 4 or Table 3).

6.5 *Using the LCD Screens*

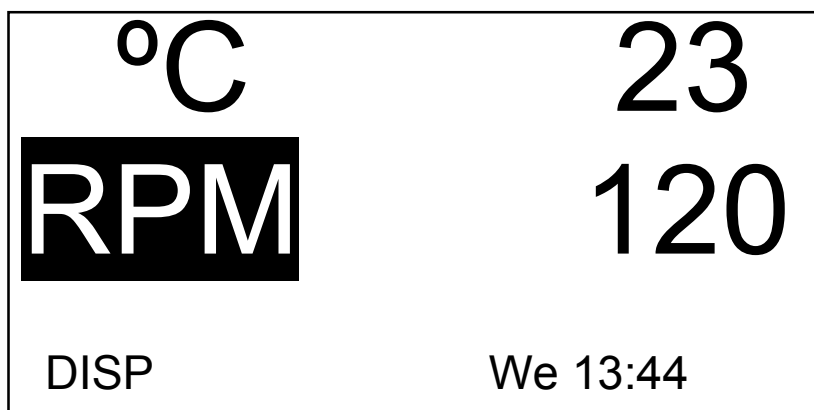
6.5.1 **Display Screen**

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:**

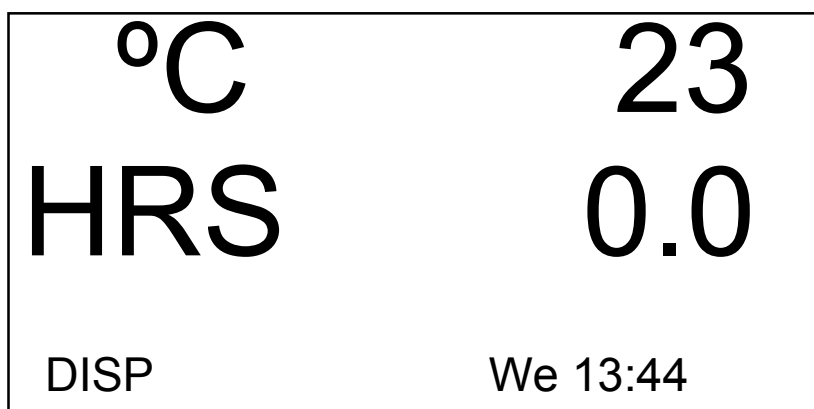
Using the Control Knob, highlight the parameter that you wish to replace. For this example, we will replace **RPM** (see *Figure 5*).

Figure 5: Changing Display Parameter



1. Click the Control Knob in. RPM will flash.
2. Turn the Knob until the desired parameter appears in the highlighted field. For this example, we will select HRS.
3. Click the Knob in, to set and save the parameter (see Figure 6).

Figure 6: 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:**

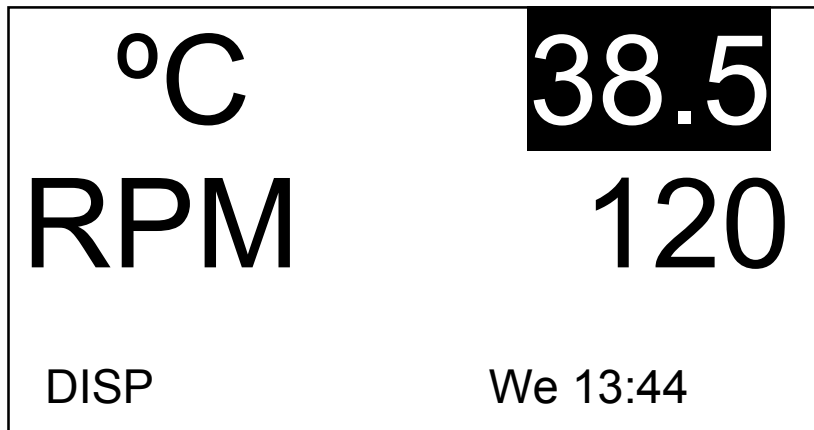
1. Use the Control Knob to highlight the value (in this example, we will view the temperature setpoint, so we will highlight the current °C, which is 23).
2. Click the Knob in to display the current setpoint, which will flash.

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:

Use the Control Knob to highlight the current value (we will continue to use the temperature as our example, so we will select **23**).
Click the Knob in to display the current setpoint (in this example, **38.5**—see *Figure 7*), which will flash.

Figure 7: Changing Setpoint



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

2.  **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 (0.1°C). If you spin the Knob, the value will change by larger increments.

3. 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.

4. 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.

6.5.2 Summary Screen

In this screen (see *Figure 8*), 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 8: Summary Screen

<u>PARAM</u>	<u>ACTUAL</u>	<u>SET</u>
RPM	100	100
°C	45.1	45.0
HRS	0.0	0.0
SUMM		Th 16:18

 **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.

- 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.

6.5.3 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 9: Setup Screen

SETUP	
Day :	Thu
Hour/Min :	16:19
Lock :	Off
Mute :	Off
SET	Th 16:19

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.

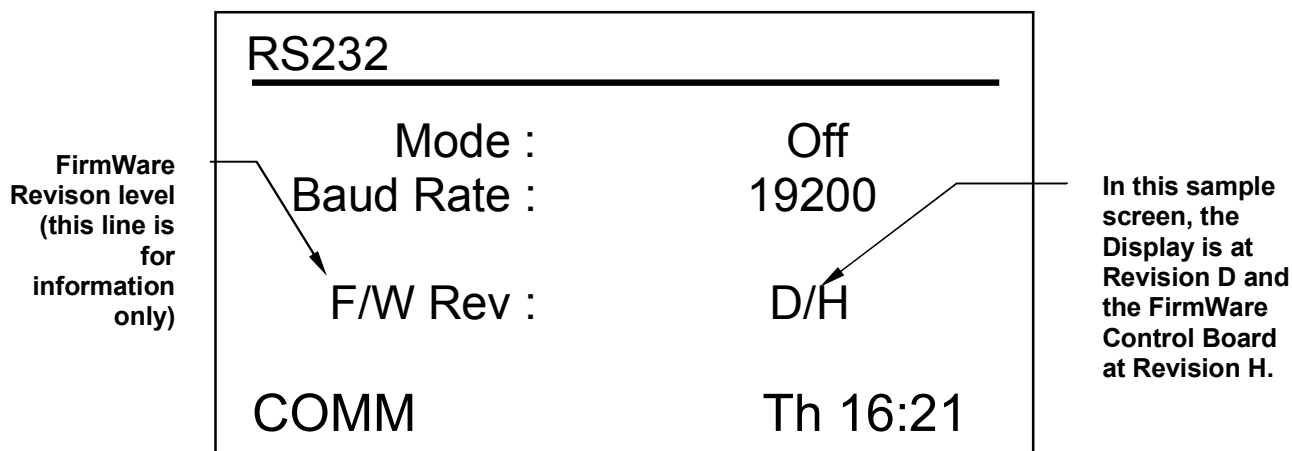
To move out of this screen and into the next:

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.

6.5.4 RS232 Screen

This screen (see Figure 10) is used only if you have connected a personal computer to the RS-232 port (see Section 5.7). Here you can select the RS-232 port's Mode and the Baud Rate appropriate to your PC.

Figure 10: RS232 Screen



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".

1. 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:

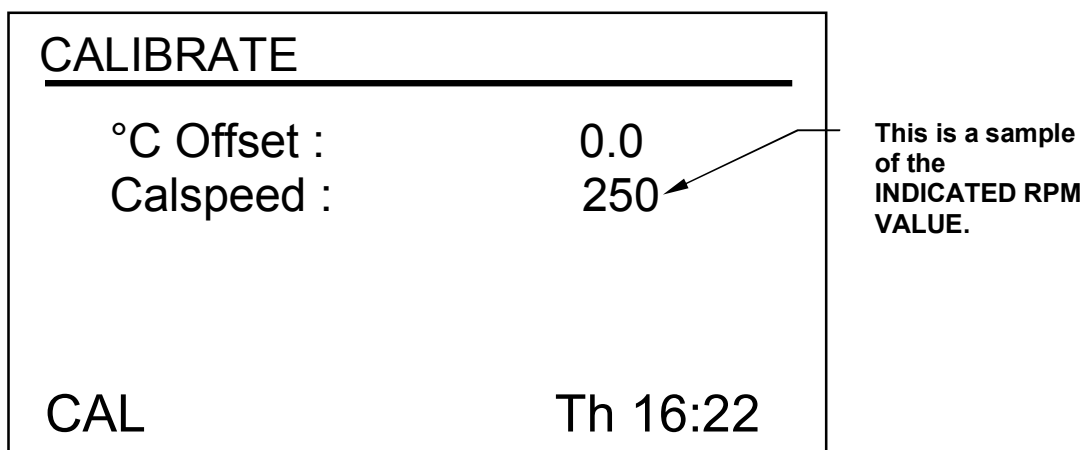
1. Turn the Control Knob to highlight the current setting (19200 in the sample screen above), then click the knob inward once. The current setting will flash.
2. Turn the Control Knob left or right until the desired setting appears: 9600, 19200 or 38400. The setting you choose should match the baud rate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

6.5.5 Calibrate Screen

Use this screen (see Figure 11) to create a temperature offset and to calibrate the shaking speed (for details, see Sections 6.8, Temperature Offset Calibration, and 6.9, Using Calspeed).

Figure 11: Calibrate Screen

6.5.6 Programs Screen

Use this screen (see *Figure 12*) to set as many as four operating programs for the shaker. Each program can have as many as 15 steps. See *Section 6.6 below* for complete details.

Figure 12: Programs Screen

PROGRAMS	
Program 1 :	Off
Program 2 :	Off
Program 3 :	Off
Program 4 :	Off
PROG	Th 16:23

6.6 Programming the Shaker

6.6.1 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 lid is opened or the Start/Stop button is pushed.

6.6.2 Programmed Steps

The resident software for the Innova 40/40R 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 12, 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 12: Programs Screen

PROGRAMS	
Program 1 :	Off
Program 2 :	Off
Program 3 :	Off
Program 4 :	Off
PROG	Th 16:23

6.6.3 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 12, 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 13):

Figure 13: Program 1 – Step 1

PRG1 - STEP	--	01	Step number
Time		00:00	
°C		20.0	
RPM		Off	
	Use these arrows to scroll through steps.		
	Save	Cancel	Use to leave Programming mode without saving any new settings.

DO NOT USE until programming is complete.


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

2. 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 14*).
3. 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.
4. 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 37.0°C (see *Figure 14*).
5. Turn the Knob to highlight the **RPM** setting (**Off** in the sample screen above), then click the Knob in. The field will flash.
6. 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 14*).

 **NOTE: DO NOT select “Save” yet!**

7. To program Step 2 (see *sample screen in Figure 14*): 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 14: Program 1 – Step 2

PRG1 - STEP	01	02	
Time	08:00	03:00	Step number
°C	37.0	40.0	
RPM	150	225	
		Save	Cancel

Whatever step is shown on the right-hand side of the display is settable (*in Figure 14, 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 for that step only; it is not cumulative (i.e., the elapsed time from the start of the program).

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

Figure 15: Program 1 – Step 3

PRG1 - STEP	02	03	Step number
Time	03:00	12:00	
°C	40.0	4.0	
RPM	225	0	
	◀▶	Save	Cancel

The three-step program we have illustrated is designed to start incubating cultures at 37°C and hold that temperature for eight hours, shaking at 150 RPM. After eight hours, Step 2 engages, increasing the temperature setpoint to 40°C 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 4°C 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 40° to 30°C, 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.

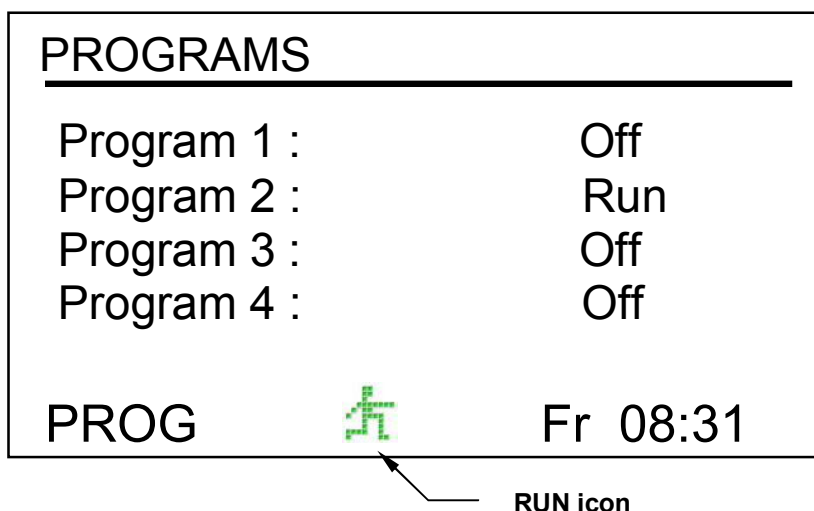
6.6.4 Editing a Program

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

6.6.5 Running a Program

Use the Run function 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 16: Programs Screen – Running



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

6.7 Muting the Audible Alarm

The Innova 40/40R 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".

6.8 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.


6.8.1 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:
4. Actual Temperature – Indicated Temperature = Temperature Offset Value.
5. To set the Temperature Calibration Offset, follow the procedure outlined in Section 6.8.2 below.

6.8.2 Setting the Offset

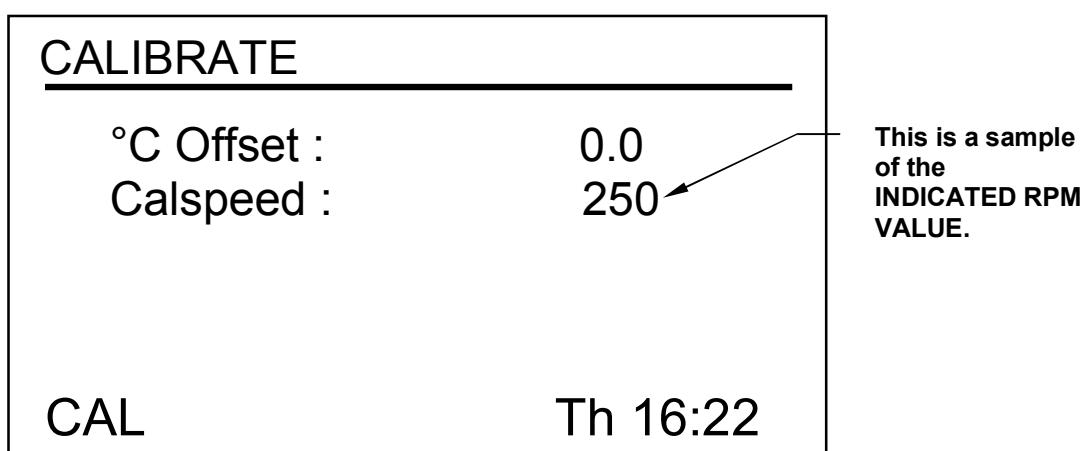
To set the temperature calibration **Offset**:

1. Use the Control Knob to enter the **CAL** screen (see *Figure 11, 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 (0.1°C).
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 °C 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 11: Calibrate Screen



6.9 *Using Calspeed*

The **Calspeed** function, which is set in the **CAL** screen (see *Figure 12 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.

6.10 *Power Interruption*

In the event of a power failure, the Innova 40/40R 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 40 and 40R.

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 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 New Brunswick Customer Service Department

In any correspondence, 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.
	Lid is open—look for Open Lid icon on display: close lid 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 (<i>see below</i>).	
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 40/40R for any reason, first contact your New Brunswick Customer Service department to obtain a Returned Material Authorization (RMA) number. This number must appear on the outside of the shipping container, otherwise the shipment will be refused.

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 that can be replaced by the user. These are located behind the front bezel panel. To access the 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 3), 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 17), 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):

Table 6: Fuses

Fuse Holder Number	Function	Type	Rating
F1	Heater	Slo Blo [®] 8A	8.0 A
F2	Refrigeration (40R only)		8.0 A

Figure 17a: Fuse Replacement, Innova 40

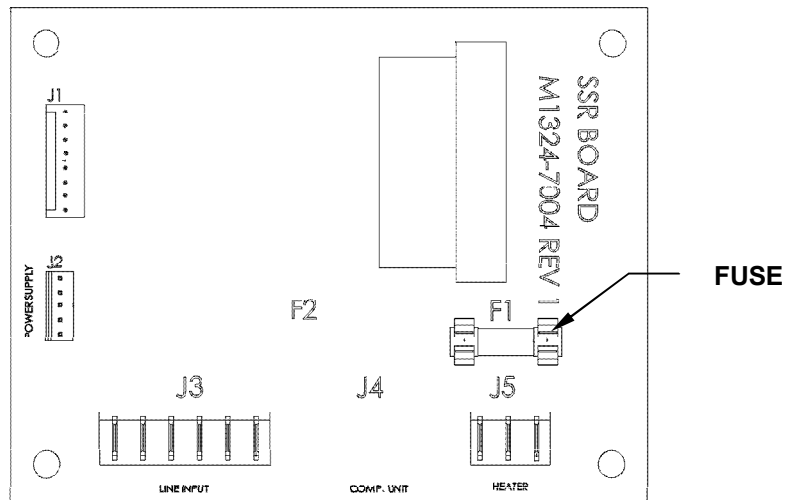
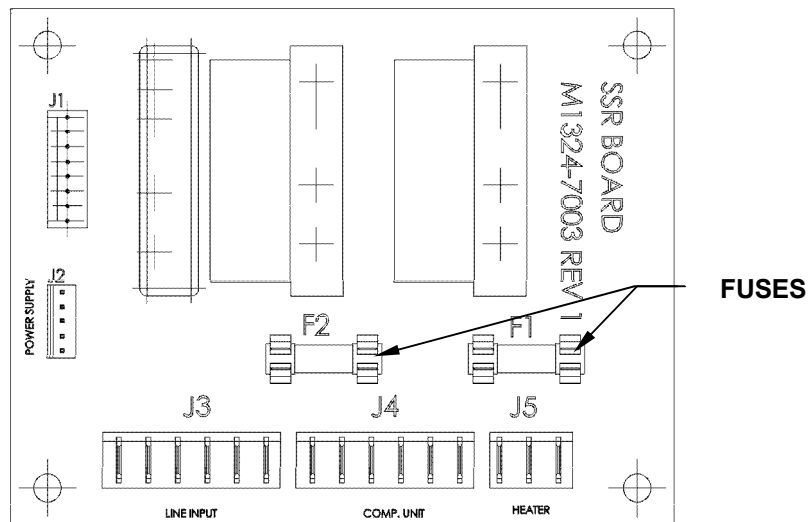


Figure 17b: Fuse Replacement, Innova 40R

**WARNING!**

The following procedures are provided for your information only.
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 18*:

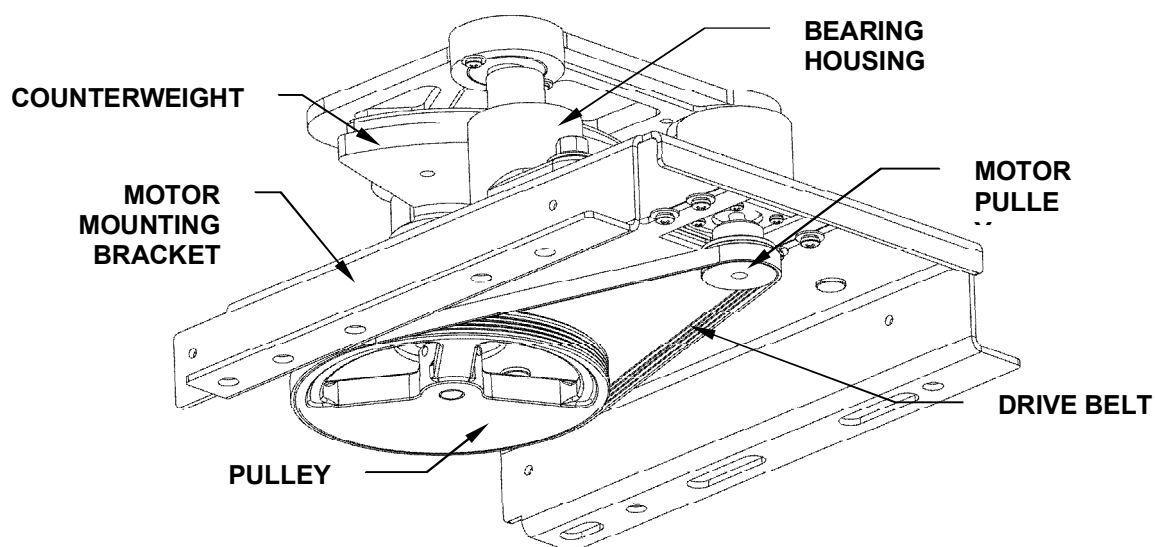


WARNING!

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 lid.
4. Using an Allen wrench, remove the four Allen head screws that hold the platform to the bearing housing. Set the platform and its mounting screws aside for reuse.
5. Remove the bearing housing assembly from the unit, and turn the bearing housing assembly upside down (see *Figure 18*).

Figure 18: Drive Belt Replacement



1. Use the hex wrench to loosen the four hex nuts on the motor mounting bracket.
2. Gently slide the motor mounting bracket toward the lefthand side of the shaker. This loosens the drive belt from the motor pulley and the large pulley. Moving the motor mounting bracket forward will cause the belt to fall from both belt tracks.
3. Remove the old belt.

4. With one hand, place the new belt around the motor pulley, and with the other hand guide the belt around the large pulley.
5. Move the motor mounting bracket back, until there is a slight resistance.
6. Verify that the drive belt has a slight pressure near the center. The recommended deflection is 3/8 inch (9.5 mm).
7. Use the hex wrench to tighten the four hex nuts on the motor mounting bracket.
8. Reinstall the platform on the bearing housing with the four Allen head screws previously removed.
9. Close the shaker lid.
10. Reconnect the power cord to the electrical outlet.

8.6 Replacement Parts

We recommend that you keep on hand one spare motor drive belt and two (each) replacement fuses. New Brunswick spare parts kits contain commonly needed replacement parts for your Innova 40/40R (see *Table 7 below*).

Table 7: Spare Parts Kit M1352-6000

Description	Quantity
V-Belt	1
Gas springs	2
Fuse, 8-amp	4

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 8: Available Platforms

<i>Description</i>	<i>Capacity</i>	<i>New Brunswick Part No.</i>
Universal Platform	see Table 9	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 9: Universal Platform Flask Capacities

<i>Flask Type</i>	<i>Capacity*</i>
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

*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 10: 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

8.7.3 Replacement Clamp Hardware

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

8.7.4 Test Tube Racks & Other Accessories

Table 11: Racks & Trays

Accessory Description		New Brunswick 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
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

...continued...

Accessory Description		New Brunswick Part Number	Platform Capacity
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 19: Control Schematics

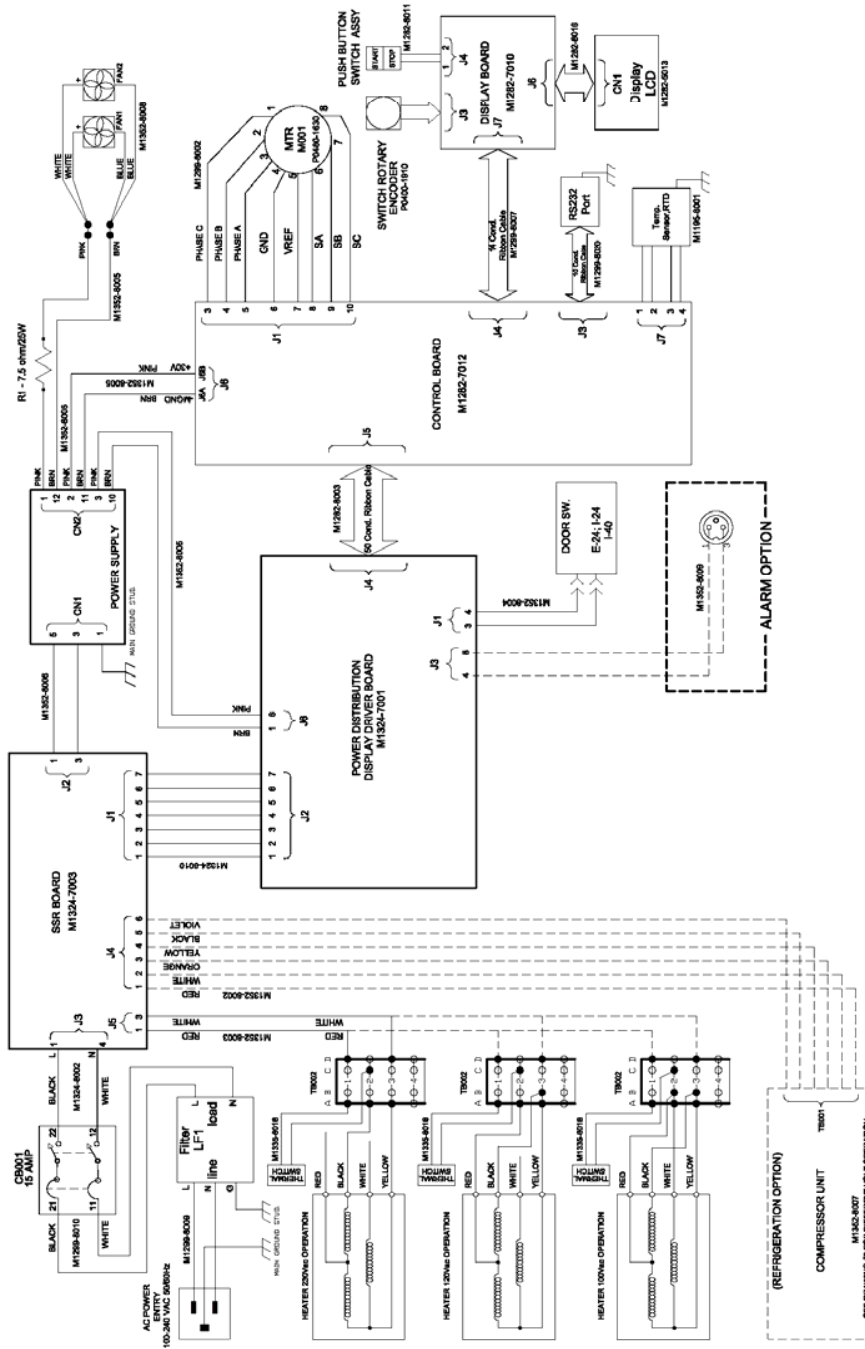


Figure 20: Refrigeration Schematic

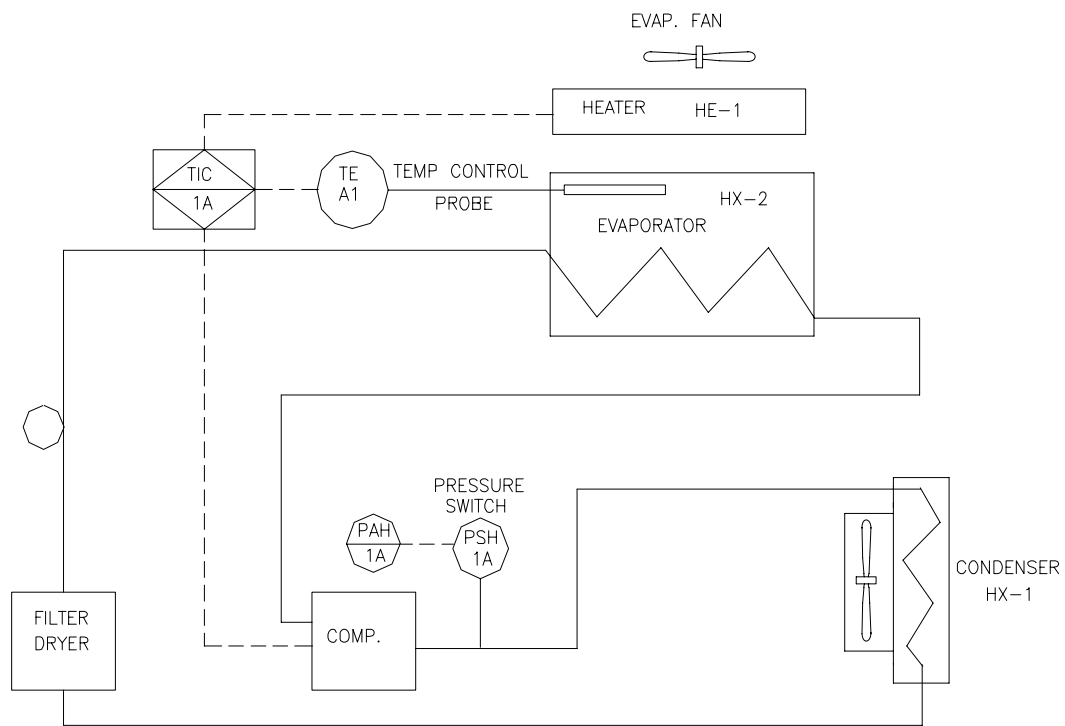


Figure 21a: Power Supply, 230 VAC/50 Hz

230Vac/50Hz OPERATION

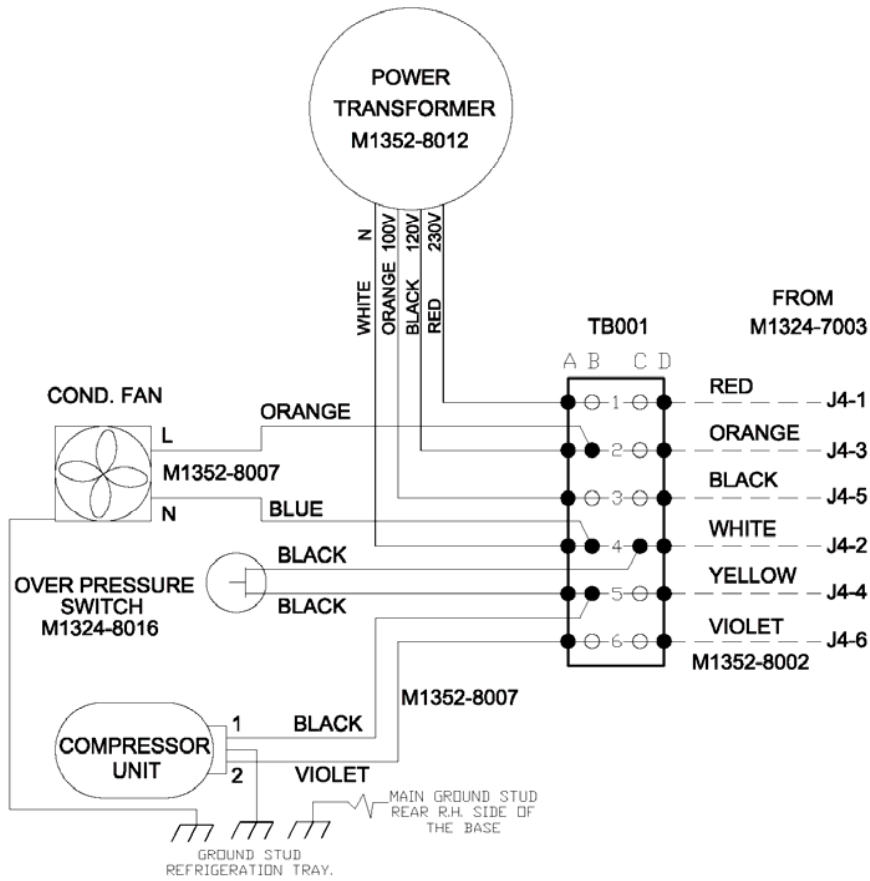


Figure 21b: Power Supply, 100 VAC/50 Hz

100Vac/50Hz OPERATION

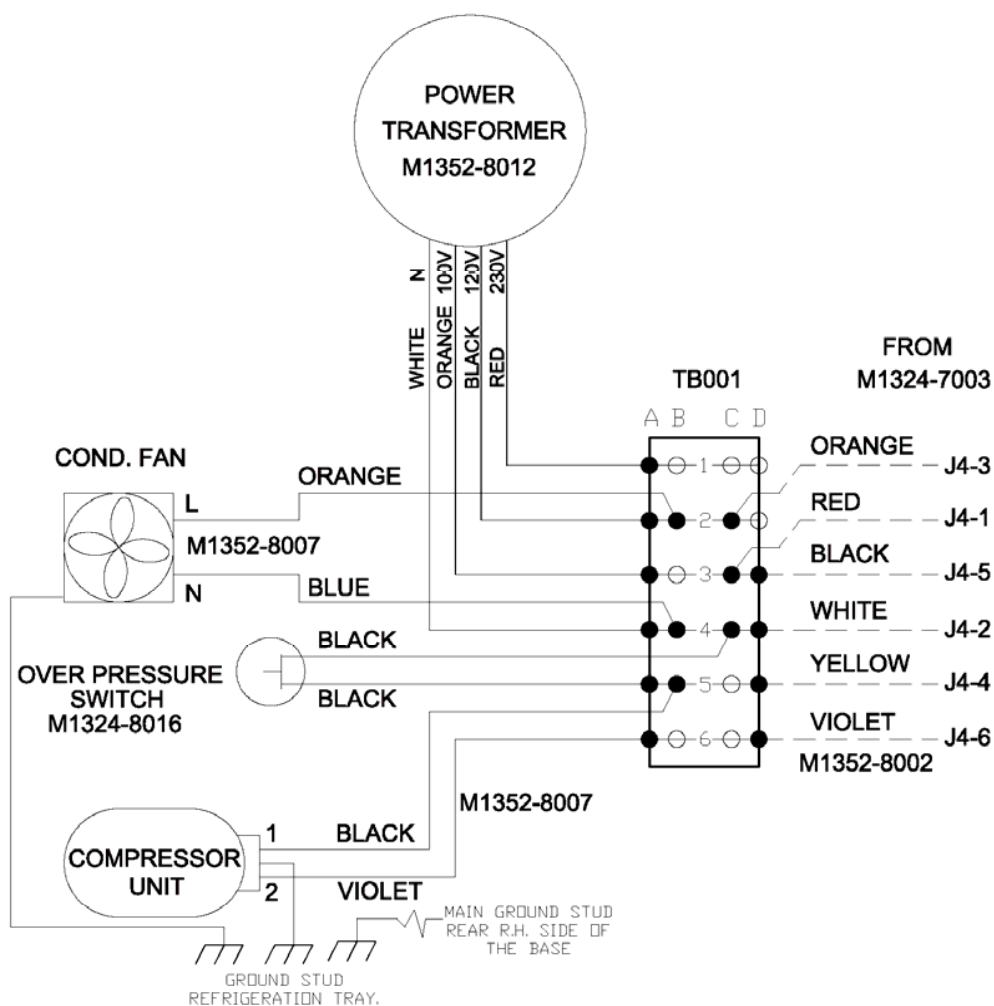


Figure 21c: Power Supply, 120 VAC/60 Hz

120Vac/60Hz OPERATION

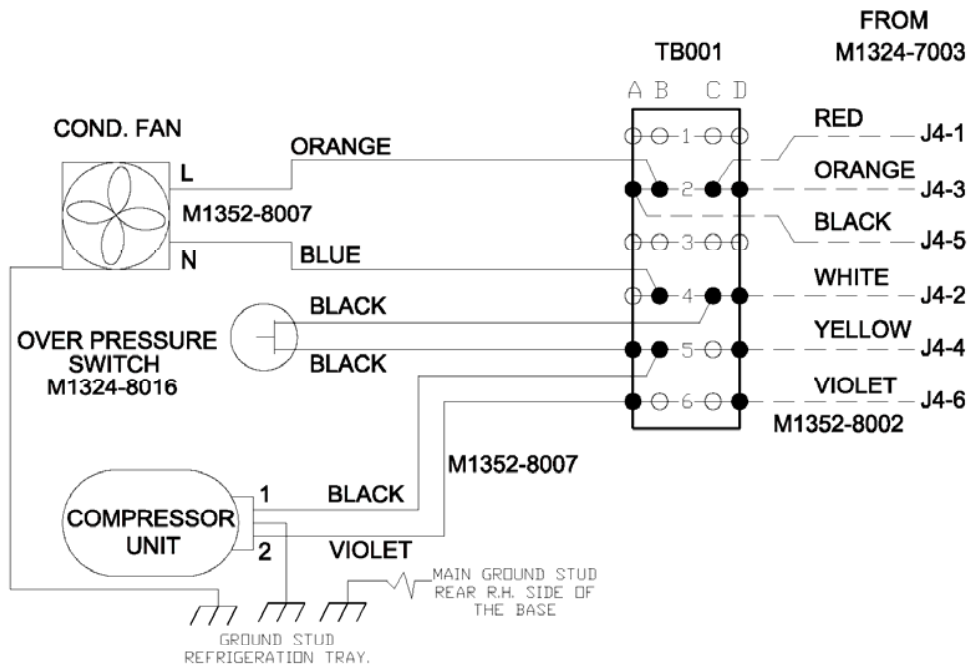
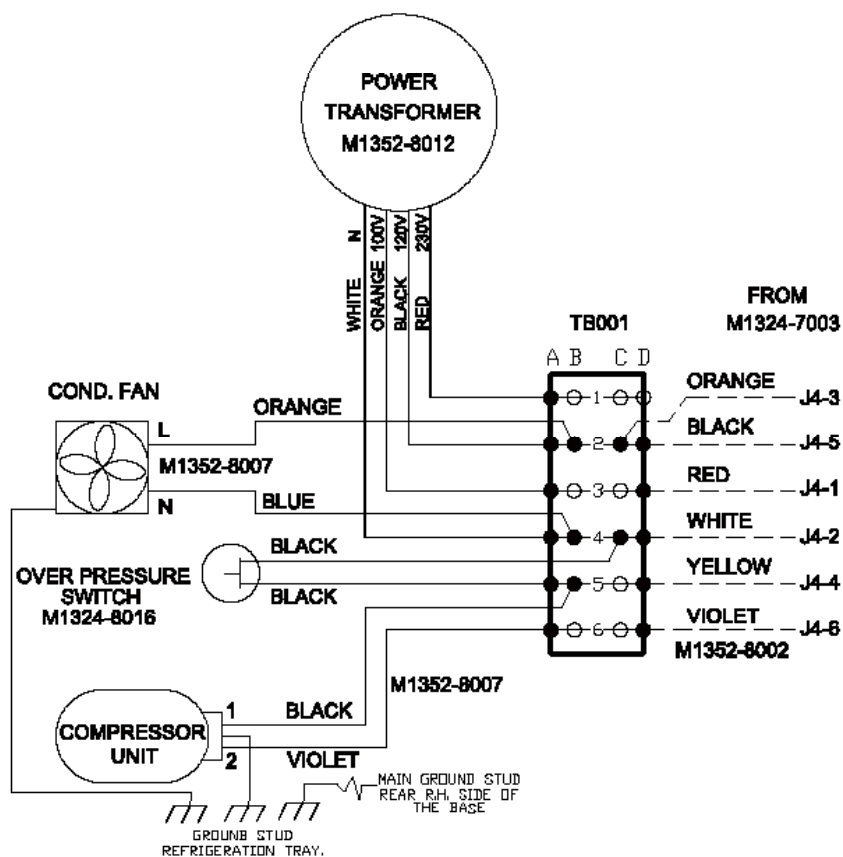


Figure 21d: Power Supply, 100 VAC/60 Hz

100Vac/60Hz OPERATION



9.2 List of Drawings

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2b	Clamp Fastener
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6	Changed Display Parameter
7	Changing Setpoint
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18	Drive Belt Replacement
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21c	Power Supply, 120 VAC/60 Hz
21d	Power Supply, 100 VAC/60 Hz

9.3 *List of Tables*

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5	Communication Mode
6	Fuses
7	Spare Parts Kit M1352-6000
8	Available Platforms
9	Universal Platform Flask Capacities
10	Flask Clamps
11	Racks & Trays
12	COM Parameters for HyperTerminal

10 SPECIFICATIONS

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

Innova 40 & 40R Incubator Shaker							
SHAKING Speed¹	25-500 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 (40)²	5°C above ambient temperature to 80°C						
Range (40R)²	15°C below ambient temperature (minimum 4°C) 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 lid 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	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">100 Volts, 50/60 Hz</td> <td style="width: 50%;">40: 800 VA per shaker</td> </tr> <tr> <td>120 Volts, 60 Hz</td> <td>40R: 1500 VA per shaker</td> </tr> <tr> <td>230 Volts, 50 Hz</td> <td></td> </tr> </table>	100 Volts, 50/60 Hz	40: 800 VA per shaker	120 Volts, 60 Hz	40R: 1500 VA per shaker	230 Volts, 50 Hz	
100 Volts, 50/60 Hz	40: 800 VA per shaker						
120 Volts, 60 Hz	40R: 1500 VA per shaker						
230 Volts, 50 Hz							
ETL REGULATORY STANDARDS	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">UL 61010A-1</td> <td style="width: 50%;">CAN/CSA-C22.2 No. 1010.1</td> </tr> <tr> <td>UL 61010A-2-010</td> <td>CAN/CSA-C22.2 No. 1010.2.010</td> </tr> </table>	UL 61010A-1	CAN/CSA-C22.2 No. 1010.1	UL 61010A-2-010	CAN/CSA-C22.2 No. 1010.2.010		
UL 61010A-1	CAN/CSA-C22.2 No. 1010.1						
UL 61010A-2-010	CAN/CSA-C22.2 No. 1010.2.010						
CE REGULATORY STANDARDS	See Declaration of Conformity, Section 10.1.						
DIMENSIONS							
Width	55.9 cm (22 in)						
Depth (Front to Back)	76.2 cm (30 in)						
Height	61 cm (24 in)						
Height with lid open	102 cm (40 in)						

¹ see NOTE on following page

² depending on ambient factors, such as relative humidity, and options installed

<i>Innova 40 & 40R Incubator Shaker</i>	
CHAMBER DIMENSIONS (W X D X H)	51.4 x 54.4 x 35.6 cm (20.3 x 21.5 x 14 in) from top of platform
PLATFORM	Aluminum, 18" x 18" (46 x 46 cm). Select universal or dedicated styles.
NET WEIGHT	
40	60 kg (133 lb)
40R	79 kg (175 lb)

 **NOTE:**

Use of baffled flasks will significantly reduce maximum speed for any shaker. We may be able to improve this maximum speed by using an alternative motor pulley. Contact your New Brunswick representative for more information.

10.1 Certifications

The Innova 40 and 40R 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 40 and 40R also conform to the appropriate CE standards (see also "CE Regulatory Standards" in the specifications table).



New Brunswick
an eppendorf company

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 40/40R

EU Directive(s)

Low Voltage (73/23/EEC93/68/EEC)
Electromagnetic Compatibility (89/336/EEC/93/68/EEC)
CE Marking Directive (93/68/EEC)

Standard(s)

EN61010-1	EN61000-4-3
EN61010-2-010	EN61000-4-4
EN55011 (CLASS B)	EN61000-4-5
EN61000-3-2	EN61000-4-6
EN61000-3-3	EN61000-4-11
EN61000-4-2	

The conformity assessment procedures were performed at the following:

- Intertek testing services, 41 Plymouth Street, Fairfield, NJ 07004 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
175 Freshwater Blvd
Enfield, CT 06082 U.S.A
Tel. (860) 253-3400
Fax. (860) 741-0859


Henry Couture
Director of QA RA

24-OCT-11
Date

11 APPENDIX: 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 6.5.4).
2. While you are in the RS232 screen (see Figure 19), 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 (see Figure 1).
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 12 below):

Table 12: 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

1. 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.
2. 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 40/40R. 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 40/40R 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 40/40R 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 40/40R 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 40/40R 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 11.4-11.7 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)	<p>PS<CR> With no other parameters, any profile currently running will be stopped.</p> <p>PS<Arg1><Space><Arg2><CR> where Arg1=Profile number (range 1 to 4), and Arg2=Step number (range 1 to 15).</p> <p>NOTE: If Arg2 is not included, the profile will start in Step 1.</p>
PW	Write Profile step to memory	<p>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)</p>

11.6 Report Request Commands

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

12.1 *Return Procedure*

As explained in Section 8.2, should you need to return your Innova 40/40R 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 your shipment will be refused.

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 Return Authorization and Decontamination Certificate

Contact your local New Brunswick sales office 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 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

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