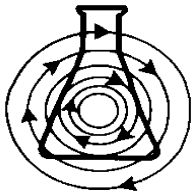




Guide to Operations

Excella E-24/24R Benchtop Incubator Shakers

MANUAL NO: M1352-0050
Revision A
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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 unit.

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

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

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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 bold face type emphasizes key words or phrases.



Biohazard-related messages.



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 .



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1 OVERVIEW

The Excella E-24/24R Benchtop Incubator Shakers use a UniCentric™ counter-balanced drive mechanism. They provide horizontal plane rotary motion in a ¾-inch (1.9 cm) diameter circular orbit. A Proportional/Integral (PI) microprocessor controls the speed and temperature over the entire range.

The incubated and refrigerated E-24R operates from 15°C below ambient (with a minimum setpoint of 4°C) to 60°C, and the incubated E-24 from 7°C above ambient to 60°C. Both these ranges depend on relative humidity and other ambient factors. Ambient temperature is measured one meter from the front of the unit.

Erlenmeyer flasks, 2.8-liter Fernbach flasks, and a wide variety of tubes and plates can be accommodated using the New Brunswick Scientific shaker accessories described in Section 9.

The E-24/24R 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, while the temperature is maintained at its setpoint.

For safe operation, the E-24/24R shakers are designed with a safety switch that automatically stops the shaker mechanism when the lid is opened.

Both the E-24 and the E-24R are equipped with visual and audible alarms that alert the user to the following conditions:

- The end of a timed run
- Deviations from speed setpoint (5 minutes after hood is closed)
- Deviations from temperature setpoint (5 minutes after hood is closed)
- Power failure
- Lid (hood) open

To accommodate customer needs, a wide variety of platforms can be used with the Excella E-24/24R:

- 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 9.

2 INSPECTION & UNPACKING OF EQUIPMENT

2.1 *Inspection of Boxes*

After you receive your order, inspect the boxes carefully for any damage that may have occurred during shipping. Report any damage immediately to the carrier and to your local sales representative.

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 Excella E-24/24R by yourself. Always ask for assistance or use a lifter or other suitable equipment when raising or handling the unit.



CRUSH WARNING!

It is preferable to lift the Excella E-24/24R from the sides of the unit, but if you lift it from the front and back, be sure to use the finger holes in the back lip (toward the bottom of the unit). If these finger holes are not used, the back lip can pinch fingers and hands.

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 sales representative. Save the crate and packing materials.



NOTE:

Use of the Excella E-24/24R Shakers requires a platform, which is a separate item. See the *Available Platforms list in Section 9.1.1.*

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 contact your sales representative and also fill out *Customer Satisfaction Form 6300*, included with your equipment, and return it by fax.

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 Excella E-24/24R by yourself. Always ask for assistance or use a lifter or other suitable equipment when raising or handling the unit.



CRUSH WARNING!

It is preferable to lift the Excella E-24/24R from the sides of the unit, but if you lift it from the front and back, be sure to use the finger holes in the back lip (toward the bottom of the unit). If these finger holes are not used, the back lip can pinch fingers and hands.

The surface where you place the E-24/24R 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 E-24/24R can be equipped to run on:

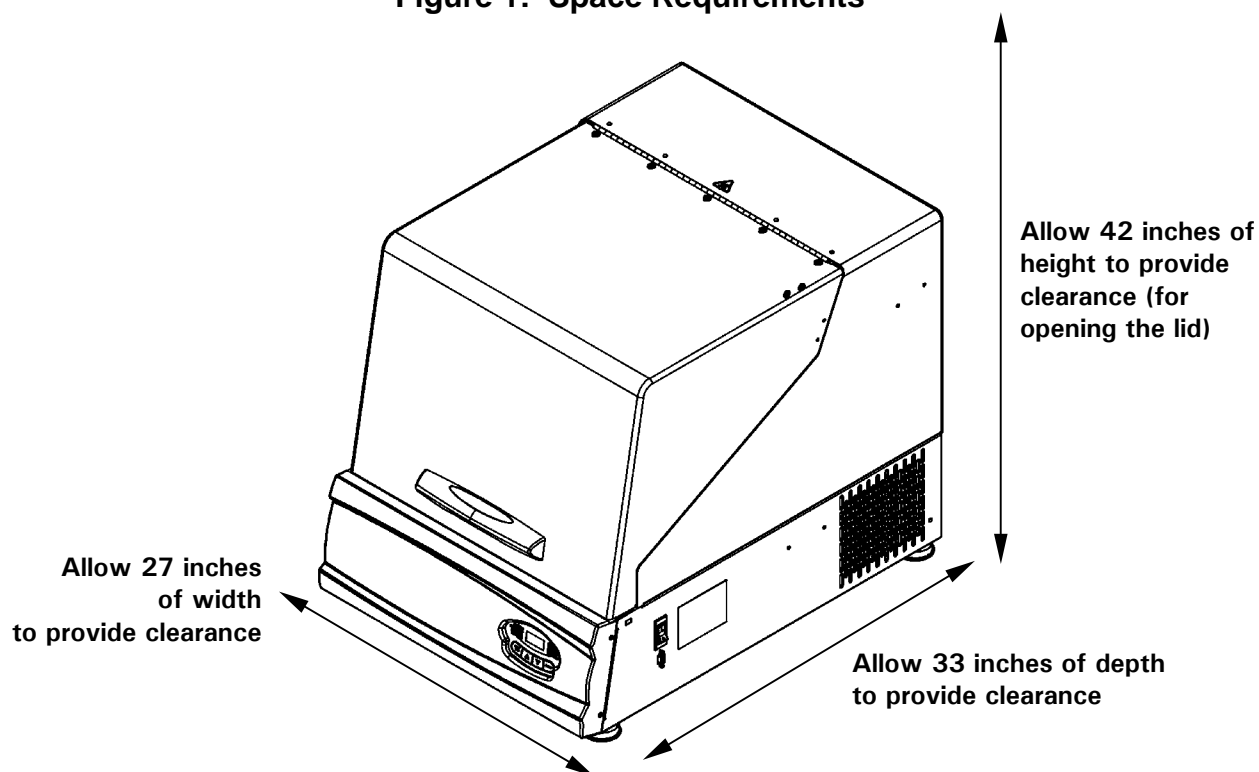
- 100 Volts, 50/60 Hz, 1500 VA maximum
- 120 Volts, 60 Hz, 1500 VA maximum
- 230 Volts, 50 Hz, 1500 VA maximum

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*).

Figure 1: Space Requirements



The dimensions of the Excella E-24/24R are:

Width	22 inches	55.8 cm
Depth	30 inches	76.2 cm
Height	24 1/16 inches	61.1 cm
Height with lid open	40½ inches	101.9 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).

The effective surface area required for operation is:

Width	24 inches	61 cm
Depth	30 inches	76.2 cm

4 INSTALLATION

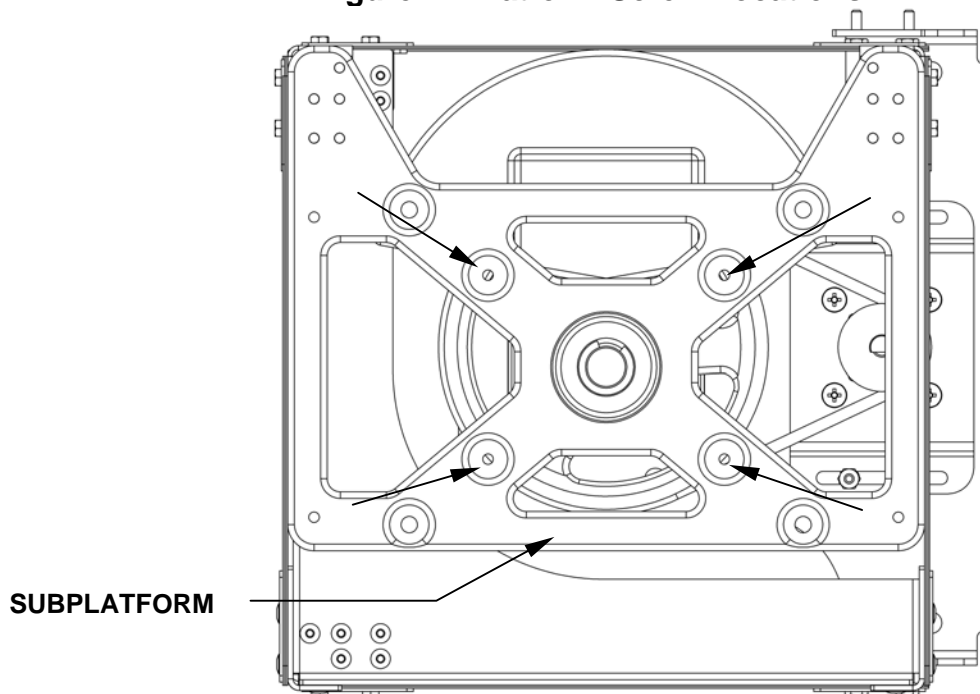
4.1 Installation of Platform

 **NOTE:**

There are two small plastic straps that hold the bearing housing in place for shipping. The straps must be removed from the unit.

Prior to use, a platform must be installed on the unit. The unit is shipped with four Allen head **PLATFORM SCREWS** installed in the **SUBPLATFORM** of the **BEARING HOUSING**. These screws must be removed and set aside for use before a platform can be installed:

Figure 2: Platform Screw Locations



1. Using the 7/32-inch hex wrench provided, remove the four Allen head platform screws from the subplatform. Set them aside.
2. Place the selected **PLATFORM** on the subplatform. Align the mounting holes of the platform with the platform screw locations in the subplatform.
3. Insert the four Allen head platform screws previously removed and set aside. Tighten them with the 7/32-inch hex wrench provided to secure the platform.

4.2 Flask Clamp Installation

Flask clamps purchased for use with universal platforms (*see Section 9.1.1*) 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 Excella E-24 and E-24R platforms require 10-24 x 5/16-inch screws, which are the smaller Phillips head screws 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:

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 3b 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 3a*), 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 3a: Double Girdle Clamp Installation

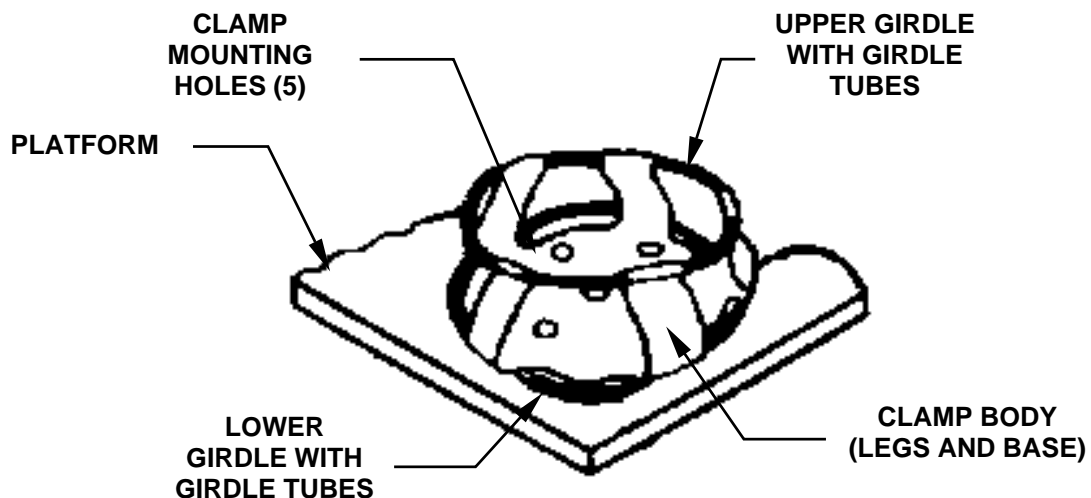


Figure 3b: Clamp Fastener** NOTE:**

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. With reference to Figure 3b above, select the appropriate screws and set the others aside.

 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!**

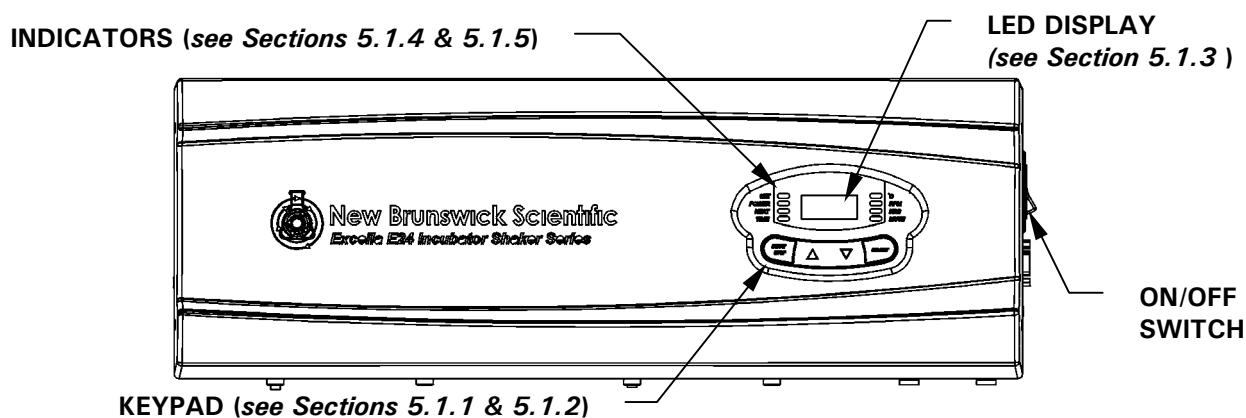
A grounded electrical outlet is necessary for the safe operation of this instrument.

5 FEATURES

5.1 Control Panel

The front panel (see *Figure 4*) of the Excella E-24/24R shakers provides easy access to the control panel, which consists of the keypad, display and indicator lights. The **ON/OFF** switch is conveniently located on the right side of the unit, as you face the controls.

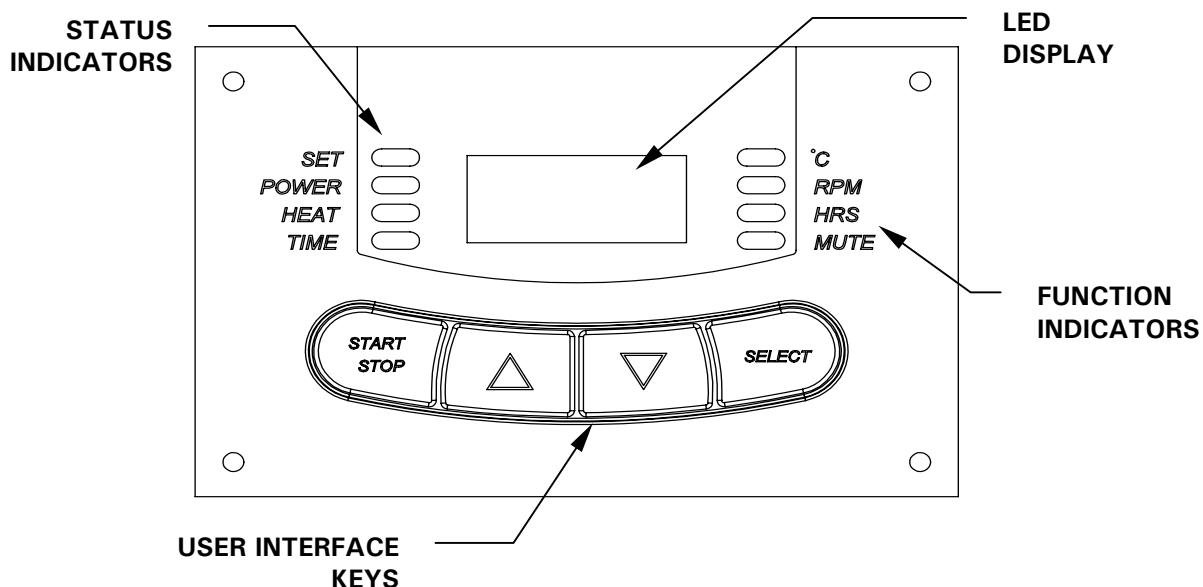
Figure 4: Control Panel



5.1.1 Keypad

The keypad (see *close-up in Figure 4a on the following page*) is the operator's command center for the shaker. In one convenient location are grouped the user interface keys, the LED display, the status indicator lights and the function indicator lights.

Figure 4a: Keypad



5.1.2 User Interface Keys

- **START/STOP** This key is used to start or stop the shaker. It will also activate or stop the timer when a timed run is desired.
- **SELECT** This key is used to change the displayed parameter.
- **▲(UP), ▼(DOWN)** These keys are used to adjust the setpoint of a displayed parameter up or down. They also allow the user to enter the **SET MODE** for setpoint changes.

5.1.3 LED Display

The digital display on the control panel is a three-digit **LED DISPLAY**. During normal shaker operation, the display will indicate:

- Shaker status (On/Off)
- Shaking speed
- Chamber temperature
- Setpoints
- Hours remaining (in a timed run)
- Lid open (“**LID**”)

5.1.4 Status Indicators

Four status indicator lights are located to the left of the **LED DISPLAY**. They are:

- **SET** Indicates that the shaker is in the **SET MODE**, when setpoints are being displayed and can be altered. This is activated by the **SELECT** key or by pressing the **▲(UP)** or **▼(DOWN)** arrow.
- **POWER** Illuminates and blinks during power up or if power is interrupted during a run. Press the **SELECT** key and change to another function to turn off this indicator.
- **HEAT** Illuminates to indicate that the heater is on.
- **TIME** Indicates that the timer is in operation. The shaker can be programmed to run for a preset time from 0.1 to 99.9 hours. The timer can be disengaged without stopping an ongoing run.

5.1.5 Function Indicators

Four function indicator lights are located to the right of the **LED DISPLAY**. They indicate the current parameter(s) being displayed:

- **°C** Interior chamber temperature. Can be set from 4°C to 60°C, when in **SET MODE**, using the **▲(UP)** or **▼(DOWN)** arrow key. It indexes at 0.1°C increments unless the key is pressed for 4 seconds, after which it indexes more rapidly.
- **RPM** Revolutions per minute. When in **SET MODE**, use the **▲(UP)** or **▼(DOWN)** arrow key to change the speed. It indexes at 1 RPM increments unless the key is pressed for 4 seconds, after which it indexes more rapidly.

- **HRS**

Time remaining in a timed run. Can be set from 0.1 to 99.9 hours, in 0.1 increments or, if the ▲(UP) or ▼(DOWN) arrow key is pressed for 4 seconds, the time indexes more rapidly.

The countdown begins when the **START/STOP** key is pressed. If the **START/STOP** key is pressed, the shaking stops (but temperature is maintained) and the timer pauses until the **START/STOP** key is pressed again.

When a timed run ends, the **HRS** indicator will blink. Press the **SELECT** key and change to another function to turn off this indicator.

- **MUTE**

This feature is controlled by the **SELECT** key. When activated, the audible alarm is muted, and remains so until is is reactivated. If **MUTE** is activated when the shaker is turned off using the **ON/OFF** switch, it will remain engaged when the machine is powered up again. To activate (or deactivate) the **MUTE** function, press the **SELECT** key until the **MUTE** indicator illuminates; press the ▲ or ▼ KEY to display **ON** or **OFF**, as desired; then press **SELECT**.

6 OPERATION

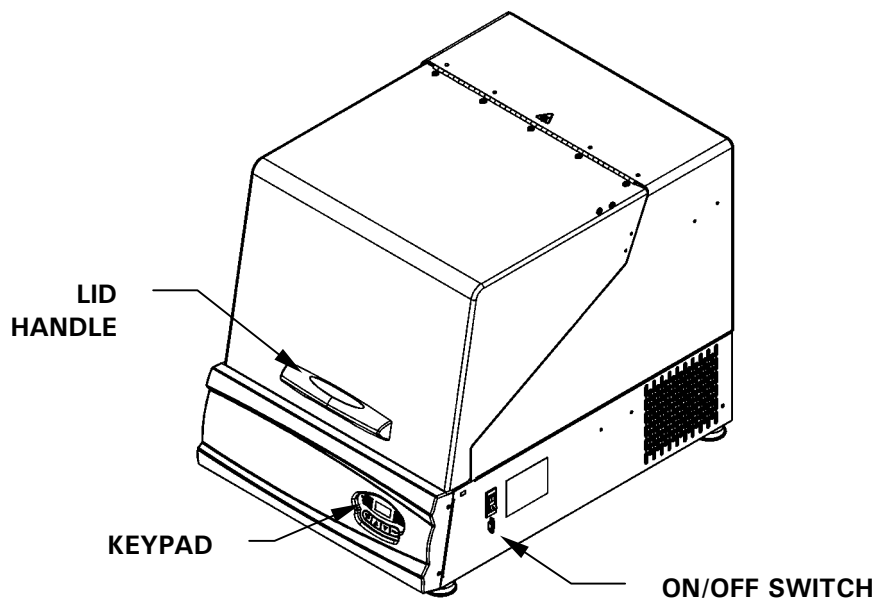
6.1 *Electrical Connections*

Before making electrical connections, verify that the power source voltage matches the voltage on the **ELECTRICAL SPECIFICATION PLATE** and that the **ON/OFF SWITCH** is on the **OFF** position. The **ELECTRICAL SPECIFICATION PLATE** is located on the rear panel of the unit near the **POWER CONNECTOR**. Connect the **POWER CORD** to the **POWER CONNECTOR** (Universal Voltage Input Module) on the rear panel, then connect the other end to a suitable, grounded receptacle.

6.2 *Starting the Shaker*

To initially start the shaker, close the lid and turn the **ON/OFF SWITCH** on the right side panel of shaker to the **ON** position. During start-up, the LED display will indicate the model of your shaker. When the shaker begins to operate, the **LED 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 KEY** on the **KEYPAD**.

Figure 5: ON/OFF Switch Location



NOTE:

The shaker will not operate if the lid is open.

6.3 *Continuous (Untimed) Run*

1. Press SELECT until the RPM INDICATOR is illuminated.
2. If the display indicates that the shaker is OFF, press the START/STOP KEY.
3. Press either ▲ (UP) or ▼ (DOWN) KEY to enter SET MODE (the SET INDICATOR will illuminate).
4. Set the speed by using the ▲ or ▼ KEY until the desired setpoint is displayed. Continued pressure on the ▲ or ▼ KEY will cause the setting to change more rapidly.

NOTE:

The setpoint may be changed during a run without stopping the shaker by following steps 2-4 above. During speed changes, a visual alarm (flashing RPM INDICATOR) will flash and an audible alarm will sound until the speed returns to within 5 rpm of the setpoint.

6.4 *Checking Any Setpoint*

1. Press SELECT until the desired indicator is illuminated.
2. Briefly press either the ▲ or ▼ KEY to enter the SET MODE and display the current setpoint.



CAUTION!

Holding the ▲ or ▼ for more than 0.5 seconds causes the speed setpoint to change. Should this occur, resetting will be necessary.

6.5 *Timed Functions*

The shaker may be programmed to automatically stop after a preset time period of 0.1 to 99.9 hours. There must be power to the shaker in order to set the timer, although a timed run can be initiated while the unit is either stopped or operating.

To set the timer:

1. Press the SELECT KEY until the HRS INDICATOR is illuminated.
2. Press either ▲ or ▼ KEY to enter the SET MODE and set the desired run time, between 0.1 and 99.9 hours.

If the shaker is stopped, skip to Step 5 below. If the shaker is already running:

3. Press the START/STOP KEY. The shaker will stop and the display will read OFF.

4. Press the **START/STOP KEY** again; the **TIME INDICATOR** will light and the shaker will start the timed run.

If the shaker is stopped:

5. Press the **START/STOP KEY**. The shaker will start in untimed mode.
6. Press the **START/STOP KEY** again. The shaker will stop and the display will read **OFF**.
7. Press the **START/STOP KEY** a third time; the **TIME INDICATOR** will light and the shaker will start the timed run.

To disable the visual alarm (flashing **TIME INDICATOR**), press the **SELECT KEY** and change to any other function.

To cancel the timer without stopping the shaker:

Repeat steps 1 and 2 above, then immediately press the **START/STOP KEY**. The **TIME INDICATOR** will cease to flash and the display will read **OFF**.

6.6 Alarm Functions

The Excella E-24/24R shakers have an audible alarm that is activated at predetermined times, as explained in Section 1 (*Overview*). It can be deactivated by using the **MUTE** function:

1. Press the **SELECT** key until the **MUTE** indicator illuminates.
2. Press the **▲** or **▼** KEY to display **ON**, then press the **SELECT KEY**.

To reactivate the audible alarm:

1. Press the **SELECT** key until the **MUTE** indicator illuminates.
2. Press the **▲** or **▼** KEY to display **OFF**, then press the **SELECT KEY**.

6.7 Temperature Setpoint

Press the **SELECT KEY** until the function **°C INDICATOR** illuminates. The temperature can be set from 5°C above ambient temperature to 60°C (non-refrigerated units) or from 4°C to 60°C (refrigerated units). Increasing or decreasing the setpoint is accomplished with the **▲** or **▼** KEY.

During operation, if the temperature of the chamber is more than 1.0°C higher or lower than the temperature setpoint, an alarm is triggered. This alarm consists of a flashing °C **INDICATOR** and audible beep. The alarm will automatically deactivate as the unit achieves the set temperature.

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 heat exchanger return vent. The controller uses the probe input to adjust air temperature, up or down, to match the temperature setpoint.

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

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

1. Let the unit equilibrate at or near the desired temperature. Record the Indicated Temperature.
2. Record the Actual Temperature.
3. Calculate the temperature correction value: Actual Temperature – Indicated Temperature = Temperature Correction Value.
4. Press the **SELECT KEY** until the function °C **INDICATOR** illuminates.
5. Simultaneously press the ▲ and ▼ KEYS. The display will indicate **CAL**.
6. Using the ▲ or ▼ KEY, enter the Temperature Correction Value calculated in Step 3 above.
7. Simultaneously press the ▲ and ▼ KEYS to save the Temperature Correction Value to memory.

NOTE:

The °C light will pulse rapidly to indicate it is not operating in the factory default mode.

To return to the factory calibration:

1. Press the **SELECT KEY** until the function °C **INDICATOR** illuminates.
2. Simultaneously press the ▲ and ▼ KEYS. The display will indicate **CAL**.
3. Using the ▲ or ▼ KEY, set the Temperature Correction Value to zero.
4. Simultaneously press the ▲ and ▼ KEYS. The rapid pulsing of the °C **INDICATOR** will stop.

6.9 **Power Failure**

In the event of a power failure, the Excella E-24/24R shakers are equipped with an **automatic restart** function.

If the shaker was in operation prior to the power interruption, the shaker will begin to operate at its last entered setpoint. The **LED DISPLAY** will flash, indicating that a power failure has occurred. Press any key to stop the flashing of the **LED** display.

6.10 **Speed Calibration**

To calibrate the shaking speed:

1. Set the shaker to a speed that can easily be measured. If you are using a strobe, minimum speed should be 250 RPM.
2. Compare the reading on the display to the measured reading.

If an adjustment is needed:

1. Press the **SELECT KEY** until the **RPM** indicator light illuminates.
2. Press the **▲** and **▼** KEYS simultaneously. The display will indicate **CAL**.
3. Press either the **▲** or **▼** KEY to change the displayed value to match the measured speed.
4. Press the **▲** and **▼** KEYS simultaneously to save the adjustment.
5. Turn unit **OFF** using the power switch, then turn it back **ON**.

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 Excella E-24 and E-24R.

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

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.
	Lid is open and "LID" is indicated 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.
	Defective main board: call for service
	Defective display controller board: call for service.
	Jammed shaking mechanism: call for service
	Defective motor: call for service
Shaker runs slowly and/or no speed indication.	Drive belt out of alignment or worn: call for service.
	Incorrect speed calibration: recalibrate shaking speed (see <i>Section 6.10</i>).
	Defective main board: call for service.
	Defective motor: call for service.
Shaker does not run at set speed.	Drive belt is out of alignment or worn: call for service.
	Shaker is overloaded and/or you are using baffled flasks: remove some contents & balance load.
	Defective motor: call for service.
Operating noise	Drive belt out of alignment or worn: call for service.
	Load out of balance: unload all contents, then reload. Loose component(s) in platform, subplatform and/or drive assembly: call for service.

...continued...

Symptom(s)	Probable Cause(s) & Solution(s)
Incubator does not reach set temperature.	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.	Defective RTD assembly: call for service.
	Defective main board: call for service.

8.2 Product Returns

Should you need to return your Excella E-24/24R 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



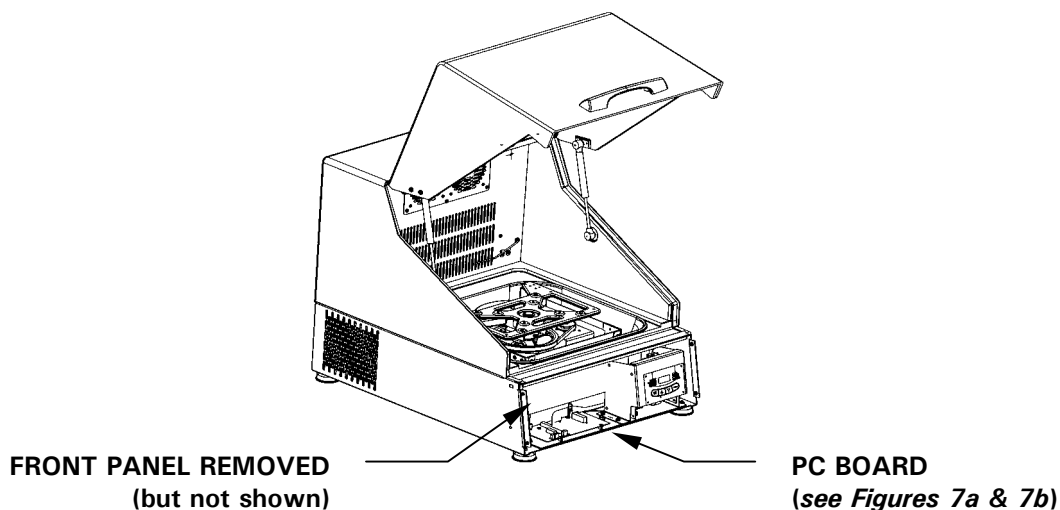
WARNING!

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

The user can replace one fuse on the Excella E-24 and two fuses on the E-24R. Fuses are located behind the front bezel panel, on the PC board. 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, 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 Figures 6,7a & 7b*), which you will find on the right side of the base weldment.

Figure 6: Accessing Fuses



5. Fuses are numbered (*see Table 1*); 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 1*):

Table 1: Fuses

Fuse Holder Number	Function	Type	Rating
F1	Heater	Slo Blo® 8A	8.0 A
F2	Refrigeration (E-24R only)		8.0 A

Figure 7a: Fuse Replacement (Excella E-24)

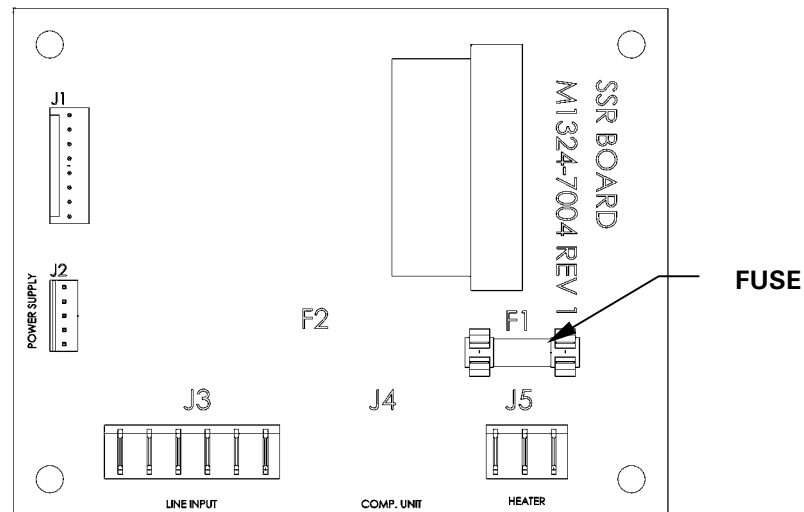
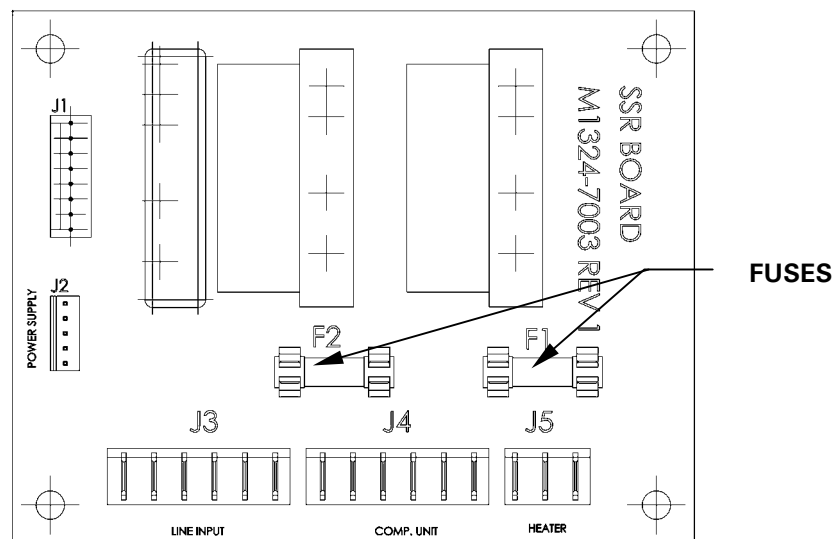


Figure 7b: Fuse Replacement (Excella E-24R)



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

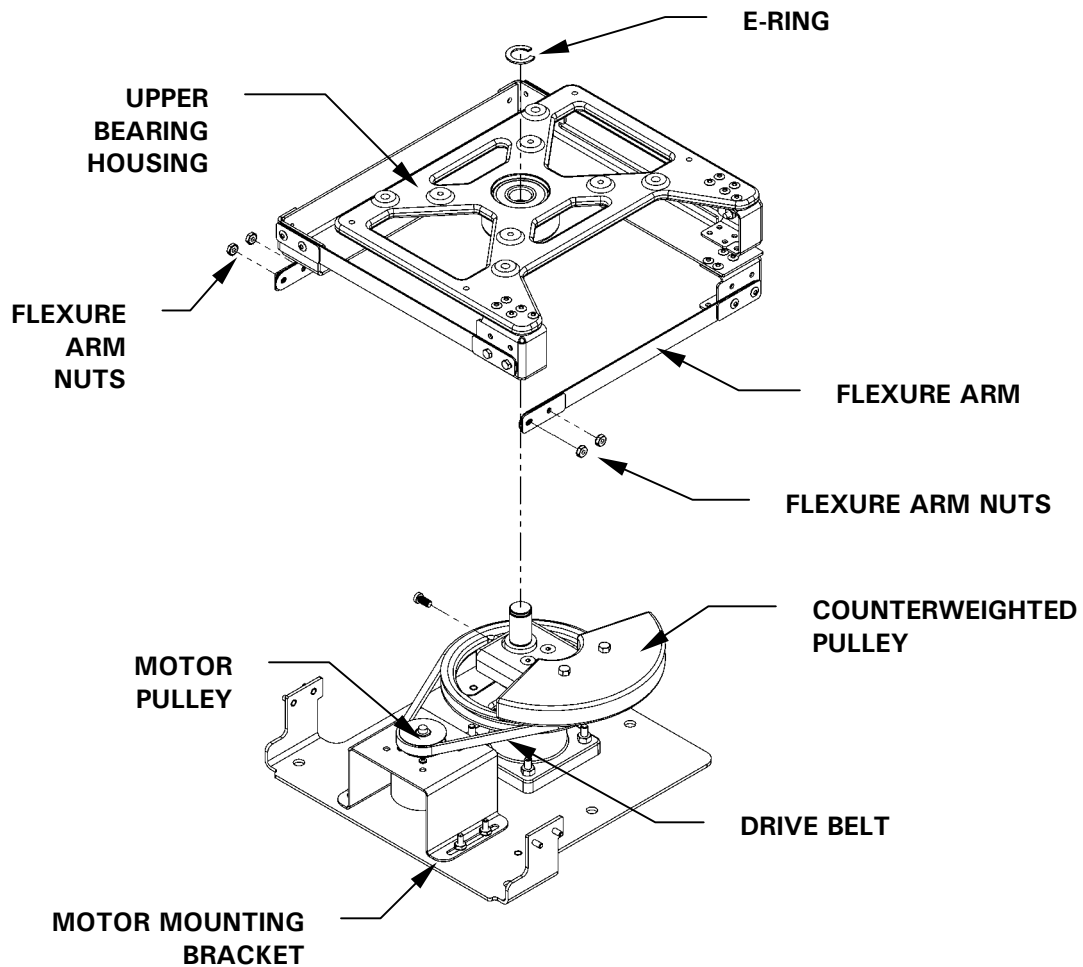
To gain access to the drive belt, your service technician will follow these steps *with reference to Figure 8*:



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 E-ring that holds the upper bearing housing to the shaft.
6. Remove the four nuts (two on either side) from the bearing housing mounting plate. These nuts hold the flexure arms in place.
7. Slide the upper bearing housing off the shaft, and set it aside.
8. Use the hex wrench to loosen the four hex nuts on the motor mounting bracket.
9. 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.
10. Remove the old belt.
11. With one hand, place the new belt around the motor pulley, and with the other hand guide the belt around the large counterweighted pulley.
12. Move the motor mounting bracket back, until there is a slight resistance.
13. Verify that the drive belt has a slight pressure near the center. The recommended deflection is 3/8 inch (9.5 mm).

Figure 8: Drive Belt Replacement

14. Use the hex wrench to tighten the four hex nuts on the motor mounting bracket.
15. Reinstall the upper bearing housing on the shaft.
16. Reattach the flexure arms to the bearing housing mounting plate with the four nuts previously removed.
17. Reattach the E-ring to the shaft.
18. Reinstall the platform on the bearing housing with the four Allen head screws previously removed.
19. Close the shaker lid.
20. 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. NBS offers a spare parts kit that contains commonly needed replacement parts for your Excella E-24/24R (*see Table 2 below*).

Table 2: Spare Parts Kit M1352-6000

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

9 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.

9.1.1 Platforms

Table 3: Available Platforms

Description	Capacity	NBS Part No.
Universal Platform	<i>see Table 4</i>	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 4: 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

*Clamps for Universal Platform are sold separately.

9.1.2 Flask Clamps for Universal Platforms

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

Table 5: 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

9.1.3 Replacement Clamp Hardware Kits

NBS flask clamps come complete with mounting screws. Additional screws are available separately in packs of 25 (*see Section 8.6*).

9.1.4 Test Tube Racks & Other Accessories

Table 6: 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	4
	60 tube capacity	M1289-0010	5
	48 tube capacity	M1289-0001	5
Adjustable angle Test Tube Rack for tubes 12 - 15 mm diameter	60 tube capacity	M1289-0200	4
	44 tube capacity	M1289-0020	5
	34 tube capacity	M1289-0002	5
Adjustable angle Test Tube Rack for tubes 15 –18 mm diameter	42 tube capacity	M1289-0300	4
	31 tube capacity	M1289-0030	5
	24 tube capacity	M1289-0003	5
Adjustable angle Test Tube Rack for tubes 18 – 21 mm diameter	30 tube capacity	M1289-0400	4
	23 tube capacity	M1289-0040	5
	18 tube capacity	M1289-0004	5
Adjustable angle Test Tube Rack for tubes 22 – 26 mm diameter	22 tube capacity	M1289-0500	4
	16 tube capacity	M1289-0050	5
	13 tube capacity	M1289-0005	5
Adjustable angle Test Tube Rack for tubes 26 - 30 mm diameter	20 tube capacity	M1289-0600	4
	16 tube capacity	M1289-0060	5
	12 tube capacity	M1289-0006	5
Microplate holder rack (stacked)	3 deep well or 9 standard	M1289-0700	8
Microplate holder rack (single layer)	5 deep well or standard	TTR-221	2

...continued...

<i>Accessory Description</i>	<i>NBS Part Number</i>	<i>Platform Capacity</i>
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	2
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

10 DRAWINGS & TABLES

10.1 Schematics

Figure 9: Control Schematics (overview)

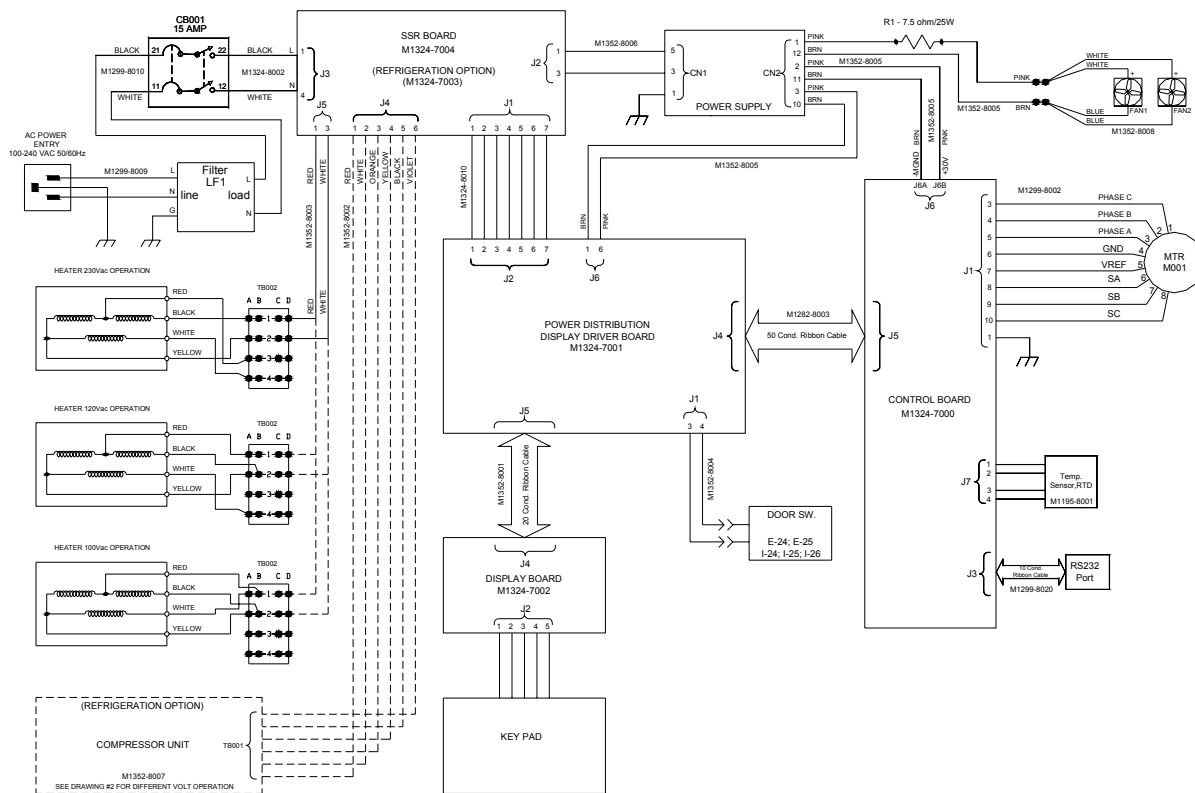


Figure 9a: Control Schematics (Quadrant A)

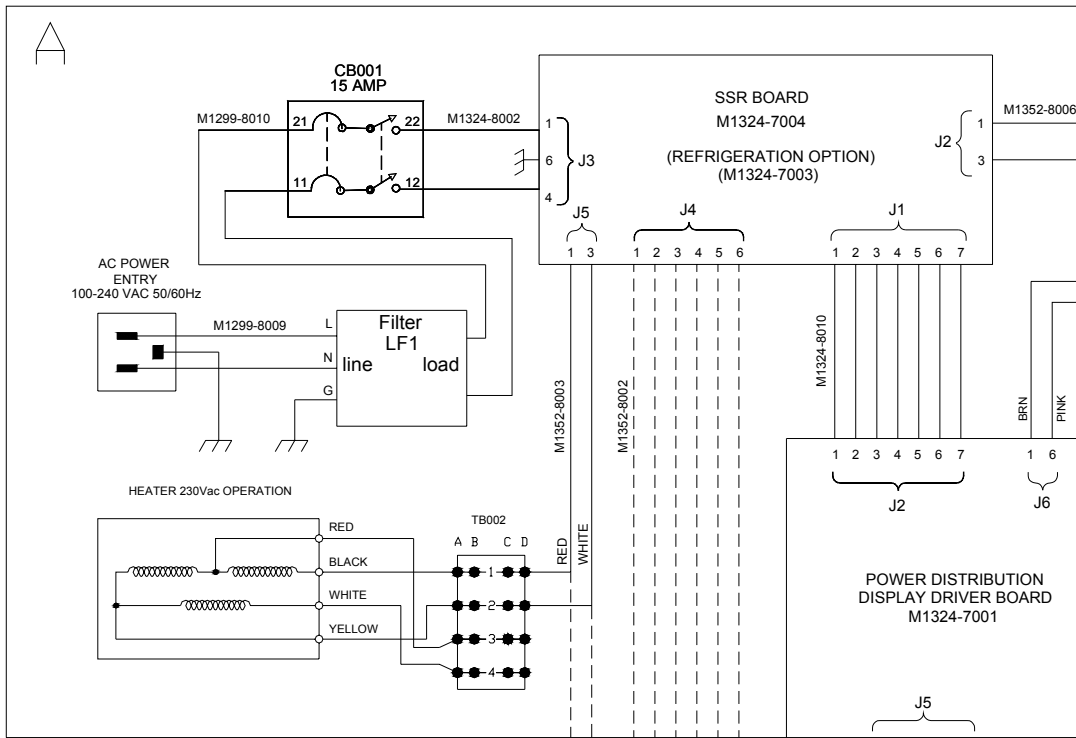


Figure 9b: Control Schematics (Quadrant B)

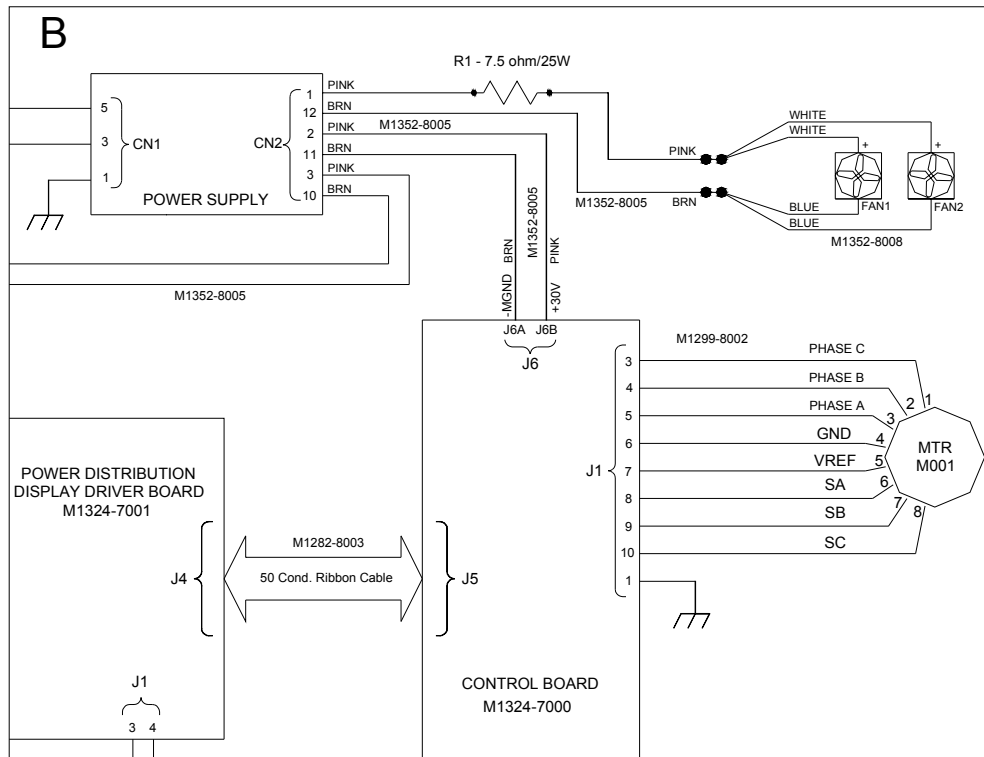


Figure 9c: Control Schematics (Quadrant C)

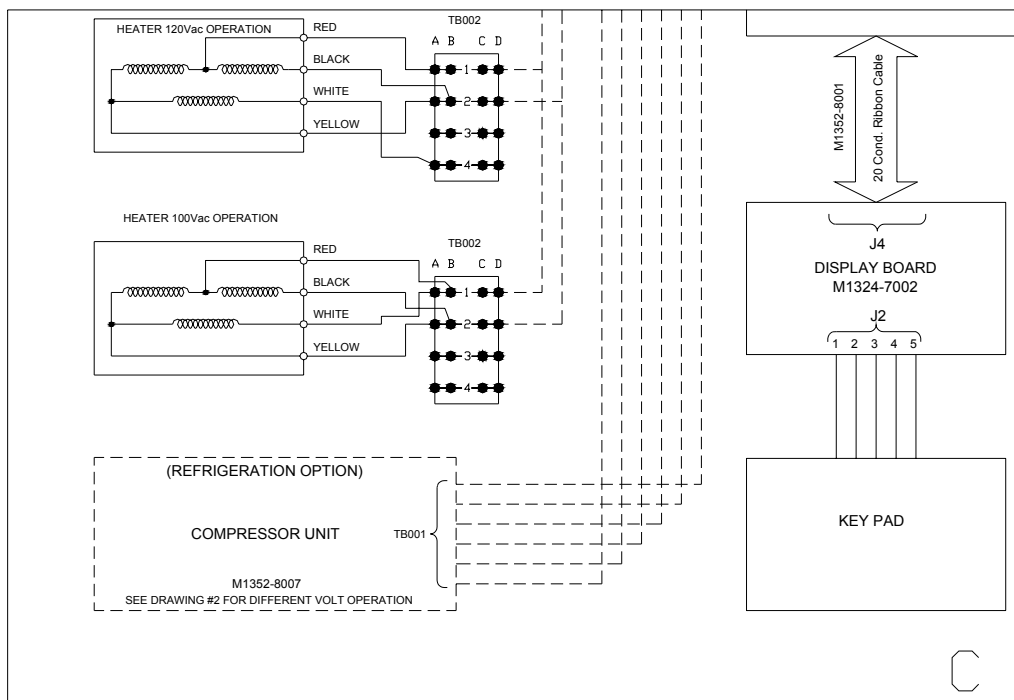


Figure 9d: Control Schematics (Quadrant D)

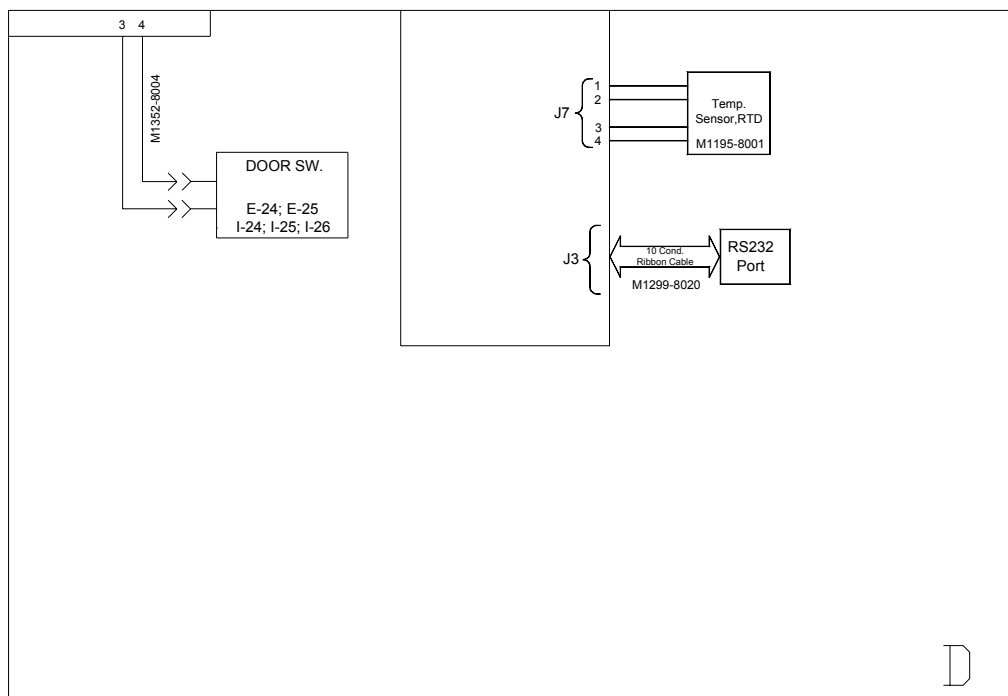


Figure 10a: 230VAC/50 Hz Schematic

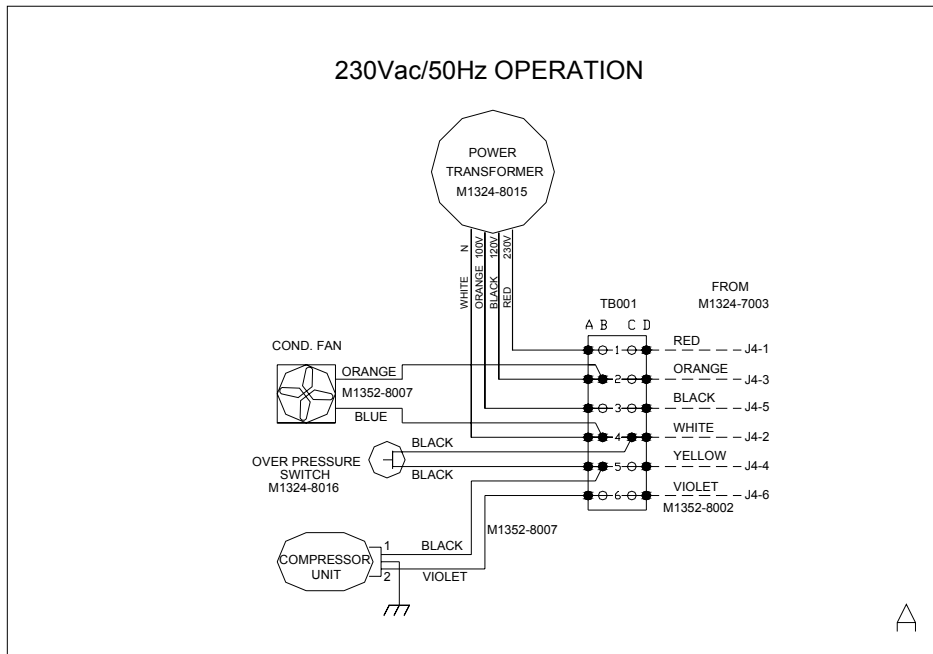


Figure 10b: 100VAC/60 Hz Schematic

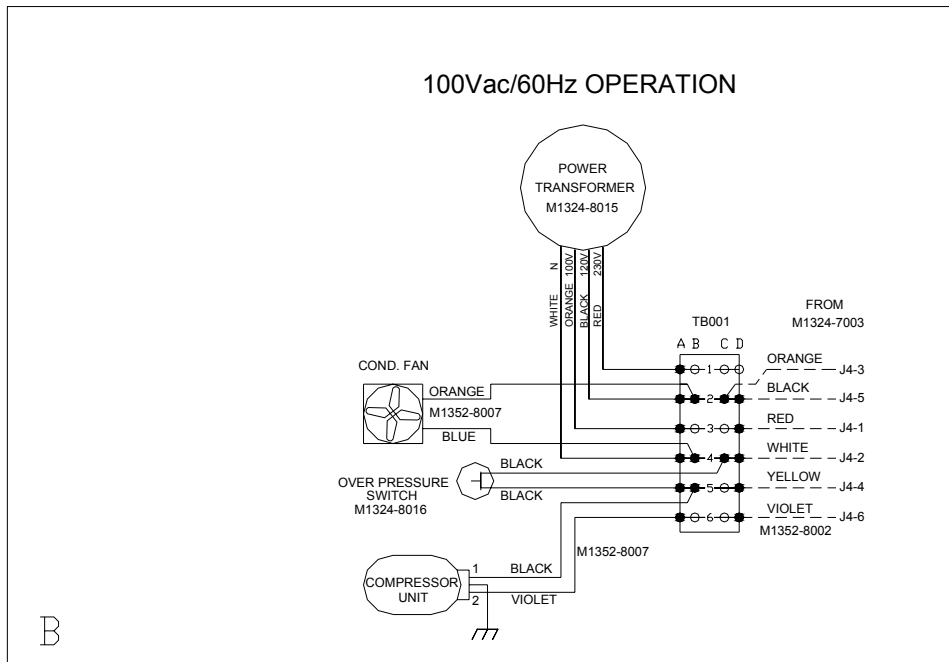


Figure 10c: 100VAC/50 Hz Schematic

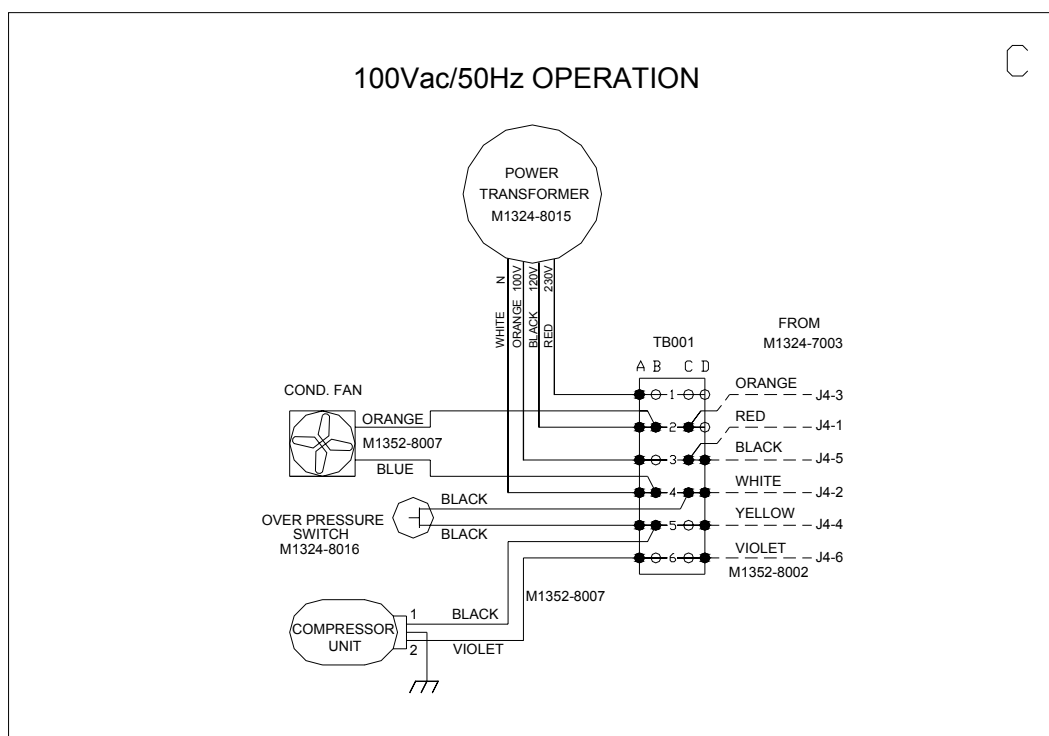


Figure 10d: 120VAC/60 Hz Schematic

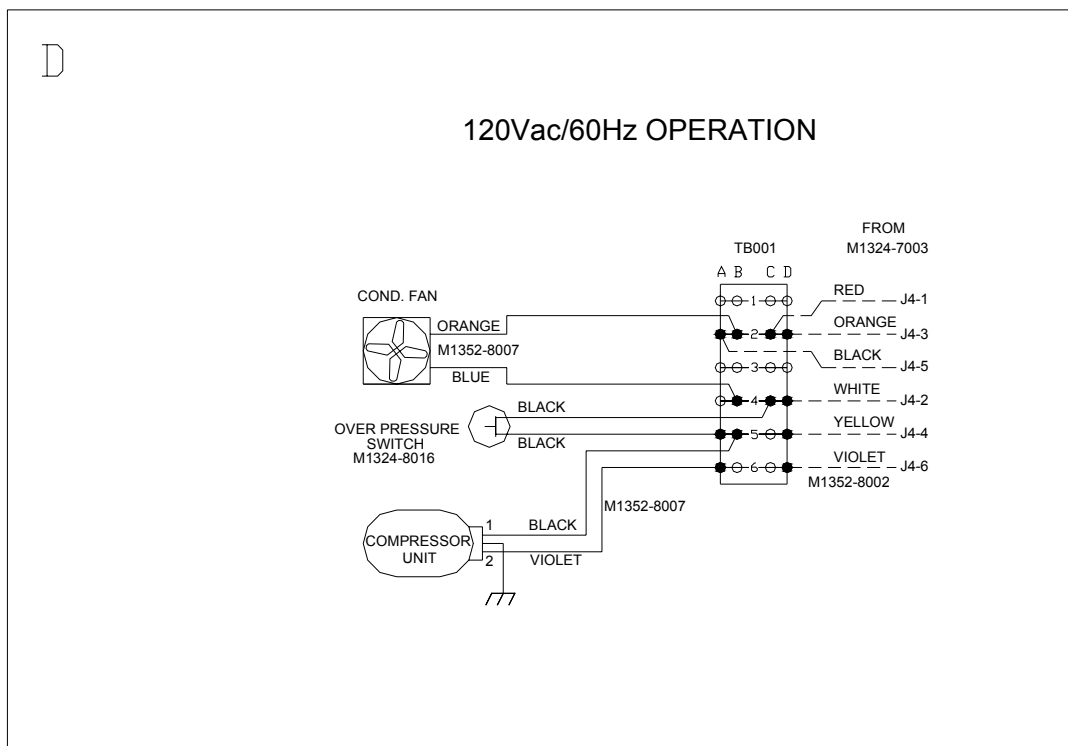
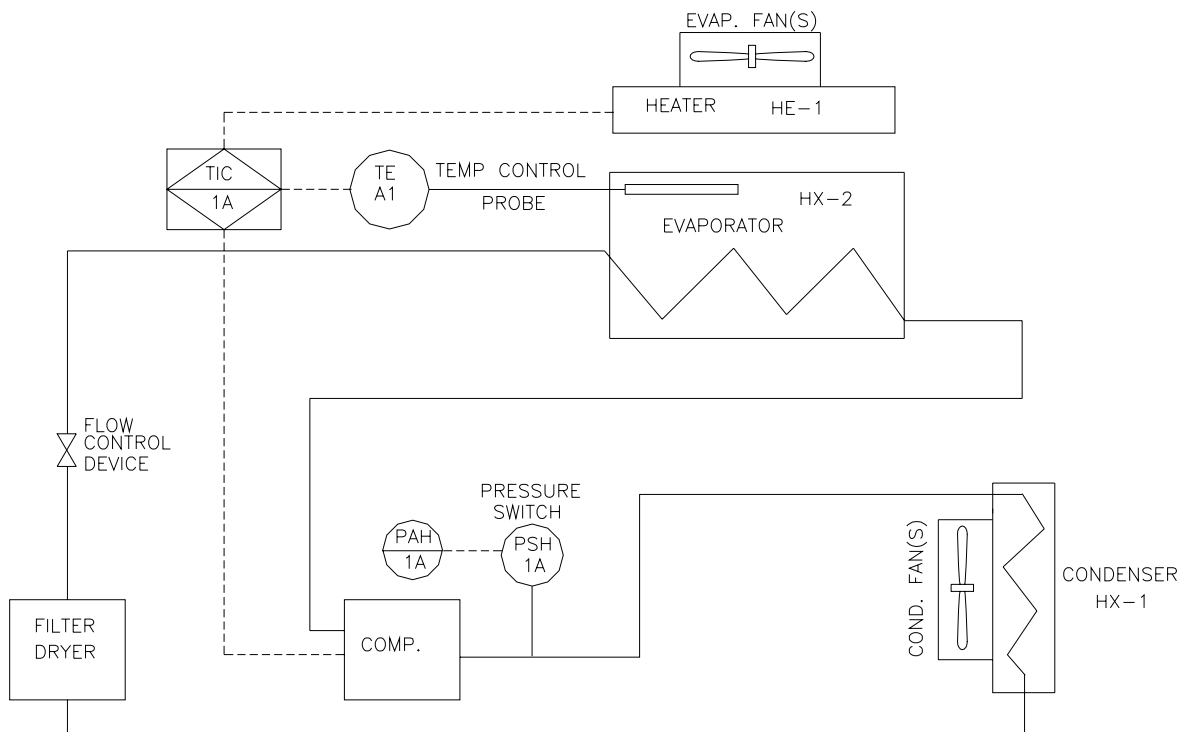


Figure 11: Refrigeration Schematic

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11 SPECIFICATIONS

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

Excella E-24 & E-24R Incubator Shaker	
SHAKING Speed ¹ Control Accuracy Indication Stroke/Orbit	50-400 rpm ± 1 rpm Displayed in 1 rpm increments ¾-inch (1.9 cm)
TEMPERATURE Range (E-24) ² Range (E-24R) ² Control Accuracy Indication Heater	7°C above ambient temperature to 60°C 15°C below ambient temperature (minimum 4°C) to 60°C ± 0.1°C at 37°C Displayed in 0.1°C increments 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.
LED DISPLAY	9/16-inch (1.4 cm)
RS-232	Data logging
SETPPOINT 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	UniCentric™ counterbalanced drive with four 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.
ELECTRICAL REQUIREMENTS	100 Volts, 50/60 Hz 120 Volts, 60 Hz 230 Volts, 50 Hz E-24: 800 VA per shaker E-24R: 1500 VA per shaker
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 11.1.
DIMENSIONS Width Depth (Front to Back) Height Height with lid open	22 inches (55.8 cm) 30 inches (76.2 cm) 24 1/16 inches (61.1 cm) 40 1/8 inches (101.9 cm)

¹ see first NOTE on following page

² depending on ambient factors, such as relative humidity. Ambient temperature is measured one meter from the front of the shaker.

<i>Excella E-24 & E-24R Incubator Shaker</i>	
CHAMBER DIMENSIONS	21 inches deep x 20 ³ / ₈ inches wide x 13 9/16 inches high (53.3 cm deep x 51.7 cm wide x 34.4 cm high) from top of platform
PLATFORM	Aluminum, 18" X 18" (46 X 46 cm). Select universal or dedicated styles.
NET WEIGHT	
24	138 lbs (62.7 kg)
24R	184 lbs (83.6 kg)

 **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 NBS representative for more information.

11.1 Certifications

The Excella E-24 and E-24R 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 Excella E-24 and E-24R also conform to the appropriate CE standards (see also “CE Regulatory Standards” in the specifications table).



New Brunswick Scientific



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)

I-26/I-26R, E-25/E-25R, I-25/I-25R, E-24/E-24R, I-24/ I-24R, E-1, E-2, E-5, E-10, I-20, I-21, I-23

EU Directive(s)

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

Standard(s)

EN61010-1: 2001 (2 nd Edition)	EN61000-4-2
EN61010-2-010 (2003)	EN61000-4-4
EN61326: 1997+A1: 1998 +A2:2001 Emissions	EN61000-4-5
EN61326: 1997+A1: 1998 +A2:2001 Immunity	EN61000-4-11
EN61000-3-2: 1995	
EN61000-3-3: 1995	

The conformity assessment procedure were performed at the following locations:

- **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


 Lee Eppstein
 VP of Science & Technology

23 Feb, 2006
 Date

12 APPENDIX: PRODUCT RETURNS

12.1 *Return Procedure*

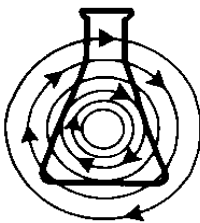
As explained in Section 8.2, should you need to return your Excella E-24/24R to NBS for any reason, first contact Customer Service to obtain a Returned Material Authorization (RMA) number. This number must appear on the outside of the shipping container, otherwise NBS Receiving will refuse to accept 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

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