Biological Shakers

New Brunswick
an eppendorf company

New Brunswick Biological Shakers
Excella® E-25/25R

Operating Manual
M1353-0050
Revision D

eppendorf

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November 16, 2011
Revision D
M1353-0050

***CAUTION!* Risk of damage to personnel and/or equipment!**

- **This equipment *must* be operated as described in this manual.**
- **Please read the entire Operating Manual before attempting to use this equipment. If operational guidelines are not followed, equipment damage and personal injury *can* occur.**
- **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. is not responsible for any damage to this equipment that may result from the use of an accessory not manufactured by New Brunswick.**

WARRANTY

New Brunswick Scientific 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 New Brunswick Scientific 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 including incubator sensors, glass, filters, single-use vessels, etc., are not covered.

The warranty begins on the date the equipment ships from New Brunswick Scientific 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, CO_2/LN_2 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.

TABLE OF CONTENTS

1 OVERVIEW

The Excella® E-25 Classic Incubator and E-25R Classic Refrigerated Incubator Shakers are large capacity shakers utilizing a UniCentric single eccentric counterbalanced drive to provide horizontal plane rotary motion in a 2.54 cm (1 in) circular orbit. A Proportional/Integral (PI) Microprocessor controller with instantaneous digital feedback controls the speed over a range of 50-400 rpm.

The E-25 provides temperature control over a range of 7°C above ambient to 60°C, while the E-25R provides temperature control over a range of 15°C below ambient (minimum 4°C) to 60°C. Ambient temperature is defined as the temperature within one meter of the shaker.

The shakers may be operated either continuously or in a timed mode via a programmable timer for shaking periods of 0.1 hr. to 99.9 hrs.

For safe operation, both the E-25 and E-25R are designed with a safety switch that automatically stops the shaker mechanism when the lid is lifted.

In addition, the Excella E-25 and E-25R are equipped with visual and audible alarms that alert the user to the following conditions:

- The end of a timed run
- Deviations of shaking speed
- Deviations of temperature setpoint
- Power failure
- Lid open

A wide variety of platforms can be used with the E-25 or E-25R. Dedicated platforms are available for a variety of flask sizes. Universal platforms, utility trays, utility carriers and test tube racks are also available.

1.1 Specifications

Excella E-25 & E-25R Incubator Shaker		
SHAKING **Speed**[1] **Control Accuracy** **Indication** **Stroke/Orbit**	 50-400 rpm ± 1 rpm 3-digit LED, displayed in 1 rpm increments 2.54 cm (1 in)	
TEMPERATURE **Range (E-25)** **Range (E-25R)** **Control Accuracy** **Indication**	 7°C above ambient temperature* to 60°C 15°C below ambient temperature* (min. 4°C) to 60°C ± 0.1°C @ 37°C 3-digit LED, displayed in 0.1°C increments	
Ambient* Operating Environment	10 - 35°C, 20 to 80% relative humidity, non-condensing	
Refrigerant (E-25R only)	R-134A	
Alarms	Visible and audible warning indication when speed deviates more than 5 rpm, and temperature more than 1°C from setpoints, and when timer has expired.	
Timer	0.1 to 99.9 hours. Shuts off agitation at end of period. Can be deactivated for continuous operation.	
Automatic Restart	Automatic restart after power is restored. Setpoints and operating status are retained in memory during power interruption.	
Drive Interrupt	Automatic drive-interrupt when cover is opened.	
Electrical Requirements	110/120 VAC, 50/60 Hz 220/240 VAC, 50/60 Hz	E-25: 800 VA per shaker E-25R: 1500 VA per shaker
ETL Regulatory Standards	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 1.2	
Platform	76 X 46 cm (30 X 18 in)	
Overall Dimensions	127 cm W X 77 cm D X 85 cm H (50 in X 30.5 in X 41.7 in)	
Chamber Dimensions	85 cm W X 58 cm D X 48 cm H clearance above platform (33.5 in X 23 in X 19 in)	
Net Weight	E-25: 191 kg (420 lb), E-25R: 204.5 kg (450 lb)	
Gross Weight	E-25: 204.5 kg (450 lb), E-25R: 281 kg (480 lb)	

[1] See NOTE below.

* Ambient temperature is defined as the temperature measured one meter from the shaker.

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.

1.2 Certifications

The Excella E-25 & E-25R have been tested to ETL standards, to comply with UL and CAN/CSA electrical safety standards (see “ETL Regulatory Standards” in the specifications table, *Section 1.1*).

As attested in the CE Declaration of Conformity reproduced on the following page, they also conform to the appropriate CE standards (see also “CE Regulatory Standards” in the specifications table).

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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)

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/EEC93/68/EEC)
Electromagnetic Compatibility (89/336/EEC/93/68/EEC)
CE Marking Directive (93/68/EEC)

Standard(s)

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

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

H. Couture
Henry Couture
Director of QA RA

24-OCT-11
Date

2 INSPECTION, VERIFICATION & UNPACKING OF EQUIPMENT

2.1 Inspection of Boxes

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

2.2 Unpacking

Save all packing materials and Operating Manual. If any part of your order was damaged during shipping, missing pieces, or fails to operate properly, contact your New Brunswick sales representative.

CRUSH WARNING!

Do not attempt to lift the E-25 or E-25R by hand. Always use a lifter or suitable equipment when raising the shaker.

2.3 Inspection of Equipment

Verify against your New Brunswick packing list that you have received the correct materials.

You should have received a Power Kit (power cord, fuse, hex wrench and key) with your shaker. Make sure your electrical supply matches the electrical specification of the power kit and the shaker (both of which should be the same).

NOTE:

Use of the Excella E-25/25R Shakers requires a platform, which is a separate item. ***See the Available Platforms list in Section 9.2.***

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.

2.5 Warranty Registration

Please register electronically at our Website: www.nbsc.com

3 PREPARING THE LOCATION

3.1 Physical Location

It is essential that the instrument be situated in a area where there is sufficient space for the shaker and platform to clear walls and obstructions during operation. The surface on which the shaker is placed must be smooth, level, and able to support the shaker under full load operating conditions.

CRUSH WARNING!

Do not attempt to lift the E-25 or E-25R by hand. Always use a lifter or suitable equipment when raising the shaker.

The feet can be adjusted for necessary leveling. Loosen the locking nuts on the threaded studs attached to the feet of the shaker. Retighten when you have achieved the correct level for your shaker.

3.2 Environment

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

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

3.3 Electrical Requirements

The E-25 shakers can be equipped to run on:

- 100 Volts, 50/60 Hz, 800 VA maximum
- 120 Volts, 60 Hz, 800 VA maximum
- 230 Volts, 50 Hz, 800 VA maximum

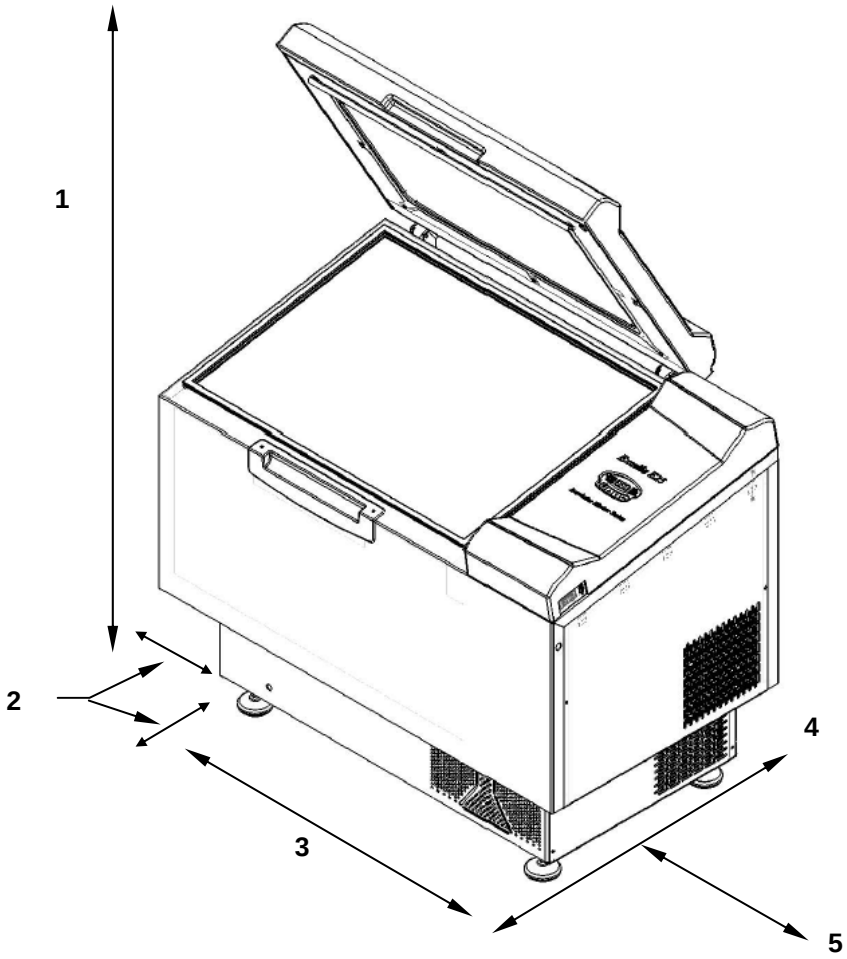
The E-25R shakers can be equipped to run on:

- 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 variation must not exceed ± 10%.

3.4 Space Requirements

Figure 1: Space Requirements



1	Height with lid open: 165.7 cm (65¼ in)
2	10 cm (4 in) front & left side clearance
3	127 cm (50 in)
4	87.6 cm (34½ in) front to back clearance
5	61 cm (24 in) for access to service door

4 FEATURES

4.1 Front Panel

The keypad on the top (front) panel is the primary user interface to command the Excella E-10. This section will acquaint you with the keypad's user interface keys, LED display, status indicators and function indicators.

Figure 2: Front Panel

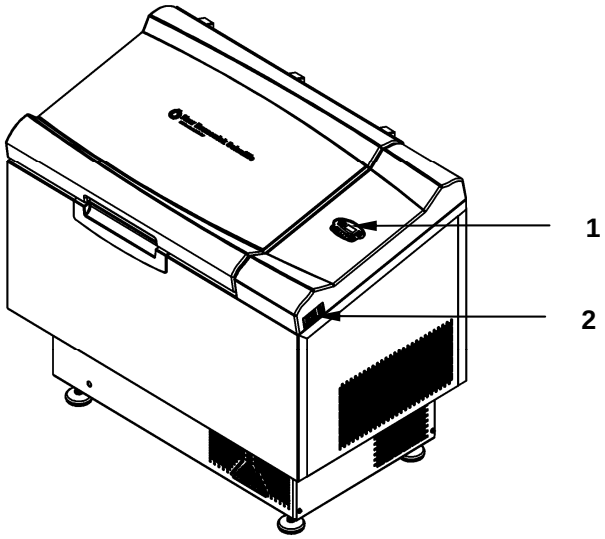
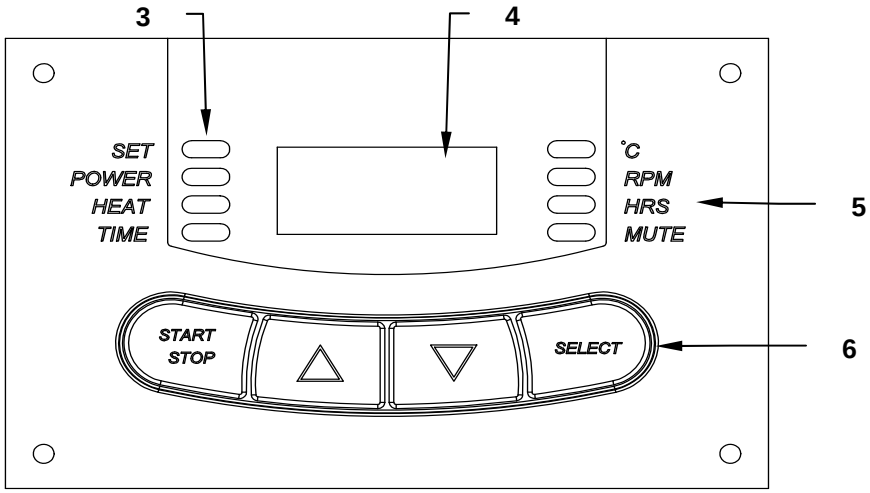


Figure 2a: Keypad



1	Keypad	4	LED display
2	ON/OFF switch	5	Function indicators
3	Status indicators	6	User interface keys

4.1.1 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**")

4.1.2 User Interface Keys

As you can see in Figure 2a, the keypad has four user interface keys: **START/STOP**, ▲, ▼ and **SELECT**. This is how they are used:

- **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.
- **▲(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.
- **SELECT** — This key is used to change the displayed parameter.

4.1.3 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) KEY**.
- **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.

…continued…

- **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.

4.1.4 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) 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) 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) KEY** is pressed for 4 seconds, after which it indexes more rapidly.

  The countdown begins when the **START/STOP** key is pressed. If the **START/STOP** key is pressed again, 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 activated by the **SELECT** key. When activated, the audible alarm is muted, and remains so until it is reactivated with the **SELECT** key. 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 (or goes out), then press **START/STOP** key.

5 GETTING STARTED

5.1 Installation of Platform

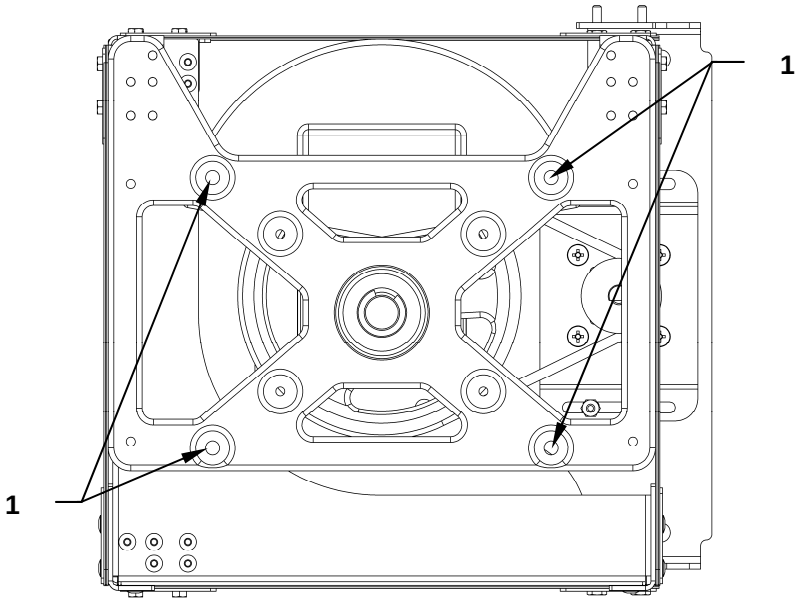
A platform is a separate item that is required for operation. The E-25 and E-25R can be used with a wide variety of New Brunswick 46 x 76 cm (18 x 30 in) platforms, which will accept a variety of clamps for flasks test tubes, etc. See Section 9, *Replacement Parts & Accessories*, for details.

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

The shaker is shipped with the four Allen (hexagonal, countersunk) head platform screws installed in the subplatform of the bearing housing. These screws must be removed before installing a platform. The Allen ("hex") wrench is provided.

1. Using the 7/32-inch hex wrench provided, remove and set aside the four Allen head platform screws from the upper bearing housing (*see Figure 3*).

Figure 3: Platform Screw Locations



1	Platform screws

2. Place the platform on the upper bearing housing, aligning the mounting holes of the platform with the platform screw locations.
3. Insert the four platform screws previously removed and, using the hex wrench, tighten them to secure platform.

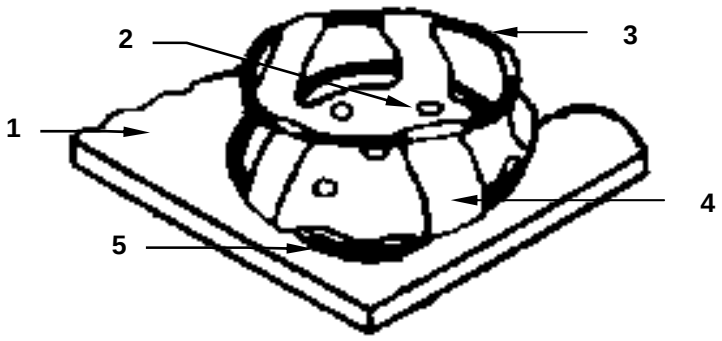
5.2 Installing Flask Clamps

Flask clamps purchased for use with universal platforms (*see Section 9.2*) 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.

Clamps for 2-, 2.8- and 4-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. *Use Figure 4b and Table 1 on the following page 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 4a*), 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 4a: Double Girdle Clamp Installation



1	Platform	4	Clamp body (legs & base)
2	Clamp mounting holes (5)	5	Lower girdle with girdle tubes
3	Upper girdle with girdle tubes		

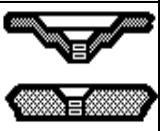
Figure 4b: Clamp Fastener

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, and all types are provided when you purchase clamps. To identify the proper screw for your shaker application by reference to the head style, consult Table 1 below, find the proper screws and set the others aside:

Table 1: Clamp Hardware Application Chart

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

Description	*Part Number*	*Qty.*	*Application*
 10-24 x 7.9 mm (5/16 in) flat Phillips (+) head screw	S2116-3051	1	7.9 mm (5/16 in) thick aluminum, phenolic and stainless steel platforms. 

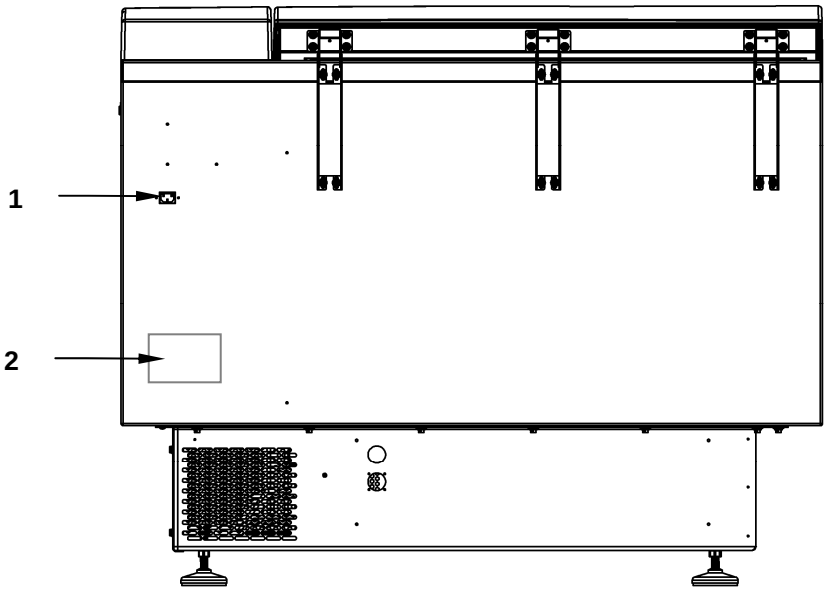
5.3 Electrical Connections

Before making electrical connections, verify that:

- the power source voltage matches the voltage on the **ELECTRICAL SPECIFICATION PLATE**, located on the rear panel (*see Figure 5 on the following page*)
- the **ON/OFF SWITCH**, located on the right side panel as you face the front of the shaker (*see Figure 2*), is in the **OFF** position.

Connect the **POWER CORD** to the **POWER CONNECTOR** on the rear panel (*see Figure 5*) and the other end to a suitable, grounded receptacle.

Figure 5: E-25 and E-25R Rear Panel



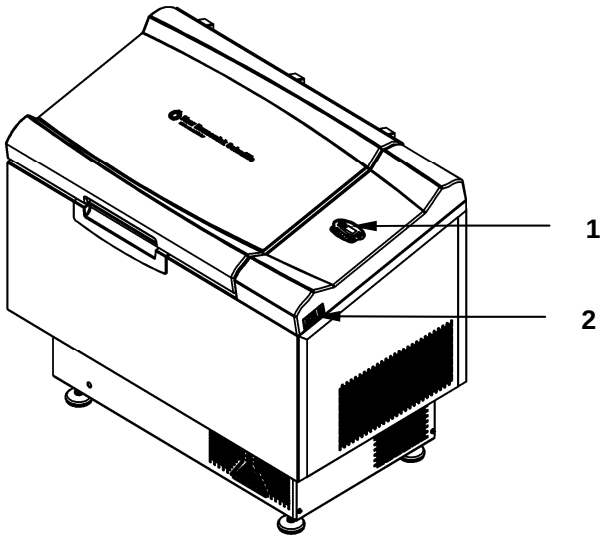
1	Power connector	2	Electrical specification plate

6 OPERATION

6.1 Starting the Shaker

To initially start the shaker, close the lid and turn the **ON/OFF SWITCH** on the right side panel (*see Figure 2, repeated here for easy reference*) to the **ON** position.

Figure 2: Front Panel



1	Keypad & LED display	2	ON/OFF switch

The shaking action may be stopped or started by pressing the **START/STOP KEY**. When the shaker begins to operate, the **LED DISPLAY** will track the speed as it accelerates to the last entered setpoint.

NOTE:
The shaker will not operate if the lid is open. This is indicated by the word "LID" appearing in the LED DISPLAY.

6.2 Continuous (Unlimited) 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 the ▲ **(UP)** or ▼ **(DOWN) KEY** to enter **SET MODE** (the **SET INDICATOR** will illuminate).

4. Set the speed by using the ▲ **(UP)** or ▼ **(DOWN) KEY** until the desired setpoint is displayed. Holding the ▲ **(UP)** or ▼ **(DOWN) 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.

6.3 Checking a Setpoint

1. Press **SELECT** until the desired indicator is illuminated.
2. Press either ▲ **(UP)** or ▼ **(DOWN) KEY** to enter the **SET MODE** and display the current setpoint.

CAUTION!
Holding the ▲ (UP) or ▼ (DOWN) KEY for more than 0.5 seconds causes the speed setpoint to change. Should this occur, resetting will be necessary.

6.4 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 shaker is either stopped or operating.

To set the timer:
1. Press the SELECT KEY until the HRS INDICATOR is illuminated.
2. Press ▲ **(UP)** or ▼ **(DOWN) 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 *while the shaker is running*:

1. Press the **SELECT KEY** until the **HRS** indicator lights.
2. Press the ▼ **KEY** until 0.0 is displayed, then press the **START/STOP KEY**. The display will read **OFF**, the shaker will stop, and the **TIME INDICATOR** light will turn off.
3. Press the **START/STOP KEY** to continue in untimed mode.

To cancel the timer *while the shaker is stopped*:

1. Press the ▼ **KEY** until 0.0 is displayed, then press the **START/STOP KEY**. The **TIME INDICATOR** will light and the shaker will run.
2. Press the **START/STOP KEY**. The shaker will stop and the **TIME INDICATOR** will turn off.
3. Press the **START/STOP KEY** a third time, and the shaker will run in untimed mode.

6.5 Alarm Functions

In addition to the visual alarm mentioned above, the Excella E-25 and E-25R shakers have an audible alarm that is activated at predetermined times. It can be deactivated by using the **MUTE** function:

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

6.6 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 shakers) or from 4°C to 60°C (refrigerated shakers). Increasing or decreasing the setpoint is accomplished with the ▲ **(UP)** or ▼ **(DOWN) KEY**. Ambient temperature is measured one meter from the front of the shaker.

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 shaker achieves the set temperature.

6.7 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 shaker 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 ▲ **(UP)** and ▼ **(DOWN) KEYS**. The display will indicate **CAL**.
6. Using the ▲ **(UP)** or ▼ **(DOWN) KEY**, enter the Temperature Correction Value calculated in Step 3 above.
7. Simultaneously press the ▲ **(UP)** and ▼ **(DOWN) 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. It will pulse for a longer duration and less rapidly (with a frequency of approximately one second) to indicate temperature is more than one degree above or below setpoint.

To return to the factory calibration:

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

6.8 Power Failure

In the event of a power failure, the E-25 & E25R shakers are equipped with an **automatic restart** function.

If the shaker was in operation prior to the power interruption, when power is restored the shaker will begin to operate at its last entered setpoint. The **LED DISPLAY** will flash and the audible alarm will sound, indicating that a power failure has occurred. Press any key to cease the flashing in the display and the audible alarm.

6.9 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.

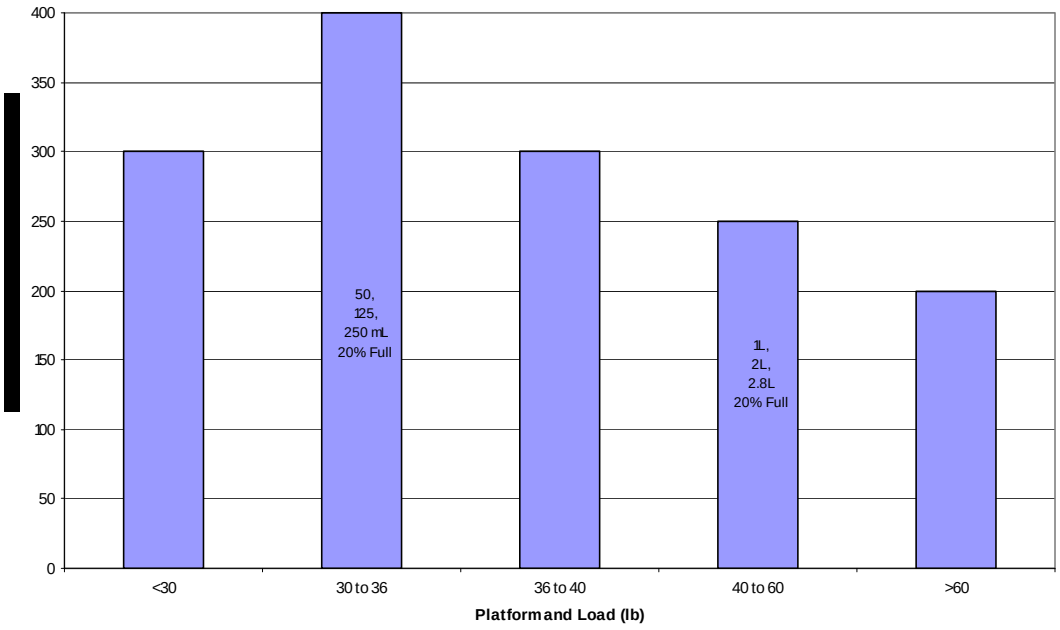
If an adjustment is needed:

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

6.10 Maximum Recommended Speed

Figure 6 shows the maximum recommended speed for your shaker, according to load.

Figure 6: Load & Speed for E-25/E-25R



NOTE:
In Figure 6, "20% Full" refers to the amount of liquid in the flasks. The platforms are fully loaded with flasks.

7 PREVENTIVE MAINTENANCE

WARNING!

Always turn off the shaker and disconnect the power cord from the power supply BEFORE performing any maintenance on the shaker.

7.1 Cleaning External Surfaces

The shaker 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 shaker and void the warranty.

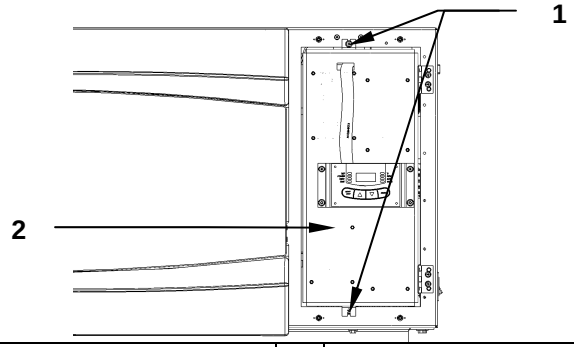
7.2 Fuse Replacement

Excella E-25 models require one electrical fuse, which is housed in the fuse holder located on the M1324-7004 PCB (*see Figure 8a*). E-25R models have two electrical fuses, housed in the two fuse holders that are located on the M1324-7003 PCB (*see Figure 8b*).

To check or replace a fuse:

1. Set the ON/OFF SWITCH to Off and disconnect the POWER CORD from the power source.
2. Remove the top right bezel from the shaker: with one hand, grasp the top edge, and with the other, using the cut-out provided on the bottom, grasp the bottom edge. Pull the bezel up from the bottom, then out and away. Set it aside.
3. *With reference to Figure 7, which looking down at the top of the shaker,* remove the two screws that fasten the electrical panel in place. Set the screws aside for reuse.

Figure 7: Top Right Bezel Removed



1	Remove these screws	2	Electrical panel

4. Swing the **ELECTRICAL PANEL** to the right to access the PCB board that houses the fuse(s); *see Figures 8a (E-25) and 8b (E-25R), where Item* **1** *identifies fuse holders—see Figures 8c & 8d for details.*

Figure 8a: Rear of Electrical Panel (E-25)

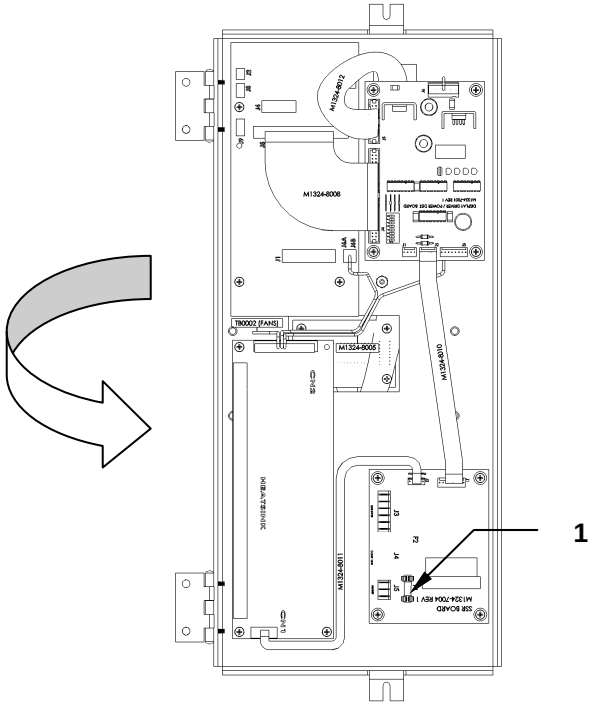


Figure 8b: Rear of Electrical Panel (E-25R)

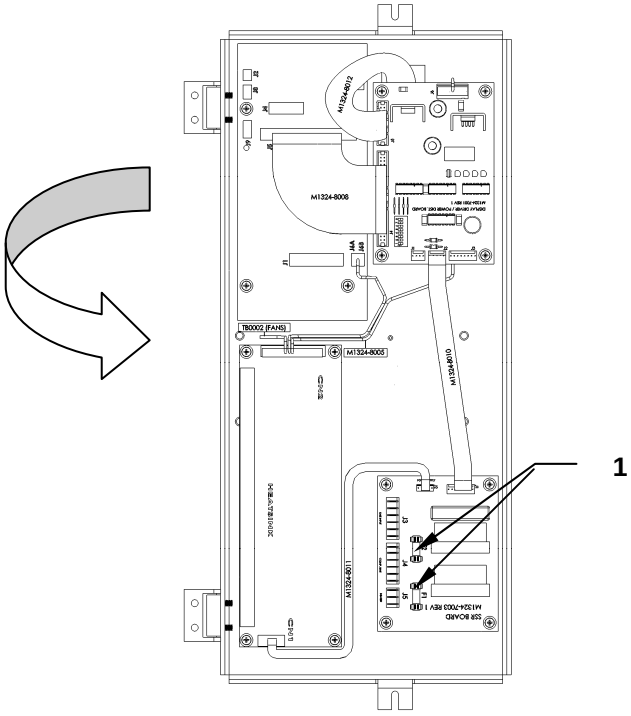


Figure 8c: Fuse Holder Detail (E-25)

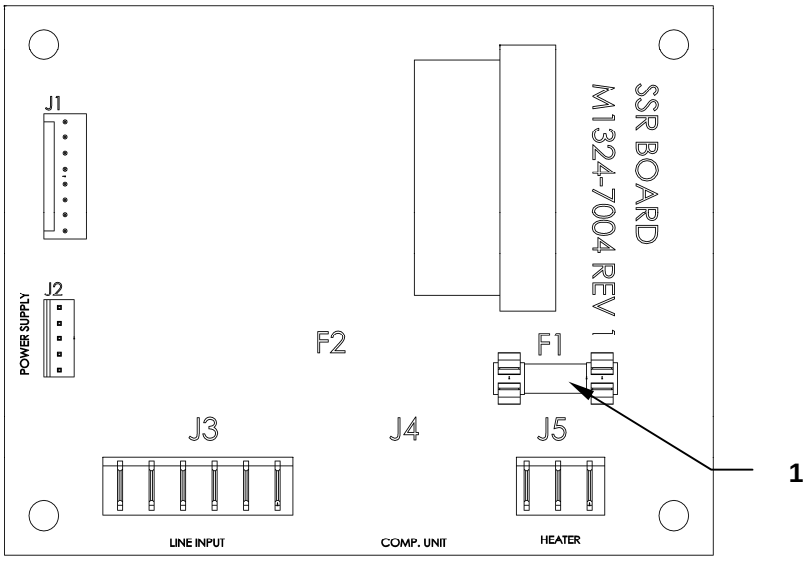
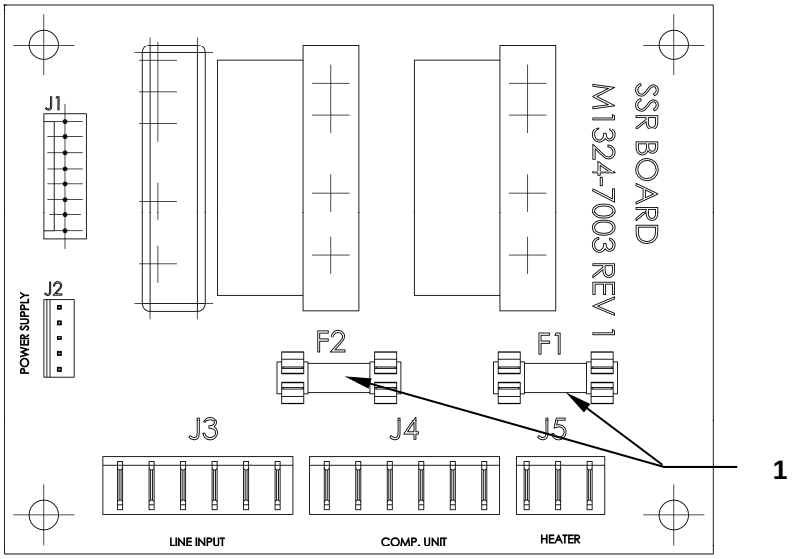


Figure 8d: Fuse Holder Detail (E-25R)



1	Fuse

5. Remove the fuse and check it. If it has failed, replace the fuse.
6. Swing the **ELECTRICAL PANEL** to the left, flush against the shaker.
7. Using the screws set aside, fasten the **ELECTRICAL PANEL** in place.
8. With two hands, reinstall the top bezel, snapping the back in place first, then the front. Verify that it fits snugly and securely.

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

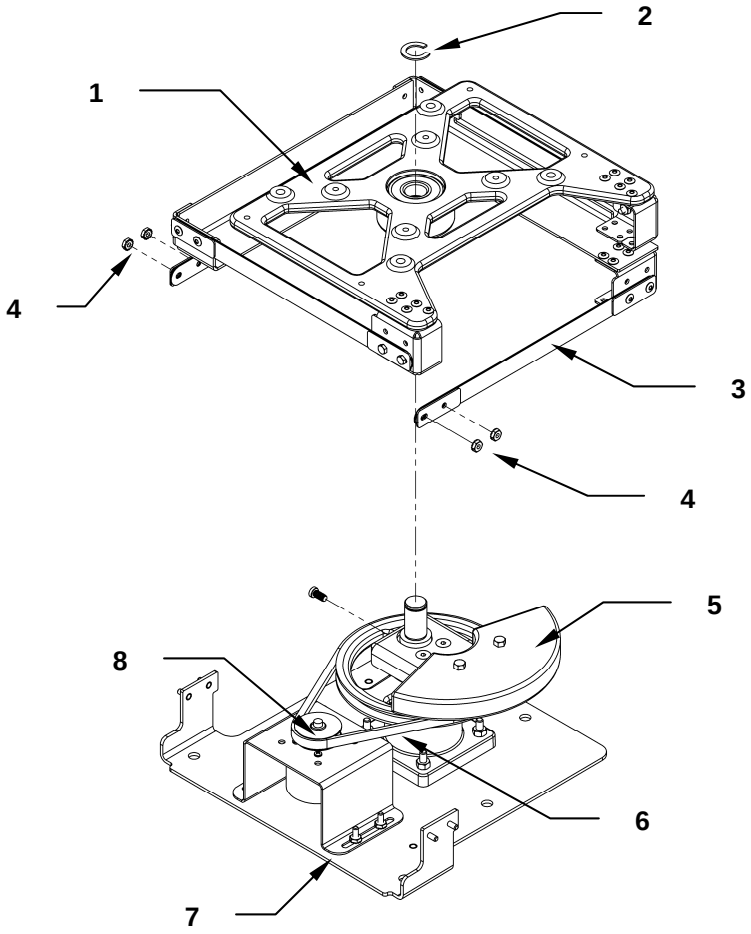
7.3 Belt Replacement

To gain access to the drive belt, your service technician will follow these steps *with reference to Figure 9*:

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 9.5 mm (3/8 in).

Figure 9: Drive Belt Replacement



1	Upper bearing housing	5	Counterweighted pulley
2	E-ring	6	Drive belt
3	Flexure arm	7	Motor mounting bracket
4	Flexure arm nuts	8	Motor pulley

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 TROUBLESHOOTING

If any problems occur with your shaker, **do not attempt to perform any service on the shaker other than specified in this manual**. Unauthorized servicing may void the warranty. Please contact your local New Brunswick Sales Order Department

In any correspondence with New Brunswick, please refer to the Model Number and Serial Number of your shaker. This information is on the **ELECTRICAL SPECIFICATION PLATE**, located on the rear panel of the shaker.

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.	No power; display is not on; power cord is not plugged in and/or power switch is off: plug in power cord (to working electric outlet), and turn on power switch.
	Door is open: close door firmly, making sure latch is engaged.
	Door is closed but not completely: door magnet is not adjusted correctly; call for service.
	On/Off switch is not working: call for service.
	Fuse(s) burned out: check and replace as needed.
	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 or by computer interface: reset shaking speed.
	Defective main board: call for service
	Defective display controller board: call for service.
	Jammed shaking mechanism: check for debris; if necessary, 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 tach board: call for service
	Defective motor: call for service.
	Drive belt is out of alignment or worn: call for service.
Shaker does not run at set speed.	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.

...continued...

Symptom(s)	Probable Cause(s) & Solution(s)
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.	Heater fuse blown: replace.
	Compressor fuse blown: replace.
	Compressor over-pressure switch activated: call for service.
	Ambient temperature too high or too low: cool or heat the room as needed.
	Defective heater: call for service.
	Defective refrigeration system: call for service.
	Incorrect temperature indication (*see below*).
Incorrect temperature indication.	Defective RTD assembly: call for service.
	Defective main board: call for service.

9 REPLACEMENT PARTS & ACCESSORIES

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

9.1 Replacement Parts

Table 2: Service Parts

Part Description	*Qty Req'd*	*Part Number*
8.0A Fuse (Motor)	1 (E-25) 2 (E-25R)	P0380-3790
15A Circuit Breaker	1	P0400-4305
120V 15A Power Cord	1	P0720-2024
220V Power Cord	1	P0720-2021
V Belt	1	P0700-7070
Gasket, Door	1	M1353-9900
AC Connector, Power Entry	1	P0460-2205
Drive Assembly	1	M1353-1003

9.2 Accessories

Table 3: Platforms

Platform Description	*Capacity*	*Part Number*
Universal Platform		
See Table 4 on the following page		M1250-9920
Dedicated Platforms		
50 ml Erlenmeyer Flasks	108	M1191-9908
125 ml Erlenmeyer Flasks	60	M1191-9909
250 ml Erlenmeyer Flasks	40	M1191-9910
500 ml Erlenmeyer Flasks	24	M1191-9911
1 L Erlenmeyer Flasks	15	AG-1
2 L Erlenmeyer Flasks	12	AG-2
2.8 L Fernbach Flasks	6	AG-28
4 L Erlenmeyer Flasks	6	AG-4
6 L Erlenmeyer Flasks	4	AG-6

Table 4: Universal Platform Flask Capacity

Flask Type	*Capacity*
50 ml Erlenmeyer Flasks	92
125 ml Erlenmeyer Flasks	39
250 ml Erlenmeyer Flasks	30
500 ml Erlenmeyer Flasks	18
1 L Erlenmeyer Flasks	12
2 L Erlenmeyer Flasks	8
2.8 L Fernbach Flasks	6
4 L Erlenmeyer Flasks	6
6 L Erlenmeyer Flasks	4

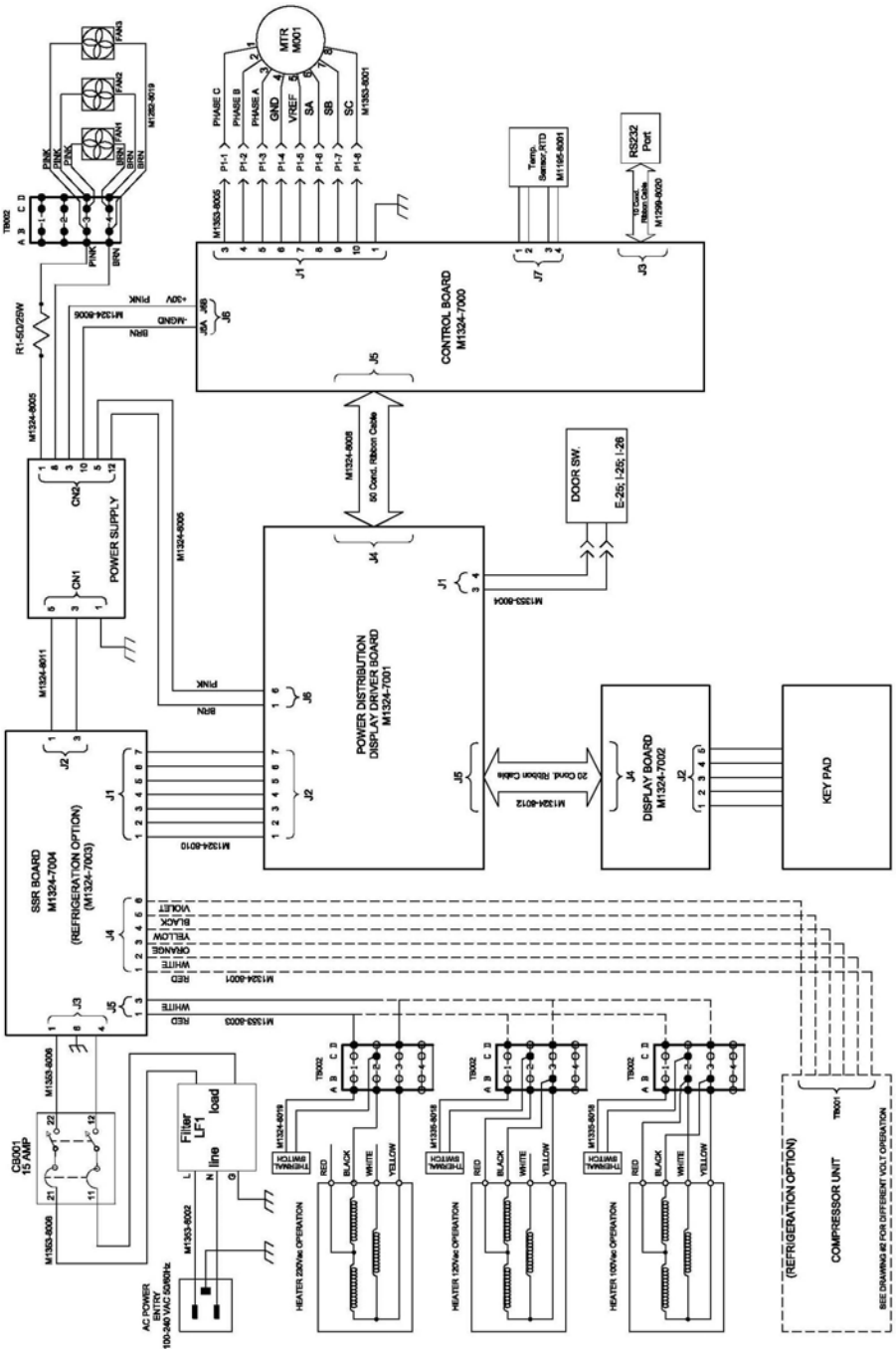
Table 5: Carriers & Test Tube Racks

Accessory Description	*Part Number*
Utility Tray with rubber mat for shaking 96 well plates, petri dishes and other labware at low speeds.	AG-00
Angled Test Tube Rack Holder for user-supplied test tube racks that are 10 - 13 mm (4 - 5 in) wide and up to 38 mm (15 in) long. Capacity: 4 racks/platform.	TTR-210*
Angled Test Tube Rack Spacer for use with TTR-210 to accommodate test tube racks that are less than 13 mm (5 in) wide and up to 38 mm (15 in) long.	TTR-215*
Microtiter Plate Carrier, capacity up to 4 microtiter plates	TTR-221*
80-tube (8-11mm) Adjustable Angle Test Tube Rack	M1289-0100⌘
60-tube (12-15mm) Adjustable Angle Test Tube Rack	M1289-0200⌘
42-tube (15-18mm) Adjustable Angle Test Tube Rack	M1289-0300⌘
30-tube (18-21mm) Adjustable Angle Test Tube Rack	M1289-0400⌘
22-tube (22-26mm) Adjustable Angle Test Tube Rack	M1289-0500⌘
20-tube (26-30mm) Adjustable Angle Test Tube Rack	M1289-0600⌘
Microplate Holder, stack 3 deep-well or 9 standard microplates	M1289-0700✧

*Universal Platform Required
⌘ Platform capacity is 7 racks
✧ Platform capacity is 16 racks

10 DRAWINGS

Figure 10: E-25 & E-25R Control Schematic (Overview)



NOTE:
For a larger version of this drawing, contact your sales or service representative.

Figure 11a: 230V ac, 50 Hz Power Schematic

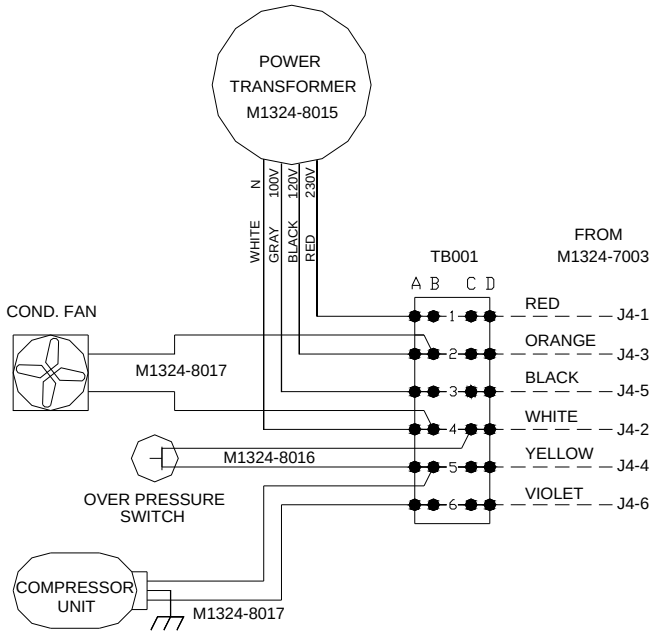


Figure 11b: 100V ac, 60 Hz Power Schematic

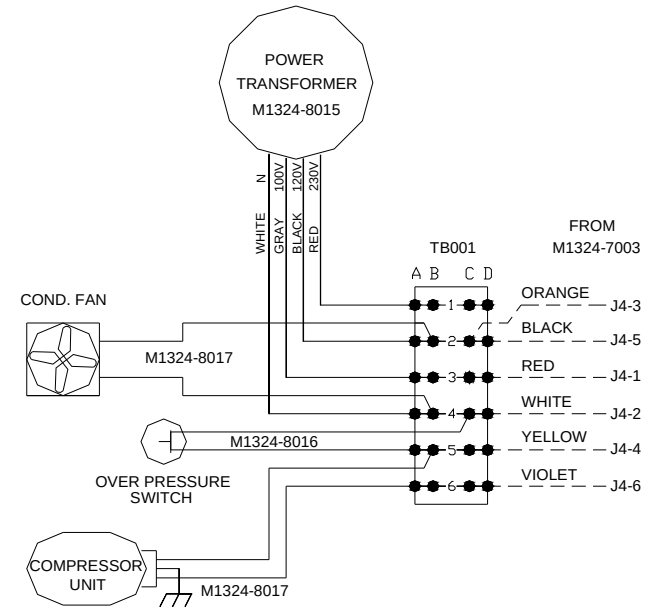


Figure 11c: 120V ac, 60 Hz Power Schematic

120Vac/60Hz OPERATION

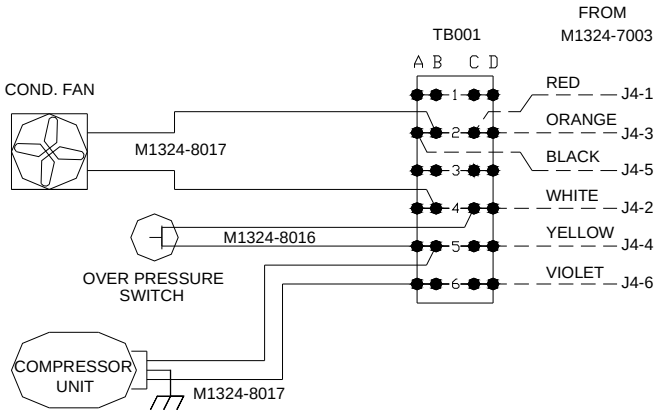


Figure 11d: 100V ac, 50 Hz Power Schematic

100Vac/50Hz OPERATION

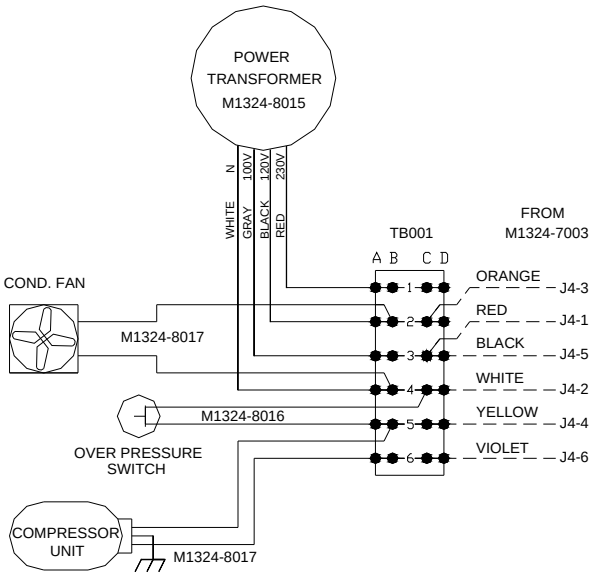
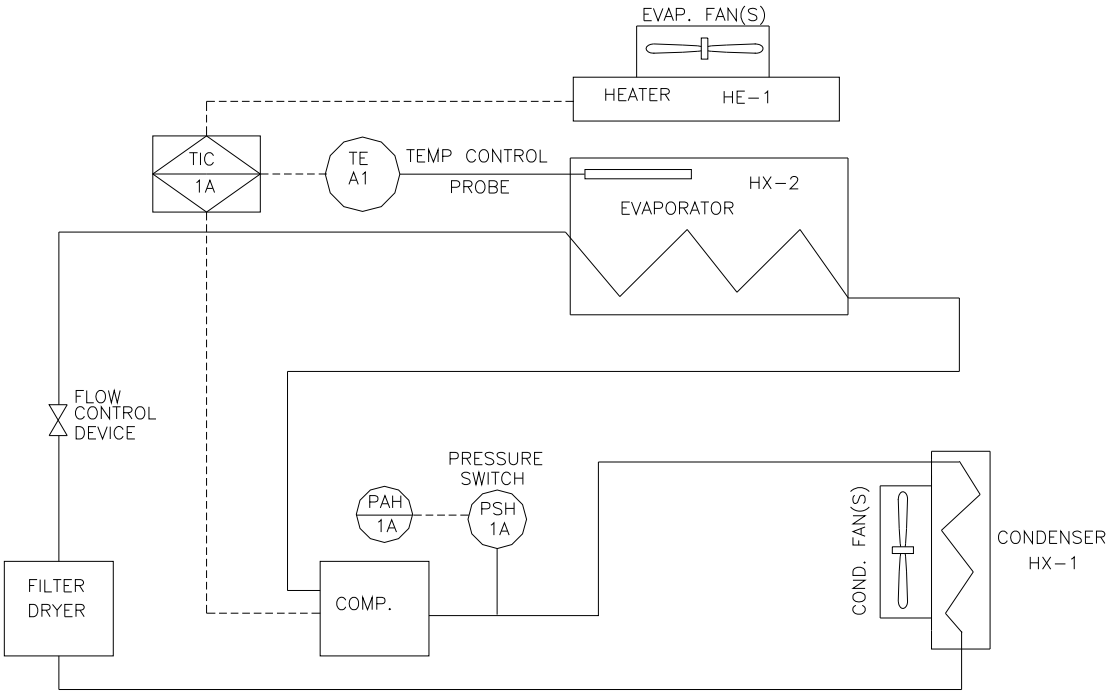


Figure 12: E-25R Refrigeration Schematic



10.1 List of Drawings

Figure	*Description*	*Page*
1	Space Requirements	14
2	Front Panel	15, 22
2a	Keypad	15
3	Platform Screw Locations	18
4a	Double Girdle Clamp Installation	19
4b	Clamp Fastener	20
5	E-25 and E-25R Rear Panel	21
6	Load & Speed For E-25/E-25R	27
7	Top Right Bezel Removed	28
8a	Rear of Electrical Panel (E-25)	29
8b	Rear of Electrical Panel (E-25R)	29
8c	Fuse Holder Detail (E-25)	30
8d	Fuse Holder Detail (E-25R)	30
9	Drive Belt Replacement	32
10	E-25 & E-25R Control Schematic (overview)	37
11a	230Vac, 50 Hz Power Schematic	38
11b	100Vac, 60 Hz Power Schematic	38
11c	120Vac, 60 Hz Power Schematic	39
11d	100Vac, 50 Hz Power Schematic	39
12	E-25R Refrigeration Schematic	40

10.2 List of Tables

11 INDEX

S

T

U

V

W

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