

**Cole-Parmer®**  
sampleprep

# HG-600 Geno/Grinder® 2010

Tissue and Cell Lyser for Biological Applications

## Operation Manual

For 115V (04500-17) and 230V (04576-84)



For Product Information



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SPEX SamplePrep is now part of Cole-Parmer®.

The Cole-Parmer® HG-600 Geno/Grinder was formerly known as SPEX 2010 Geno/Grinder.

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## **1.0 INTRODUCTION**

The HG-600 Geno/Grinder® was re-engineered with a new look and updated features. The features include: programmable and operating commands through a series of touchscreen displays, administrative lockout (passcode) which allows Lab Manager to restrict user access to specific protocols, self-diagnostics, larger observation window, improved visibility of sample loading area, and the new clamp orientation makes it easier to load/unload samples.

The Geno/Grinder® is designed to effectively disrupt cellular materials by vertically oscillating two or more deep-well titer plates, jars, tubes, or vials. This motion allows the unit to be used to prepare sample tissue for extractions of nucleic acid, proteins, and other constituents by agitating the tissue, steel balls or beads, and a lysis agent together in each well of the titer plate, tube, or vial.

Operation is simple: the titer plates, jars, tubes, or vials are secured in a clamp, and the cabinet lid closed. The controls are checked for the proper running time, stroke rate, number of cycles, pause time and the RUN button pushed. When the run is complete, the lid is lifted and the titer plates, jars, tubes, or vials are unclamped.

The isolation of nucleic acids from intact samples requires mechanically disrupting the samples, followed by the extraction and subsequent purification of the nucleic acid. Mechanical tissue disruption is often performed manually with a mortar and pestle, an approach that is not practical for high-throughput screening since manual grinding of tissues is slow, and re-use of mortars and pestles may lead to cross-contamination. Alternatively, nucleic acids can be isolated in a multi-well titer plate, tubes, or vials using balls or beads that mechanically disrupt the sample. Conventional isolation methodologies can then be used to extract the nucleic acids from the homogenate.

Sample materials that can be prepared include seeds, stems, roots, leaves, and certain animal tissue. Because the unique vertical shaking motion of the Geno/Grinder® is so strong, many seeds and other forms of plant tissue can also be pulverized dry in titer plates, jars, tubes, or vials with the help of one or two grinding balls per well, jar, tube or vial.

The Geno/Grinder® is also highly effective at improving extractions from food products, such as for pesticide analysis according to the QuEChERS<sup>1</sup> method. A pre-cut fruit or vegetable sample of 10-15 g is placed in a 50 ml conical centrifuge tube and the appropriate salts and solvent are added. Two ceramic grinding cylinders are added; the tubes are capped and shaken on the Geno/Grinder® for 1 min. Following clean-up, the samples are analyzed by LC or GC-MS. Pesticide recovery in samples prepared using the Geno/Grinder® has been found to be significantly improved over samples prepared manually.

<sup>1</sup>QuEChERS method developed by the USDA Eastern Regional Research Center. M. Anastassiades, S.J. Lehotay, D. Stajnbaher, F.J. Schenck, *J. AOAC International* 86, p. 412-431 (2003).

## **2.0 SPECIFICATIONS**

<b>Type of Grinder:</b>	Homogenizer, Bead Beater
<b>Display:</b>	Touchscreen
<b>Grinding Mechanism:</b>	Grinding balls of stainless steel, silica or zirconia beads.
<b>Dimensions</b>	28 in. (71.1 cm) high (40 in., 102 cm with lid open) x 14 in. (35.6 cm) wide x 22.5 in. (57.2 cm) deep including handle.
<b>Weight:</b>	100 lbs. (45.5 kg)
<b>Capacity:</b>	Six standard 96 deep-well titer plates, sixteen 50 ml or twenty-four 15 ml centrifuge tubes, forty-eight 5 ml tubes or ninety-six 2 ml microfuge tubes. <b><i>Dynamic loads &gt; 2 lbs. can create a rate error.</i></b>
<b>Clamp Speed:</b>	Adjustable range: 500-1750 strokes/min.
<b>Clamp Travel:</b>	1.25 in. (3.2 cm)
<b>Electrical Specifications:</b>	CE approved. 115V/230V, 60/50Hz
<b>Fuse:</b>	3AG 15-amp, 250 V slow-blow fuse for 115V/60Hz model. 3AG 12A-amp, 250 V slow-blow fuse for 230V/50Hz model.
<b>Current:</b>	115V/60Hz 10A and 230V/50Hz 7A
<b>Power Cord:</b>	<b>Do not plug mill into GFCI outlet (Ground Fault Circuit Interrupter)</b> 115V/60Hz model: 3-prong grounded plug supplied. 230V/50Hz model: 2-prong European plug supplied. 230V/50Hz model: 3-prong Standard UK plug supplied.
<b>Safety Features:</b>	Lid locks while running. Interlock prevents mill from running if lid is not closed. Manual lid release latch on the back of the unit.
<b>Run Timer:</b>	Maximum 20 minutes (1 - 5 cycles).
<b>Motor:</b>	1/2 HP (3-Phase). Maximum speed 3280 rpm. Maximum power 220 V.
<b>Environment:</b>	For indoor use only at a maximum altitude of 6600 ft. (2000 m). Operate at ambient conditions between 40°F (5°C) and 104°F (40°C), with maximum relative humidity 80% below 88°F (31°C) decreasing linearly to 50% at 104°F (40°C). Main supply voltage fluctuations up to 10% of nominal voltage (115 or 230 volts AC RMS). Pollution degree 2: none or only dry, conductive pollution occurs.



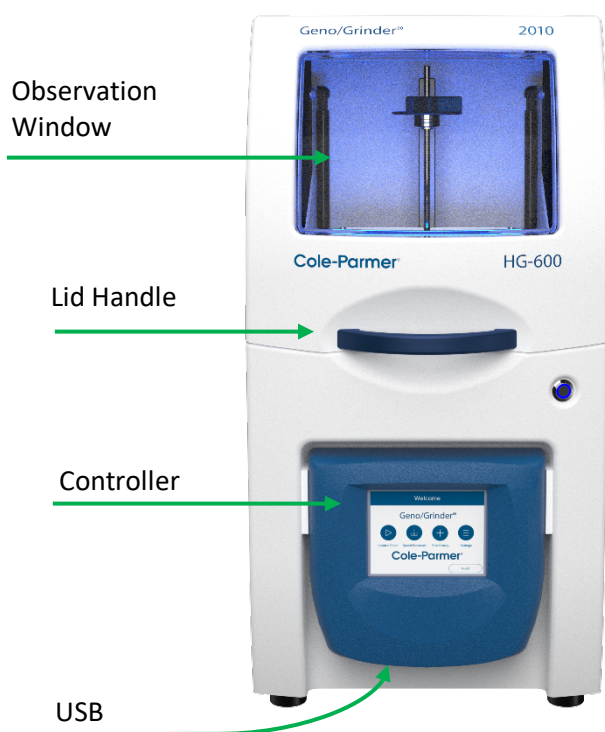
### **3.0 UNPACKING**

Carefully inspect the exterior of the packing box. Any visible damage should immediately be reported to the carrier. Remove all packed documents from the exterior of the box and file in your records. Remove the top of the shipping box, the foam packaging material, and the Geno/Grinder® accessories (power cord, titer plates, etc.). Lift the sleeve of the packing box to remove it from the base of the box. Remove the top foam protector with the clamp assembly inserted. Grasp the Geno/Grinder® on both sides, using proper lifting techniques, and place it on a stable bench top (This is a 2-person job). Make sure that there is adequate clearance on the sides to reach the AC inlet at the rear of the unit and on top when the lid is fully open.

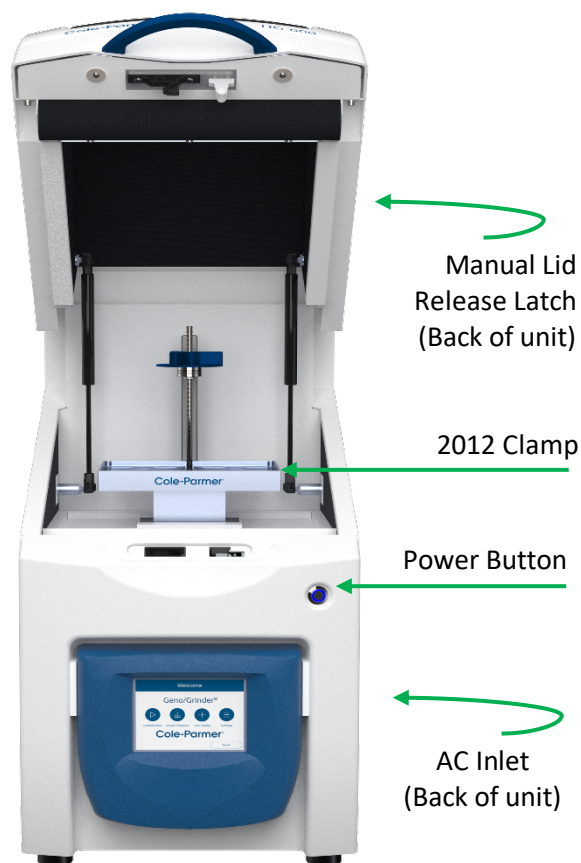
Follow a logical sequence of steps as you inspect the unit (see Figures 1 and 2).

1. Inspect the electrical input module for any visible damage.
2. Inspect the cabinet and lid for any visible damage.
3. Ensure that the controller is intact.
4. If the lid is locked, open by pressing and holding the Manual Release Latch on the back of the unit (at the top left) while lifting the red Lid Handle at the same time.
5. Remove the cardboard/foam protector around the shaft inside the unit before attaching the clamp assembly (refer to Section 4.3) or turning the unit on.
6. Check the clamp assembly (packed separately). Ensure that it is undamaged.
7. Inspect the accessories and compare with the packing list.

If everything appears to be in proper order, store the packaging materials in case there is a need to return the unit for service or repair.



**Figure 1**



**Figure 2**

## **4.0 SETTING UP**

The HG-600 Geno/Grinder® weighs 100 pounds (45.5 Kg). The lid opens from the front with the handle in the center. The AC Input module, fuse tray, and power cord receptacle are located on the rear of the Geno/Grinder® cabinet, toward its bottom. The power (On/Off) button is on the front right, as shown in Figure 2. The Manual Lid Release Latch is located on the rear of the unit at the top left. There are gas springs on both sides of the cabinet to control the movement of the lid. The touchscreen controller is affixed to the front side of the unit. Under the front edge of the controller is a USB port to export run history, or upgrade system software (Figure 1).

### **4.1 Electrical Connection**

The detachable power cord should be plugged firmly into its inlet, then into an electrical outlet. **Do not plug mill into a GFCI (Ground Fault Circuit Interrupter) outlet.** Make sure that the electrical outlet is easily accessible in case it becomes necessary to unplug the unit. For 115V/60HZ use, a 3-prong outlet fused at 20 amps is recommended. The 230V/50HZ Geno/Grinder® power cord has a standard European 2-prong plug, and a standard UK cord.

### **4.2 Cabinet Set-Up**

To open the cabinet, grasp the red handle and raise the lid to its full upright position. The gas spring will hold the lid in its open position. To close, grasp the red handle and lower the lid until it is fully closed.

A safety interlock will engage the Geno/Grinder® only when the lid is closed. If the RUN button is touched while the lid is open, the Geno/Grinder® will not start. The lid stays locked when the unit is running which prevents the user from opening it during operation. If the locking mechanism fails and the lid is opened, the motor will immediately stop, and movement of the clamp assembly will cease.

### **4.3 Installing the Clamp Assembly**

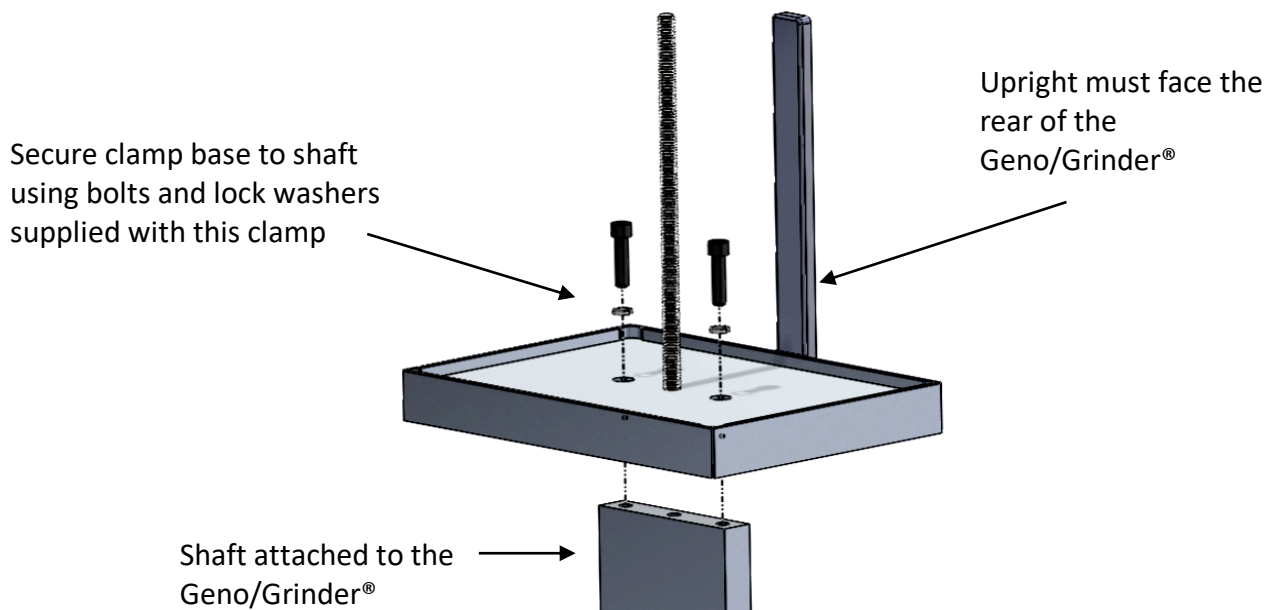
The 2012 adjustable clamp can accommodate a variety of titer plates (up to six) and vial sizes. This clamp assembly is also used with 15 ml or 50 ml centrifuge tubes. The Geno/Grinder® clamp can also be adapted to hold anything with the same general dimensions (5 in. long x 3 in. wide x 2 to 4 in. high). This includes titer plates with fewer and/or larger wells, racks that hold multiple individual vials, and other possible configurations. Spacers are not required for the 2012 adjustable clamp.

To prevent damage during shipping, the clamp assembly is not installed at the factory. Before operation, this must be installed by the user.



#### **4.3.1 Installing the Adjustable Clamp Assembly**

To install the clamp, first locate the 3/16" Allen wrench and the two bolts and lock washers supplied with the Geno/Grinder®. Open the Geno/Grinder® lid and place the clamp base on top of the shaft. Using the lock washers and bolts, secure the clamp base to the shaft with the Allen wrench (Figure 3).



**Figure 3 – Installing the Adjustable Clamp**

**IMPORTANT: THE BOLTS AND LOCK WASHERS SUPPLIED WITH THIS CLAMP MUST BE USED!!**

**NOTE: PLEASE DO NOT OPERATE THE GENO/GRINDER® UNTIL YOU HAVE READ THESE INSTRUCTIONS AND ARE FAMILIAR WITH ITS CONTROLS AND CLAMP MECHANISM. THE GENO/GRINDER® IS INTENDED FOR USE ONLY BY QUALIFIED AND TRAINED PERSONNEL.**

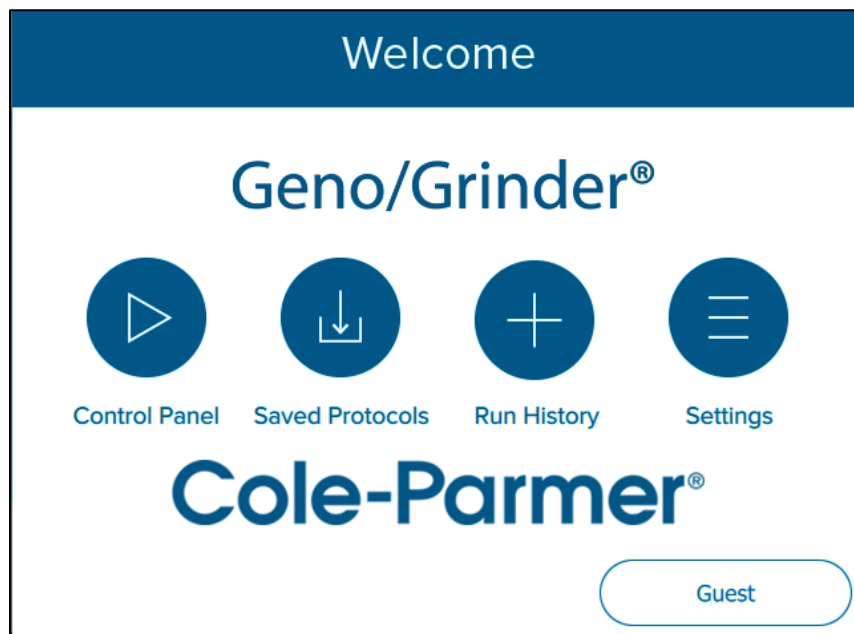
## 5.0 TOUCHSCREEN DISPLAY

The HG-600 Geno/Grinder® is programmed and operated through a series of touchscreen displays. Transition between screens, and all programming and operating commands, are done by touching the screen with a fingertip or stylus. ***Do not use a sharp point as this can damage or deface the screen.***

### 5.1 Logo Screen

When the power is switched ON at the front of the mill, “Please wait” appears during start-up as the software loads. The screen will switch to the **Home Screen**, as shown in Figure 4. From the Home Screen the User Name, Control Panel, Saved Protocols, Run History, and Settings can be accessed by touching the buttons displayed.

The Home Screen Icon can be found on the Control Panel positioned at the bottom right of the screen. Touching the Home Icon allows the user to return to the Home Screen.



**Figure 4** – Home Screen

## 5.2 User List

To access the **USER LIST** screen touch the Username button on the Home Screen. An infinite number of users can be stored. Only 10 user slots at one-time are visible on the User List screen (Figure 5). To access or make visible additional users, or vacant spaces swipe up or down the touchscreen. This brings up vacant slots on the User List screen. Touching the Back Arrow button (top left) allows the user to return to the previous screen.

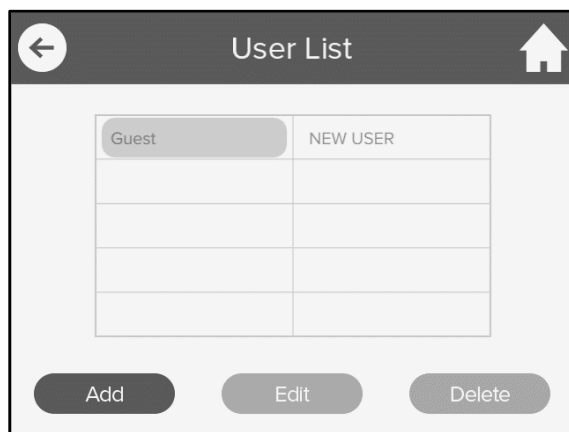


Figure 5 – User List Screen

### 5.2.1 Recalling a User

In the **USER LIST** Screen, touch the username to highlight the name. Then touch the Back Arrow button at the top left of the screen to send the username to the **CONTROL PANEL** Screen. The username will appear below the Date and Time at the bottom right of the screen, as shown in Figure 6.

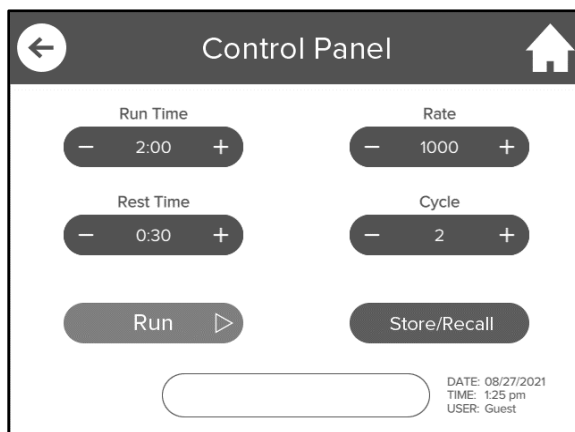


Figure 6 – Control Panel

### 5.2.2 Add a User

To add a new user, touch the add button on the User List Screen (Figure 5) which will bring up the **EDIT/ADD USER** Screen. Touch inside the Box, as shown in Figure 7. Touching the Back Arrow button (top left) allows the user to return to the previous screen.

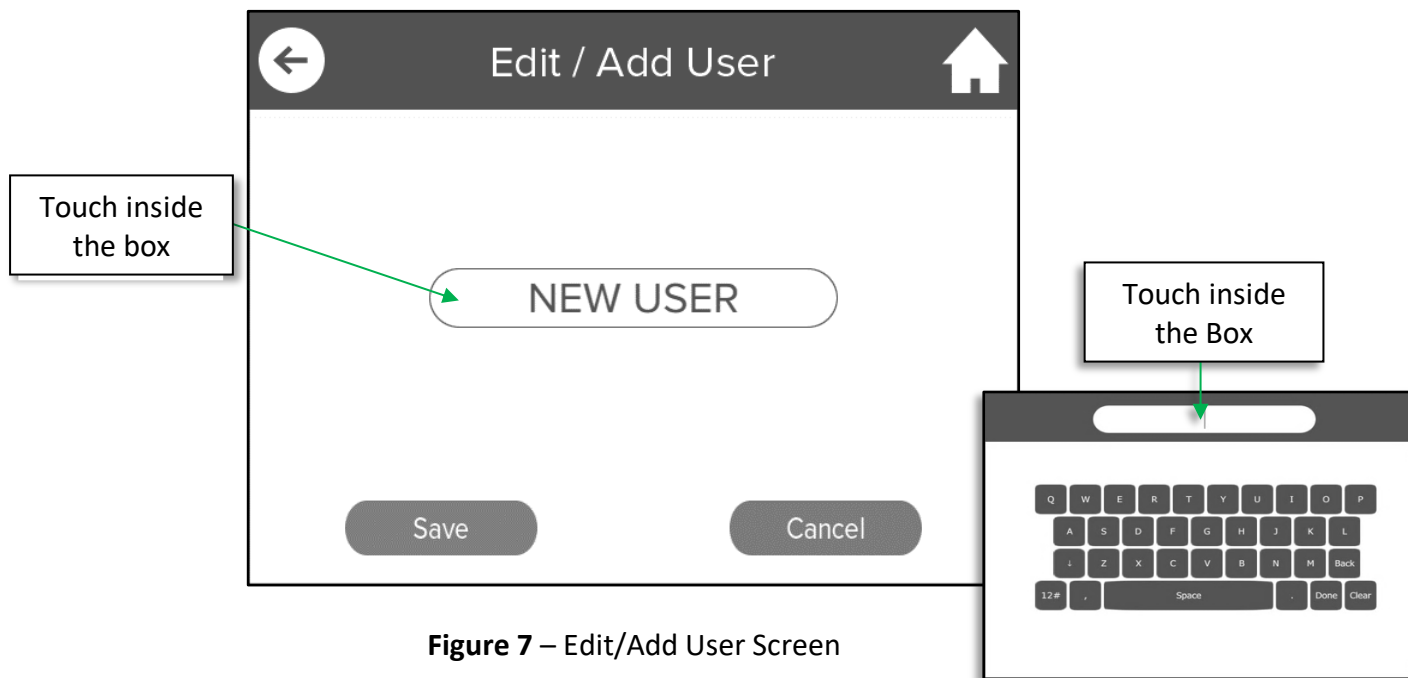


Figure 7 – Edit/Add User Screen

This will bring up the **KEYBOARD** screen, a simplified version of the standard keyboard for a computer. In addition to number and letter keys, this keyboard has standard symbol keys (#, %) and four function keys (SPACE, BACK, DONE, and CLEAR).

The CLEAR key deletes whatever has been entered in the Box. As the letters/numbers are touched, they appear above the keyboard in the Box with a centered cursor. To access the number and symbol keys touch the 12# button located bottom left on the KEYBOARD screen. To switch back to letter keys touch the ABC button (same button) bottom left on the KEYBOARD screen.

The Up/Down yellow arrow key allows the user to shift back and forth from upper case to lower case (the default is upper case). Touch Down arrow to switch to lower case. Or touch Up arrow to revert to upper case.

Touching the SPACE key advances the cursor one space. Touching the BACK key deletes one space. Touching the DONE key enters the label shown in the box.

Touch the SAVE USER button to save the label shown in the Box. The label will appear as the username in the **USER LIST** Screen (Figure 5). The CANCEL key does not change anything on the screen, except returns the display to the **USER LIST** Screen.

### 5.2.3 Edit a User

To edit a saved user, touch the username to highlight the name on the User List screen (Figure 5). Then touch the EDIT User button. From the Edit/Add User screen change the name by touching inside the box. This will bring up the **KEYBOARD** screen, follow the instructions listed in the Add a User **SECTION 5.2.2**. Note, changes cannot be made to the Guest field.

### 5.2.4 Delete a User

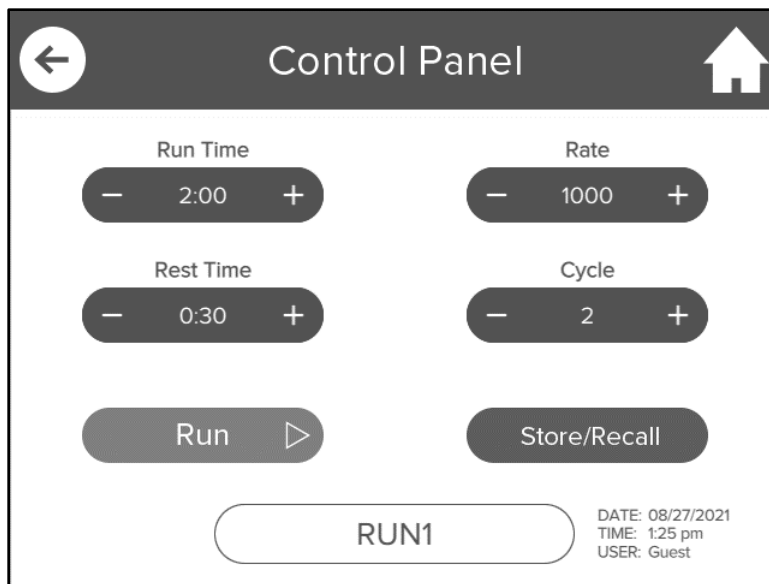
To delete a saved user, touch the username to highlight the name on the User List screen (Figure 5). Then touch the Delete button. A pop-up window opens confirming to delete this user. Touch YES to clear or touch NO to retain the username.

## 5.3 Control Panel

The Control Panel displays the programmed run parameters, Date & Time and User name at the bottom right of the screen, Protocol name at the bottom center of the screen, as shown in Figure 8. Changes to the run settings, are made from this screen.

To recall stored run protocols, touch the button located at the bottom right of the screen. (See section 5.5 for more information on Saved Protocols)

--To return to the Home Screen touch the Home Icon.



**Figure 8 – Control Panel**



### 5.3 Control Panel (Cont'd)

The following sequence of events will occur from the current settings in Figure 8.

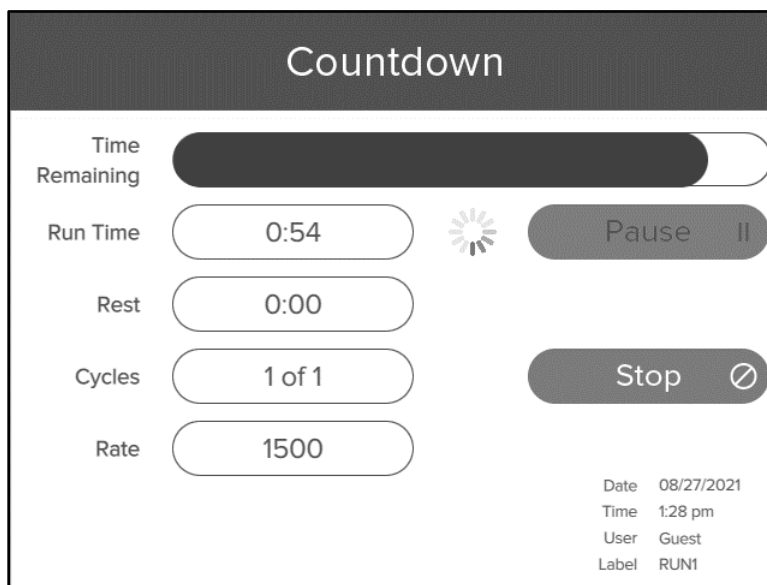
1. Cycle 1 - the unit runs for 2 minutes at a rate of 1000 strokes per minute.
2. Pause - the unit is inactive for 30 seconds allowing the samples to undergo lysis.
3. Cycle 2 - the unit runs for another 2 minutes at a rate of 1000 strokes per minute.

In the **CONTROL PANEL**, The STATUS BAR (top of screen) counts down the time remaining for a run (Figure 9).

To change the settings of a selected field, press the plus and minus buttons on the **CONTROL PANEL** Screen. The minus buttons decrease the number displayed and the plus buttons increase the number displayed.

#### 5.3.1 Starting a Programmed Run

To run the program displayed on the **CONTROL PANEL** Screen, touch the run button. The Geno/Grinder® can be started, stopped, or paused in the middle of a grinding program from the button selections to the right of the screen.



**Figure 9** – Run Screen (time remaining)

### 5.3 Control Panel (Cont'd)

During the RUN TIME stage the TIME REMAINING line counts down the time for the programmed run in 1-second increments. To pause the program, touch the pause button. To continue the program, touch the RESUME button. To abort the program, touch the STOP button.

To start a new program, touch the RUN button.

The RUNTIME line will display the time remaining in that cycle of the grinding stage. If there are 2 total grinding periods, the CYCLES line will countdown to "0". The maximum number of cycles is 5.

#### 5.3.2 Stopping or Pausing a Run

To stop a program, touch the stop button on the **RUN SCREEN** (Figure 9), the button will dim or turn a muted red and the program will end. If the RUN button is touched after the program has stopped then the entire program will start over.

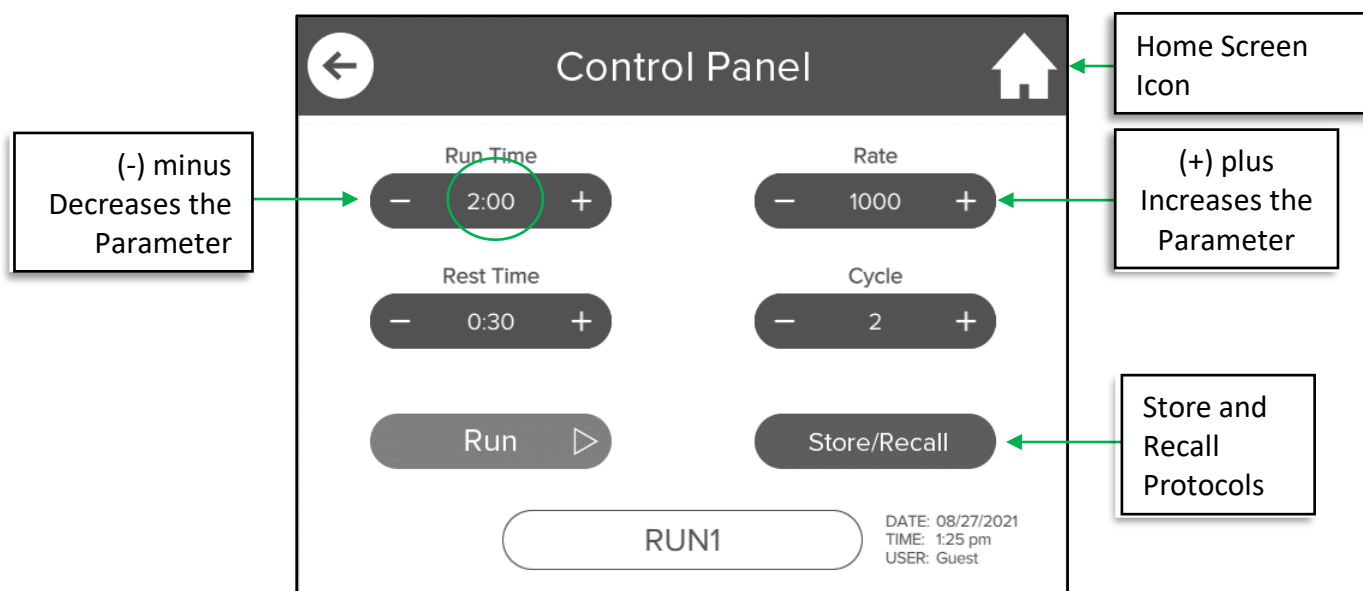
To pause during a grinding program, touch the PAUSE button. **Note, the TIME REMANING line will turn yellow which indicates runtime is inactive.** The run will hold the settings at that moment (elapsed time, cycle, etc.). At this point the door to the sample area can be opened. To resume the program, touch the RESUME button. This will restart the program at the point at which it was paused. Alternatively, pressing STOP will end the program.

### 5.4 Changing Settings

To change parameters (run time, pause time, cycles, and rate), touch the plus and minus buttons on the **CONTROL PANEL** Screen. Touching the plus button increases the parameter, while touching the minus button decreases the parameter. Tap or hold the plus or minus buttons until the desired number is reached. The changes will appear in the blue area between the plus and minus, as shown in Figure 10. The maximum run time is 20 minutes for 1 – 5 cycles. The minimum Rest is 15 seconds per cycle for 2 - 5 cycles. To run a program with the new settings, touch the run button.

***NOTE: If the run parameters are changed to a Protocol and not saved then (MOD) will appear to the right of the Protocol name at the bottom center of the screen.***

## 5.4 Changing Settings (Cont'd)



**Figure 10** – Changing Settings

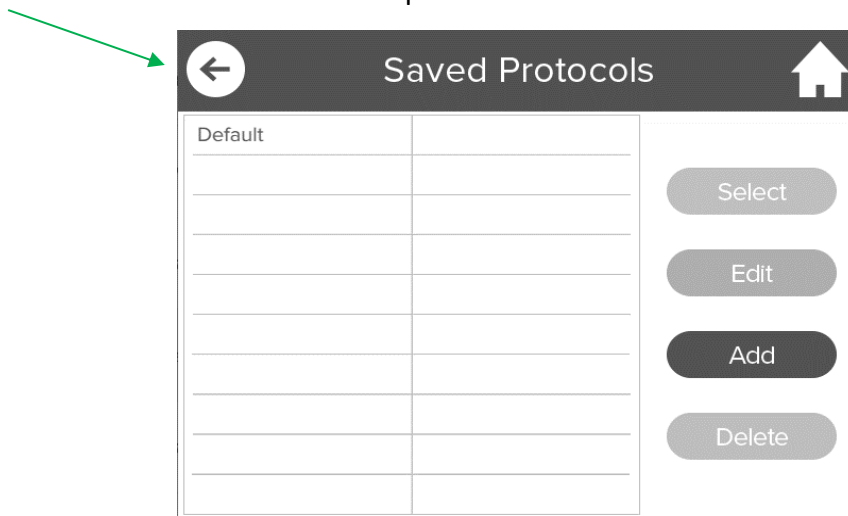
## 5.5 Saved Protocols

The **SAVED PROTOCOLS** Screen is shown in Figure 11. Up to 500 Protocols can be saved for simple and fast recall, increasing productivity and reducing operator error. Only 20 protocols are visible at one-time on the Saved Protocols Screen. To view additional protocols, or vacant protocol spaces, swipe up or down on the touchscreen. This brings up vacant protocol slots on the **SAVED PROTOCOLS** Screen.

A saved program retains the settings for number of cycles, run time, pause time between cycles, and rate. Be sure to adjust the rate to the desired setting after recalling a stored program.

## 5.5 Saved Protocols (Cont'd)

The Default protocol recalls the last programmed run setting that was not saved. The Default protocol can be changed without saving the new settings, as described in section 5.4. At the top left on the Saved Protocols Screen is the Back Arrow button. Touching the Back Arrow button returns the user to the previous screen.



**Figure 11** – Saved Protocols Screen

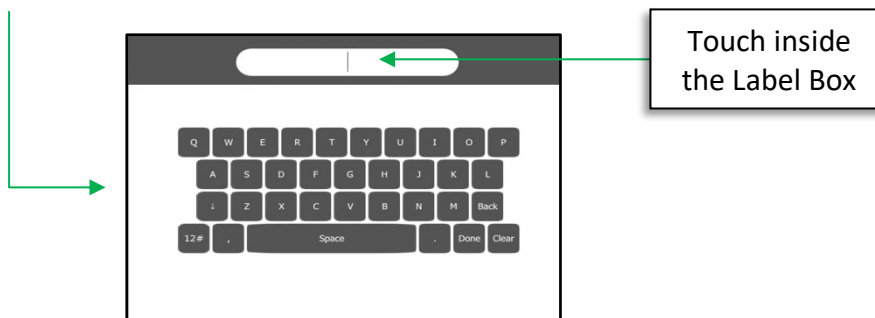
### 5.5.1 Recalling a Protocol

To recall a stored program, touch the button on the Control Panel Screen (Figure 10). In the **SAVED PROTOCOLS** Screen, select the protocol to highlight the box. Then touch SELECT to send protocol to the **CONTROL PANEL** Screen (Figure 11).

### 5.5.2 Storing a New Protocol

To store program, touch the button on the Control Panel Screen (Figure 10). In the **SAVED PROTOCOLS** Screen, touch the add button, as shown in Figure 11.

This will bring up the **KEYBOARD** screen, a simplified version of the standard keyboard for a computer.



### 5.5 Saved Protocols (Cont'd)

The CLEAR key deletes whatever has been entered in the Label Box. Touching the DONE key enters the label shown in the box.

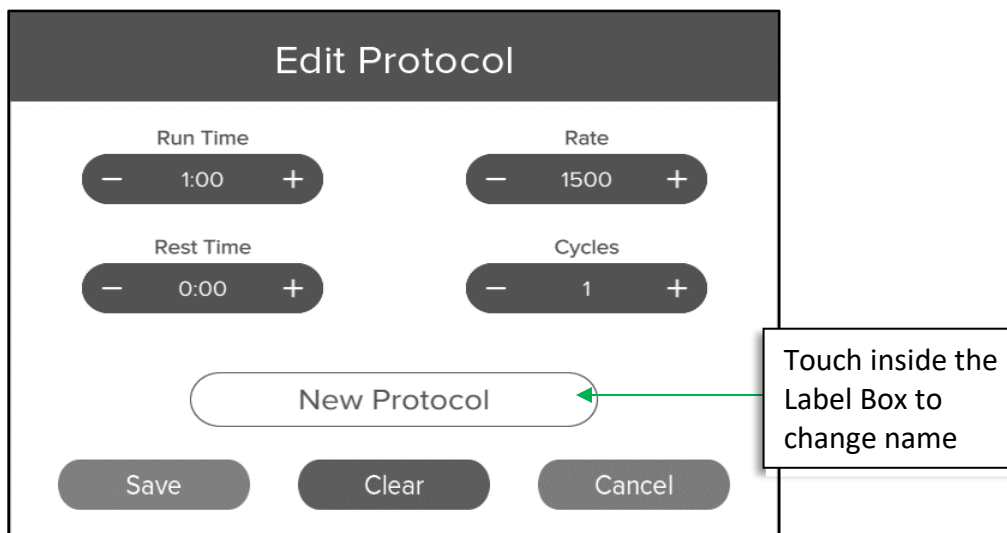
Touch the SAVE button to save the label shown in the Box. The label will appear as the name of the program in the **SAVED PROTOCOLS** Screen (Figure 11).

The CANCEL key does not change anything on the screen, except returns the display to the **SAVED PROTOCOLS** Screen.

To run the newly saved protocol, touch the protocol to highlight the box. Then touch SELECT to send the protocol to the **CONTROL PANEL** Screen. Review the parameters and touch the RUN button to initiate the protocol.

#### 5.5.3 Edit a Protocol

To edit a saved protocol, touch the protocol name to highlight the box on the Saved Protocol screen (Figure 11). Then touch the EDIT button. From the Edit Protocol Screen change the name by touching inside the box. This will bring up the **KEYBOARD** screen, follow the instructions listed in the Storing a Protocol **SECTION 5.5.2**.



**Figure 12 – Edit Protocols Screen**



#### 5.5.4 Delete a Protocol

To delete a saved protocol, touch the protocol name to highlight the name on the Saved Protocols Screen (Figure 11). Then touch the Delete button. A pop-up window opens confirming to delete this protocol. Touch YES to clear or touch NO to keep the saved protocol, as shown in Figure 13.

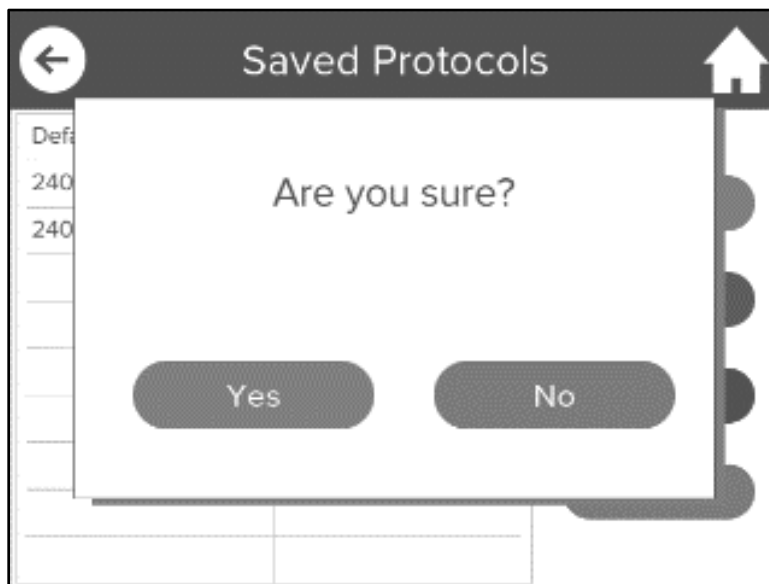


Figure 13 – Protocols Deletion Screen

#### 5.5.5 Modify a Recalled Protocol

Once a saved protocol is recalled to the **CONTROL PANEL** Screen, the User can modify the parameters by using the plus (+) and minus (-) buttons. If the protocol is modified, (MOD) will appear next to the protocol name, e.g. WHEAT(MOD).

### 6.0 LOADING THE CLAMP



**Lock Sample Holder!**

This warning symbol is visible in front of the clamp assembly. It is essential that samples are securely locked into the sample holder (clamp assembly) before operation.

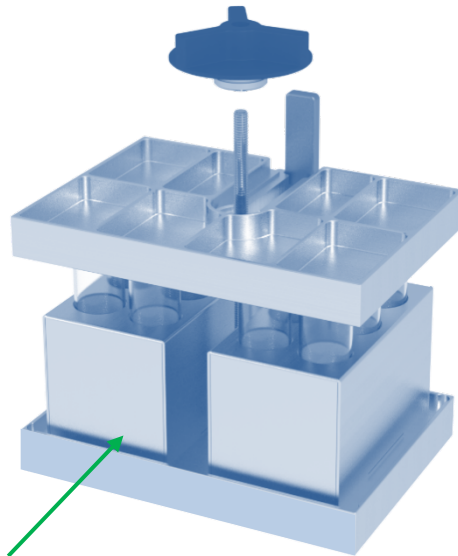
## **6.1 Loading the Adjustable Clamp**

The clamp is the most critical component of the HG-600 Geno/Grinder®, as it must be carefully adjusted to hold the titer plates (or vials, centrifuge tubes, etc.) firmly in place. The up-and-down motion of the clamp is extremely vigorous. Sample holders (titer plates, vials, centrifuge tubes, etc.) must be held securely in the clamp during operation to prevent damage and leakage.

### **6.1.1 Vials in Holders or Cryo-Blocks**

1. Place the sample vials (in the appropriate holder or cryo-block) in the clamp base (Figure 14). The sample load must be evenly distributed at all sides of the clamp to avoid excess wear to the Geno/Grinder®. Also, the clamp lid must have a flat surface upon which to rest. If running less than a full holder of vials, be sure to place vials at the 4 corners to support the clamp lid.
2. Slide the lid on top of the vials. Screw down the locking knob onto the threaded screw and the guide onto the upright at the back of the clamp (Figure 15).
3. Turn the knob clockwise until finger tight to secure the vials in the clamp. It is not necessary to over tighten the clamp lid. Check to see whether the vials can be moved from side to side in the clamp. If not, the clamp is tight and samples are secure. If the vials can be moved, tighten the handle gradually until the vials are secure.
4. Close the Geno/Grinder® lid and run the unit.

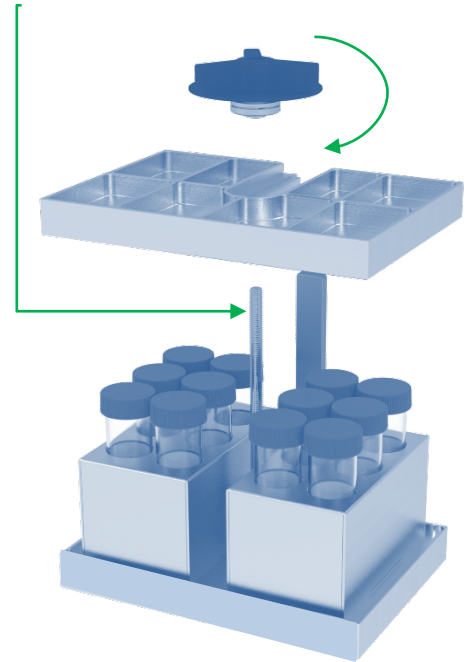
### 6.1.1 Vials in Holders or Cryo-Blocks (Cont'd)



Place vial in holders or cryo-blocks in clamp base

**Figure 14** – Loading the 2012 Clamp

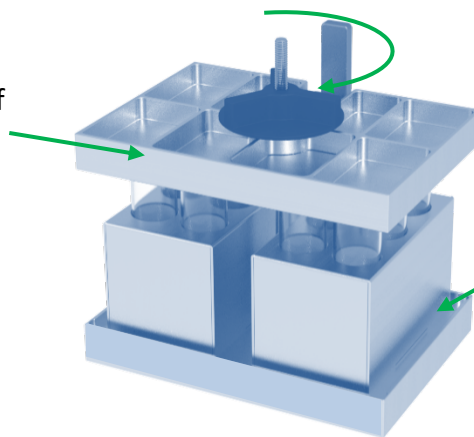
Slide lid on top of the vials (with guide on upright at rear). Screw down the locking onto the threaded rod.



**Figure 15** – Attaching the Standard 2012 Clamp Lid

**B)** Turn knob clockwise to tighten (finger tight).

**A)** Slide the clamp lid on top of the vials. Screw down the locking knob on the threaded rod.



**C)** Make sure the cryo-blocks are secure and cannot be moved from side to side

**Figure 16** – Securing the 2012 Clamp Lid

### **6.1.2 Titer Plates**

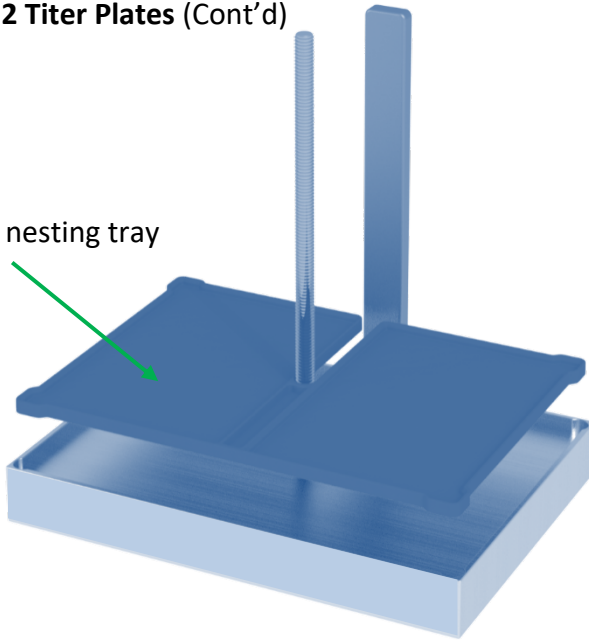
Titer plates are made by many companies and are sealed in various ways. The Geno/Grinder® is designed for use with the vast majority of currently available titer plates. Plates can be sealed using a variety of formats. For PCR and DNA/RNA work a heat sealer is suggested, to minimize the possibility of contamination between wells.

1. A minimum of two titer plates must be run as the clamp lid requires a level surface upon which to rest. If running a set of 2 titer plates, simply place one plate on either side of the 2012 clamp and follow the instructions above for closing the clamp.
2. Titer plates can also be stacked in the clamp to increase throughput. A maximum of 6 deep-well plates can be run in the 2012 clamp, stacked three high on either side of the clamp.
3. When stacking titer plates, it is necessary to use the 2189T nesting trays. These provide a rigid surface on the top of the plate to prevent the grinding balls from perforating a film if used to seal the plate. The nesting trays must also be used if plates are sealed with cap mats as these hold the cap mats securely in place and prevent leakage from the plate wells.
4. The 2189T nesting tray set consists of one tray that has nests on one side only and two trays that are nested on both sides.
5. Place the single-sided nesting tray in the bottom of the clamp base, as shown in Figure 17, with the nests facing up.
6. Place a set of 2 titer plates in the clamp base making sure that the plates are properly seated in the nests (Figure 18).
7. Place a double-sided nesting tray onto the titer plates in the clamp and stack a second row of plates on top, again making sure that the plates are properly seated in the nests (Figure 18). It is not necessary to place a nesting tray on top of the upper row of titer plates.
8. Secure the clamp lid to the loaded clamp (Figure 19), following Steps 2 – 5 in Section 6.1.1, and run the Geno/Grinder®.

**NOTE: Never run the Geno/Grinder® without the 2012 clamp screw-tightened or with titer plates held loosely in the clamp. Damage and leakage will result. When processing samples in only one titer plate, load an empty titer plate on the other half of the clamp assembly. Similarly, if less than a full rack of vials is used, be sure to place an equal number of vials on each side of the clamp, to ensure that the load is balanced and tightly clamped. Empty vials can be used as place holders if an uneven number of samples are run.**

### 6.1.2 Titer Plates (Cont'd)

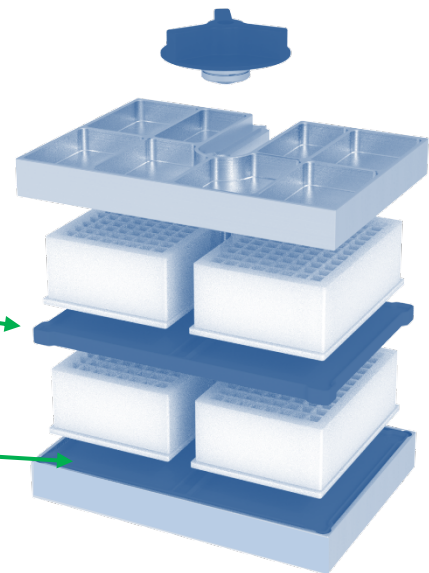
Single-sided nesting tray



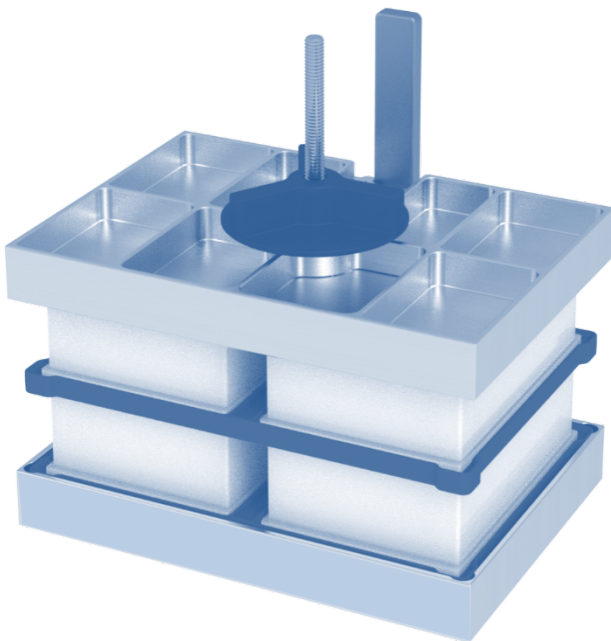
**Figure 17**– Bottom nesting Plate in the 2012 Clamp Base

Double-sided nesting tray

Single-sided nesting tray (bottom only)



**Figure 18** – Stacking Titer Plates



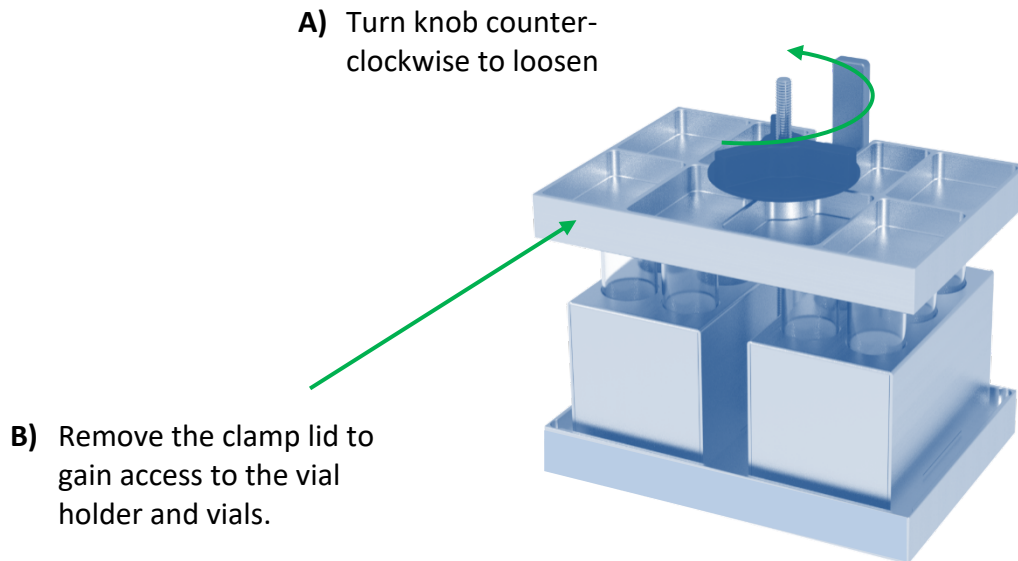
**Figure 19** – Closed 2012 Clamp with 4 Titer Plates

**Note:** When stacking 4 or 6 titer plates, do not add more than five 4 mm steel balls to a single titer plate well.



### 6.1.3 Releasing the 2012 Clamp

1. When the Geno/Grinder® comes to a complete stop, open the lid.
2. Turn the clamp lid knob counterclockwise until it rotates freely (Figure 20).
3. Remove the clamp lid entirely. The sample vials or titer plates are easily accessible. Vials or titer plates can be unloaded and the next set loaded.



**Figure 20** – Releasing the 2012 Clamp Lid

**NOTE:** To maintain proper functionality of the HG-600 Geno/Grinder®, the maximum recommended total sample load in the clamp assembly is 4 lb. (1.8 kg). The total sample load includes sample, vials (or titer plates), grinding media, holders (or cryo-blocks), and nesting trays. For Sample loads exceeding 2 lb. (0.9 kg), the maximum recommended operating rate is 1500 rpm. Sample loads less than 2 lb. can be run at rates up to the maximum of 1750 rpm. Dynamic loads greater than 2 lb. can create a rate error. When stacking 4 or 6 titer plates, do not add more than five 4 mm steel balls to a single titer plate well.

***Operating with loads that exceed the recommended maximum rate and weight limits can result in damage to the HG-600 Geno/Grinder®. Therefore, warranty restrictions or invalidation may apply.***

## 7.0 OPERATION

Before operating the Geno/Grinder®, make sure it is plugged in and turned on. The power cord inlet is located on the rear of the cabinet. The On/Off button is located on the face of the unit to the right of the red handle.

The following steps outline a standard operating cycle:

1. Load and seal the titer plates, or load and cap the sample vials.
2. Clamp the titer plates or vials in place, using nesting trays as needed, or vial holders.
3. Close and secure (lock) the lid.
4. Set the timer.
5. Set the number of cycles.
6. Set the pause time.
7. Set the clamp stroke rate.
8. Press the green RUN button to start a run.
9. When the run is complete, lift the lid.
10. Unclamp the titer plates or vials.

### 7.1 Preparing the Titer Plates

While the precise details are left to the individual user, each well in the titer plate can be loaded with a seed, plant tissue, or other sample, and an eluent, solvent, etc. If it is necessary to disrupt the sample, a grinding media is typically added first. The 2100 Grinding Ball Dispenser available for the Geno/Grinder® will deposit one 5/32" (4 mm) steel ball layer in each well of the titer plate. Dry grinding may require a second ball in each well, possibly sandwiching the sample between them during grinding. **When stacking 4 or 6 titer plates, do not add more than five 4 mm steel balls to a single titer plate well. Dynamic loads greater than 2 lb. can create a rate error.**

To use the 2100 Grinding Ball Dispenser, fill the tray with more than enough steel balls to cover the bottom, and shake it gently until a steel ball falls into every hole. Then place the dispenser over an empty titer plate and push in the slide, releasing the balls caught in the slide. Set the dispenser aside, and check that a ball is in each well of the titer plate.

Sealing the loaded titer plate is, again, a matter of choice, which can vary with the brand of titer plate and the necessity of sealing a fluid in each well. Some manufacturers of titer plates make sealing systems; many technicians have also developed other methods for plugging the top of each well. Users must decide for themselves which method is most effective. What matters most is that the contents of one well do not contaminate the sample in an adjacent well.

**NOTE: Because the action of the Geno/Grinder® is so energetic and efficient, run times are short, typically 2 minutes or less. When developing a procedure, always start with a short running time and increase it only if needed.**

## 7.2 Operating the Lid

To close the cabinet, grasp the handle and slowly lower the lid to the closed position. The lid must remain closed during a run.

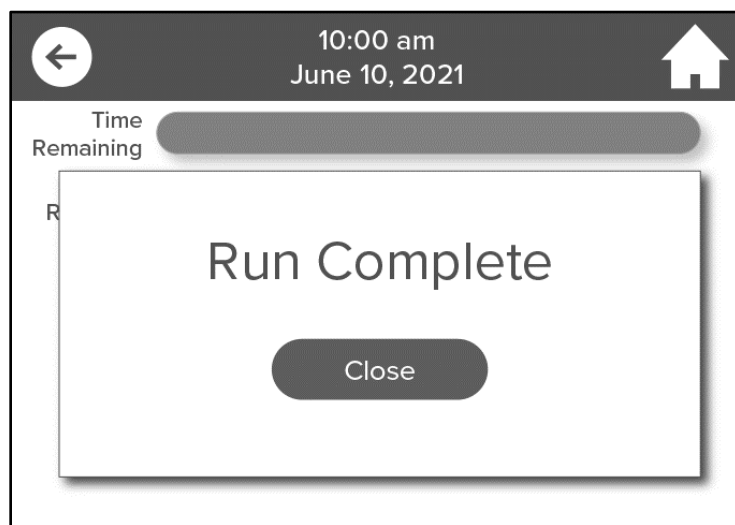
To open the cabinet, grasp the handle and raise the lid to its full upright position. The gas springs will hold the lid in its open position.

### 7.2.1 Manual Lid Release Latch

To open the cabinet if the power to the Geno/Grinder® fails, press and hold the metallic button on the back of the unit (at the top left) while lifting the red Lid Handle at the same time.

## 7.3 Running the Geno/Grinder®

Press the green RUN button to initiate a programmed run. The screen will display a countdown of the time remaining in a run, as shown in Figure 10. The Geno/Grinder® will stop automatically at the end of the run. When the grinding program has ended, the screen will display RUN COMPLETE, as shown in Figure 21. Touch the screen to return to the Control Panel.



**Figure 21** – Run Complete Screen

To stop the Geno/Grinder® during a run, press the red STOP button on the screen. Operation will cease and the timer will reset.

The lid locks automatically while the Geno/Grinder® is in operation. If the lid lock fails and the lid opens, the screen will display a “LID OPEN” message, as shown in Figure 22. The timer will maintain the time remaining in the run. To restart, close the lid and press the green Resume button to finish the run. To abort the run and reset the timer, press the red STOP button. The “LID OPEN” message will disappear once the lid is closed.

### 7.3 Running the Geno/Grinder® (Cont'd)



**Figure 22** – Lid Open Screen

### 7.4 Safety Recommendations

The HG-600 Geno/Grinder® is intended for use only by qualified and trained personnel. For questions about the OPERATION, MAINTENANCE, or SERVICE of the HG-600 GENO/GRINDER®, please call Cole-Parmer® at 1-732-623-0465.

**Note:** In the case of main power interruption, the unit will not restart on restoration of the electricity supply.

Every effort has been made to ensure that the HG-600 Geno/Grinder® is safe to operate. However, the safety protection provided by the unit may be impaired if the Geno/Grinder® is operated in a manner other than that described in this manual. In addition, the Geno/Grinder® should only be used with accessories provided by or recommended by Cole-Parmer and must be used in the intended manner. Use of accessories not recommended by Cole-Parmer may negatively affect the safety protection provided by the unit. For example, do not use glass vials in the Geno/Grinder®. The impact of the grinding media may cause the vials to break, resulting in broken glass and spilled samples.

Do not use the HG-600 Geno/Grinder® with hazardous materials for which the unit was not designed. Be aware of the hazards of the materials that are being used, particularly in the event of a spill. For instance, use of a flammable liquid could create a fire hazard if a sample is spilled.

## 8.0 Run History

To recall Run History touch the Run History button. The Date, Time, User, Run Label, and Run Protocol data are stored on this screen, as shown in Figure 23. The Run History can be exported to computer devices via the USB located under the front of the Controller. **Note, the Export History button will have a dimmed or muted green appearance which indicates it is inactive. After a flash drive or USB cable (connected to computer device) is inserted into the port the button will turn a brighter green indicating it is active.** To export Run History touch the EXPORT HISTORY button at the bottom right of the screen. To clear Run History or delete Run History permanently from data storage, touch the Clear History button at the bottom left of the screen. To return to the Resources Screen touch the Back Arrow button at the top left of the screen.



Date	Time	Protocol	Label	User	Run	Cycle	Rate	Complete
08-24-21	15:47	Default		Guest	02:00	2	1000	No
08-24-21	15:45	Default		Guest	02:00	2	1000	No
08-24-21	14:18	Default		Guest	02:00	2	1000	No
08-24-21	14:11	Default (m...		Guest	00:25	1	1000	Yes
08-24-21	14:10	Default (m...		Guest	00:25	1	1000	Yes
08-24-21	13:59	Default (m...	TEST	Guest	00:25	1	1000	No
08-24-21	13:58	Default (m...	TEST	Guest	00:25	1	1000	No
08-24-21	13:57	Default	TEST	Guest	02:00	2	1000	No
08-24-21	13:17	Default (m...		Guest	00:25	1	1000	No
08-24-21	13:16	Default (m...		Guest	00:30	1	1000	Yes
08-24-21	13:15	Default (m...		Guest	00:20	1	1000	Yes
08-24-21	13:15	Default (m...		Guest	00:20	1	1000	No
08-24-21	13:14	Default (m...		Guest	00:20	1	1000	No
08-24-21	13:11	Default (m...		Guest	00:20	1	1000	No
08-24-21	13:11	Default (m...		Guest	00:20	1	1000	Yes
08-24-21	13:10	Default (m...		Guest	00:20	2	1000	No
08-24-21	13:10	Default		Guest	02:00	2	1000	No

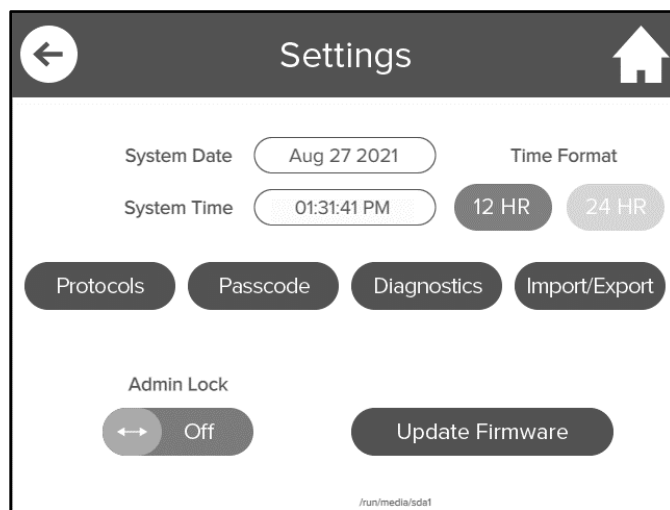
Clear History      Export History

No Export Device...

**Figure 23 – Run History Screen**

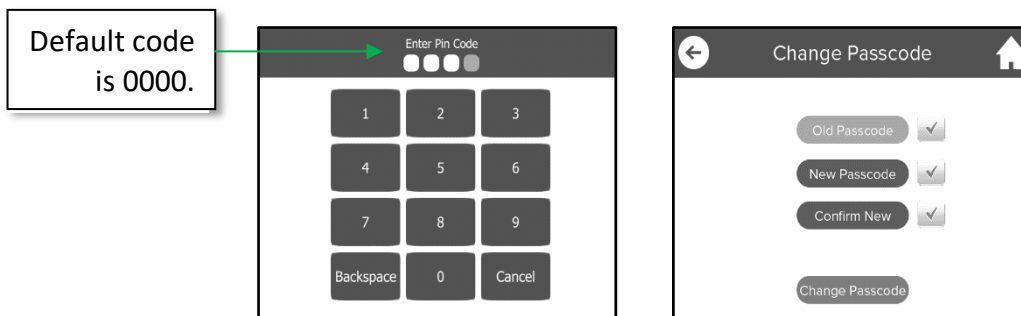
## 8.1 System Settings

To access the Settings Screen touch the Settings Icon on the Home Screen (Figure 4). The System can be upgraded, Diagnostics view/exported, and files exported (Run History, Saved Protocols) and saved protocols imported, as well as the time display changed from 12-hour to 24-hour, and Time and Date can be entered or changed, as shown in Figure 24. Touch inside window to change the Date or Time. A pop-up window opens to enter Time or Date. Touch the SET button to confirm the change. Select 12 or 24 hr. time, which will be displayed on the Run screen. Touching the Back Arrow button returns the user to the previous screen.



**Figure 24** - Settings Screen

Admin Lock Protocols can be accessed by touching the Protocols button. A 4-digit code is entered to view, enable, or edit a locked protocol (**default code is 0000**). To change the passcode touch the PASSCODE button, next enter the old passcode, then enter the new passcode, confirm the new passcode by re-entering it. After all 3 steps are complete touch the Change Passcode button to make the new 4-digit code active.



## **8.2 Administrative Lockout Features**

The Administrative lockout features (passcode protected) restricts user access to specific protocols or modify a protocol. From the Home Screen touch the Settings Icon. The Admin Lock button is located on the bottom left of the screen.

When the Admin Lock mode is disabled the button will display “OFF” highlighted with a red background, as shown in Figure 18. To enable or disable the Admin Lock feature touch the button to toggle ON or OFF. This will bring up a Number Pad to enter a 4-digit authorization code (**default code is 0000**). To abort entering a code touch the Cancel key on the Number Pad. Note, if the wrong 4-digit code is entered the Admin Lock mode will remain enabled.

### **8.2.1 Protocols in Admin Mode**

To choose the protocols to be available to users when in Admin Lock mode, touch the PROTOCOLS button (see Figure 18) and enter the passcode. Then touch ENABLE and touch the protocols to be made available. When finished, touch SELECT. Go back to the Saved Protocols screen to verify that the correct protocols are shown.

To edit a Protocol, touch PROTOCOLS again on the Setting screen and enter the passcode. Then make sure the EDIT it selected. Touch the Protocol to be edited and touch EDIT. Make the necessary changes to the Protocol and touch SAVE.

### 8.3 Diagnostics

The Diagnostics Screen can be accessed from the Settings Screen (Figure 24). Touching the Back Arrow button returns the user to the previous screen.

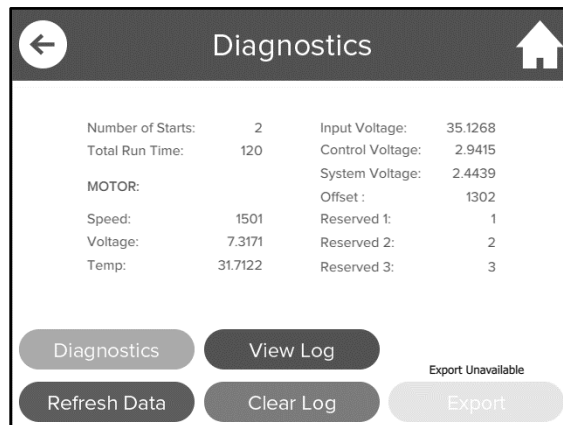


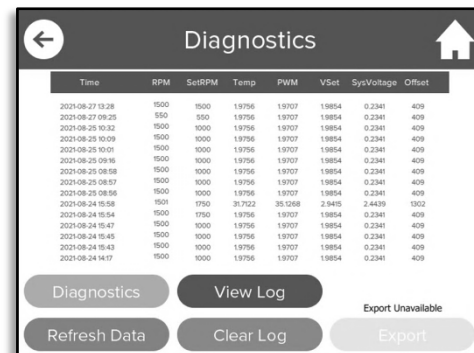
Figure 26 – Diagnostics Screen

#### 8.3.1 Refresh Data Button

Touching the Refresh Data Button allows the user to take a reading of the data displayed in Figure 26.

#### 8.3.2 View Log Button

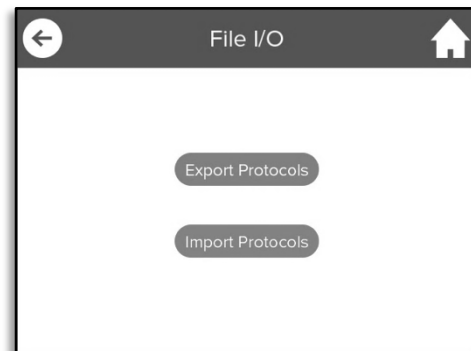
Touching the View Log Button allows the user to view the diagnostic data for the unit. A pop-up window opens listing the date/time, rate, and voltage data. To close window touch the View Log button a second time.



#### 8.3.3 Export Button

Touching the Export Button allows the user to transfer diagnostic data to a flash drive and send to Cole-Parmer Service Department for evaluation.

**Note, the Export button will have a dimmed or muted appearance which indicates it is inactive. After a flash drive or USB cable (connected to computer device) is inserted into the port the button will turn a brighter indicating it is active.**

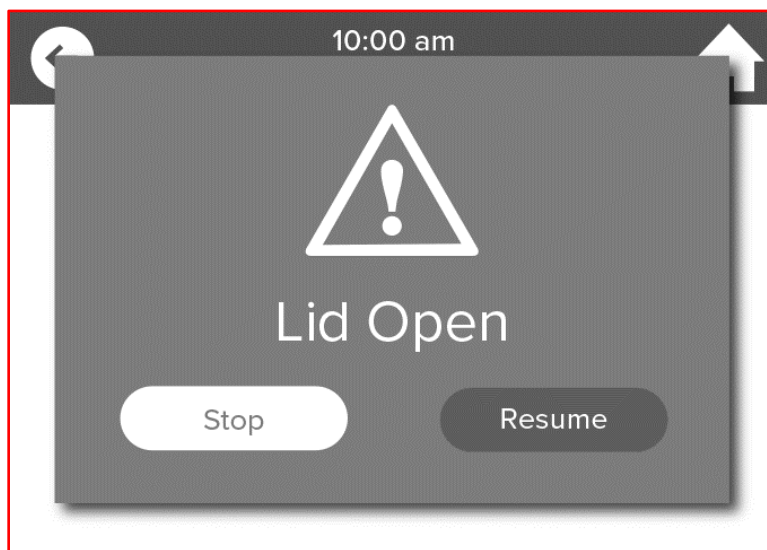




## 9.0 ERROR MESSAGES

### 9.1 Lid Error

If the lid lock fails while the HG-600 Geno/Grinder® is running, the mill will stop running and the screen will display a “LID OPEN” message. The timer will maintain the time remaining in the run. To restart, close the lid and press the green RESUME button to finish the run. To end the run and reset the timer, press the red STOP button. The “LID OPEN” message will disappear once the lid is closed.



**Figure 27 – Lid Open**

### 9.2 Rate Error

If a “RATE ERROR” message appears on the screen, this indicates the HG-600 Geno/Grinder® is not operating within an acceptable range of the set rate. Dynamic loads greater than 2 lb. can create a rate error. When stacking 4 or 6 titer plates, do not add more than five 4 mm steel balls to a single titer plate well. Press the red STOP button to discontinue operation and contact Cole-Parmer Service Technician at 1-732-623-0465 for assistance.

## 10.0 MAINTENANCE

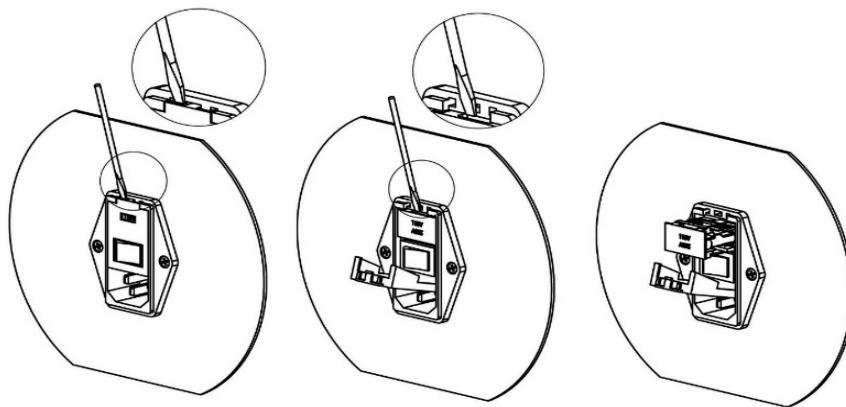
The HG-600 Geno/Grinder® has been designed to provide trouble-free operation over a long period of time. To assure proper performance, the most important factor is cleanliness. Any spills should be wiped up immediately.

The HG-600 Geno/Grinder® cabinet is made primarily of painted aluminum. The front panel is painted plastic. The interior as well as the exterior surfaces of the unit are designed to be easily cleaned in case of a sample spill. To maintain the overall appearance of the unit, occasionally wipe the exterior and interior of the Geno/Grinder® with a mild window cleaner or similar product (use a soft non-abrasive cotton cloth).

There is a raised “dam” around the clamp shaft to keep spilled liquid from dripping onto the motor or drive mechanism; however, any spills should be cleaned up immediately. It is never a good idea to leave the cabinet dirty. Sample contamination and/or equipment damage can result.

### 10.1 Changing the Fuses

If the HG-600 Geno/Grinder® will not operate when the start button is pressed, it is possible that one or both fuses may have blown. To access the fuses, first remove the power cord from the back of the Geno/Grinder®. Then open the door on the fuse compartment by gently prying it open at the top and flipping it down. Use a small screwdriver to gently pry the red fuse holder out of the compartment, as shown in Figure 28. Remove the fuses and check them using a continuity tester. If either fuse is blown or defective, replace both with proper amp (see Specifications, Sec. 2). Position the fuse holder such that the appropriate operating voltage appears on top. Return the fuse holder to the fuse compartment and close the access door. Check the window of the fuse compartment to make sure that it shows the appropriate voltage. If not, the fuse holder is upside down and must be turned around before attempting to operate the HG-600 Geno/Grinder®.



**Figure 28 – Changing the Fuses**

**11.0 WARRANTY**

Cole-Parmer® guarantees its products against defects in materials or workmanship for one year from the date of original shipment. Repairs, replacements, or parts are guaranteed for 30 days or for the remaining original warranty period (whichever is greater) for the item that was repaired or replaced. Items not produced by Cole-Parmer® carry the manufacturer's warranty only.

The warranty excludes wear parts. These are parts that wear out through use and must be replaced periodically for proper operation. Geno/Grinder® wear parts include the timing belt, gas springs, and 2012 clamp. If these or other parts require service, please contact Cole-Parmer® to arrange a return shipment.

Wear Parts	
Part No.	Description
#50174	Timing Belt
#51227	Gas Spring
#2012	Clamp Assembly

The customer pays return freight for warranty claims. If the warranty claim is valid, Cole-Parmer® will pay return freight to the customer. However, Cole-Parmer® reserves the right to judge whether a malfunction during the warranty period is due to defects in materials or workmanship, or to wear, negligence, or misuse.

**11.1 Product Specifications**

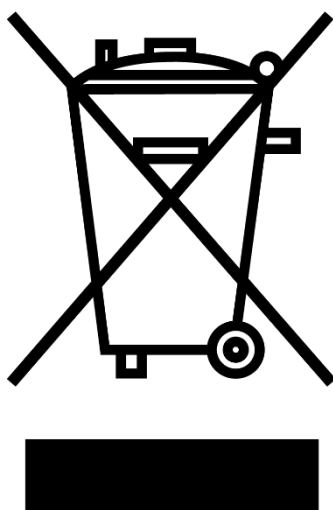
Every effort has been made to provide complete and accurate product operation and information in this manual. However, since specifications are subject to change without notice, changes may be made from time to time to improve the performance of the product.

**11.2 To Arrange A Return Shipment**

We want you to be satisfied with your purchase from Cole-Parmer®. Please bring any problem to our attention, but please DO NOT RETURN any item before contacting us for a Return Authorization Number and instructions. Unauthorized returns will be refused. The cost for all return transportation is the responsibility of the customer. Credit for returned merchandise will be issued only after goods have been received and inspected. Returned goods are subject to a 25% restocking charge.

## **12.0 INSTRUMENT DISPOSAL**

In accordance to the EU Directive 2012/19/EU covering Waste Electrical and Electronic Equipment, all equipment with the disposal symbol must not be disposed of with general waste. (See Figure 29)



Disposal Label is located  
on the back of unit.

**Figure 29 – Disposal Symbol**

Throughout the European Community, guidelines regarding disposal regulations may vary from territory to territory. Please contact the national legislation or local authority for more information on proper disposal of all equipment with this symbol.

**13.0 CONTACT US**

**Repair Service**

Phone: 1.732.623.0465

Cole-Parmer SamplePrep  
65 Liberty St  
Metuchen, NJ 08840  
US

**Attn:** Service and Repair

Please include RA Number on the shipping label.



65 Liberty Street  
Metuchen, NJ. 08840  
USA

Phone: +1.732.623.0465  
Email: [sampleprep@coleparmer.com](mailto:sampleprep@coleparmer.com)  
Web: [cpsampleprep.com](http://cpsampleprep.com)