OPERATOR'S MANUAL

Baker SterilGARD®II
Biological Safety Cabinet

MODELS
SG400STD, SG600STD,
SG400ULT, SG600ULT

THE BAKER COMPANY

NSF classification: Class II, Type A. (When the unit is vented to the outside, the classification is Class II, Type B3).

This manual includes information for installation, operation, maintenance and spare parts. We recommend that it be kept near the cabinet for ready reference.

November, 1998
Revised: 10-2009

THE BAKER COMPANY

INTRODUCTION AND WELCOME

It is a pleasure to welcome you to the growing number of customers who own and operate Baker biological safety cabinets. As the inventors of the laminar flow biological safety cabinet and the leaders in the field, Baker people take special pride in providing a cabinet which is designed for maximum performance.

Your new SterilGARD®II has a number of remarkable features. Among them, the contaminated positive pressure areas, which include the work area, are surrounded by a negative pressure plenum. This arrangement provides an extra measure of protection because any particle in the contaminated zone will invariably be drawn through the blower and trapped on a filter.

You will find your SterilGARD®II cabinet suitable for use not only with I.V. drug preparations and other pharmaceuticals, which could have adverse health effects on operators, but also for clinical diagnostic work involving tissue culturing of possibly infectious samples and other techniques requiring a contamination-free atmosphere.

Please note that all open-front containment cabinets, including this one, are for use with low to moderate risk agents only. Open-front cabinets do not provide absolute protection for the user. The adequacy of a cabinet for user safety should be determined on-site by an industrial hygienist, safety officer or other qualified person. Remember that you, the owner and user, are ultimately responsible and that you use your cabinet at your own risk.

Built to exceed all microbiological aerosol tests specified by applicable NSF standards, your SterilGARD®II unit includes many unusual Baker features which are included for superior performance, simpler maintenance and lower life cycle cost. Your SterilGARD®II unit is designed for both safety and value.

We recommend this manual, along with the factory test report that is included, be kept near the cabinet for convenient reference by operators and qualified maintenance personnel. If you have any questions about the use or care of your new SterilGARD®II cabinet, please do not hesitate to contact our Customer Service Department for assistance.

Sincerely,

Dennis Eagleson
President
The Baker Company, Inc.

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"Creating immaculate atmospheres"

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I - FUNCTION AND DESCRIPTION OF THE STERILGARD®II CABINET

The SterilGARD®II is a biological safety cabinet of original design. It features vertical laminar airflow and a front access opening. The unit is designed to protect not only the environment and the people using the cabinet, but also the product within from airborne contaminants.

Airflow Inside the Biological Safety Cabinet

The SterilGARD® II cabinet features The Baker Company's zoned airflow principle. See Fig. 1. The stainless steel metal diffuser just below the supply filter creates a faster airflow at the front of the work zone than at the center. The protective faster airflow in front makes an extremely effective air barrier.

A feature of the unique Baker design is the high volume return air slots, which maximize the cabinet's protective capability. It is generally accepted that maintaining containment and a particle free work area is most difficult in the area in which airflow turbulence is greatest — at the intersection of the side walls, the front access opening and the work surface. Turbulence caused by friction will also be found along a cabinet's side walls. In cabinets without high-velocity return air slots, this turbulence may allow contaminants to escape from the work area, or it may make it possible for unfiltered room air to enter the work area.

The Baker high-velocity return air slots are located along the side walls of the work area. Air is drawn into the slots at very high speed, preventing the escape of particulates and ensuring that no unfiltered air enters the work area. Additional high-velocity return air slots are located at the top and sides of the viewscreen to prevent gases, vapors or particulates from coming up behind the viewscreen and escaping into the laboratory. In the same way, they prevent room air from migrating down behind the viewscreen and contaminating the work area.

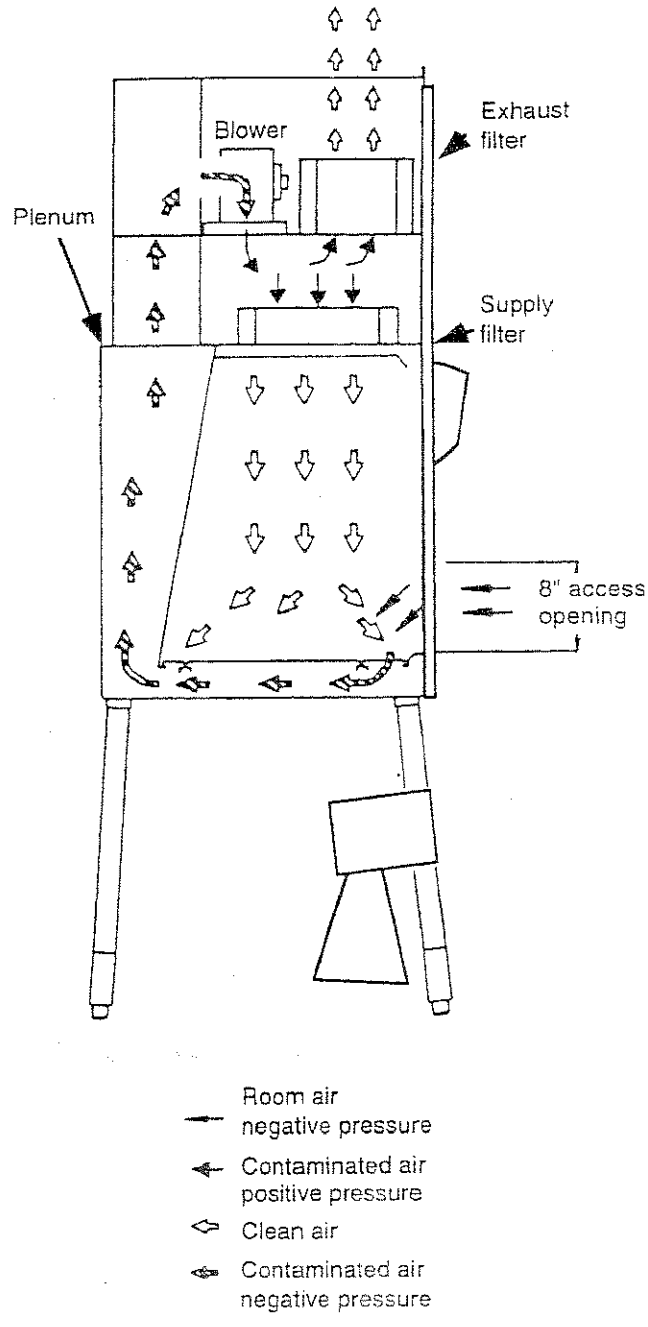


Fig. 1 Airflow Inside Cabinet

Positive and Negative Pressure Areas

One of the many features that sets the SterilGARD®II unit apart from other cabinets is the interaction of positive and negative pressure areas. The small positive pressure plenum is completely surrounded by a negative pressure area so that any particle passing through is invariably drawn through the blower and trapped in a filter.

From the small positive pressure plenum, which is shown in Figure 1, about 30 percent of the total cabinet airflow is expelled through the exhaust filter. The remaining 70 percent is recirculated through the supply filter and re-enters the work area as particle-free air. Because the cabinet must take in air to replace the air expelled through the exhaust filter, the same volume of room air enters the cabinet through the 8-inch front access opening. This air, which never enters the work area, completes the air barrier at the front access opening.

All air is combined under the work surface. From here, the contaminated air is pulled, under negative pressure, through a plenum up the rear of the cabinet into the motor-blower, which blows it into a positive pressure plenum. Please note again that the positive pressure plenum is completely surrounded by negative pressure areas. If a leak should occur in a contaminated negative pressure plenum, or in the side wall or rear wall, the negative pressure will create suction and pull air in, not allowing it to escape into the operator's area. If there is a leak from the positive pressure plenum, the surrounding negative pressure area will recapture the contaminated air and recirculate it through a filter.

Access to the Work Area

For easy entry of apparatus into the work area, SterilGARD®II has a vertical sliding viewscreen. Its ¼-inch safety plate glass allows excellent visibility and may be opened to a height of 18 ½" to permit placement of items in the work area. The window should be set at a height of 8" while work is being performed, and an alarm is provided to remind the operator if the window is not in the correct position for using the cabinet. (Chapter 3 on "Proper Cabinet Use" will explain how to use the viewscreen correctly while the cabinet is in use.)

As with other Baker cabinets, the electrical outlets inside the work area have a circuit breaker so that an electrical overload by ancillary equipment will not affect air handling. Overloading with electrical equipment should, of course, be avoided in any case. (See the "Ancillary Equipment" instructions in Chapter 3 on "Proper Cabinet Use", and in the "Appendix.")

Design Details

Performance assurance

Meticulous care in manufacturing is followed by more than 14 separate performance tests prior to shipment of your cabinet. In addition, a complete factory test report on the performance of your unit is included at the back of this manual.

Motor/ blower capacity

A motor/blower's capacity is measured by its ability to provide a nearly constant volume of air as resistance increases because of filter loading. Verification by a simulated filter loading test has established that your SterilGARD®II cabinet is capable of automatically handling an 80% (in both 4-foot and 6-foot unit) increase in pressure drop across the filter without reducing total air delivery more than 10%. A convenient magnehelic gauge (or bar graph display on the ULTRA models) shows the current relative performance of the blower. With the use of the manual speed control, a 165%/180% (4-foot/6-foot unit) increase in the pressure drop across the filter can be handled. The resulting long filter life means significant cost savings.

One-piece interior wall construction

The interior side and rear walls of your SterilGARD®II's work area are constructed from a single piece of 16-gauge stainless steel. The easy-to-clean 7/16-inch radiused (rounded) corners prevent buildup of contaminants and resist corrosion.

Protective screen

Located under the work surface at the bottom and sides of the rear return-air plenum, a

protective screen is provided to help prevent wipes and other paper materials from being drawn into the blower system. This precaution eliminates costly decontamination and downtime. The screen affords easy access to waste materials and should be kept clean at all times.

All-metal plenums

The plenums of your SterilGARD®II unit have been constructed entirely of metal in order to provide strength, durability, air-tightness and resistance to deterioration.

Recessed stainless steel work surface

The work surface is constructed of corrosion-resistant 16-gauge type 304 stainless steel. Its satin finish diminishes light reflection. It is recessed to retain spills, and the 3/16" radiused corners make for easy cleaning.

Cabinet exterior

External construction is of 14-gauge cold-rolled steel, protected by a smooth white baked enamel finish.

Tested HEPA/ULPA filters

Supply and exhaust filters in SterilGARD®II are zero-probed HEPA. They have been found to be 99.99% effective on particles of 0.3 micron size. In the SterilGARD®II ULTRA 4-foot model only, supply and exhaust ULPA filters are used, which are 99.999% effective on particulates of 0.12 micron. Each filter is scan-tested to assure leak-free installation.

Viewscreen

The cabinet's ¼-inch safety plate glass vertical sliding viewscreen may be opened to 18 ½" for placement of large items in the work area, and may be fully closed for system shutdown.

Drain valve

Meeting NSF requirements for drainage in Class II biological safety cabinets, a stainless steel ball valve in the SterilGARD®II unit is installed for safe and effective drainage of the drain pan.

Work area lighting

SterilGARD®II's lighting system produces 100 to 150 foot candles of illumination at the work surface area. The fluorescent light is externally mounted to minimize heat buildup. The unit uses two common fluorescent bulbs.

Air balance adjustments

Air balancing can be done by either of the following methods. It should, however, be done only by a technician with proper training and equipment. (See Section 4, "On-Site Checks and Maintenance Procedures.")

- A speed controller adjusts for voltage differences and filter loading.
- An adjustable damper compensates for differences of supply and exhaust filters if they are changed at a later date.

Easy filter access

For convenience and ease of service, the supply and exhaust filters are loaded and removed from the front of the cabinet without entry into SterilGARD®II's work area. This is particularly helpful if the cabinet is connected to an exhaust duct. Filters should be replaced by qualified technicians only.

Stainless steel telescoping leg assembly

The SterilGARD®II unit has a distinctive assembly with four telescoping legs, which allows the cabinet to be shipped with a minimum height of 74 7/8". The assembly also makes it possible to adjust the cabinet to two heights, providing a work surface of either 30" or 36" above the floor.

	Leg Extension	Knee Space Height	Work Surface Height	Overall Height
Shipping & Installation	11 3/4"	—	—	74 7/8"
Setting A	25"	26"*	30"*	89 1/8"
Setting B	31"	32"*	36"*	95 1/8"

*Dimensions can be reduced or increased 1 ¼" by adjustable levelers.

Specifications

Weight

The weight of the SterilGARD®II 4-foot cabinet is 630 pounds with a shipping weight of 875 lbs. A 6-foot cabinet weighs 840 pounds with a shipping weight of 1075 pounds.

Electrical specifications

115V AC, 1 Phase, 60 Hz

The SterilGARD®II incorporates a solid-state controller for the blower motor. This compensates for variations in incoming line voltages. The usable voltage range is 95 to 130V AC.

The unit is provided with two duplex G.F.I. receptacles at a total of 5.0 amps, controlled by an internal self-resetting circuit breaker. The unit is furnished with one 12' power cord with 20-amp plug, type NEMA 5-20P.

	SG400/SG600
Blower motor (1,625 RPM)	6.6 amps/9.9 amps
Fluorescent Light (ballast)	0.7 amps/0.7 amps
Duplex outlets (G.F.I.)	5.0 amps/5.0 amps
Total running load	12.3 amps/15.6 amps

II - PREPARING THE STERILGARD®II CABINET FOR USE

Checking the Cabinet On Arrival

Upon receipt of your new SterilGARD®II cabinet, first inspect the exterior of the crate and skid. If there is any broken glass or other visible damage, that fact should be noted on the receiving slip and immediately reported to the delivering carrier.

Now remove the crate and inspect the unit itself. The top cover of the crate should be taken off first, then the boards from front and back. Bend both ends of the crate outward away from the sides of the unit and remove front or rear blocking from the skid. Remove the cabinet from the skid with a fork lift or other available equipment. If any concealed damage is found it should be reported to the delivering carrier, who will want an opportunity to inspect the damage. A claim for restitution should be filed within 15 days.

Because of the danger of mishandling by trucking companies, we have removed certain parts of the cabinet and have packed them separately. These items are listed on the packing slip which accompanies the unit. Please check the packing slip carefully to be sure that all items have been located.

The Uses of a Biological Safety Cabinet

The SterilGARD®II cabinet has been designed to provide a work area which protects the experiment from the environment, and the environment from the experiment. The laminar flow biological safety cabinet is designed for work with Biosafety Levels 1, 2 and 3 (low to moderate risk) agents as listed in The Center for Disease Control's "Biosafety in Microbiological and Biomedical Laboratories", U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and National Institutes of Health, U.S. Government Printing Office, Washington, D.C. 20402. HHS publication number (CDC) 84-8395.

Biosafety level 4 or extremely high risk agents should *never* be used in this cabinet. Please consult your safety professional for a proper risk assessment.

CAUTIONS

* *The use of any hazardous material in the cabinet requires that it be monitored by an industrial hygienist, safety officer or other qualified individual.*
* *Explosive or flammable substances should never be used in the cabinet unless a qualified safety professional has evaluated the risk.*
* *If hazardous biological work is to be performed, apply the appropriate biohazard decal which is enclosed. This is in accord with OSHA regulations, volume 39, number 125, Part II.*
* *If chemical, radiological or other nonmicrobiological hazards are present, be sure to employ appropriate protective measures in addition to formaldehyde decontamination. Call upon a suitably trained individual to monitor the operation.*

Location Within the Laboratory

The ideal location for any laminar flow biological safety cabinet is in a dead-end corner of the laboratory away from personnel traffic, vents, doors, windows and any other sources of disruptive air currents. Published research from The Baker Company (Rake, B.W. "Influence of Crossdrafts" on the Performance of a Biological Safety Cabinet. Appl. Microbiology 36:278-283, 1978.) and unpublished tests performed at the National Cancer Institute show that if a draft or other disruptive air current were to exceed the intake velocity of the cabinet, then contamination can enter the work area or escape from it. **Proper placement within the laboratory is essential.**

If the cabinet exhausts its air into the laboratory instead of venting to the outside, it is important that there be adequate space between the top of the cabinet and the ceiling. A solid ceiling located

too close to the exhaust filter will restrict the air and limit the intake velocity. A minimum of 12" of clearance on all sides and top of the cabinet is necessary to achieve ideal conditions for testing. If a free space of 12" above the exhaust filter is not available, inaccuracies in exhaust flow measurements may result. Consult with our Customer Service Department for the implications of this, and for alternatives.

Installing the Cabinet

Installation of this cabinet should be carried out in accordance with appropriate OSHA regulations and those of other regulatory agencies having jurisdiction.

1. First, move the cabinet from the unloading area to its intended location on dollies. The overall dimensions in the shipping position for the 4-foot unit are: 34 1/32" deep x 53 3/16" wide x 74 7/8" high. For the 6-foot unit, the overall shipping dimensions are: 34 1/32" deep x 77 3/16" wide x 74 7/8" high.

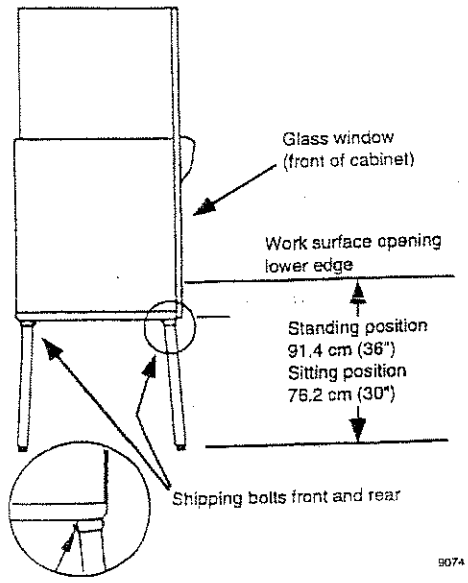


Fig. 2 Adjusting the Telescoping Leg Assembly

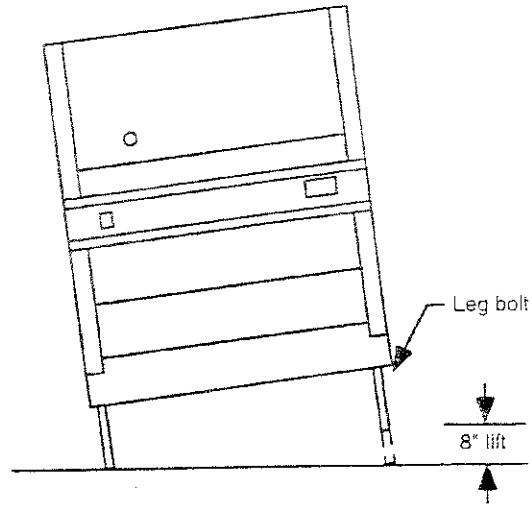


Fig. 3 Installation Without Lifting Equipment

2. For convenience in moving the cabinet, its depth may be reduced to 31 7/8" by removing the light canopy assembly. First, with the unit disconnected electrically, remove the two nuts holding the canopy clips at the top of the canopy. Then let the canopy pivot down until the end restraints stop it. Disconnect the electrical plugs inside on each end. Disconnect the restraints and lift the canopy up and off. Then move the canopy to a new location.
3. The unit can be assembled with the work surface either 30" or 36" from the floor according to the needs of the owner. The unit is shipped with the legs extending 6" below the cabinet. If lifting equipment is available, lift the cabinet vertically to a height of approximately 40." All four legs may then be extended to the desired height by removing the four shipping bolts, setting the height of the legs and then securing the legs in position with the four bolts which are supplied with the unit (3/8" x 2 3/4" - see Figure 2). Use a 9/16" wrench. The cabinet must be held safely at the 40" height during the entire operation, and set back onto the floor only after all four legs have been secured. Final leveling may

be accomplished with the adjusting leveling pads, located at the bottom of each leg.

4. If lifting equipment is *not* available, the legs may be extended to the desired height in the following manner. It is recommended that at least four people be used for this operation.

> ***WARNING!***
>
> ***The 4-foot SterilGARD®II weighs 630 lbs. (6-foot unit weighs 840 lbs.). At least four people should be used to perform the following procedure.***

Lift either the right or left end of the cabinet approximately 8" to 9." See Fig. 3. Remove the shipping screws and lower the free legs to the next hole position in the leg. Then replace the shipping screws to the lock-in position.

Repeat the step above by lifting from the opposite end. This will bring the cabinet to a level position. Extreme care should be taken in this step to make sure the cabinet does not slip on the floor.

Now repeat the steps above once to obtain the sitting position height and twice to obtain the standing position height.

5. After the unit has been adjusted to the desired position, insert the solid dot plugs (shipped in a small bag on the work surface), into the unused holes in the legs to prevent dust and dirt from entering the legs through the open holes.
6. The drain pan is located under the work surface. During shipment, this work surface is held in place by hold-down clips. Lift the work surface and remove the hold-down clips.
7. Level the work surface by adjusting the glides on each of the four corners of the leg risers. Be sure that all four are firmly on the floor so that the cabinet does not teeter. An adjustment range of 1 1/4" is provided. Adjust to obtain a work surface height of 30" to 36."
8. Check to be sure that the liquid drain valve is in the closed position. (The handle on the valve should be parallel to the floor). If something is spilled in the work area, it will remain in the drain system and won't reach the laboratory floor. Precautions may be required for the safe disposal of the effluent from the drain.
9. Also check to see that service petcocks, if present, are in the closed position. (The handle on each valve should be perpendicular to the rear wall of the unit if installed in the sidewalls).
10. Remove the hardboard (masonite) shipping cover from the top of the exhaust filter.
11. Remove the viewscreen shipping clips and supports and *carefully* check the viewscreen for smooth vertical operation. If the viewscreen binds, adjust the track by loosening the screws, arranging the track in the proper position, and then re-tightening to hold the track in the correct position. In order to be effective, the wiper gasket must exert a modest amount of "drag" on the glass. If the viewscreen is loosened, make sure that the wiper still makes contact. Also remove the shipping screws and clips from the front and rear perforated grills.

Assembling the Footrest

1. Slide the right-hand and left-hand footrest tube brackets over the front adjustable legs as shown in Fig. 4.
2. Using the supplied hardware, secure each tube bracket to the mounting hole. Each hole is located 18 3/8" from the floor. Insert the bolt from the rear, through the slot, and through the hole of the adjusting leg. Be sure that the slot on the underside of the bolt fits into the slot on the bracket. This will prevent the bolt from turning as the assembly is tightened. Slide the bracket up or down so the bolt is centered in the vertical slot. Finish securing each bracket using a 3/8" washer, a 3/8" lockwasher, and a locking handle.

The handles may be adjusted to many positions. Pulling out on the handle

disengages it while the threaded portion remains stationary. Releasing the handle re-engages it for tightening and loosening. The handles for the tube brackets should be set in the vertical positions.

3. Find a helper to assist you. Slide the footrest between the legs of the unit. On each side, place the upper part (3/8" dia. hole) over the upper stud. The curving slot should fit over the lower slot. On each side, secure the stud at the top with the supplied hardware (3/8" washer on inside, 3/8" lockwasher, and nut on outside).

   Set the footrest so the lower stud is centered in the radiused slot. Secure the lower stud with the supplied hardware (3/8" washer on inside, 3/8" lockwasher, and nut on outside).

4. The height of the footrest may be adjusted over the range allowed by the slots on the tube brackets. The angle of the footrest may be adjusted over a range of 20°.

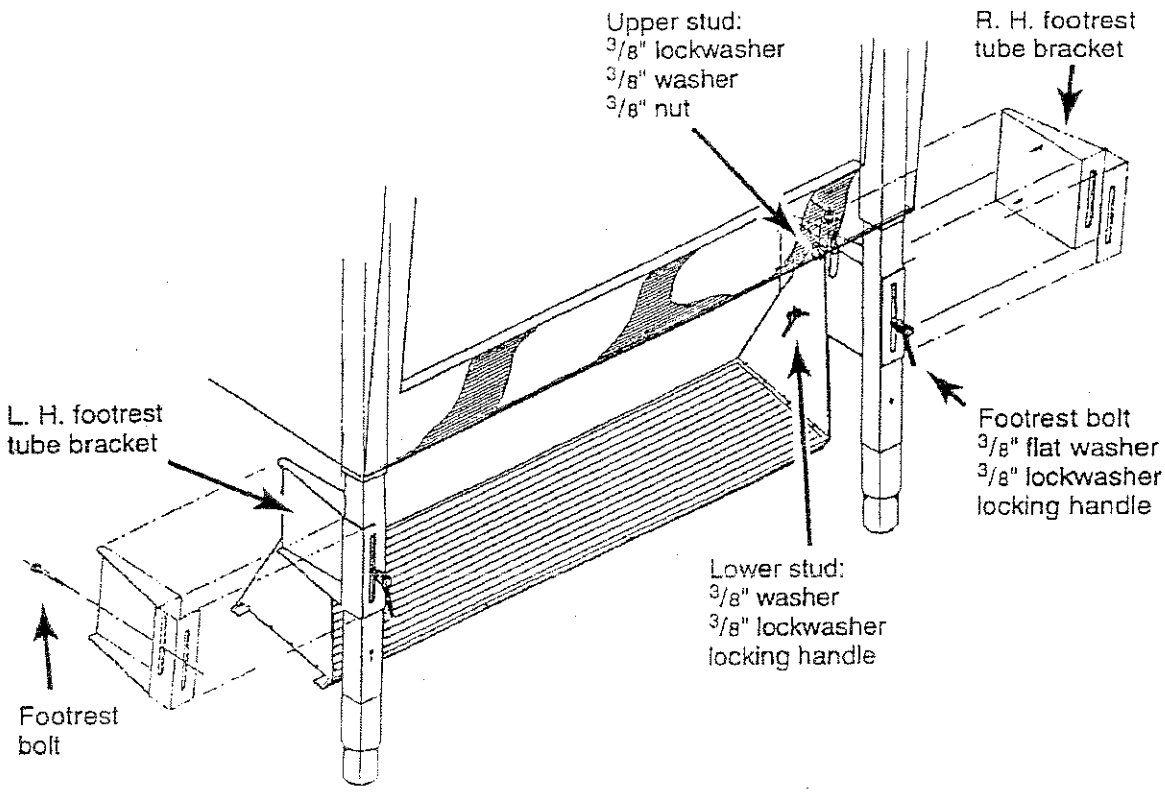


Fig. 4 Assembling the Footrest

Connecting the Exhaust

The SterilGARD®II cabinet can operate with filtered exhaust air entering directly into the room, or with filtered exhaust ducted to the outdoors. Details of these alternatives are as follows:

Exhaust into the room -

If the cabinet exhausts its air directly into the laboratory instead of ducting it to the outside, it is important that there be adequate space between the top of the cabinet and the ceiling. If the solid ceiling is located less than 4" from the exhaust filter, it may restrict the air and limit the cabinet's intake velocity.

Although 4" of top clearance may be sufficient for day-to-day operation of the cabinet, it will be difficult to obtain airflow testing information. At least 12" of clearance on the top of the cabinet is recommended for reliable measurement of airflow.

Never use the top of the cabinet or the work area for storage purposes, and never use flammable, explosive or toxic vapors or gases, or substances which generate them, unless a qualified safety professional has evaluated the risk. The filter removes only particulates and not gases, thus causing the recirculation of these within the cabinet.

Attach the long-legged exhaust filter guard, located in the rear, to prevent inadvertent blocking of the filter area.

Remove the two nuts from the back of the exhaust filter guard, and then remove two nuts from the front and two from the rear of the exhaust filter housing on top of the unit.

Install the legs on the studs at the rear of the exhaust filter housing. Tighten them down with the previously-removed nuts.

Install the exhaust filter guard, setting the front clips on the front studs of the exhaust filter housing. Tighten them down with previously removed nuts.

Now secure the filter guard to the 3/8-inch NPT nipples in the top.

Exhaust to the outside -

Whenever possible, the filtered exhaust should be connected to its own separate exhaust system. If it must be channeled into a multi-duct system, make sure that the system is not a recirculating one. You will, of course, also want to make sure that the system can handle the volume of air required to pass through it, and that there is sufficient static pressure for proper cabinet function.

The exhaust requirements of the 4-foot SterilGARD®II are 268 CFM at .02"-.04" water column suction directly above the exhaust filter before any reductions, elbows or other restrictions. If using Baker's hard exhaust transition (ET400), add 0.10" water column. If a Baker thimble exhaust transition is being used, 322 CFM minimum at 0.10" water column.

The exhaust requirements of the 6-foot SterilGARD®II are 408 CFM at .02"-.04" water column suction directly above the exhaust filter before any reductions, elbows or other restrictions. If using Baker's hard exhaust transition (ET600), add 0.10" water column. If a Baker thimble exhaust transition is being used, 462 CFM minimum at 0.22" water column.

You may want to install an indicator light or some other safety device to give warning if the exhaust system fails. A properly designed duct system includes an airtight damper to balance the air and also to shut off the duct for purposes of cabinet decontamination. The Baker Company offers a transition duct piece for connecting the unit to the exhaust system. Call for details.

For further information, refer to the National Sanitation Foundation's Standard No. 49 and other guidelines regarding ventilation.

Final Connections and Tests

1. The plumbing connection to the service petcocks must be made with great care because the effluent from a safety cabinet may be biologically hazardous. When present, petcocks are piped within the

cabinet. The external connection uses 3/8-inch NPT nipples at the base of the cabinet. Connection to plant utilities should be made with proper materials and technique. *No flammable gas should be used.* However, if the risk is professionally evaluated and a decision is made to install a flammable gas petcock, then an emergency shut-off valve should be situated in an accessible location *outside* the cabinet.

2. A 20-amp power cord with a NEMA 5-20P plug is furnished with the SterilGARD®II. It should be plugged into an appropriate 115 Volt, 60 Hz, 20 amp dedicated utility outlet.
3. Press the blower switch. The yellow indicator above the switch should light.
4. Before using the cabinet, turn on the fluorescent light and make sure the bulb is lighted. These bulbs are locked into place with stop-lock fittings.
5. Allow the cabinet to run for about half an hour so the dirty air in the work area will be purged.

   Leave the blower running and wash the entire cabinet, inside and out, with a detergent-disinfectant to remove surface dust. Once started, we recommend that all cabinets be left running continuously.

   For additional start-up and use procedures, please turn to Section 3, "Proper Cabinet Use."
6. The SterilGARD®II cabinet has been subjected to a comprehensive series of physical tests before shipment from the factory. A physical test report is filed by serial number as a permanent record at Baker headquarters, and a copy of the report accompanies each shipment. Your copy is at the back of this manual.
7. Although all units are carefully tested at the factory, it is advisable that certain other checks be made on-site by a qualified technician after installation. These include testing the filters for leaks and checking the air balance of the unit, especially if it is connected to an exhaust system. A description of these tests can be found in Section 4, "On-site Checks and Maintenance."
8. It is also recommended that all personnel who will be using the cabinet study this Operator's Manual to learn how to make the most effective use of the unit. For additional and start up and use procedures, please turn to Section 3, "Proper Cabinet Use."

FOR MORE INFORMATION

For a complete listing of articles, papers and reports related to containment, clean air products and safety, contact The Baker Company for our complete Bibliography or visit our website at www.bakerco.com.

III - PROPER CABINET USE

A biological safety cabinet is a valuable supplement to good sterile technique, but is not a replacement for it. If the cabinet is not understood and operated correctly, it will not provide an adequate protective barrier.

All activities that are to be performed in your cabinet should first be approved by a competent professional, such as an industrial hygienist or safety officer, to make sure that the cabinet is appropriate for the work it will be required to do. This person should monitor the cabinet and its operating personnel at regular intervals to see that it is being used correctly.

In order to keep the interior workspace clean and free of particulates, all Baker laminar flow cabinets are designed for continuous operation. If the blower is turned off, the unit becomes contaminated with room air. Therefore it is recommended that the blower be left on.

Operator Controls

The operator controls and indicators are arranged on the front panel of the unit. See Fig. 5. A number of switches are arranged in a single membrane switch assembly.

1 - Alarm Reset Switch/ Sash Level Alarm -

For normal operation, the viewscreen must be placed to allow an opening of exactly 8." This setting is important to allow the correct airflow into the work area. The window may also be closed completely. If the window is left in any other position, an alarm will sound. An indicator above the alarm reset switch will flash.

To mute the audible alarm, press the alarm reset button. The indicator will continue to flash. After five minutes, the alarm will sound again to remind you to lower the window. You may press the alarm reset switch again to mute the alarm for another five minutes. *The alarm will sound again if the view screen is not in the proper 8" position.*

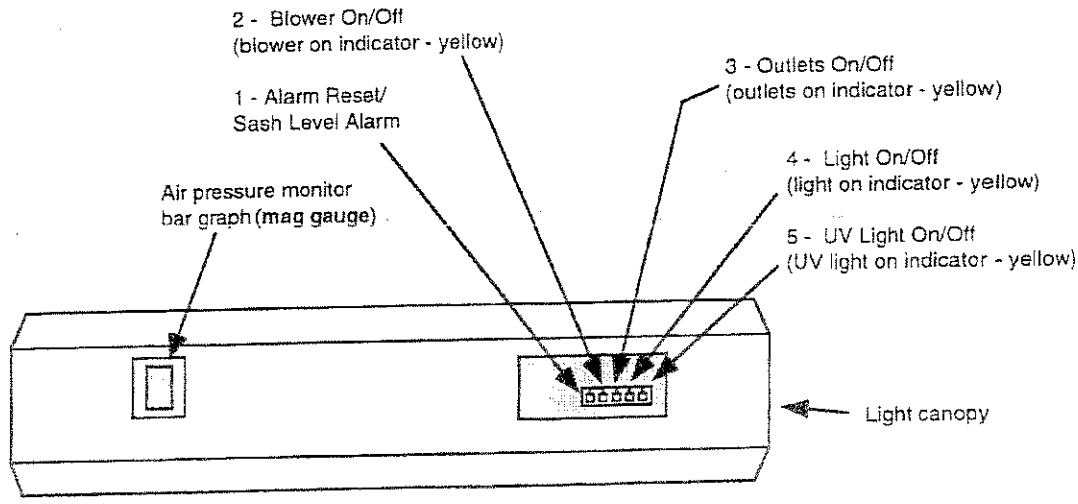


Fig. 5 Operator Controls

When the unit is operating, the viewscreen must be open exactly 8", or must be completely closed. At any other setting, the sash level alarm indicator will flash.

2 - Blower On/Off Switch -

This switch controls the power to the blower for the unit. When the switch is turned on, the yellow indicator will light. The lights and outlets will not operate unless the blower switch is turned on first.

The indicator light above the switch shows that the switch has been turned on.

3 - Outlet On/Off -

This switch controls the two outlets on each side of the work area. When the outlets are turned on, the yellow indicator above the switch will light.

The indicator above the switch will light when the outlets are turned on.

4 - Light On/Off Switch -

This switch controls the fluorescent light inside the work area. The blower must be turned on first. The fluorescent light will not operate if the UV light is already turned on.

The indicator above the switch will light when the fluorescent light is turned on.

5 - Ultraviolet (Germicidal) Light On/Off Switch

A bulb which produces light in the ultraviolet range (UV) may be used to help disinfect the work area. This switch controls the UV light inside the work area. Before the UV light may be turned on, the blower must be turned on, the viewscreen must be fully closed, and the fluorescent light must be turned off. The UV light will shut off if the viewscreen is opened.

The indicator above the switch will light when the UV light is turned on.

Air Pressure Monitor

The air pressure monitor is mounted on the left side of the control panel (comes standard on SGII ULTRA model and as an option on the SGII Standard model). See Fig. 5. The bar graph shows the relative cabinet performance, measured in terms of the total volume of air being handled by the unit.

The top of the lighted area indicates the relative airflow. When the airflow is normal, the LED's in the center of the bar graph will glow with a steady green light.

If just one or two LED's at the bottom of the graph glow with a red light, the unit is handling a low volume of air. An alarm will also sound. This indication means that the unit is not receiving enough intake air.

WARNING!

If the unit continues to operate in this condition, it is possible that contamination may spread outside of the work area. The product inside the work area may also be contaminated. If you see the low airflow indicator, take these steps:

- *Leave the unit running. The blower will continue to move air through the cabinet and filters.*
- *Close the window completely.*
- *Call a supervisor and/or a service technician.*

If the two LED's at the top blink with a green light, this indicates a high air flow condition. If the sash is lowered and the UV light is on, this is a safe condition. However, if you are working in the cabinet or the sash is at the operating height (8"), check the intake grilles for blockage. If this condition persists, call a supervisor or maintenance technician. Product protection may be compromised.

Magnehelic Gauge

Your SterilGARD®II may be equipped with a magnehelic gauge in place of the air pressure monitor (all SGII Standard models feature the magnehelic gauge). The magnehelic gauge should be zeroed after the unit has been leveled, and before it is initially turned on.

The purpose of the magnehelic gauge is to measure pressure in the filter plenum. This gauge **cannot** be used to measure cabinet airflows. It gives an indication of static pressure in the filter area. If the reading is lower that normal, it may suggest improper blower operation. As filters load, the gauge indication will rise slowly to show a higher pressure required to deliver the same air volume through the filters. This is **not**, however, a direct reflection of airflow.

Ground Fault Interrupter

The outlets on this unit are protected by a ground fault interrupter (G.F.I.). The G.F.I. is designed to protect the operator from a possible electrical hazard. If the G.F.I. detects a hazardous condition, it will cut off electricity to all of the outlets. The button in the center of the unit will pop out. To reset the G.F.I., correct the cause of the problem, then press the button in.

Start-up Procedure

1. If the unit has not been left running continuously, press the blower on/off switch. The yellow indicator above the switch will light. Make sure that you have cabinet airflow, either by listening for blower sound or feeling the airflow across your fingers. Check the reading on the air pressure monitor (magnehelic gauge). See Fig. 5. The reading on the monitor (magnehelic gauge) should be consistent with the last time the unit was on.
2. Turn on the fluorescent light. The fluorescent light will not operate unless the ultraviolet light is turned off. *Never leave the ultraviolet light on while there is anyone in the room.*
3. Check to determine that the drain valve is in the closed position or the drain coupling is capped.
4. Wipe down the interior area of the cabinet with a surface disinfectant.

   Note: Some disinfectants may corrode or stain the steel surfaces. If this happens, clean the surfaces afterward with a detergent and rinse with sterile water to prevent corrosion.
5. Place all materials to be used for the next procedure inside the cabinet. Disinfect the exterior of these materials.

   Everything required (and nothing more) should be placed in the cabinet before beginning your work so that nothing passes in or out through the air barrier until the procedure is completed. Implements should be arranged in the cabinet's work area in logical order so that clean and dirty materials are segregated, preferably on opposite sides of the work area.

   Blocking the front and rear perforated grills must be avoided. If wipes or absorbent towels are used on the work surface, be sure to keep them away from the grills.
6. After your equipment is in place inside the cabinet, adjust the vertical sliding viewscreen so it is open exactly 8", no more and no less. This aperture is important for proper airflow.

   If the viewscreen is at the wrong height, an alarm will sound.
7. After the cabinet has operated for at least three minutes with the window in the proper position, you are ready to begin.

Working in the Cabinet Work Space

1. Hands and arms should be washed thoroughly with germicidal soap both before and after work in the cabinet. Operators are encouraged to wear long-sleeved gowns or lab coats with tight-fitting cuffs and sterile gloves. This minimizes the shedding of skin flora into the work area and protects hands and arms from contamination.
2. Perform all work on the depressed area of the solid work surface. Work with a limited number of slow movements. Since all of the equipment you need is already in the cabinet, it will not be necessary to move your arms in and out through the air barrier.
3. Because opening and closing doors in the laboratory causes air disturbance which might interfere with cabinet airflow, this kind

of activity should be kept to a minimum while the cabinet is in use.

4. Avoid using floor-type pipette discard canisters. It is important that your used pipettes be discarded onto a tray or other suitable container inside the cabinet. This reduces the temptation to move in and out of the work area unnecessarily.

   Because of the restricted access, pipetting within the cabinet will require the use of pipetting aids.

5. Use good aseptic technique. Procedures done with good technique and proper cabinet methods will not require the use of a flame.

   If, however, a safety officer approves the use of flame after evaluating the circumstances, then a burner with a pilot light such as the "Touch-O-Matic" should be used. Place it at the rear of the work area where the air turbulence caused by the flame will have the least possible effect. Flame disturbs the directional airstream and also contributes to the heat load. If the cabinet blower is unintentionally turned off, the flame could also damage a filter.

   Tubing for a burner within the cabinet should be resistant to cracking or puncture. Material such as Tygon tubing may not be acceptable for this use.

6. ***Never operate your cabinet while the viewscreen alarm indicator is on.*** The operating position of the sash provides an 8-inch high access opening. This restricted opening permits optimum operating conditions for the cabinet. For operating comfort it is recommended that the top of the operator's shoulder be at the same height as the bottom of the viewscreen. Because operators will not all be the same height, it is suggested that the operator use a chair which may be adjusted for height.

7. After a procedure has been completed, all equipment which has been in contact with the research agent should be enclosed, and the entire surface decontaminated. Trays of discarded pipettes and glassware should be covered. The cabinet should then be allowed to run for at least three minutes with no activity so that the airborne contaminants will be purged from the work area. Next, make sure that all equipment is removed from the cabinet.

8. After you have removed all materials, culture apparatus, etc., decontamination of the interior surfaces should be repeated. Check the work area carefully for spilled or splashed nutrient which might support bacterial growth. *Never* use the cabinet to store supplies or laboratory equipment.

9. We recommend that the cabinet be left running continuously to ensure containment and cleanliness. If the user elects to turn the cabinet off at the end of a work session, the viewscreen should be closed completely. The sash alarm will be silenced when the viewscreen is in the closed position.

Reacting to Spills

1. If an accident occurs which causes spills and spatters around the work area, you will need to decontaminate all items and surfaces before any items are removed. If the spill was enough to create puddles of liquid in the drain pan, then an emergency spill procedure should be followed. (This procedure should be established ***prior*** to an accident.)

   It is recommended that the researchers, in coordination with their consulting safety professional, have a written plan available in case of an accidental exposure or spill. The safety plan should include all of the emergency procedures to be followed in the event of an accident. All employees should be familiar with the emergency procedures.

   The emergency spill procedure may vary according to the agents being used.

2. In the case of a biological spill, for example, the area containing the spill may be flooded with an appropriate disinfectant. The drain capacity of the SG400 models is 19.5 gallons, with the SG600 models having a 28.7 gallon capacity.

   After the disinfectant has had time for a complete kill, remove or drain the residue. If

you have used a disinfectant which is harmful to stainless steel (Hypochlorite solutions, for example) be sure that none remains to corrode cabinet surfaces. Clean the surfaces with sterile water.

3. If you have a spill involving a hazardous Biosafety Level 2 or 3 agent, then you are advised to leave the cabinet running and close the viewscreen, so as to let the aerosols settle before you start cleanup procedures. With some spills, it may be necessary to decontaminate the room with an agent such as formaldehyde gas. (Biosafety Level 4 agents should *never* be used in this type of cabinet.)
4. If the spill contains volatile liquids which generate vapors creating a danger of fire or explosion, turn off the unit and other electrical appliances and close the viewscreen. Evacuate and seal the room and call for immediate help from a safety professional.
5. If the agent is a hazardous chemical, it may be recommended that a Spill Kit be kept readily available. This kit should be clearly labeled, and might include such items as a respirator, chemical splash goggles, two pairs of gloves, two sheets of absorbent material, spill control pillows, a solution to clean the contaminated area, and waste disposal bags or other containers. Consult your safety professional for proper procedures and treatment of the specific agents you plan to use.

Ultraviolet (Germicidal) Light

This SterilGARD®II unit has an ultraviolet light. The light is controlled by an on/off switch on the front panel. See Fig. 5. When the fluorescent light is on, the ultraviolet light cannot operate. The UV light will not operate unless the viewscreen is completely down and the fluorescent light is off.

Ultraviolet lamps lose their effectiveness over time and should be replaced when intensity drops below the optimum level. Check regularly.

WARNING!

- *Eyes and skin should not be exposed to direct ultraviolet light.*
- *Ultraviolet light should not be relied upon as the sole decontaminating agent. Additional surface disinfection should be performed both before and after every cabinet use.*
- *A biological safety cabinet acts as a supplement to good aseptic practices, not as a replacement.*

Decontamination

Whenever maintenance, service or repair is needed in a contaminated area of your cabinet, the unit must first be decontaminated by an appropriate agent. The National Institute of Health, National Cancer Institute and the Center for Disease Control have all recommended the use of formaldehyde gas for most microbiological agents. Its application requires individuals who are experienced in the decontamination of cabinets, since the gas itself is toxic.

A good reference for this procedure is The National Cancer Institute's "Formaldehyde Decontamination of Laminar Flow Biological Safety Cabinets" (pamphlet and/or slide program), U.S. Department of Health, Education and Welfare: National Institutes of Health. Available through Chief of Sales Branch, National Audiovisual Center, Washington, DC 20409.

An ethylene oxide gas mixture is an alternative, but it involves a more complicated procedure and should only be used by personnel who are familiar with its operation.

Whatever gas you choose, have the proper safety equipment (gas masks, protective clothing, etc.) within easy reach. In addition, you will want to be sure that the gas you are using will be effective against all of the biological agents within the cabinet. When you have decided which gas to use, post the antidote to it in a visible and nearby location. The volume of the SG400 cabinet is 55 cubic feet (75 cubic feet for the SG600). Provide the correct amount of decontaminating gas for this volume.

Carcinogens present a unique chemical deactivation problem and the standard biological decontamination will not, be effective against chemicals or other non-biological materials. With materials of this kind, consult a qualified safety professional.

Decontamination procedure

Warning!
This procedure should be performed by qualified technicians only.

1. Surface-disinfect the inside of the viewscreen and all other surfaces on the viewscreen assembly.
2. Calculate the total volume of the cabinet by multiplying the height, width, and depth.
3. Multiply the total volume of the cabinet by 0.3 g/ft^3 of space to determine the gram weight of paraformaldehyde required.
4. If the cabinet is equipped with an exhaust duct, this duct must be gas tight. This may be accomplished at the terminal end of the duct, or if present, at the damper located near the cabinet. If the exhaust duct is more than 10 feet long, additional paraformaldehyde may be needed to compensate for the increased volume. If the cabinet exhausts into a recirculating building exhaust system, disconnect the cabinet from the building system and form a gas tight seal. (Plastic film and tape may be used.)
5. If the cabinet exhaust air is discharged into the room, tape a plastic cover over the exhaust port. A flexible hose can be applied to an opening in the plastic cover to exhaust formaldehyde gas following decontamination. However, the end of the flexible hose must be sealed with plastic film and tape during decontamination. This flexible hose can be directed into the room, another cabinet or hood exhaust system, provided the exhaust is not recirculated. It may also be placed out a window to exhaust the formaldehyde gas.
6. Place a heating device, such as a commercially available electric frying pan or a remote formaldehyde generator/neutralizer, with the thermostat set at 450 to 475°F (232.2 to 246.1°C) on the work tray. The generator may also be fitted to the side wall of the unit. Spread the paraformaldehyde evenly over the heating surface of the frying pan.

Caution!
The auto-ignition temperature of paraformaldehyde is 572°F (300°C).

7. Place a hot plate, beaker of water, and temperature and humidity indicators on the cabinet work tray.
8. Close the opening to the work area with heavy gauge plastic film and tape. Close all possible leak areas, such as the exit of electrical cords, the area around the viewscreen, the suction slots, and the junction of the plastic film and cabinet.
9. Determine the temperature and humidity inside the cabinet.
10. The temperature should be 21.1°C (70°F) or higher, and humidity should be 60 to 85%. Use the hot plate to heat the beaker of water until the desired temperature and humidity are achieved.
11. Plug the cord of the electric frying pan into an outlet not installed on the cabinet, if the cabinet is not outfitted with a Formalin vaporizer.
12. After 25% of the paraformaldehyde has depolymerized, turn on the cabinet blower(s) for 10 to 15 seconds. Repeat after 50%, 75% and 100% of the paraformaldehyde has depolymerized.

    Note - With the viewscreen sash closed and the blower on, a high flow condition will most likely exist. In this mode the audio portion of the air flow alarm is disabled. The unit is safe to run in this fashion.

13. Disconnect the hot plate and frying pan from the electrical outlets.
14. Allow the cabinet to stand for a minimum of two hours, preferably overnight.
15. If it is not possible to attach a flexible hose, add the same amount of NH_4HCO_3 as of paraformaldehyde to the frying pan. Turn on the frying pan and the cabinet blower until the NH_4HCO_3 has dissipated.
16. Let the cabinet stand for at least one hour before opening the seals.

Using Ancillary Equipment

The rule to keep in mind is that the more equipment is in the cabinet, the greater will be the air turbulence it causes. The turbulence resulting from equipment and materials can disrupt the designed airflow and reduce the effectiveness of the cabinet. When you use equipment which rotates, vibrates or heats, be sure to place it at the rear of the work area if possible. This will minimize the turbulence in the access opening.

Avoid using equipment which exceeds the amperage limit of the outlets in the work area. The limit for the SterilGARD®II is a total of 5.0 amps. The outlets are protected by a ground-fault interrupter and a circuit breaker. The circuit breaker is a self-resetting type which will reset automatically after an improper load has been removed. Each G.F.I. outlet includes a lighted indicator which monitors the state of the outlet. To control the outlets, use the controls on the front canopy.

Certain procedures, such as those involving some types of centrifuge or blender, can generate a large volume of aerosols capable of penetrating the air safety barrier. In order to estimate how much aerosol you may create when you are using common procedures or ancillary equipment, please refer to "Potential for Accidental Microbial Aerosol Transmission in the Biological Laboratory", Dimmick, R.L., Vogl, W.F. and Chatigny, M.S., 1973. Biohazards in Biological Research, p. 246-267, Hellman, A., Oxman, M.N. and Pollack, R. editors. Cold Spring Harbor Laboratory.

Using a blender

Homogenizing cultures with a blender can create an ***enormous*** aerosol load, so special precautions must be taken. It is essential to decontaminate surfaces and carry out an air purge both ***before*** and ***after*** the use of the blender. ***Do not*** perform other research activities or leave your arms in the cabinet while the blender is in operation. And wait at least five minutes after the blender has come to a complete stop before you open its cover.

The air safety barrier could possibly be penetrated by the high concentration of contaminated particles if the blender were opened during or just after operation. In that case, the surrounding laboratory would very likely be contaminated.

Using a centrifuge

Small clinical centrifuges can also create severe turbulence because of their rotating action. They disrupt the airflow within the cabinet and also at the opening, sometimes allowing contaminated air to escape into the laboratory. ***Do not*** perform other research activities or leave your arms in the cabinet while the centrifuge is operating. Wait at least five minutes after the centrifuge has come to a complete stop before you open its cover. Conduct surface decontamination and air purge both ***before*** and ***after*** using the centrifuge.

If you use a centrifuge often or work with fairly hazardous agents, we recommend that you purchase a laminar flow safety cabinet which has been modified to hold various centrifuges. In these modified units, the centrifuge is placed in a well which is recessed so as to hold air turbulence to a minimum.

About the HEPA Filters

The HEPA (High Efficiency Particulate Air) filter is one of the essential components of a biological safety cabinet. It is the shield which stands between the environment and the experimental agent.

The HEPA filter consists of a continuous sheet of glass fiber pleated over rigid corrugated separators and mounted in a frame. It is very

delicate and the filter media should never be touched.

Proven efficiency of all HEPA filters used in Baker cabinets is 99.99% for particles 0.3 microns in diameter. The 0.3 micron particle is used as the basis for filter definition because theoretical studies have shown that filtration efficiency should be at a minimum for particles of this diameter, with efficiency increasing for particles either larger or smaller. (Model SG400ULT comes with ULPA, Ultra Low Penetration Air, filters which have a proven efficiency of 99.999% for particles 0.12 microns in diameter.) Experiments with various viruses and microbial agents have proven the effectiveness of HEPA (and ULPA) filters. Contact Baker for more information.

It must be pointed out that HEPA (and ULPA) filters are ***not*** intended to filter gasses or vapors. Since most Baker cabinets are partially recirculating, there will be gaseous buildup to the point of equilibrium. Before any chemicals are used in the cabinet it is necessary to consider these points:

1. Are these chemicals, either singly or in combination, able to attack filter components?
2. Are these chemicals potentially toxic to the operator? Is there any combination of two or more which could be toxic? If the cabinet is being used correctly and only the operator's hands and arms are inside the work area, then toxicity or irritation could occur through skin penetration. A proper evaluation of toxicity must deal not only with onetime exposure, but also with the effect of many small exposures over a period of time.
3. Are these chemicals explosive or flammable? If so, they should never be used in your cabinet. With a buildup caused by recirculation of air, an explosion can be the result of a motor spark or a burner operating in the work area.

In cases where chemical carcinogens, mutagens or teratogens are to be used, the risks should be carefully weighed in choosing a cabinet. Where the exhaust effluent contains a contaminant, it may need treatment.

The life of a filter is determined by how it is used and how often. Under normal laboratory conditions, you can expect at least five years of use. However, misuse or a heavy dust load within the cabinet will shorten any filter's lifetime. Bunsen burners and misuse of chemicals will also shorten the useful life.

Operating procedures

After many years of seeing our equipment used and misused, we have made up this list of suggestions:

- Store equipment and supplies outside of the cabinet.
- Always turn on the blower.
- Set the view screen at the proper height.
- When possible, use pipetting aids.
- Avoid use of an open flame within the cabinet unless the use has been specifically approved by a safety professional.
- Always keep the air intake grills clear and unobstructed.
- Only use toxic, explosive or flammable substances if a safety professional has approved them for work in your cabinet.
- The control system will adjust automatically for small changes in the load on the blower. Adjustments for larger changes should only be made by a qualified technician. Don't change the cabinet or blower speed unless the change is required by a decrease in measured air velocity.
- Work with only low- or moderate-risk agents in this cabinet.
- Always close the drain valve after each use.
- If the unit presents a warning signal, don't operate the unit until the warning ceases.

If the operators are well trained and use good common sense when operating your cabinet, you should have very few problems.

IV - ON-SITE CHECKS AND MAINTENANCE PROCEDURES

We recommend that the following checks be performed before initial use, after relocation, and after each filter change. They should also be carried out at regular intervals, usually six months or one year, as specified by an industrial hygienist, safety officer or other qualified person. The tests described below meet recommended minimum requirements. They must be performed by an experienced technician using proper procedures and instruments. Our representatives can tell you about other tests which you may consider desirable.

As reported earlier in this manual, each individual cabinet made by The Baker Company is carefully tested before it leaves the factory. Your copy of the test report, which you will find at the back of this manual, gives the factory test results for your own SterilGARD®II cabinet. Use it as your record of the original testing, and as your guide to testing in the future. To gain many years of satisfactory service, please be sure that your maintenance personnel come as close as possible to duplicating these original test figures.

Your test procedures should be identical to ours so that comparing test results will have meaning. Please correspond directly with us to request detailed procedures for your particular cabinet model. Alternate testing procedures can be found in the NSF International Standard No. 49.

The Airflow Balance

Warning! This procedure should be performed by qualified technicians only.

The airflow balance which is set at the factory provides your unit with air volume and velocity control to minimize leakage of airborne contamination either in or out of the work area.

In order to duplicate as closely as possible the aiflow characteristics described in the original factory test report, please follow these steps:

1. Adjust the viewscreen to its connerct 8-inch operating height. If the viewscreen is set to any other height an alarm will sound.

2. Use one of the following methods:

1) Primary method using a Direct Instrument Measurement Device (DIM) sealed to the front access opening. Taking the average of five reading, divided by the front access opening square footage to calculate inflow velocity. Sash areas are noted below. The calculated inflow velocity required is 100 to 110 FPM.

2) Secondary method using a thermal anemometer mounted on a ring stand 5 inches above the exhaust filter, take reading on a grid as shown on the cabinet air flow data plate. Average these reading and multiply the average by the open area of the exhaust collar installed over the exhaust filter. SG400 1.72 square feet and SG600 2.37 square feet. Divide this value (CFM) by the sash open area to determine the inflow velocity. The calculated inflow velocities required are, SG400 125 to 135 FPM and SG 600 115 to 125 FPM

Sash areas	8 Inch sash	10 Inch sash
SG 400	2.56 ft^2	3.19 ft^2
SG 600	3.89 ft^2	4.86 ft^2

3. Using the same instrument mounted on a ring stand within the work area, take readings with the anemometer probe set in plane of the bottom of the sash with the supply air diffuser installed. The location and average of these readings should be the same as shown in the factory test report and the table below.

	Uniform Downflow	Zone Downflow		
			8in Sash	10in Sash
SG400	60 to 70 FPM	Zone 1	62-72 FPM	60-70 FPM
		Zone 2	110-120 FPM	110-120 FPM
SG600	60 to 70 FPM*	Zone 1	60-70 FPM	62-72 FPM
		Zone 2	105-115 FPM	100-110 FPM

*SG600 10" sash is only zone downflow.

4. After you have compared your figures with those originally recorded at the factory, make whatever adjustments may be necessary.

5. As the HEPA (High Efficiency Particulate Air) filters load up with particulates, airflow will be maintained automatically, at least until the filter resistance increases 50 percent or more. When airflow eventually diminishes, an alarm will sound. (We explained the alarm function at the beginning of Section 3.) You will have to increase the blower speed in order to maintain the original volume of recir-

culating air. There is a speed control located in the light canopy.

Turn it clockwise until you have the desired airflow. If the airflow cannot be maintained, it will be necessary to replace the HEPA filters. (See "Replacing the HEPA Filters" later in this section.)

> *WARNING!*
> ***When the light canopy is lowered, some electrical parts are exposed. Do not perform this work unless you are a trained electrician or electronic technician.***

Filter Media and Seal Leak Tests

When preparing your cabinet for use after shipment, and then at prescribed intervals throughout its working life, you will need to verify that the filters have maintained their integrity. This is done by probe-testing the filter faces and seals.

The equipment you will need includes:

- An aerosol photometer. The instrument should sample air at a flow rate of 1 CFM.
- A D.O.P. generator with Laskin nozzle(s). Liquid dioctylphthalate (D.O.P.), dioctylsebacate or a comparable substance is aerosolized by flowing through the nozzle(s). When generated with Laskin type nozzle(s), the mean droplet size of the aerosol is 99 percent less than 0.3 microns.

Here is the procedure:

1. Turn on the aerosol photometer and calibrate it according to the manufacturer's instructions.
2. Position the D.O.P. generator so as to introduce air generated smoke into the area upstream of the filter.
1. Measure the upstream concentration of D.O.P.

> *WARNING!*
> ***Do not do this unless the unit has been properly decontaminated.***

4. Holding the photometer probe about one inch from the filter face with the diffuser removed on the downstream side, scan the entire surface area and perimeter (filter gasket frame area) in slightly overlapping strokes at a traverse rate of not more than ten feet per minute. Repeat at 90 degrees to the first scan pattern.
5. Eliminate leaks in the gasket frame area by re-tightening the filter gasket.
6. An HEPA filter is considered acceptable when all significant leaks have been sealed.

Airflow Smoke Pattern Test

To check for the direction of air movement, use a smoke generator and trace along the front access opening on the inside of the cabinet. Observe that no smoke is escaping from the work area.

In order to be sure that room air is not entering the work area, trace along the outside of the front access opening. Observe that no smoke penetrates farther into the cabinet than the front perforated grille.

Cabinet Integrity Test

The purpose of this test is to determine that the cabinet welds and gasketed seams are free of detectable leaks.

1. Decontaminate the cabinet if it has been used.
2. Seal off the exhaust filter port. This may be done by installing a gasketed panel over the opening using the studs on the filter box flange. An alternative is to tape a piece of cardboard or plastic over the opening.
3. Disconnect the electricity and then remove the two nuts holding the canopy clips at the top of the canopy. Let the canopy pivot down. Disconnect the electrical plugs inside on each end. Disconnect the restraints and hinges. Lift the canopy up and off.
4. Lower the viewscreen until it is completely closed.
5. Remove the top viewscreen tracks by removing the two cap nuts at the top of each track, then pulling upward on each track.

6. Tape a sheet of plastic or other material around the viewscreen and the lower tracks.
7. Attach compressed air to the drain valve and pressurize the cabinet to 2" water column. This pressure can be maintained by flowing compressed air if there are leaks in the taped area.
8. Apply liquid leak detector along all welds, gaskets, penetrations and seals on the exterior surfaces of all cabinet plenums. A leak will be revealed by the appearance of bubbles. Make sure not to miss large leaks which may blow the leak detector solution away without creating bubbles.
9. Repair all leaks until no further bubbles appear.
10. Remove the compressed air lines, making sure that the drain valve is closed. Remove the sealing material. Then clean up the cabinet and re-assemble the viewscreen by reversing the disassembly process.

Grounding Continuity Test

Using a volt-ohmmeter, set it to read the low resistance scale. Touch the two leads together and see that the display reads 0.0 to 0.1 ohms. Touch one lead to the ground lug on the cabinet power cord while touching the other lead to bare metal on the unit where the user would be likely to touch the cabinet. If the display reads 0.0 to 0.1 ohms the unit passes the test.

Maintenance Notes

Cleaning the Work Area

Whatever spills fall through the perforated grills can be removed through the drain valve after proper decontamination.

To wash the drain pan under the work surface, simply lift up the solid work surface and the perforated grille. Remember that this area must be assumed to have contamination, so use caution in the way you approach the task.

Ultraviolet (Germicidal) Lamp

As reported in other sections of this manual, UV germicidal lamps lose their effectiveness over time and should be replaced when their intensity at the work surface drops below 40 microwatts per square centimeter.

If your cabinet has a germicidal lamp, frequently measure its intensity at the work surface with an ultraviolet light meter. The appearance does not indicate UV effectiveness.

Check the HEPA Filters Regularly

Changes in areas surrounding the laboratory may produce unexpected dust or other conditions which affect the filters. To maintain filter integrity and good cabinet operation, check the air pressure monitor (or magnehelic gauge) periodically. If the unit consistently operates near either end of the normal range, check the filters carefully.

Replacing the HEPA Filters

If the control system presents an alarm, or if your periodic checks of total airflow show a drop of ten percent or more from the original settings, the filters may be loading with particulates. As explained earlier in this section, the blower speed can be manually increased to compensate for filter loading. However, when the airflow can no longer be maintained or when the filters are damaged, they need to be replaced.

Before any panels are removed, the cabinet must be decontaminated. Please see Page 15 for specifics on decontamination. The filters are sure to have collected microorganisms and other potentially harmful particles generated in the work area during their lifetime, and maintenance personnel should not allow themselves to be exposed. It should also be remembered that a specific gaseous decontamination may work against microorganisms, but not against chemical agents. Where chemicals are present, consult an industrial hygienist or other qualified person.

A chemically-contaminated filter must be handled with caution. Personnel should be protected by clothing or breathing apparatus as necessary to the nature of the hazard. It is

advisable to seal the contaminated side of the filter by taping a plastic sheet or cardboard over the face before removal. This should minimize the number of particles shaken loose from the filter. Once removed, the filter should immediately be sealed in a chemical hazard bag and then disposed of safely in accordance with environmental regulations.

After filter replacement has been completed, the cabinet and the room should be cleaned and decontaminated in a manner consistent with the nature of the hazardous material. The cleaning materials, along with the protective gear and clothing, should be properly disposed of.

HEPA filters are very easily damaged, and you will want to use great care in handling so as to avoid injury to the filter media and gasket surfaces. When installing the new filters, it is a good idea to tape a piece of cardboard over the filter media to give protection against dropped wrenches or misdirected fingers. Of course, you'll need to make sure that the cardboard is removed before the access panels are re-installed. Inspect the filters carefully before and after installation. A broken or damaged filter is worthless.

Changing the Exhaust Filter

Move the viewscreen to its fully-closed position. Remove the canopy retaining wing nuts and swing the canopy down to its open restraint position. Loosen the retaining hardware (cap nuts) at top backside of each upper track. Pull the upper tracks out to the side at the top to clear the slots and pull them up and out of the lower tracks to remove them.

Remove the front access panel on the top section of the unit, as well as the smaller inner exhaust access panel. Loosen and remove the exhaust filter clamps and remove the filter through the front opening into a heat-sealable polyethylene bag for disposal. If the unit is *not* connected to an exhaust system, the exhaust filter may be removed from the top of the unit.

Prepare the new filter by putting a light coat of silicone grease on the face of the gasket. Clean the sealing flange thoroughly. Then carefully slide the new filter into place and make sure that it is properly seated on the flange. Replace the filter clamp assemblies and screw the stainless steel studs finger-tight. Tighten the studs uniformly and moderately, a few threads at a time, until the filter gasket has been compressed about 20 percent. *Do not overtighten.* Then replace the exhaust filter access panel securely and make the leak test described earlier in this chapter.

Changing the Supply Filter

Move the viewscreen to its fully-closed position. Remove the canopy retaining wing nuts and swing the canopy down to its open restraint position. Loosen the retaining hardware (cap nuts) at top backside of each upper track. Pull the upper tracks out to the side at the top to clear the slots and pull them up and out of the lower tracks to remove them.

Remove the front access panel on the top section of the cabinet, as well as the inner supply filter access panel. Loosen and remove the supply filter clamps and carefully lift the dirty filter into a heat-sealable polyethylene bag for disposal.

Use a replacement filter of the correct type. Put a light coat of silicone grease on the face of the replacement filter gasket. Clean the sealing flange thoroughly. Then slide the new filter into place and make sure that its correctly seated on the flange.

Replace the filter clamp assemblies and screw the stainless studs finger-tight. The filter gasket should be compressed about 20 percent. Finally, replace both the access panels securely and then the viewscreen frame/light canopy assembly.

When filters are replaced, the airflow must be balanced. Thorough filter and cabinet leak tests must be made by qualified personnel.

Adjustment of the Balancing Damper

Filters for the cabinet should be selected as a pair so that their resistance will be as close as reasonably possible. Resistance of HEPA filters may vary considerably from one to another, so a damper has been installed on your cabinet's exhaust to maintain the proper balance between

exhaust and recirculating air. This balance is critical because too much positive or negative pressure in the work area could mean an outflow of pathogens or an inflow of room contamination.

The balancing damper adjusts the volume of the exhaust air so as to maintain the proper supply and calculated intake air velocities. The damper is preset at the factory and ***should not*** be changed unless the proper airflow balance cannot be achieved after new filters are installed. On those occasions when adjustment becomes necessary, adjustments can be performed by a damper quadrant located on the top of the unit.

The procedure is as follows:

1. Loosen the quadrant wing nut.
2. To decrease exhaust airflow, move the quadrant arm towards the front of the unit (clockwise rotation).
3. To increase exhaust airflow, move the quadrant arm towards the rear of the unit (counter-clockwise rotation).
4. When final adjustments have been achieved, make sure to tighten the wing nut on the damper quadrant.
5. If, after adjusting the damper, both supply and exhaust are high or low, adjust the speed control.

Troubleshooting

Here are some suggestions based on our experience with the use and misuse of biological safety cabinets.

DANGER!

Whenever the potentially contaminated areas of your cabinet must be entered, make sure that the unit is first decontaminated by use of appropriate methods.

When a smoke test indicates that there is air flowing from the interior of your cabinet into the surrounding room -

1. Make sure that the shipping cover is removed from the exhaust filter and that no other objects are blocking the airflow.
2. If your cabinet is connected to an in-house exhaust, make sure that there is adequate exhaust suction and the system is not producing back pressure. Also, be sure the dampers are open. Re-balance the exhaust system to handle an adequate volume of air and static pressure (suction). Consult with building maintenance people.
3. The exhaust filter may be loaded with dirt if the unit has been in service for some time. Decontaminate, and replace all filters.
4. There may be high cross-drafts in the room which are causing the outflow of smoke. Check the airflow balance, following the procedure recommended earlier in this chapter. Eliminate the source of the cross-draft.

When there is low airflow within the work area and through the exhaust filter -

1. Check the incoming line voltage. Low voltage may cause the blower to operate at a slower-than-designed speed. Although this should be corrected in the building's electrical system, you may be able to compensate by adjusting the blower speed control clockwise until proper velocity is reached. The control is located on the left side of the light canopy.
2. The reduced airflow may be caused by damaged or leaking filters. Decontaminate the unit and replace the filters at once.

If there is no air flow within the work area -

1. If the lights and electrical outlets also fail to operate, make sure the unit is plugged into a dedicated electrical outlet (grounded 20 amp, 115 Volt, 60 Hz). Also make sure that the blower switch is turned on. The yellow indicator above the button should be lighted.

2. If the lights are working, then turn the blower switch off and let the cabinet rest for ten minutes. When the time has passed, turn the blower switch on again. If the blower starts, you know there has been overheating of the blower motor. Also check the wiring connections inside the right end of the light canopy which connect the canopy to the cabinet. Be sure the connections are pushed together.
3. If these solutions do not correct the problem, or if the blower failed to start after the rest period, then either the speed control, blower motor or capacitor is defective. A qualified electrician can find out if the speed control is defective by bypassing it, using the wiring diagram in the Appendix of this manual as a guide. If there is a noise problem, it may be caused by faulty motor bearings.

If one (or both) of the electrical outlets does not function -

1. Be sure the outlets on/off switch has been pressed. The yellow indicator above the switch should be on.
2. Both outlets are equipped with ground fault interrupters. If the button on the G.F.I. outlet has popped out, press it in to reset.
3. The outlets are also protected by a self-resetting thermal circuit breaker. Check this breaker.

If the ultraviolet light does not work -

1. Be sure that the viewscreen is completely closed, and the fluorescent light is off.
2. Check the ultraviolet bulb and lamp sockets for good electrical connections.
3. Change the ultraviolet light bulb.
4. Have a qualified electrician check the wiring and ballast for continuity. The wiring can be traced to the source of a break. If none of the above is effective, the ballast may need replacing.

When there is uneven fan operation, or noise from the motor/blower assembly -

1. It may be necessary to decontaminate the cabinet.
2. Look for loose objects in the fan cage.
3. Check to see if the fan wheel is contacting the blower housing.
4. Remove wing nuts and drop canopy to open (full restraint) position. Check the multi-pin connectors at each end to be sure they are securely engaged.
5. Another possible source of the problem is the speed control.

When the viewscreen open alarm is sounding -

1. The viewscreen alarm should be silent in only two positions. The first silent position is when the viewscreen is at its proper operating height (8" standard). The second silent position is when the viewscreen is in a closed position. The viewscreen alarm is located in the light canopy and is de-activated when it senses hidden magnets attached to the viewscreen frame.
2. If the viewscreen is in an incorrect position, the alarm will sound. The indicator above the alarm reset button will flash. You may cancel the audible alarm for five minutes by pressing the alarm reset button. The indicator will continue to flash until the viewscreen is set in the correct position. After five minutes, the alarm will sound again. You may press the alarm reset button again.

If the fluorescent light does not work -

1. The blower switch should be turned on, and the yellow indicator above the switch should be lighted.
2. Remove wing nuts and drop canopy to open (full restraint) position. Check the multi-pin connectors at each end to be sure they are securely engaged. If the lamp flickers and can be corrected by vigorous rubbing of the bulb, there is probably an improper ground.

The wiring can be traced to the source of a break.

If the air pressure monitor or magnehelic gauge has high or low readings –

A higher reading than .09 to .12 inches water column could be an indication of the following:

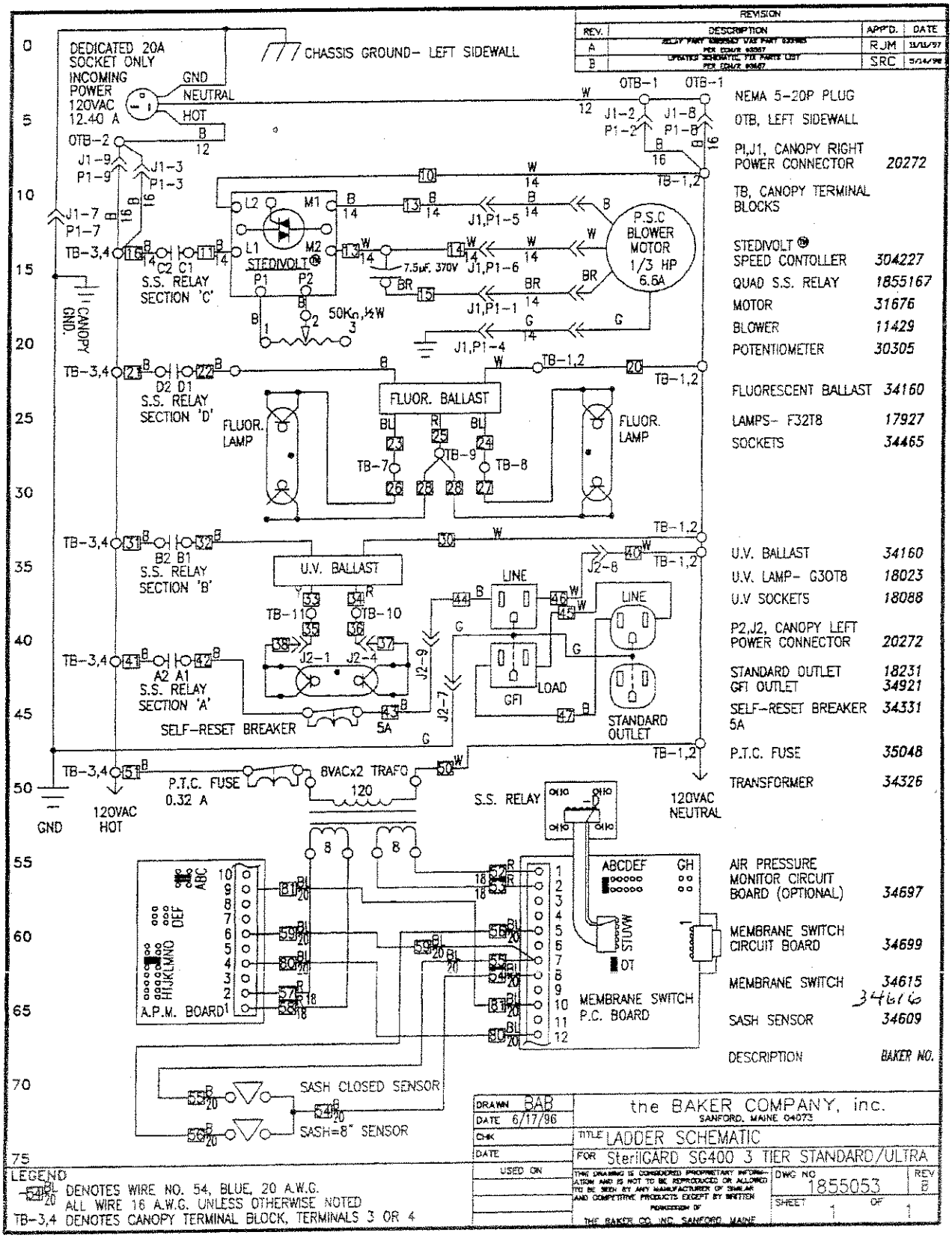
1. Blocked or partially obstructed perforated grilles (front and/or rear).
2. Towels or wipes have blocked the towel guard on either the back or sides of the unit.
3. The viewscreen is in the closed position and the in-house exhaust fan is still pulling air though the cabinet.
4. Incorrect air flows

For any of the above conditions, always check for proper air flows first.

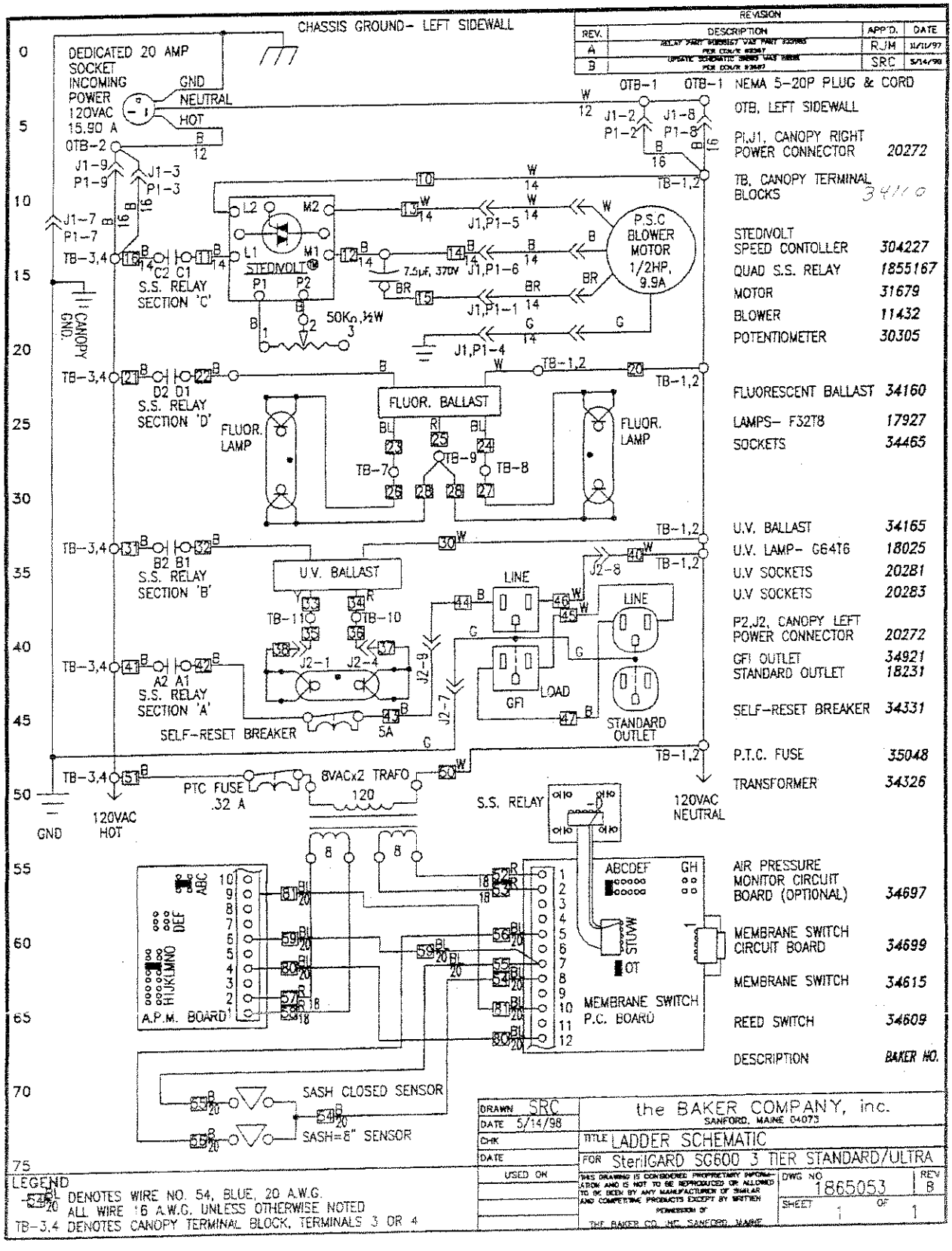
A lower reading than .09 to .12 inches water column could be an indication of the following:

1. Partially or totally blocked filters.
2. Incorrect air flows.
3. Perforated grilles or worksurface has been removed.

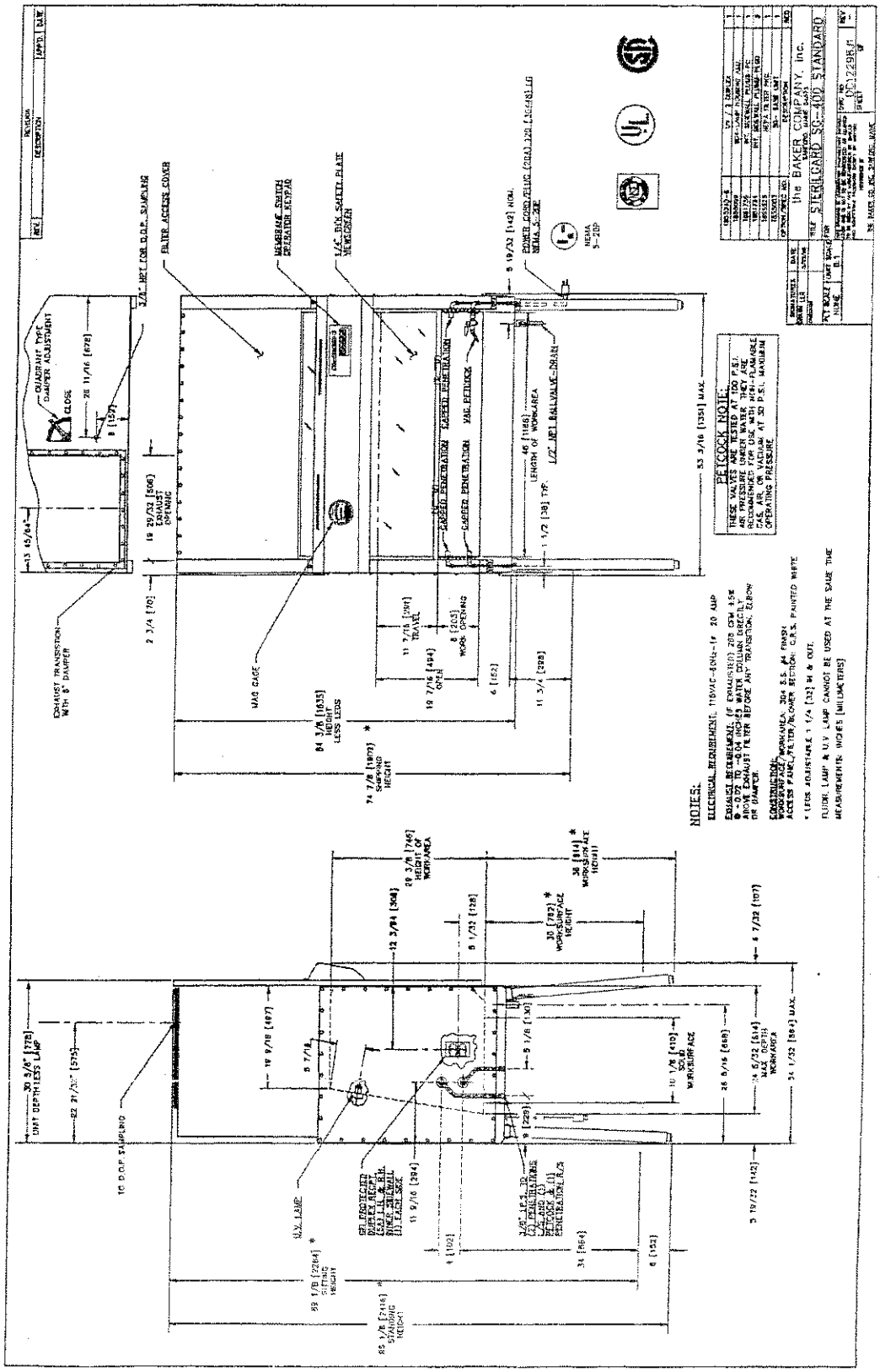
For any of the above conditions, always check for proper air flows first.



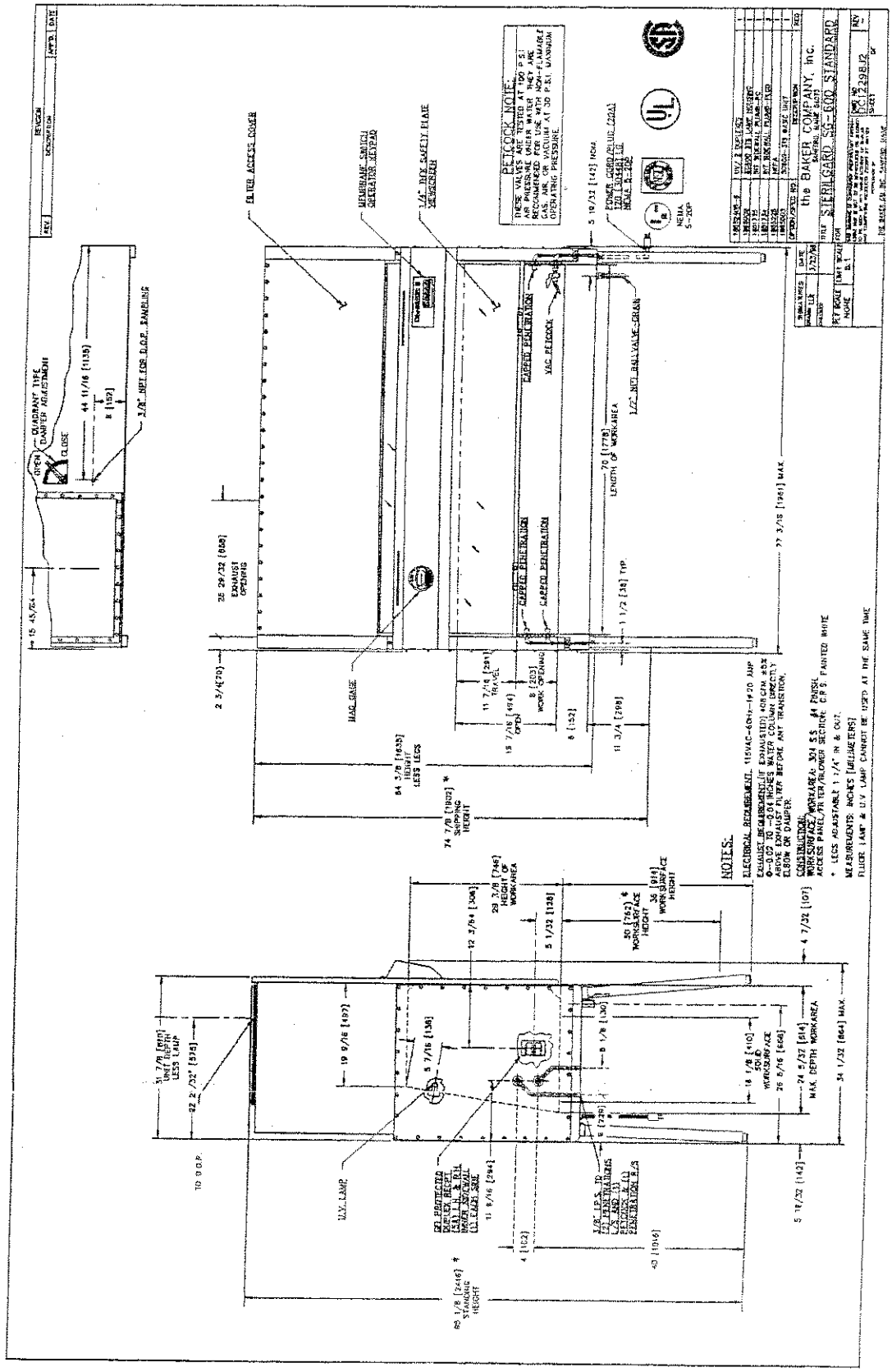
Wiring Diagram – SG400 Models



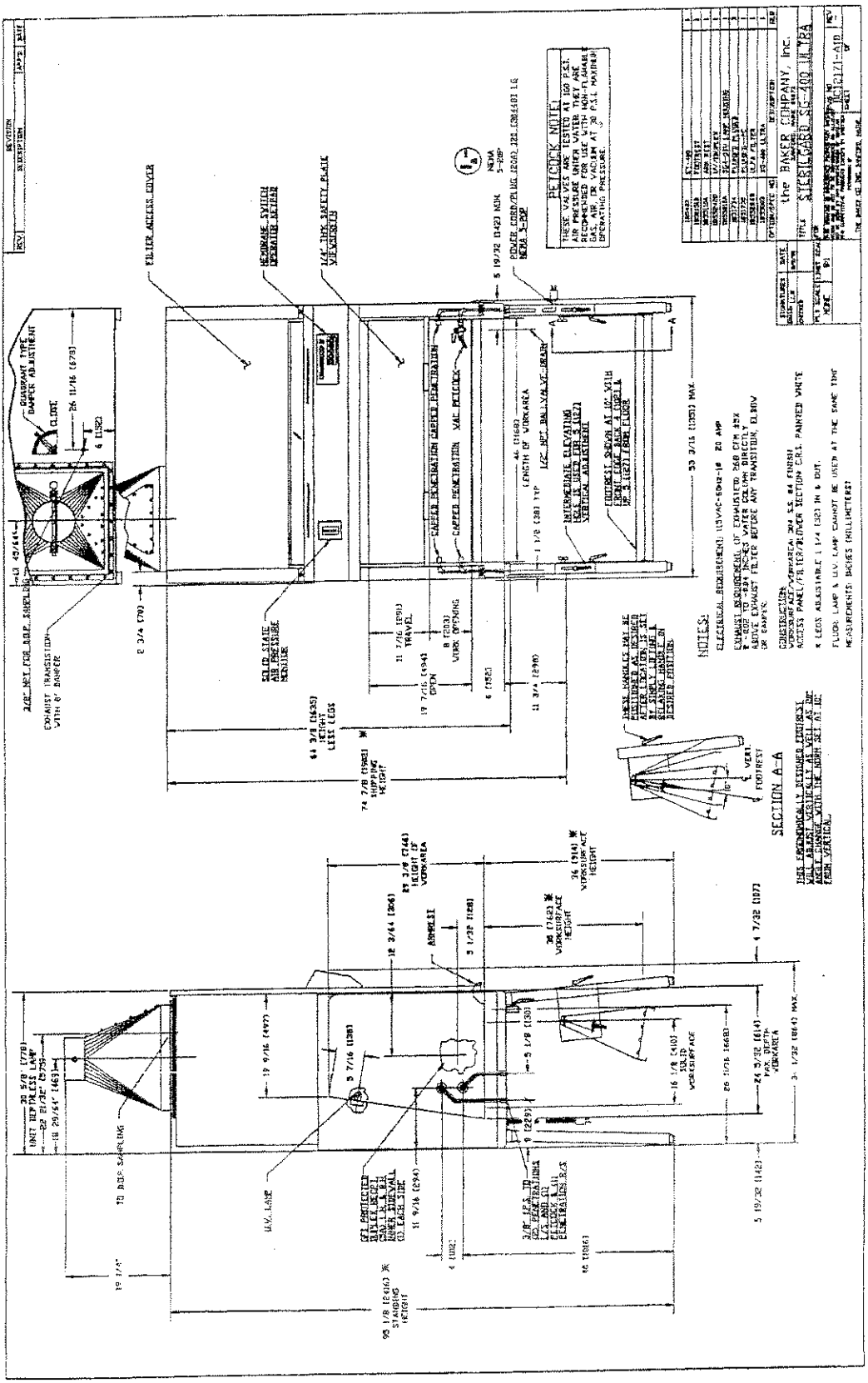
Wiring Diagram – SG600 Models



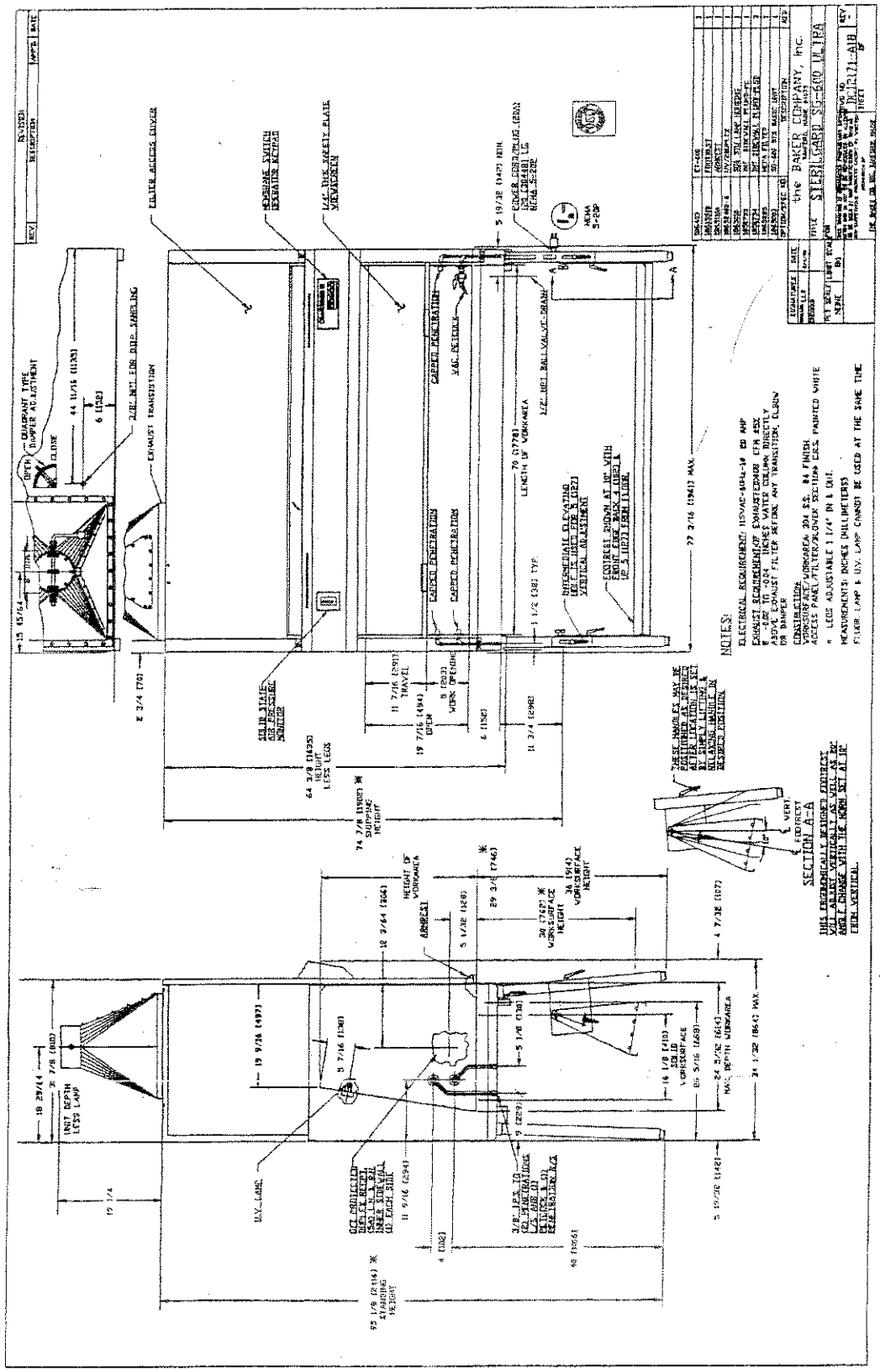
Dimensional Drawing, Model SG400STD



Dimensional Drawing, Model SG600STD



Dimensional Drawing, Model SG400ULT



Dimensional Drawing, Model SG600ULT

REPLACEMENT PARTS LIST

STERILGARD® II MODELS SG400STD & SG600STD

VERTICAL LAMINAR FLOW CABINET

Part Name	*SG400STD Part Numbers BOM #1855199*	*SG600STD Part Numbers BOM #1865199*
Magnehelic Gauge	20776	20776
Capacitor	11557	11558
Circuit Breaker - 5A	34331	34331
Exhaust HEPA Filter 18X18X12	28322	36262
Fluorescent Ballast	34160	34160
Fluorescent Lamp	17927	17927
Ground Fault Interrupter with Indicator Light	34921	34921
Lamp Holder, "Butt-On" Type	34465	34465
Magnetic Sensor	34609	34609
Membrane Switch Controller	34699	34699
Motor/Blower Controller	304227	304227
Relay, Solid State	33985	33985
Sash Balance - Left Piston	36475	36478-R
Sash Balance - Right Piston	36476	36477 L
Supply Blower	11429	11432
Supply HEPA Filter Superpak 18X48X3	28302	28303
Supply Motor	31676	31679
Switch, Touch-Type	34615	34615
Transformer	34326	34326
Ultraviolet Lamp	18023	18025
Ultraviolet Lamp Ballast	34165	34165
Ultraviolet Lamp Socket	18088	20281 & 20283
Window Assembly	1851703	1861692B
Window Wiper	1855095	1865095

NOTE: When ordering replacement parts, please furnish the serial number of the unit, as well as the model number.

Petcocks -
19326 - petcock
19304 - flange

AIR Button
19392

Motor blower assem
w/motor 1865231
SG600

19326

ET4RFM
1350959

1865003 (98) SG600STD BOM

REPLACEMENT PARTS LIST

STERILGARD® II MODELS SG400ULT & SG600ULT

VERTICAL LAMINAR FLOW CABINET

Part Name	*SG400ULT Part Numbers BOM SG400ULT#194*	*SG600ULT Part Numbers BOM SG600ULT#194*
Air Pressure Monitor	34697	34697
Capacitor	11557	11558
Circuit Breaker - 5A	34331	34331
Exhaust Filter	37206 (ULPA)	36262 (HEPA)
Fluorescent Ballast	34160	34160
Fluorescent Lamp	17927	17927
Ground Fault Interrupter with Indicator Light	34921	34921
Lamp Holder, "Butt-On" Type	34465	34465
Magnetic Sensor	34609	34609
Membrane Switch Controller	34699	34699
Motor/Blower Controller	304227	304227
Relay, Solid State	33985	33985
Sash Balance - Left Piston	36475	36478 ~~34678~~
Sash Balance - Right Piston	36476	36477 ~~34677~~
Supply Blower	11429 95.	11432 89.
Supply Filter	37173 (ULPA)	28303
Supply Motor	31676	31679
Switch, Touch-Type	34615	34615
Transformer	34326	34326
Ultraviolet Lamp	18023	18025
Ultraviolet Lamp Ballast	34160	34165
Ultraviolet Lamp Socket	18088	20281 & 20283
Window Assembly	1851703	1861692 SASH only (1861695F w/gaskets)
Window Wiper	1855095	1865095

NOTE: When ordering replacement parts, please furnish the serial number of the unit, as well as the model number.

Motor Blower Assem
SG-600 (93) 186063D

430.70 SG600ULT
Motor/Blower Assy 1865231
SG400ULT
Motor/Blower Assy 1855237

Warranty

The Baker Company, Inc., expressly represents and warrants all goods (a) to be as specified (and described) in The Baker Company catalogs and literature, and (b) to be free under normal use, service and testing (all as described in The Baker Company catalogs and literature) from defects in material and workmanship for a period of thirty-six months from the invoice date.

The exclusive remedy for any breach or violation of this warranty is as follows: The Baker Company, Inc., will F.O.B. Sanford, Maine, furnish without charge repairs to or replacement of the parts or equipment which proved defective in material or workmanship. No claim may be made for any incidental or consequential damages.

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THE BAKER COMPANY

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