DO NOT REMOVE THIS SHEET FROM MANUAL

I M P O R T A N T

This BBL Biological Cabinet has been specially modified for 220 Volt, 50 Cycle operation at the customer's request. As a result it will provide approximately 80% of the specified airflows of the standard 115 Volt, 60 Cycle model.

COMPARATIVE AIRFLOWS ARE SHOWN BELOW:

AIRFLOWS	115 Volt, 60 Hz SPECIFICATIONS	220 Volt, 50 Hz (this unit) TEST AIRFLOWS*
1. Supply Velocity	90 FPM + 20	70 FPM avg.
2. Exhaust Velocity	350 - 400 LFM	270 LFM avg.
3. Air Curtain	200 + 40 FPM	155 + 30 FPM

*The containment capability of this cabinet has been tested using a smoke source for visual airflow pattern determination. Tests incorporating biological agents have not been performed at these airflows. The adequacy of containment of any cabinet for personnel safety should be determined by a Biological Safety Officer, Hygienist or Health Physicist. On-site test and certification is not provided outside the forty-eight contiguous United States. The buyer hereby, upon receipt, assumes the obligation for testing the product to assure it functions properly, safely and as intended.

Manufactured for BBL Microbiology Systems By:

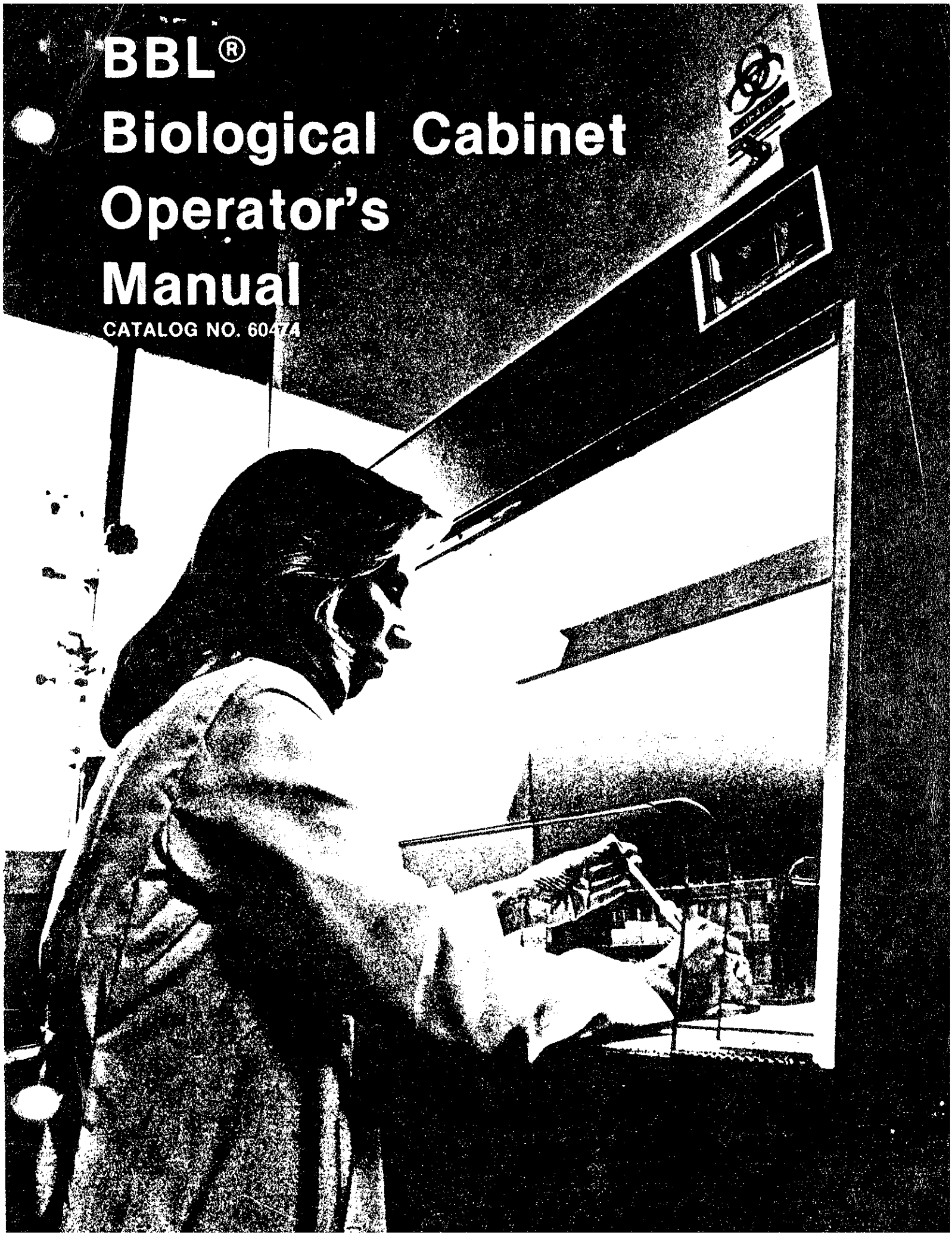
ENVIRCO, Division of Bio-Dynamics, Inc.
6701 Jefferson N.E.
Albuquerque, N.M. 87107

Replacement Parts Available From:

ENV Services, Inc.
P.O. Box 6468
Albuquerque, N.M. 87197
800/545-6902 or 505/883-0506

BBL®
Biological Cabinet
Operator's
Manual

CATALOG NO. 60474



CAUTION

Read this manual completely before installation or operation of the **BBL®** Biological Cabinet. Keep this manual for future reference and new employees.

Operate this equipment only as specified by this manual.

The **BBL** Biological Cabinet is equipped with a three-wire grounding plug for your protection against shock hazard and this should be plugged directly into a properly grounded three-pronged receptable. If a two-pronged receptacle is encountered, it must be replaced with a properly grounded three-pronged receptacle in accordance with the National Electric Code, local codes and ordinances. This work should be done by a qualified electrician.

Do not, under any circumstances, cut or remove the grounding prong from the plug. *Unplug the power cord before servicing this machine or changing the filters.* Do not use extension cords. *Should the power cord or plug become cracked, frayed, broken or otherwise damaged, they should be replaced immediately.*

- Service on this equipment is usually performed by the authorized **BBL** service contractor. However, certain procedures are outlined in the manual that can be performed by the owner. Do not attempt to perform any procedures not specifically outlined in the manual.

Do not remove the caution labels from this equipment or the associated work area (except for the caution label located on the view screen).

Do not remove the front panel or HEPA filters until the cabinet has been decontaminated.

Do not work in cabinet while the UV light is on.

As with any piece of safety equipment, Laminar Airflow Biological Cabinets must be used properly to be effective. Adherence to accepted laboratory safety standards and techniques is mandatory to assure maximum personnel and process protection. The use of any biological cabinet for handling special biohazardous agents must be approved by a health physicist or biological safety officer.

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Printed in USA

INTRODUCTION

PURPOSE

The Biological Cabinet creates a work area for the safe handling of low to moderate risk level biohazardous material.

The Biological Cabinet utilizes HEPA (High Efficiency Particulate Air) filters and provides the following features:

Protects the worker from airborne contaminants generated in the work area.

Protects the work from airborne contaminants generated in the ambient air.

Protects against cross-contamination within the work area, by preventing particles from moving laterally during a work procedure.

Allows for the handling of low level infected material without encumbering the worker with a glove panel and gloves.

May be decontaminated with formaldehyde to allow for safe removal of loaded HEPA filters.

Complies with Federal Standard No. 209B Class 100.

Unit is designed for work procedures primarily in microbiology, virology, tissue culture and sterility testing.

DESCRIPTION

The **BBL** Biological Cabinet (Catalog No. 60474) may be defined as "A ventilated cabinet for personnel and product protection having an open front with inward air flow for personnel protection and HEPA-filtered mass recirculated air flow for product protection. The cabinet exhaust air is filtered through a HEPA filter as required by National Sanitation Foundation Standard No. 49*. The cabinet, however, is not specifically listed as approved under this standard.

The Biological Cabinet may be mounted on a bench top, or may be supplied as a two-piece unit, including an optional Base Support with adjustable leveling legs.

The work area is protected by a double polycarbonate viewscreen set at a comfortable visual working angle of 14°. The access opening to the work area is 7" in height. When the Base Support is used, the distance from the floor to the work surface may be adjusted from 36" to 38" for worker comfort. The front six inches of the work surface are perforated to accommodate the protective air curtain which flows through the polycarbonate viewscreen. The actual area for working is beyond this perforated front section and on the solid work surface. The work area is provided with outlets for electricity, gas and air/vacuum.

FUNCTION

The Cabinet is a recirculating vertical airflow unit with a front air barrier and a filtered suction exhaust.

NOTE:

This cabinet is suitable for work with low to moderate risk biological agents. Vapors or gases which are hazardous from a toxic, radioactive, or flammability standpoint should not be used in this cabinet.

The Supply System

Air is supplied to the work area and to the air curtain through HEPA filters. The HEPA filters remove particulate matter from the air (with an efficiency of 99.97%—particle size 0.3 micron and larger), and impart laminar characteristics to the airflow as it enters the work area at a velocity of 90 ± 20 linear feet per minute (lf/m). The speed of the blower which supplies the HEPA filters may be varied to compensate for air velocity loss due to HEPA filter loading. This applies to exhaust blower also.

The fact that the airflow is laminar assures that the entire body of air within the work area moves with uniform velocity and along parallel flow lines. Thus the flow of clean air enters and exits the work area in a non-turbulent, uniform manner, preventing particles generated on one side of the work area from traveling laterally to the other side. Cross-contamination during a working procedure is thereby prevented.

*See Glossary for definitions of Federal Standard 209B and National Sanitation Foundation Standard 49.

The Air Barrier (Patent No. 3811250)

When the Cabinet is operating, a controlled air flow pattern is established at the access opening to the work area. This forms a barrier which acts to prevent airborne particulate material from leaving or entering the Cabinet. The "barrier" is composed of three air flow vectors entering the perforated area in front of the work surface.

They are:

1. A high velocity (200 ± 40 lf/m) curtain of air flowing through the channeled polycarbonate viewscreen.
2. Work area air entering behind air curtain.
3. Room air entering in front of the air curtain.

The Exhaust System

A controlled volume of air is exhausted from the unit through a HEPA filter. This serves three purposes:

1. Effects the drawing of room air into the unit at the front return.
2. Creates a negative pressure in the return plenum, thus preventing unfiltered air from entering the room.
3. Minimizes the buildup of heat, fumes and odors within the unit.

FEATURES

1. Electrical, gas and air/vacuum outlets for work area.
2. Glove panel and gloves for use when desired. (Optional)
3. Filtered adjustable air intake for use with glove panel.
4. Fluorescent lighting in work area during Cabinet utilization.
5. UV lighting in work area may be turned on when Cabinet is not in use.
6. Drainage pan for control of spilled liquids in work area.
7. Audible alarm in the event exhaust filter should become loaded or should blower fail.
8. Human engineering design for operator comfort:
   a. Can be used without glove panel.
   b. Viewscreen at comfortable working angle (14°) and hinged to allow access for cleaning, filter testing, placing large objects in work area, etc.
   c. Recessed knee area in base, which may be adjusted for optimal work surface height.
   d. 140 ft. candles provided by fluorescent lights. (Average)
9. Air flow indicator for monitoring work area air velocity.
10. Meets specifications of the City of Los Angeles and the Canadian Standards Association (C.S.A.).
11. Meets National Electrical Code requirements.

SPECIFICATIONS

Superstructure and Base	—Sheet Metal
Work Area	—Stainless Steel
Viewscreen	—Polycarbonate, Fire Retardant
Electrical & Motor Components	—Formaldehyde compatible
Standard Paint	—Polyurethane

LOCATING THE CABINET

The Cabinet should be placed in an area of the laboratory free from strong air currents and heavy air contamination, so that the life of the HEPA filters will be prolonged and the air flow patterns at the work area access opening will not be disrupted.

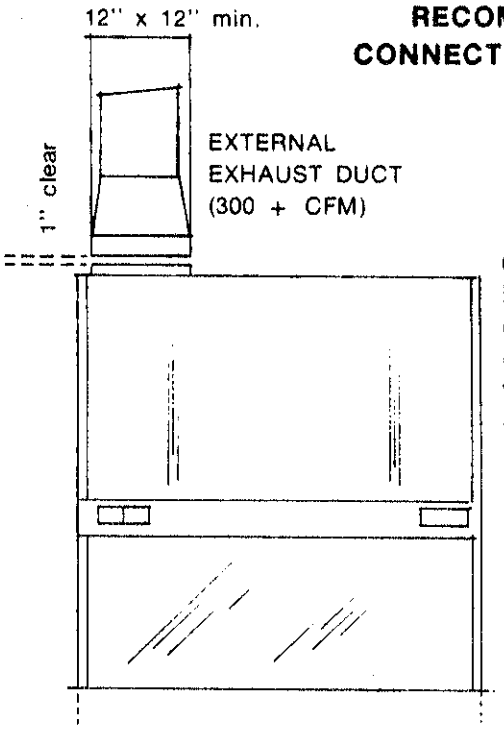
The Cabinet should be placed in a room with a minimum ceiling height of *96 inches* in order to allow free passage of exhaust air.

The Cabinet cannot feed into a recirculating exhaust system. If the Cabinet is feeding into a building exhaust system, a separate fan or blower is needed, usually mounted on the exit port of the exhaust duct. *A minimum rate of 300 cf/m is required. The Cabinet is not capable of exhausting through a building exhaust system at the proper flow rate without the aid of a separate fan or blower.*

NOTE

Per the instructions accompanying the cabinet on arrival, contact the **BBL** Authorized Service Contractor, ENV Services, Inc., Albq., N.M. for on site certification of the equiment and detailed information regarding *user responsibility* for maintenance and servicing.*

ENV SERVICES, INC.
P.O. Box 6468
6009 Osuna N.E.
Albuquerque, N.M. 87197
Telephone (800) 545-6902



RECOMMENDED EXTERNAL DUCT CONNECTION FOR BIOLOGICAL CABINET

The exhaust duct should **not** directly connect to Cabinet exhaust. A minimum clearance of 1" is required. (See Diagram).

CAUTION:
Direct attachment to external exhaust duct may disrupt air flow balance and cause Cabinet air to be expelled out the front access opening in the event of a change in the external exhaust volume.

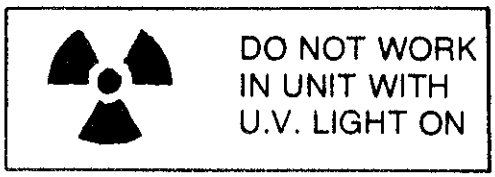
PREPARING THE CABINET FOR OPERATION

Gas and air pipe stubs are not shipped with the Cabinet but are required if services are to be connected. Pipes must be screwed in place at rear of Cabinet when ready to install. The spaces around the pipe stubs in the rear wall of the Cabinet should be caulked. (Pipe Size: 3/8" × 8")

Do not operate the unit until on site testing has been completed.*
Adjust leveling feet at rear of unit slightly higher than front feet. In the event of spillage within the work area, this adjustment will effect a pooling of fluid in the vicinity of the drain plug in front area of drainage pan beneath work surface.
Plug the line cord into a NEMA 5-20 120 volt AC single-phase, 60 cycle outlet, 3 wire ground outlet. If a two-pronged receptacle is encountered, it must be replaced with a properly grounded three-pronged receptacle in accordance with the National Code, local codes and ordinances. This work should be done by a qualified electrician. The circuit must provide 20 amperes. The outlet contained in the Cabinet work area is factory wired to handle 120 volt AC power of 5 amperes maximum.
Open viewscreen and lock in the raised position. Clean walls and surface of the work area with a fast-drying, noncorrosive disinfectant, such as Asepto† air-surface spray.

*On site HEPA filter testing and tests for Cabinet leakage and proper airflow after the Biological Cabinet has been installed are services provided by the authorized **BBL** service contractor, the cost of which is included in the selling price of the Cabinet for the 48 continuous states. On site testing and certification for Alaska and Hawaii must be arranged directly with ENV SERVICES, INC., Albuquerque, N.M. The selling price of the cabinet for these areas has been adjusted in lieu of these services.
†Manufactured by Bard-Parker, Division of Becton Dickinson and Company B-D

WORKING IN THE BIOLOGICAL CABINET



Cabinet is ready to use after on site testing procedures have been completed, and Cabinet has been certified by the authorized **BBL** service contractor.

All equipment should be clean before being placed inside the Cabinet work area.

Close the viewscreen and secure in the working position.

Turn on the lights and blowers via switches located in the control panel. Hold a smoke source in front of the access opening. The alarm will sound until the air flow reaches acceptable speed. Observe the movement of smoke, which should enter the front return grill, to make certain that exhaust system is functioning properly. If it is not, see section "Exhaust Air Unbalanced" on page 14.

Allow the Cabinet to run for five minutes in order to remove any airborne particulate material from the system before beginning work.

Equipment should not obstruct the front and rear return grills in order to maintain proper air flow and avoid air turbulence. Work procedures should be conducted only on the nonperforated work surface.

All equipment and containers should be placed in the Cabinet before work is begun. The front viewscreen should never be lifted during a procedure, as this disrupts the airflow characteristics of the Cabinet allowing contaminated air to leave the Cabinet and room air to enter the Cabinet.

Unnecessary items should not be stored in the work area.

The Cabinet does not have the ability to remove contaminants from surfaces. Clean equipment and proper techniques must, therefore, be employed in order to avoid surface-to-surface contamination.

CAUTION:
Use of flammable materials within the cabinet is not recommended.

The operator's hands and arms should be placed in and withdrawn from the work area slowly, thus preventing "dragging" of air from one environment to the other. Laboratory coat sleeves and cuffs should fit snugly on operator's arms in order to avoid trapping the contaminated air that is entering front return grill. Surgical gloves are recommended for wear while working in the Cabinet.

If the glove panel is used,* room air will be blocked from entering front return grill. The Cabinet should, therefore, be opened by sliding back the air intake cover on top of the unit to expose pre-filter. This will allow make-up air to enter the Cabinet, and minimize the build up of heat, fumes and odors. Position glove panel in front of access opening so that it is centered and fits snugly against viewscreen. Turn retaining clamp knobs on glove panel until panel is clamped tightly to viewscreen. Check clamps by placing hand a few inches in glove and testing to make sure they grasp polycarbonate viewscreen firmly. When work procedure is ended, decontaminate gloves and glove panel with a suitable surface decontaminant. Gloves should be disinfected with an aqueous solution of a phenolic based disinfectant. Make certain air intake cover on top of unit is shut for work procedures without glove panel.

After the working procedure is completed and the containers of biohazardous material are closed and sealed, the Cabinet should be allowed to run for five minutes to remove air-borne contamination within the Cabinet before the equipment and containers are removed. If the normal daily working routine in the Cabinet includes the constant exposure of low to moderate risk level agents, it is suggested that the Cabinet be operated continuously, 24 hours a day, seven days a week.

*(Glove Panel is optional and must be ordered separately).

After the Cabinet is shut off, the work area surfaces should be cleaned with a suitable surface disinfectant. In case of spillage within the work area, pry up and lift out the work surface to expose the drainage pan. Cleanse and decontaminate the drainage pan. Utilize drainage plug in bottom of drainage pan if necessary.

After the operator has finished working, the ultraviolet light may be turned on and left on overnight. *Caution: Do not work in the Cabinet while the ultraviolet light is on.*

USE OF ANCILLARY EQUIPMENT

Do not use equipment requiring more than 5 amperes maximum.

Bunsen burner: If a flame is required in the work area, it is recommended that a small "touch-light" type be employed in order to avoid the heat build up and subsequent operator discomfort (and possible viewscreen damage) which a continually burning flame may create. To avoid exposing an open flame in the work area, an incinerator-type sterilizer is recommended for sterilizing innoculating loops.

NOTE:

Bunsen Burners must be operated so as to prevent unburned gas mixture collection in cabinet.

A blender may be operated without the glove panel in place. Because of the severity of the aerosol generated, however, it is suggested that the operator keep his arms, other equipment and containers out of the work area during this procedure.

Caution: Be sure that the Cabinet is operating before starting a Bunsen Burner, centrifuge or a blender, and that the Cabinet continues to operate for five minutes after the appliance is shut off.

MAINTENANCE AND SERVICING

Maintaining air velocity: Supply air flow should be checked at least every two weeks. A decrease in velocity will occur as the HEPA filters load; however, velocity can be recovered by increasing blower speed.

Velocity gauge: The velocity gauge on the control panel is calibrated at 90 lf/m at the center of the black zone. The high and low zones correspond to greater than 110 and less than 70 lf/m respectively. The work area air flow should be adjusted so that the velocity gauge indicator ball stays within the black zone.

If the properly functioning supply blower is unable to maintain a velocity above the red zone, the HEPA filters are loaded and must be replaced. The average life of a HEPA filter under continuous use is two years. Contact your service contractor for filter replacement and recertification.

NOTE

Per the instructions accompanying the cabinet on arrival, contact the **BBL** Authorized Service Contractor, ENV SERVICES, INC., for on site certification of the equipment and detailed information regarding *user responsibility* for maintenance and servicing.**

ENV SERVICES, INC.
P.O. Box 6468
6009 Osuna N.E.
Albuquerque, N.M. 87197
Telephone (800) 545-6902

Decontamination Procedure

The Cabinet must be decontaminated by the decontamination procedure before removal of the front panel or contaminated HEPA filters to avoid exposure of personnel to biohazardous material.

Decontamination of the **BBL** Biological Cabinet is accomplished by use of decontamination filter and filter frame. The decontamination filter absorbs and oxidizes formaldehyde, changing the gas to carbon dioxide and water. During the process, the filter media (oxidizing medium) is reduced. The decontamination filter is effective for only *one decontamination cycle*. The filter frame is permanent.

Suggested equipment and materials include: optional glove panel and gloves†, decontamination filter and frame†, electric frying pan*, paraformaldehyde*, hot-plate, large beaker, and two-inch-wide plastic or rubberized tape.

†Available from ENV SERVICES, INC., Albuquerque, N.M. 87197
*Available from Vineland Poultry Laboratories, Vineland, N.J. 08360
On site HEPA filter testing and tests for Cabinet leakage and proper airflow after the Biological Cabinet has been installed are services provided by the authorized **BBL service contractor, the cost of which is included in the selling price of the Cabinet for the 48 continuous states. On site testing and certification for Alaska and Hawaii must be arranged directly with ENV SERVICES, INC., Albuquerque, N.M. The selling price of the cabinet for these areas has been adjusted in lieu of these services.

IMPORTANT: Do not remove the disposable decontamination filter from its protective foil package until ready to decontaminate the Biological Cabinet; prolonged exposure to room air will cause the filter to become ineffective. Prolonged storage of the decontamination filter in its protective package is not recommended.

PROCEDURE:

Refer to Diagram on Page 13

WARNING

Both view screen latches must be in locked position whenever the view screen is raised. DO NOT attempt to work under a raised screen unless it is properly secured. Replace worn latches as required.

1. Open the viewscreen on the Biological Cabinet. Place hot plate with large beaker of water, electric frying pan, and 20 grams of paraformaldehyde in closed container in work area. (If a steam line is available, the hot plate is not needed.) Plug in the hot plate and frying pan. **Do not turn on.** Close viewscreen.

2. Attach glove panel and gloves to Cabinet.

3. a. Remove decontamination filter frame from package and place on flat surface with airflow arrows on frame pointing upward. Unhook side fastenings and remove top of frame.

   b. Remove decontamination unit disposable filter from package. Remove protective foil wrap. Orient the filter so the airflow arrows on the filter point upward, then carefully lower the filter into the frame.

   c. Replace top of frame and clamp down with side fastenings to form seal.

   d. Place assembled decontamination unit over exhaust port on top of Cabinet. Make sure gasket on bottom of frame is in complete contact with top surface of Cabinet around exhaust port and airflow arrows point upward. See diagram page 8. Tape bottom edges of unit to top of cabinet.

4. Tape, with plastic or rubberized tape, the seams around the front access panel, the viewscreen (top hinge and sides), the glove panel, including along the bottom edge, and the air intake cover on top of the unit. Be certain pipe stub openings have been caulked. Taping is necessary because the exhaust blower is not on during the decontamination cycle; thus the Cabinet shell is not under negative pressure relative to ambient, as it is during normal operating procedures.

5. The Cabinet does not have a separate exhaust blower speed control knob. To adjust exhaust air flow, remove supply blower speed control knob and with a small screwdriver, turn slotted inner shaft counter-clockwise to adjust exhaust blower speed so Cabinet pressure becomes slightly negative relative to the room. This is indicated by expansion of rubber gloves in Cabinet. Turn off blowers.

6. Turn on hot plate by reaching in with gloved hand. Boil water on the hot plate or remove one glove and inject steam into the work area with a steam line. Turn on the blowers for ten seconds only to disperse moisture until a 60 to 70 percent relative humidity is achieved throughout the Cabinet. Example: If the relative humidity is 35 per-

cent and temperature in the Cabinet is 30°C, a minimum 30 ml H_2O should be vaporized in the Cabinet to achieve 60 to 70 percent relative humidity. Here an allowance is made for the loss during the 15 second exhaust cycles. Humidity may also be measured with a hydrometer if available. If steam line is used, remove steam line and replace glove.

7. Open the container of paraformaldehyde and spread the 20 grams in an even layer in the frying pan. Adjust the frying pan to 450°F.

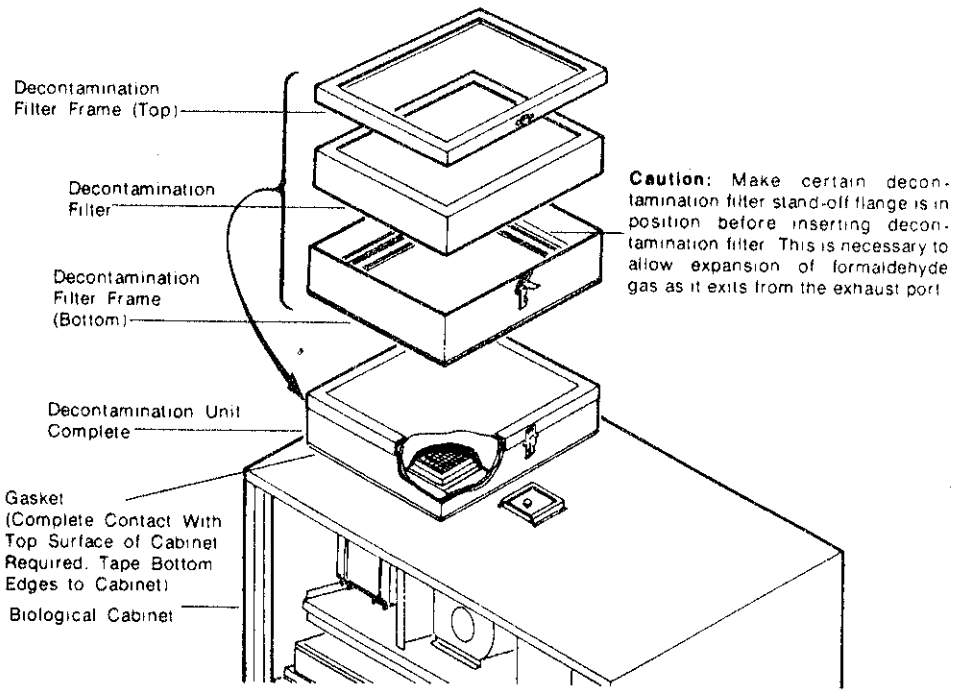
8. After half of the paraformaldehyde has depolymerized (by visual inspection), turn on the blowers for 15 seconds only, in order to disperse the formaldehyde gas. When all of the paraformaldehyde has been depolymerized, turn on the blowers for 15 seconds more. Turn off blowers, frying pan and hot plate.
Allow a minimum four hour contact time.

9. After the contact period, turn on the blowers. Make sure the Cabinet pressure becomes negative relative to the room (see Step 5 above). Remove one glove. With smoke stick in front of glove port, adjust exhaust speed until smoke is drawn into Cabinet. **Do not increase blower speed beyond this point.**

10. Allow Cabinet to purge through decontamination unit for a minimum of five hours, or until all formaldehyde gas is removed and oxidized before shut down and removal of HEPA filters.

11. Remove decontamination unit from top of Cabinet. Unhook side fastenings on filter frame and remove and discard used decontamination filter. Incineration is not necessary. Filter frame should be kept for future use.

12. **It is recommended that HEPA filters be removed by the authorized BBL service contractor.**



CAUTION:

(red & black)

WARNING: To avoid possible contact with infectious agents, DO NOT REMOVE FRONT PANEL until this cabinet has been decontaminated.

HEPA Filter Replacement

This procedure is normally performed by the authorized **BBL** service contractor.

A. Filter removal. Remove the front access panel and HEPA filter access panel to expose filters. Remove the filter clamping mechanism from the HEPA filters. Wearing rubber gloves, remove the supply HEPA filters and deposit them in plastic bags which can be sealed. Remove exhaust HEPA filter, and then pre-filter, in similar fashion. The filters sealed in plastic bags are then ready for incineration. Thoroughly clean filter holding frames.

Note that the filter media is very fragile and even finger pressure can cause leaks.

B. Filter installation. Install new filters in frames. Replace channels with flat face against filters. Install springs, washers and nuts in that order. Tighten nuts gradually, applying equal torque, until all springs are fully compressed. Do not tighten further. Insert new pre-filter in holder.

C. After the HEPA filters have been replaced, "on-site" testing procedures must be followed, so that the Cabinet can be recertified.

SURFACE MAINTENANCE

Formica and painted surfaces may be cleaned with soap and water. *Caution:* Nonabrasive special purpose plastic cleaners must be used on polycarbonate viewscreen surfaces. Never use abrasive cleaners. Mild soap and water, and isopropyl alcohol are two recommended cleaners. A light abrasive soap can be used on the stainless steel areas to help remove scratches and stains. Rub in the direction of the grain only.

ON SITE TESTING PROCEDURES

After the Biological Cabinet is shipped or the HEPA filters replaced, the Cabinet must be tested before use in order to assure that there are no filter or filter seal leaks. *These "on site" testing procedures detailed below are the responsibility of the authorized **BBL** service contractor.*

The American Association of Contamination Control (AACC) approved method of testing is to challenge the integrity of the HEPA filters by introducing an aerosol of dioctylphthalate (D.O.P.) smoke particles on the upstream side of the HEPA filters while using a photometer to detect the presence of D.O.P. smoke particles on the downstream side—and relating this data in terms of per cent penetration through the filter media. In addition, the Cabinet must be tested for leakage into the room; and the airflow characteristics must be adjusted.

HEPA FILTER TESTING

Equipment

The following equipment is recommended for use when testing the HEPA filters: Light scattering Photometer; Cold D.O.P. Generator; screwdriver; hex wrench set; 9/16" deep socket with ratchet wrench; 4" and 6" crescent wrenches; work light; hot wire anemometer; 3" diameter 8' length of flexible hosing; silicone RTV sealent; spare HEPA filters; masking tape; small step ladder.

Preparation (Refer to Biological Cabinet Illustration, page 13)

1. Open viewscreen; remove lights and perforated ceiling diffuser to expose faces of HEPA filters.
2. Close viewscreen; turn panel screws (No. 8) on bottom of front access panel to the left until panel is loose. Remove front access panel.

3. Locate removable plug (No. 6) on interior access panel. Remove plug.

4. Set up D.O.P. Generator so that the D.O.P. smoke is fed directly into the intake of the supply blower (See No. 3 on drawing, page 13). Tape hose in position which allows viewscreen to be opened. Leave front access panel off Cabinet.

5. With Cabinet operating as for normal work procedures, turn on smoke generator and check to see if smoke is entering supply blower; turn off generator.

Testing

1. Set up photometer and calibrate per manufacturer's instructions.

2. Hold photometer sampling probe to hole in interior access panel in order to sample upstream smoke concentration in supply plenum (See No. 5 on drawing, page 13).

3. Adjust D.O.P. Generator concentration and the photometer sensitivity such that a "full scale" or 100% reading is obtained upstream of the HEPA filter.

4. "CLEAR" the photometer and check "ZERO" level. Set sensitivity to measure .01% of the "FULL SCALE" reading.

5. Carefully probe the faces of the HEPA filters (slowly) about one inch from the filter surface. Probe edges of the filters to check for filter seal leaks; if the probe meter needle moves past the ten mark (first large index mark), this indicates a leak. Mark leaking areas with masking tape.

6. To test exhaust HEPA filter, remove hose from supply blower intake and place in work area so smoke feeds into rear return grill (See No. 15 on drawing, page 13). Replace front access panel; leave viewscreen in down position. When checking exhaust HEPA filter, put probe into position over exhaust HEPA filter face (No. 18, Page 13); set photometer at .01% and scan the entire area of the exhaust screen.

FILTER REPAIRS

1. To seal a media leak, remove filter from plenum. Set filter on a cellside. Place light behind media and visually inspect for a leak. If the hole appears to be more than 1/2" into the media from the filter surface, it will be necessary to use glue poured into the media. Filter glue recommended is: Rulabond No. 2277, manufactured by Rubber Latex Co. of America, Clifton, NJ 07013.

2. If gasket is not properly glued to cellsides, air can flow between the surfaces. Use contact cement to bond. (See drawings 1 and 2, page 12.)

3. Because of shipping movement, the hard glue which holds the media to cellside may crack. Leaks between the cellsides and media are patched with either silicone sealant or glue. Filter should be raised on edge opposite leaking edge if glue is used. (See drawing 3, page 12.)

4. If a "surface" media leak is discovered,* silicone caulking is forced down into media at least 3/8". Forcing caulking in with fingers. Do not force tip of caulking gun into the media. Run bead of caulking along media 3/4" in each direction of leaking surface. Also caulk adjacent rows of media. (See drawing 4, page 12.)

5. If media leak is in "interior" of filter, it is repairable only by pouring filter glue into area of leak. To seal leak, pour glue from side; let stand 30 minutes; turn filter over and pour from other side; let stand an additional 30 minutes.

CABINET LEAKAGE TESTS

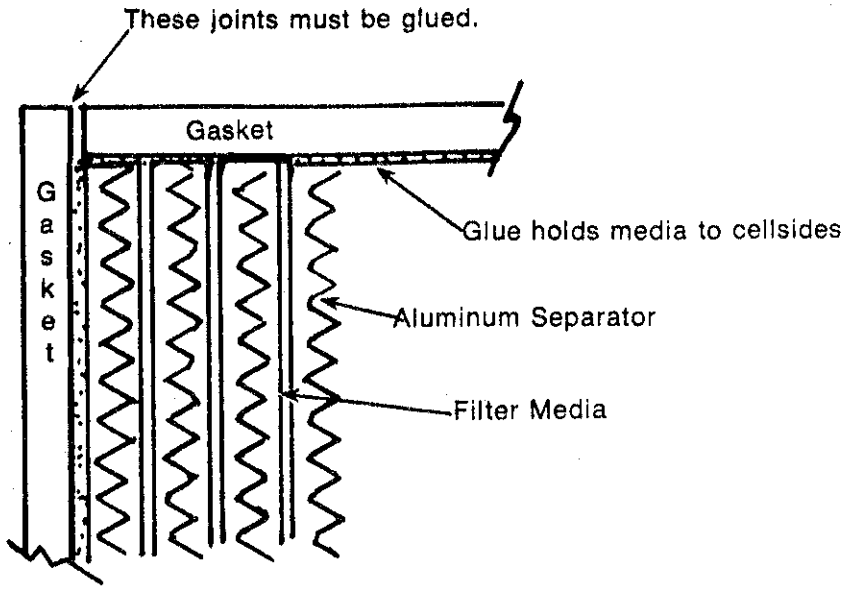
Make certain access panels are in position and viewscreen is down. With smoke entering rear return grill, set photometer at 1.0% and "TEST." Allow the probe to pull in ambient air; determine the meter needle position for ambient contamination. This is to be considered "zero" and a leak is any reading above ambient level. Probe the metal seams and joints on the Cabinet, especially in the area around the exhaust plenum. Leaking areas may be sealed with silicone R.T.V. sealant.

AIRFLOW TESTS*

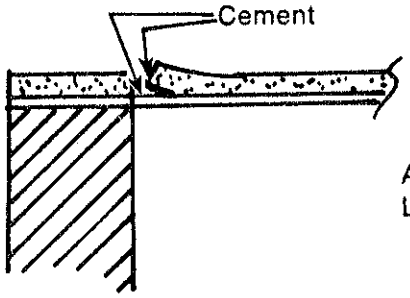
1. With a hot wire anemometer, measure the air velocity 6" below the ceiling diffuser in the work area. Take 10 readings at various locations beneath the ceiling diffuser and calculate the average velocity in linear feet per minute. Adjust the supply blower speed to provide 90 ± 20 lf/m. With a hex wrench, turn the set screw beneath the flowmeter on control panel until ball is centered in the black zone.
2. Remove the blower speed control knob (No. 10, page 13) to expose slotted inner shaft. Turn the inner shaft with a small screwdriver, thus adjusting the exhaust blower speed until smoke is drawn into the front return grill (No. 14, page 13), and the velocity of air leaving the exhaust filter measures 350 – 400 lf/m with a hot wire anemometer.

***NOTE:** A ring stand and clamp should be used take velocity readings.

1.

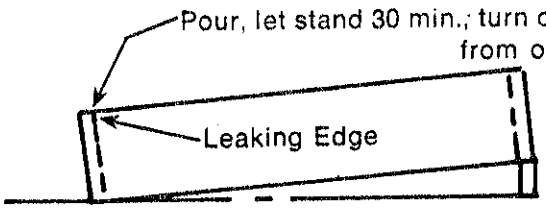


2. Gasket Joints



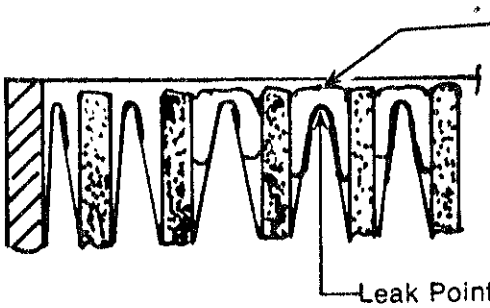
Apply contact cement to end of Gasket.
Let cement dry, press Gaskets together.

3. Cellside Leak



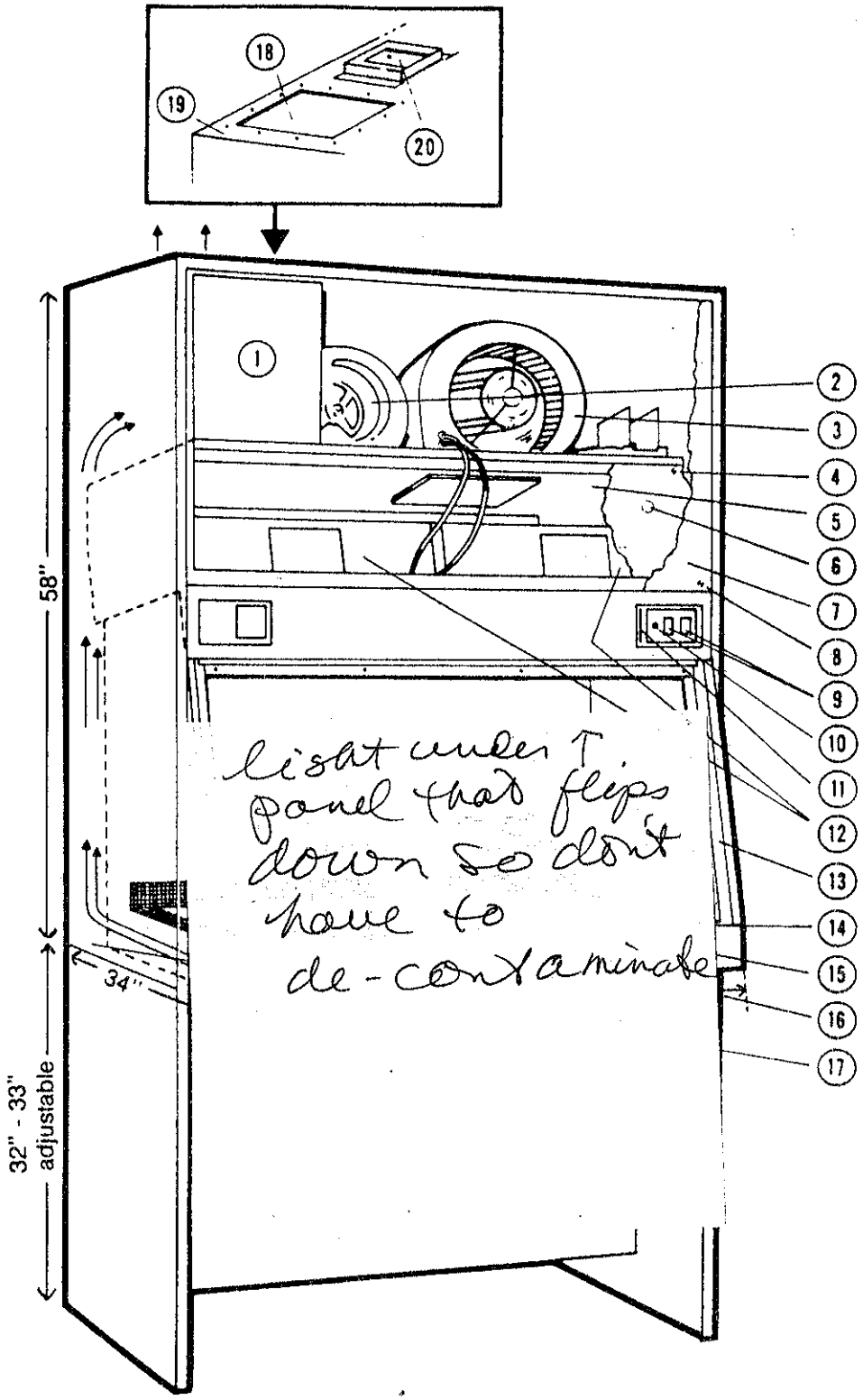
Note: Use same procedure for deep media leaks.

4. Media Surface Leak



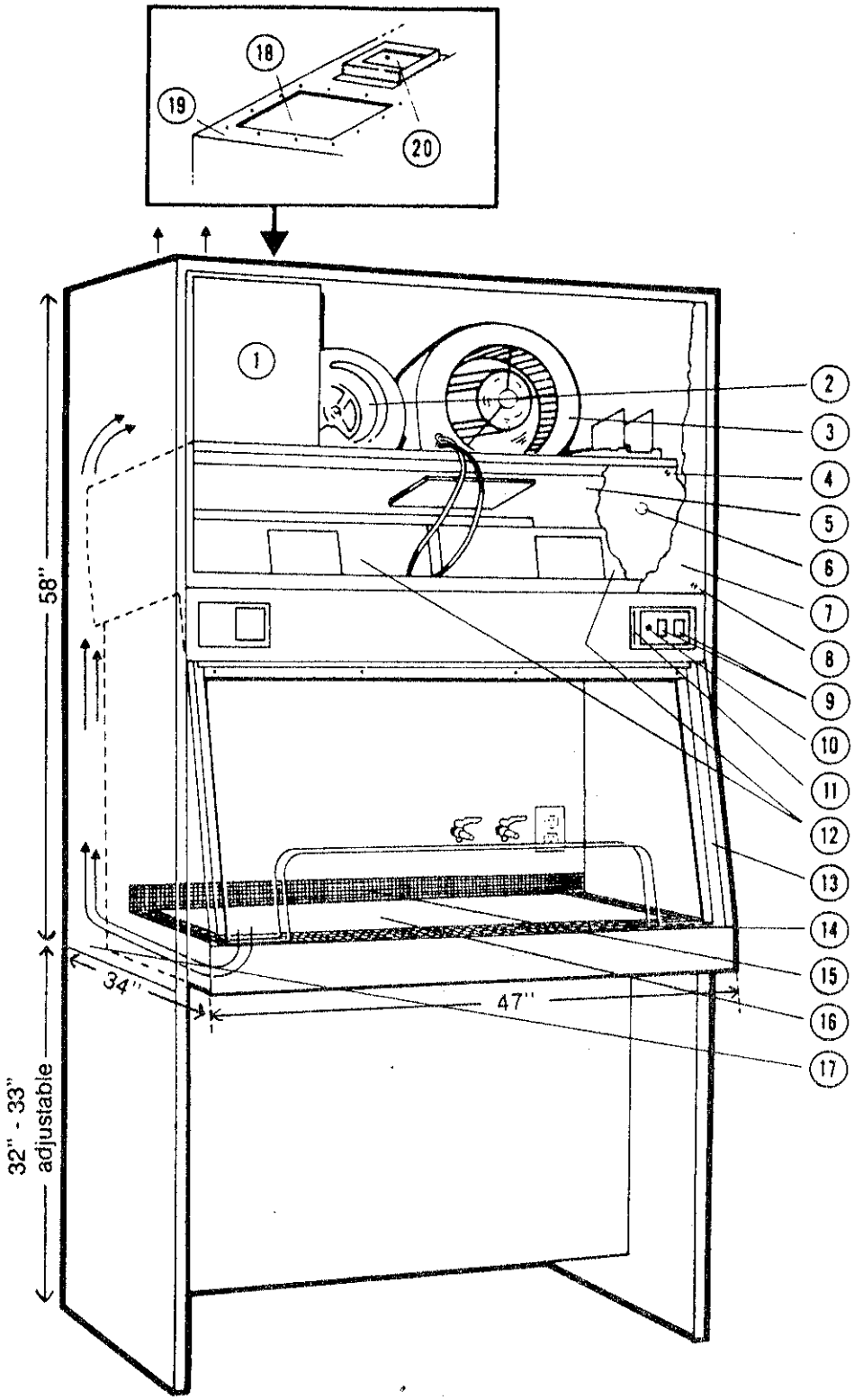
Force Silicone down into media by finger wiping. Keep tube tip away from media.

BIOLOGICAL CABINET ILLUSTRATION



1. Exhaust Plenum
2. Exhaust Blower
3. Supply Blower (Intake Side)
4. Filter Access Panel
5. Supply Plenum
6. Removable Plug For Sampling
7. Front Access Panel
8. Front Access Panel Screw
9. Control Panel Switches (Blowers and Lights)
10. Supply Blower Speed Control (Exhaust Blower Speed Control: Remove Knob).
11. Work Area Air Velocity Indicator
12. Supply HEPA Filters
13. Viewscreen
14. Front Return Grill
15. Rear Return Grill
16. Solid Work Surface/ WORK Deck Assy
17. Return Plenum
18. Exhaust HEPA Filter Protective Screen
19. Exhaust Plenum Seams
20. Air Intake and prefilter

BIOLOGICAL CABINET ILLUSTRATION



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18. Exhaust HEPA Filter Protective Screen
19. Exhaust Plenum Seams
20. Air Intake and prefilter

TROUBLE-SHOOTING

The procedures listed below may help locate malfunctions which may occur with the Biological Cabinet, and may permit correction of these malfunctions in the shortest possible time. It is recommended that the authorized **BBL** service contractor be contacted in the event a malfunction occurs.

To locate the source of any difficulty proceed in order under the specific problem area.

CAUTION:

(red & black)

WARNING: To avoid possible contact with infectious agents, DO NOT REMOVE FRONT PANEL until this cabinet has been decontaminated.

Air Supply Inoperative

1. Check power supply to Cabinet for circuit failure.
2. After decontamination remove front access panel.*
3. Cycle blower switch off and on to see if blowers move.
4. Turn internal (if equipped) and external speed controls to full speed position. If blowers operate, the SCR (Silicone Control Rectifier) circuit is defective.
5. Place power switch in "OFF" position; wait 10 minutes for thermal overload on motors to reset. While waiting, check blower wheels for free rotation. Turn switch on.
6. Use enclosed electrical schematic to trace wiring for continuity test. Replace defective equipment.

Exhaust Air Unbalanced

This is demonstrated by holding a smoke stick at the access opening. If room air is not entering the front return grill:

1. Make sure exhaust blower is running under its own power.
2. Adjust blower speed control to obtain 350 – 400 lf/m air flow measured at exhaust filter face.
3. Check gasket between blower and plenum for tight seal.
4. Check exhaust discharge for obstructions.
5. Proceed as in "Air Supply Inoperative" section.

***NOTE:** Before front panel is removed, the decontamination procedure must be followed, and the Cabinet should be recertified after filter replacement. Normally filter replacement and recertification will be handled by the authorized **BBL** service contractor. The testing procedures necessary for certification are described in the "On Site Testing Procedures" section on page 9.

Alarm System

The exhaust blower is wired so that in the event the blower should fail, an audible alarm (buzzer) will be activated. To check, remove supply blower control knob to expose slotted inner shaft (exhaust blower control). Turn inner shaft full left to activate buzzer. If buzzer is not heard, follow procedures in "Air Supply Inoperative" section.

Low Air Velocity

1. Check blower-plenum gaskets for tight seal.
2. Adjust supply blower speed.
3. Check power supply for low voltage.
4. If blower operation proves normal, replace filters. Filters are filled and must be replaced.*

Excessive Vibration or Noise

1. After decontamination open front panel; check blower mounting for security.
2. Check electrical subpanel for loose parts.
3. Check supporting members for tightness.
4. Check exhaust plenum access door for tight fit.
5. Check HEPA filter mounting.*

CAUTION:

(red & black)

WARNING: To avoid possible contact with infectious agents, DO NOT REMOVE FRONT PANEL until this cabinet has been decontaminated.

Nonlaminar Flow

1. Make sure no large objects are blocking the return air openings.
2. Check for low or high air velocity, as described in "Low Air Velocity" section.
3. Check diffuser screen for proper installation and damage.
4. Check surrounding area for excessive drafts, etc., which might disrupt flow patterns in the unit.

Inoperative or Low Illumination

1. Inoperative
   a. Check lamp switch, wiring.
   b. Using wiring diagram, trace circuit.
   c. Replace lamps.
   d. Replace ballast.
2. Low light level
   a. Replace lamps.
   b. Check power supply voltage.
   c. Replace ballast.

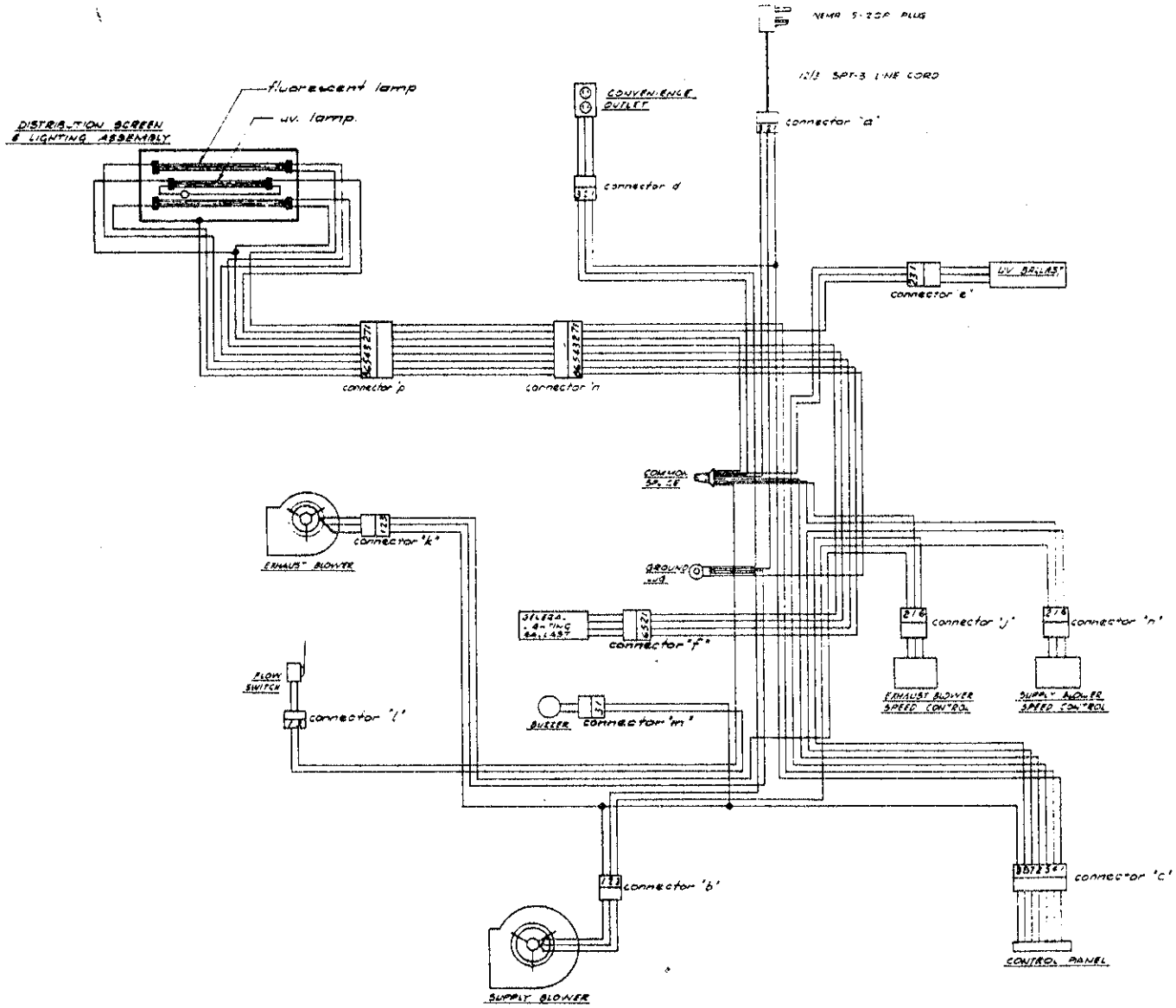
Troubleshooting Electrical System

(See wiring and electrical diagrams, page 16-17)

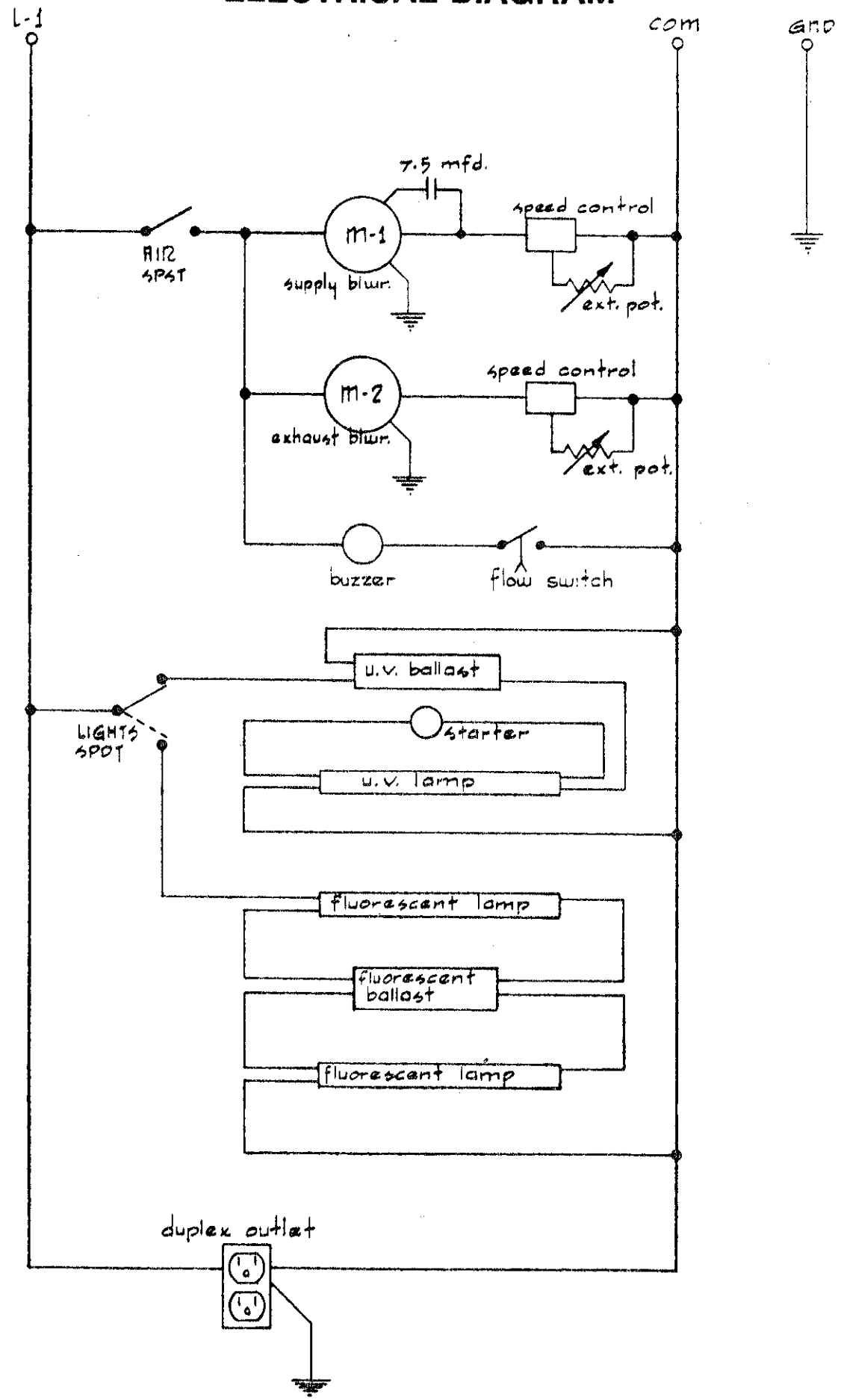
Most of the electrical components of the Cabinet are located in the supply blower compartment.

***NOTE:** Before front panel is removed, the decontamination procedure must be followed, and the Cabinet should be recertified after filter replacement. Normally filter replacement and recertification will be handled by the authorized BBL service contactor. The testing procedures necessary for certification are described in the "On Site Testing Procedures" section on page 9.

WIRING DIAGRAM



ELECTRICAL DIAGRAM



BIBLIOGRAPHY ON USE OF LAMINAR AIRFLOW EQUIPMENT

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2. Coriell, Lewis L., and McGarrity, Gerald J. 1968. "Biohazard Hood to Prevent Infection During Microbiological Procedures." *Applied Microbiology*, Vol. 16, No. 12:1895-1900.

3. Favero, Martin S., and Berquist, Kenneth R. 1968. "Use of Laminar Air-Flow Equipment in Microbiology." *Applied Microbiology*, Vol. 16, No. 1:182-183.

4. Federal Standard No. 209B, U.S. Government Printing Office, 1973. Superseding Federal Standard No. 209A, 1966.

5. Kreider, John W. 1968. "Some Practical Aspects of the Use of Laminar Airflow Systems for Tissue Culture Manipulations." *Applied Microbiology*, Vol. 16, No. 11:1804-1805.

6. McDade, Joseph J.; Sabel, Fred L.; Akers, Ronald L., and Walker, Robert J. 1968. "Microbiological Studies on the Performance of a Laminar Airflow Biological Cabinet." *Applied Microbiology*, Vol. 16, No. 7:1086-1091.

7. Staat, Robert H., and Beakley, John W. 1968. "Evaluation of Laminar Flow Microbiological Safety Cabinets." *Applied Microbiology*, Vol. 16, No. 10:1478-1482.

BBL BIOLOGICAL CABINET METRIC EQUIVALENTS

Access opening height	- 7"	- 17.78 cm
Work area	w. 44' x d. 26" x h. 21"	- w. 111 cm. x d. 58.5 cm. x h. 52 cm.
Adjustable base support	- 32" - 33"	- 81.28 cm - 83.82 cm
Cabinet height	- 58"	- 147.32 cm
Cabinet depth	- 34"	- 86.36 cm
Cabinet width	- 47"	- 119.38 cm

GLOSSARY OF TERMS

Federal Standard 209B Class 100—Federal Standard 209B prescribes air cleanliness classes and certain other environmental air conditions required for achieving and maintaining the levels of environmental cleanliness specified in the product specifications. *Class 100*—Air cleanliness class where particle count does not exceed a total of 100 particles per cubic foot (3.5 particles per liter) of a size 0.5 micron and larger.

D.O.P.—Dicotylphthalate: oil used to generate aerosol of particles used to challenge HEPA filters.

HEPA filter—High efficiency particulate air filter unit; specifically filters with minimum efficiency of 99.97% determined by the homogenous D.O.P. method of airflows of 100% and 20% of the rated flow capacity of the filter.

Laminar airflow—Airflow in which the entire body of air within a confined area moves with uniform velocity along parallel flow lines.

cf/m—Cubic feet per minute: unit of measurement for air velocity.

lf/m—Linear feet per minute: unit of measurement for air velocity.

Plenum—A chamber for conveying or containing air.

Aerosol—a colloid of liquid or solid particles suspended in a gas, usually air.

Biohazard—A contraction of the words Biological and Hazard; infectious agents presenting a risk or potential risk to the well being of man, or other animals, either directly through infection or indirectly through disruption of the environment.

NSF Standard 49—National Santitation Foundation Standard pertaining to Class II (Laminar Flow) Biohazard Cabinetry. This standard applies to cabinetry designed to minimize biohazards inherent in low and moderate risk biological agents.

Class II—NSF Standard 49 defines a Class II cabinet as "a ventilated cabinet for personnel and product protection having an open front with inward air flow for personnel protection, and HEPA filtered mass recirculated air flow for product protection. The cabinet exhaust air is filtered through a HEPA filter.

Risk Levels

Low Risk—Risk level of agents and/or operation having minimal effect on personnel, other animals, or plants under ordinary conditions of use. This classification is restricted to all etiological agents designated Class I by the U.S. Department of HEW, Center for Disease Control.

Moderate Risk—Risk level of agents and/or operations that require special conditions for control or containment because of:

a. Known pathogenicity to personnel, other animals, or plants

b. Concentration

c. Genetic alteration, synergistic effect with other materials

This classification includes all etiologic agents designated Class II or Class III by the U.S. Department of HEW, Center for Disease Control and oncogenic viruses specified as moderate risk by the National Cancer Institute.

High Risk—Risk level of agents and/or operations that require additional control measures beyond those for moderate risk. These are agents or operations with various dangerous combinations of the following characteristics:

a. Infection produced by low doses

b. High mortality

c. Potential for spread outside the laboratory

d. Concentration

e. Release of microbial aerosols

f. Genetic alteration or genetic recombination that significantly increases potential pathogenicity or spread

This classification includes all etiological agents designated Classes IV and V by the U.S. Department of HEW, Center for Disease Control, and oncogenic viruses classified as high risk by the National Cancer Institute.

BIOLOGICAL CABINET

REPLACEMENT PARTS

ITEM	QUANTITY	PART NUMBER*
Exhaust Blower Assembly	1	21462
Supply Blower Assembly	1	20003
Fluorescent Lamb F42T12CW)	2	64650
Germicidal Lamp (G30T8)	1	60265
Lamp Ballast	1	20077
U.V. Ballast	1	60202
15 Amp Triac Assembly Units	2	60446
Control Panel Assembly	1	20389
Prefilter (CHP) 6" x 6" x 1"	1	60034
HEPA Filter (supply) 20" x 22-3/8" x 5-7/8"	2	60004
HEPA Filter (exhaust) 12" x 12" x 11-7/8"	1	60002
Distribution Screen	1	20343
Viewscreen	1	20007
Glove Port Panel	1	60324
Neoprene Gloves	2	60438
Air Cock	1	60203
Gas Cock	1	60119
Buzzer Assembly	1	20297

*These parts are available directly from:

ENVIRCO
6701 Jefferson, N. E.
Albuquerque, NM 87109
TELEPHONE: (505) 345-3561
(TOLL-FREE): (800) 545-6598
(FAX): (505) 345-8875

BBL BIOLOGICAL CABINET MANUFACTURER'S LIMITED WARRANTY

The **BBL** Biological Cabinet is manufactured by Envirco, Division of Bio-Dynamics, Inc., of Albuquerque, New Mexico, and is warranted to be free from defects in material and workmanship. This warranty is subject to the following qualifications, conditions and limitations set forth below to provide information concerning the duration and extent of this warranty, the procedure to be taken to obtain performance, and other information concerning the warranty policy.

This warranty is valid only in the 48 contiguous United States, covers parts and labor only, and extends for a period of one year from the date of On-Site Certification by the manufacturer or his Authorized Service Contractor. This warranty applies only to the original purchaser of the **BBL** Biological Cabinet. The fluorescent light tubes and ultraviolet lamp are not covered by this warranty. Defects, malfunctions, failure or damage of the **BBL** Biological Cabinet caused by improper, unreasonable, or negligent use or abuse by the consumer are excluded from this warranty. This warranty is also void if the serial number has been removed or the cabinet has been accidently damaged.

To secure performance of this warranty and repair of the **BBL** Biological Cabinet, the following procedures should be taken:

1. To put this warranty into effect, the **BBL** Biological Cabinet must be tested and certified, on-site, by the manufacturer or his Authorized Service Contractor.

2. To make repairs or replacements within the terms of this warranty, contact: ENV Services, P.O., Box 6468, Albuquerque, NM 87197 Telephone: 800/545-6902

Upon compliance with the above procedure, all warranted defects will be repaired (at no additional charge to the consumer) as long as the **BBL** Biological Cabinet has not been accidentally damaged, tampered with or negligently used as described above.

BBL Microbiology Systems and Envirco, Division of Bio-Dynamics, Inc. make no warranty expressed or implied except as stated above. For **BBL** Biological Cabinets sold or located outside the 48 contiguous United States, Envirco assumes liability only for the replacement of defective part(s), excluding labor.

(NOTE: On-Site Test and Certification of the **BBL** Biological Cabinet by the manufacturer or his Authorized Service Contractor is a precondition to warranty service or performance. Under no circumstances should the user operate the **BBL** Biological Cabinet prior to its On-Site Certification.)

The cabinet shall be an open front, Laminar Airfow unit suitable for work with low and moderate risk biohazards. Protection for both the operator and for the procedure being performed in the work area shall be provided. Exhaust air shall be filtered through a self-contained 12" deep (nominal) high efficiency particulate air (HEPA) filter.

The cabinet shall be 47" wide and suitable for mounting on a laboratory bench or counter. It shall require only 120V, 60 Hz. electrical power for operation. A base stand accessory with adjustable leveling feet shall be available to match the cabinet and form a floor console unit. Overall height of the unit, when mounted on the base support, shall be 90", adjustable to 91" using the leveling feet. Total depth of the unit shall be 34".

The product shall incorporate a negative pressure design to assure that no contaminated plenums are at positive pressure to the laboratory during cabinet operation.

A high velocity air barrier shall be provided across the front access opening of the cabinet. The air curtain shall be formed by channeling HEPA filtered air between a double Lexan® or Plexiglass® viewscreen. The viewscreen shall be U.V. stablized and hinged for access into the work area. A minimum opening height of 7" shall be provided when the viewscreen is closed. The viewscreen shall be slanted to improve visibility into the work area.

HEPA supply and exhaust filters shall have a minimum efficiency of 99.97% when handling 0.3 micron particles (DOP test method). The HEPA filters shall be serviceable through a removable front panel and mounted with a compression spring clamping system. On-site testing and certification of the cabinet shall be performed (at no additional cost) to assure proper operation in accordance with specifications. A one year limited parts and laboratory warranty shall be provided and initiated upon completion of on-site testing and certification of the cabinet. Extended warranty and service shall be offered.

Construction shall be of 18 gauge steel finished with a textured polyurethane paint. Color sahll be Cortex blue and white. Interior walls shall be #304 stainless steel. The work surface shall be solid formica laminated over perforated stainless steel. A drip pan shall be provided under the work surface and equipped with a drain plug for convenient clean up in the event of gross spills.

Work area services shall include a duplex electrical outlet equipped with drip-proof cover, on the right rear wall of the cabinet. Two laboratory petcocks with rear stub-out locations shall be provided adjacent to the electrical outlet.

Motors shall be single phase, 115V, 60 Hz., thermally protected, automatic reset type with direct drive blowers. Separate motor/blowers and variable speed controls shall be provided for both the supply and exhaust airflow.

An externally adjustable damper shall be provided to regulate cabinet make-up air. This inlet shall be equipped with a prefilter and located on top of the unit adjacent to the exhaust port.

Air flow monitoring shall be provided by a front mounted Rotometer®. Failure of the air supply system or an exhaust airflow blockage will be indicated by an audible alarm system.

Work area illumination shall be provided by a fluorescent lamp located on the clean side of the HEPA filter and controlled via a separate switch on the unit control panel. The cabinet shall also be equipped with a self-contained U.V. lamp, complete with eye shield and appropriate labels to warn the operator against working while the U.V. lamp is on. The lamp switch will also operate so as to prohibit simultaneous use to the flourescent and U.V. lamps.

An 8' long single power cord with a NEMA S-20 cap, three-prong plug shall be provided. The cord shall exit form the rear of the cabinet. The product shall bear the listing seal of the Los Angeles City Electrical Testing Laboratory and the Canadian Standards Association (CSA).

Dimensions of the cabinet shall be as follows:

Overall height	...	58"
(With/base support	...	90" - 91")
Overall depth	...	34"
Overall width	...	47"
Workarea height	...	21"
Workarea depth	...	26"
Workarea width	...	44"
Operating weight	...	430 lbs.

The cabinet shall be Envirco catalog #10006.
The matching base support stand shall be Envirco catalog #10007. An optional glove port panel gloves shall be offered; Envirco catalog #60324.