

Labgard Class II, Laminar Flow Biological Safety Cabinet

Models

NU-440-300E/400E/500E/600E

NU-440-300G/400G/500G/600G

Bench/Console

Operation Manual

December, 2007

(Series 50 and Higher)

Revision 1



(NU-440-300E/400E/500E/600E, 230 VAC, 50 Hz)

Manufactured by:

NuAire, Inc.

2100 Fernbrook Lane

Plymouth, Minnesota USA 55447

Toll Free: 1-800-328-3352

In MN: 763-553-1270

Fax: 763-553-0459

Congratulations!

You have just purchased one of the finest Laminar Flow Biological Safety Cabinets available. With proper care, maintenance (certification), and laboratory procedure, this cabinet will give you years of product and personnel protection from particulate contaminants as prescribed in NSF/ANSI 49 and EN12469. Please read this manual carefully to familiarize you with proper installation, maintenance and operation of the cabinet. Other reference and guideline materials are available through the following web sites.

www.hc-sc.gc.ca
www.cdc.gov/od/ohs/
www.absa.org
www.absa-canada.org
www.ebsa.be
www.inspection.gc.ca
www.who.int
www.biosafety.be
www.hse.gov.uk
www.nsf.org
www.cetainternational.org
www.osha.gov/dts/osta/
www.nuaire.com

ABOUT THIS OPERATION MANUAL

The information contained in this manual is intended to reflect our current production standard configuration model along with the more frequently purchased options. Any unique additions/modifications/shop drawings are appended in the back flap of this manual, along with any modifications and/or additions to procedures as outlined in this manual. A copy of the original factory test report is also appended to this manual. In case this manual and/or test report is lost or misplaced, NuAire retains a copy in our files. A replacement copy can be obtained by calling or writing NuAire, Inc. stating the model number and serial number and a brief description of the information desired.

**Labgard Class II, Laminar Flow
Biological Safety Cabinet**

Models NU-440-300E/400E/500E/600E
NU-440-300G/400G/500G/600G

Operation Manual

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BCD-12135 NU-440-300E/G Specification Drawing
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Labgard Class II, Laminar Flow Biological Safety Cabinet

Models

NU-440-300E/400E/500E/600E

NU-440-300G/400G/500G/600G

MANUFACTURED BY:

NuAire, Inc. - Plymouth, Minnesota, U.S.A.

1.0 General Information

1.1 Description

The LABGARD Model NU-440E/G Laminar Flow Biological Safety Cabinet (LFBSC) is a bench/table top model, optionally available with a base support stand, for operation as a console model.

The Laminar Flow Biological Safety Cabinet, (LFBSC) is a product resulting from the development of the "laminar flow" principle and the application of environmental controls as required in the field of biological research or chemical containment. The LFBSC, when used with proper technique, is an effective laboratory aid in obtaining the optimum control over product quality while reducing the potential for exposure of both product and personnel to airborne biological or particulate chemical agents in low to moderate risk-hazard research and drug preparation or product operations, as prescribed by the Center for Disease Control (CDC) Atlanta, Georgia.

The NU-440 bench LFBSC meets the requirements of a Class II since the cabinet conforms to the following requirements:

1. Maintains a minimum inflow velocity of 100 LFPM (.51mps) through the work access opening.
2. Has HEPA filtered downflow air that is mixed with the inflow air from a common exhaust plenum.
3. Discharges a percentage of air to the outside atmosphere after HEPA filtration.
4. Has all biologically contaminated ducts and plenums under negative pressure or surrounded by negative pressure.

Cabinets used for work with minute quantities of non-flammable or explosive volatile toxic chemicals and traces amounts of radionuclides required as an adjunct to microbiological studies must be exhausted through properly functioning exhaust canopies.

1.2 Safety Instructions

These safety instructions describe the safety features of the LABGARD Model NU-440E/G LFBSC. The safety cabinet has been manufactured using the latest technological developments and has been thoroughly tested before delivery. **However, the cabinet may present potential hazards if it is not installed and used as instructed for its intended purpose or outside of operating parameters.** Therefore, the following procedures must always be observed:

- The safety cabinet must be operated only by trained and authorized personnel.
- For any operation of this unit, the operator must prepare clear and concise written instructions for operating and cleaning, utilizing applicable safety data sheets, plant hygiene guidelines, and technical regulations, in particular.
 - Which decontamination measures are to be applied for the cabinet and accessories?
 - Which protective measures apply while specific agents are used?
 - Which measures are to be taken in the case of an accident?
- Repairs to the device must be carried out only by trained and authorized expert personnel.
- Keep these operating instructions close to the unit so that safety instructions and important information are always accessible.
- Should you encounter problems that are not detailed adequately in the operating instructions, please contact your NuAire Representative of NuAire technical Services.

1.3 Explanation of Symbols



WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION:

CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

CAUTION

CAUTION used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.



Potential electrical hazard, only qualified person to access.



NOTE:

Used for important information.



Biohazard



Flammable Hazard



Hazardous Gases! Personal Protection Equipment Required.



Ground, Earth

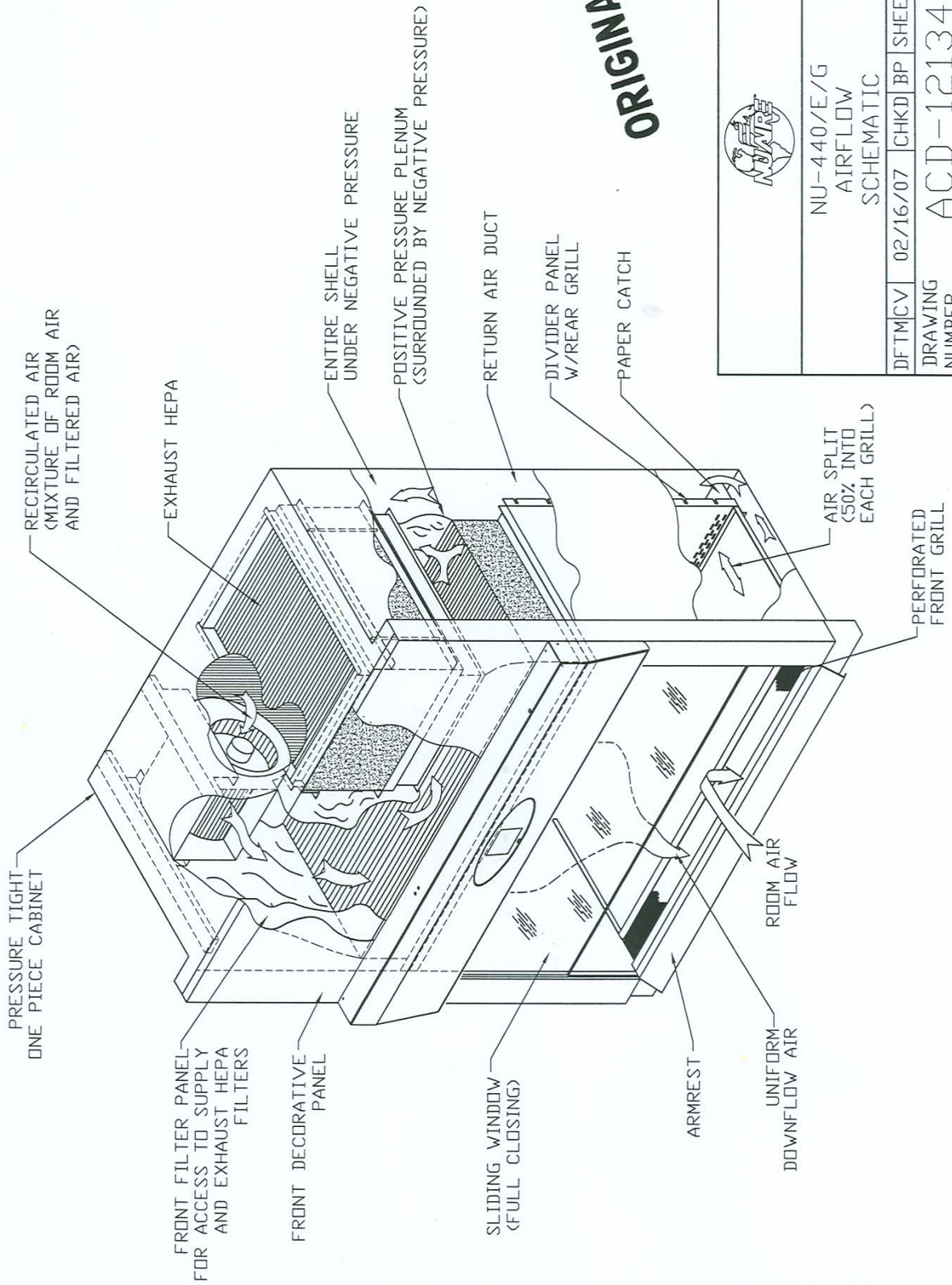


Lead Free



Chemical Hazard

REV	ECD	DESCRIPTION	DATE	DRFT	CHKD
A	9870	RELEASED TO PRODUCTION	8/15/07	BM	BP



ORIGINAL



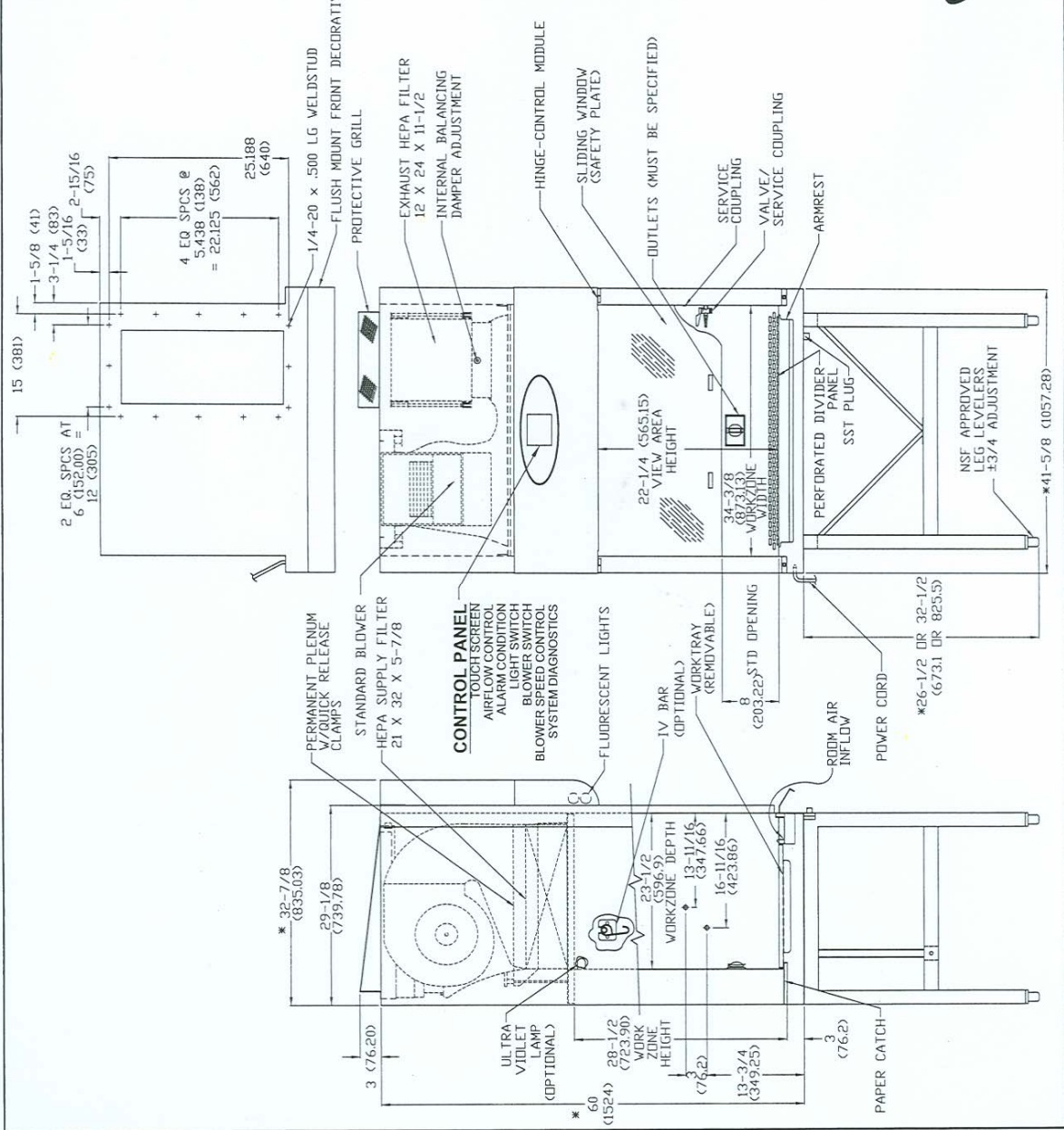
NU-440/E/G
AIRFLOW
SCHEMATIC

DFTM	CV	02/16/07	CHKD	BP	SHEET 1	DF 1
DRAWING NUMBER				ACD-12134		A

2.0 Models & Features

The model NU-440E/G, Class II, Laminar Flow Biological Safety Cabinet is manufactured in four sizes: 3 ft.(.8m), 4 ft.(1.2m), 5 ft.(1.5m), and 6 ft.(1.8m).

REV	ECD	DESCRIPTION	DATE	DRF T	CHKD
A	9870	RELEASED TO PRODUCTION	8/15/07	BM	BP

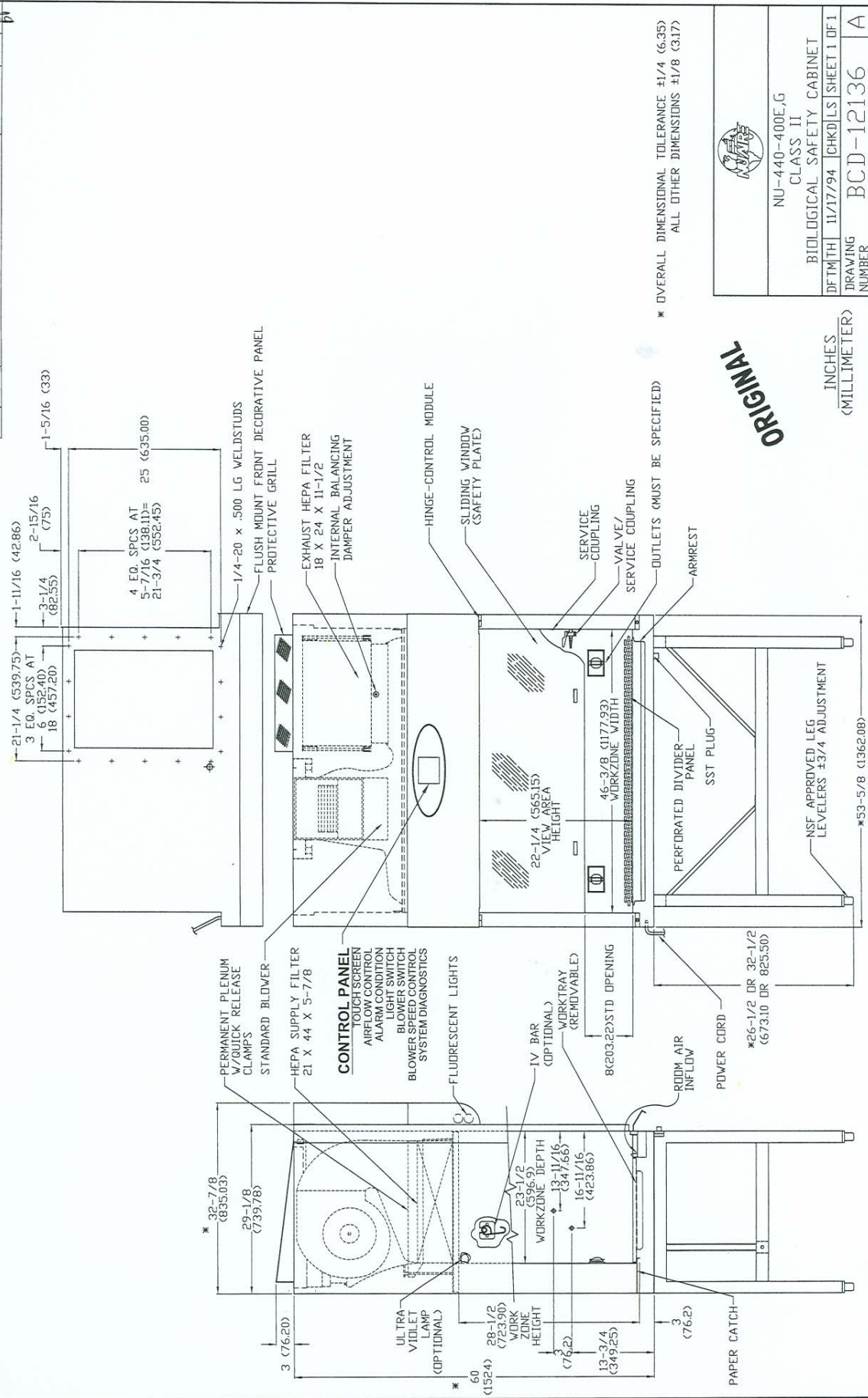


* OVERALL DIMENSIONAL TOLERANCE ±1/4 (6.35)
 ALL OTHER DIMENSIONS ±1/8 (3.17)

NU-440-300E,G CLASS II BIOLOGICAL SAFETY CABINET	
DATE	11/17/94
DRWING NUMBER	BCD-12135
SHEET	1 OF 1
INCHES (MILLIMETER)	A

ORIGINAL

REV	ECO	DESCRIPTION	DATE	DRFT	CHKD
A	9870	RELEASED TO PRODUCTION	8/15/07	BM	BP

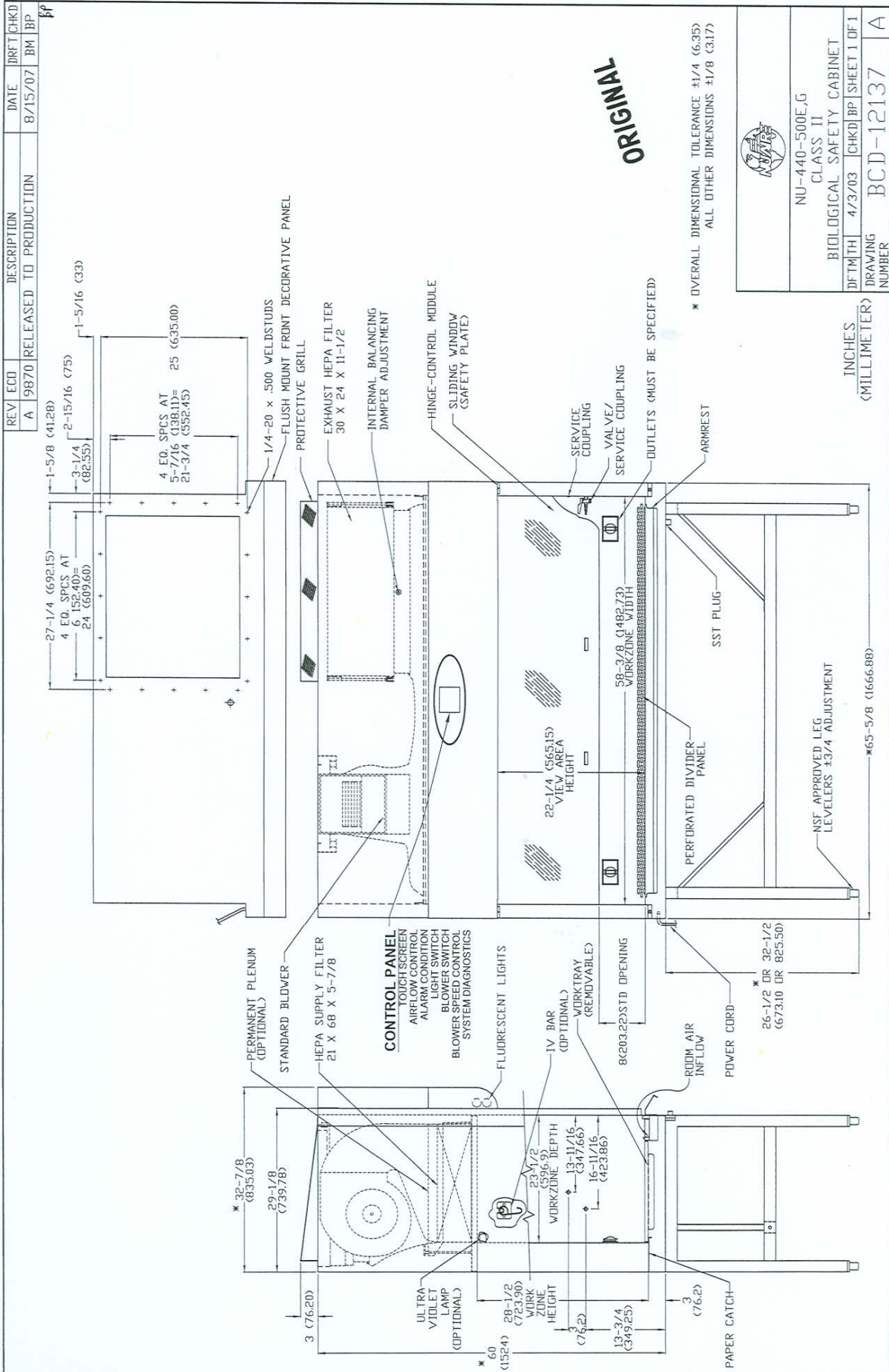


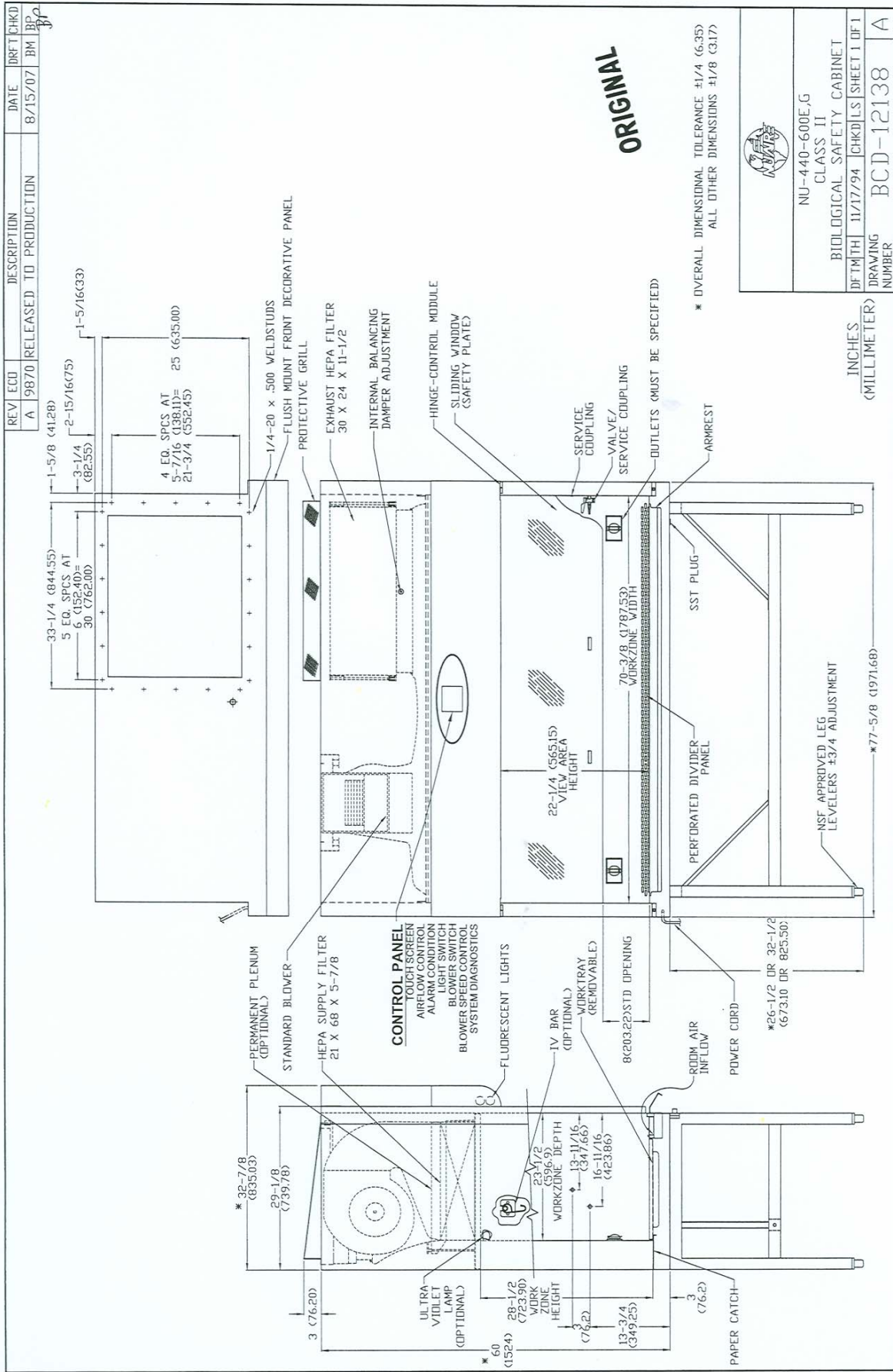
* OVERALL DIMENSIONAL TOLERANCE ±1/4 (6.35)
ALL OTHER DIMENSIONS ±1/8 (3.17)

ORIGINAL

INCHES
(MILLIMETER)

NU-440-400E,G CLASS II BIOLOGICAL SAFETY CABINET	
DFMTH	11/17/94 (CHKD)LS
DRAWING NUMBER	BCD-12136
A	





3.0 Warranty

NuAire, Inc. warrants that it will repair F.O.B. its factory or furnish without charge F.O.B. its factory a similar part to replace any material in its equipment within 36 months after the date of sale if proved to the satisfaction of the company to have been defective at the time it was sold provided that all parts claimed defective shall be returned, properly identified to the company at its factory, charges prepaid. Factory installed equipment or accessories are warranted only to the extent guaranteed by the original manufacturer, and this warranty shall not apply to any portion of the equipment modified by the user. Claims under this warranty should be directed to NuAire, Inc. setting forth in detail the nature of the defect, the date of the initial installation and the serial and model number of the equipment.

This warranty shall not apply to any NuAire product or part thereof which has been subject to misuse, abuse, accident, shipping damage, improper installation or service, or damage by fire, flood or acts of God. If the serial number of this product is altered, removed or defaced as to be illegible, the Warranty shall be null and void in its entirety.

The warranty is for the sole benefit of the original purchaser and is not assignable or transferable. Prior to returning any item, for any reason, contact NuAire for a Return Authorization Number. This number must accompany all returns. Any product shipped to NuAire without this number will be returned refused shipment or collect freight.

4.0 Shipments

NuAire takes every reasonable precaution to assure that your LABGARD cabinet arrives without damage. Motor carriers are carefully selected and shipping cartons have been specially designed to insure your purchase. However, damage can occur in any shipment and the following outlines the steps you should take on receipt of a NuAire LABGARD cabinet to be sure that if damage has occurred, the proper claims and actions are taken immediately.

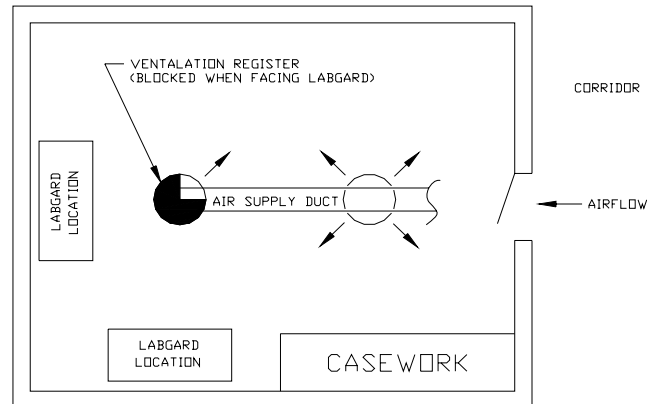
4.1 Damaged Shipments

- 4.1.1** Terms are factory, unless stated otherwise. Therefore, it is important to check each shipment before acceptance.
- 4.1.2** If there is visible damage, the material can be accepted after the driver makes a notation on the consignee's copy of the freight bill. Then an inspection must be made to verify the claim against the carrier. This inspection is the basis of your filing the claim against the carrier.
- 4.1.3** If concealed damage is found it is absolutely necessary to NOTIFY THE FREIGHT AGENT AT ONCE and request an inspection. Without this inspection, the transportation company may not accept a claim for loss or damage. If the carrier will not perform the inspection, an affidavit must be prepared stating that he was contacted on a certain date and that he failed to comply with the request. This along with other papers in the customer's possession will support the claim.

5.0 Installation Instructions

5.1 Location

Within the laboratory, pharmacy, etc., the ideal location of the biological safety cabinet is away from personnel traffic lanes, air vents (in or out), doors and/or any other source of disruptive air currents.



THE EXHAUST FILTER AREA IS ESPECIALLY SUSCEPTIBLE TO DISRUPTIVE AIR CURRENTS FROM AIR VENTS. The Electronic Airflow Control System's exhaust sensor is located just above the exhaust HEPA filter and if disruptive air currents are present, the exhaust sensor could be influenced by them, and indicate disruptive readings on the front panel display.

If drafts or other disruptive air currents exceed the inflow velocity of the cabinet through the access opening, the *potential* exists for contaminated air to exit or enter the work zone area of the cabinet. It depends on the severity of the air current. **REMEMBER: A BIOLOGICAL SAFETY CABINET IS NO SUBSTITUTE FOR GOOD LABORATORY TECHNIQUE.**

Where space permits, a clear 6" (152mm) area should be permitted on each side of the cabinet for maintenance purposes. The electrical outlet into which the cabinet is connected should be readily accessible for maintenance purposes. **Do not position the cabinet to prevent access to the power cord.** The power cord plug serves as the disconnect and should remain readily accessible. If the outlet is inaccessible, such as a conduit (hardwired) connection, then an appropriate warning label should be applied near the cabinets on/off switch to indicate the circuit breaker on the power distribution panel to be used. A MINIMUM CLEARANCE OF 6" (152MM) IS REQUIRED FROM THE TOP OF THE CABINET TO THE CEILING FOR PROPER VENTILATION OF THE EXHAUST EFFLUX.

If this cabinet is used in a pharmacy application, **it is strongly recommended that the cabinet be exhausted to the outside.** In addition, if this cabinet is used in microbiological application with minute quantities of volatile toxic chemicals and tracer amounts of radionuclides, **Per CDC/NIH and NSF it is strongly recommended that the cabinet be exhausted to the outside.** NuAire offers two general categories of exhaust transitions, which will capture the exhaust efflux from the cabinet. These are:

Canopy, Thimble or Air Gap Exhaust Transitions (with and without integral fan) **Strongly Recommended**
Gas-Tight Exhaust Transitions

NOTE: THE EXHAUST SYSTEM SHOULD BE FITTED WITH A BACKDRAFT DAMPER TO PREVENT REVERSING OR AIRFLOW IN THE SYSTEM.

Both types of transitions have some common attributes in addition to some that are unique. **NuAire strongly recommends a canopy or thimble exhaust for most applications.** See separate instruction sheets for a discussion of exhaust transitions and installation requirements

NOTE, some countries (i.e. Germany) only allow canopy or thimble type transitions. Verify requirements per Local, State and Federal code laws.

5.2 Set-Up Instructions

Remove outer shipping protection (carton or crating). The cabinet is fastened to the base skid and it is usually the best procedure to leave the skid in place until the cabinet is located in its approximate position to facilitate ease in handling. It can then be removed from the skid by removing the banding, bolts and screws holding the cabinet to the skid. It may be necessary to remove the Control Center in order to gain passage through a doorway.

5.2.1 Base Stand Assembly

The base stand is shipped knocked down in a separate carton. Remove the banding holding the cabinet to the base skid. Lift the cabinet from the base skid and place on the floor. Now lift the cabinet on top of the base and bolt the base stand to the cabinet using two 3/8" - 16 x 3/4" bolts and washers provided for the front base stand tabs and two 1/4" acorn nuts for the rear weld studs. Place the cabinet in its desired location.

The base stand storage cabinets will usually be shipped according to customer requirements. It is recommended that the upper and lower base stand braces be installed first, then the rear and bottom panels (the end panels are always prefastened). Once assembled, fasten the cabinet per the above instructions.

5.2.2 Leveling

Using a level placed on the work tray, adjust the leg levelers, first, end to end, then, front to back. The NSF approved leg levelers provide a $\pm 3/4$ inch (19mm) adjustment.

5.2.3 Bench Installation

Place the cabinet on the bench with approximately a 2 inch (51mm) overhang clearance for installation of the drain valve. If the drain valve is not desired, place the cabinet in its desired location and using RTV sealant seal all around the base of the cabinet and the bench. This provides a tight seal to prevent bench spills from migrating under the cabinet.

If a drain valve is desired, (**NOTE, CHECK WITH YOUR SAFETY PERSONNEL FOR REGULATORY REQUIREMENTS (i.e. LOCKING TYPE) OF DRAIN VALVE INSTALLATION**) remove the handle from the valve stem to gain clearance for valve body rotation. Add Loctite 242 (furnished) to the threads and rotate valve body until secure, with the valve stem (for handle) on the left side. Re-install handle to valve stem. Adjust the cabinet on bench to provide a 2 inch (51mm) overhang and seal the interface of the bench and cabinet, using RTV sealant as above.

5.2.4 Gas Service

NuAire doesn't recommend the use of natural gas within the BSC, but if gas service is determined to be necessary for the application, appropriate safety measures must take place. All NuAire BSC's have precautionary warning labels that say the following:



CAUTION: Use of explosive or flammable substances in this cabinet should be evaluated by your appropriate safety personnel.

Once the determination has been made by the appropriate safety personnel, the application of natural gas must be performed in accordance to national, state and local codes. **IT IS ALSO STRONGLY RECOMMENDED THAT AN EMERGENCY GAS SHUTOFF VALVE BE PLACED JUST OUTSIDE THE BSC ON THE GAS SUPPLY LINE.**

The gas valve, when this option is installed, will only operate or flow gas when the cabinet blower is on and no alarm is present. A solenoid valve is installed on the gas supply line for this purpose.



NOTE, some countries (i.e. Germany) only allow certain types of certified valves to be used for natural gas (i.e. Germany DVGW Certified). Verify requirements per Local, State and Federal codes/laws.

As previously stated NuAire does not recommend the use of natural gas within the BSC and **ASSUMES NO RESPONSIBILITY FOR ITS USE. USE AT YOUR OWN RISK.** The Bunsen burner flame within the BSC not only contributes to heat build-up; it also disrupts the laminar air stream, which must be maintained for maximum efficiency. **IF THE PROCEDURE DEMANDS USE OF A FLAME, A BUNSEN BURNER WITH ON DEMAND IGNITION IS STRONGLY RECOMMENDED. DO NOT USE CONSTANT FLAME GAS BURNERS.** During use, the Bunsen burner should be placed to the rear of the workspace where resulting air turbulence will have a minimal effect.

5.2.5 Plumbing Services

Service ball valves with the type of service specified by the removable button on the handle are located in the work zone. The service ball valves are not recommended for pressure over 75 p.s.i. (5.2 BAR). Reducing valves should be installed external to the cabinet if necessary. Service ball valves should never be used for flammable gasses or oxygen service. A special needle valve for oxygen service or certified valve is required and available upon request.

External connection is to 3/8 inch (10mm) NPT coupling in the inner sidewalls. Connection to plant utilities should be made with proper materials for the individual service and according to national and/or local codes. Observe all labels pertaining to the type of service and operating pressure.

5.2.6 Electrical Services

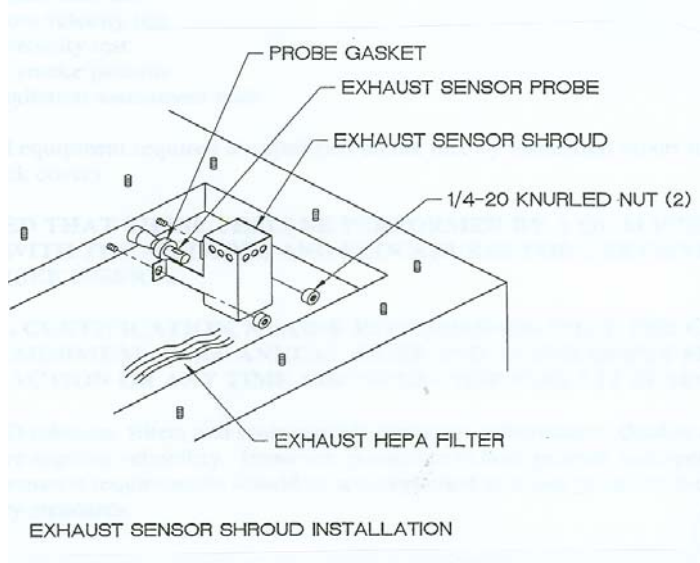
The NU-440E/G series Biological Safety Cabinets may be "hardwired" (optional) or plugged into an outlet with protective earthing connection with the standard power cord. The unit requires 230/220 VAC, 50 or 60 Hz, single phase (current rating varies per cabinet size, reference Electrical/Environmental Requirements). It is recommended that power to the cabinet, whether hardwired or plug connected be on its own branch circuit, protected with a circuit breaker at the distribution panel near the cabinet.

5.2.7 Final Assembly

NOTE: REMOVE THE PROTECTIVE CARDBOARD COVER OVER THE EXHAUST HEPA FILTER.

Attach the exhaust sensor shroud over the exhaust sensor. The shroud should be placed as close as possible to the exhaust HEPA filter without coming in contact. The sensor gasket should be tightly against the sensor shroud to prevent airflow paths. The exterior surface and viewing glass are easily cleaned with any mild household detergent cleaner using a soft cloth. Harsh chemicals, solvent-type cleaners and abrasive cleaners should not be used.

Do not attempt to clean the HEPA filter media. Cabinet interior walls or work surface are easily cleaned with any mild household detergent cleaner using a soft cloth. Turn the cabinet on and let it operate for 60 minutes before using it as a LFBSC.





5.3 Certification Testing Methods and Equipment

After installation and prior to use, NuAire recommends that the cabinet be certified or commissioned to factory standards. As part of certification, the certifier should go through the following initial checklist to assure all aspects of the BSC installation are complete and ready for certification.

- Review product installation
 - Exhaust connection, if present
 - Damper valve installed correctly with label toward front, if present
 - BSC basestand level
- Verify airflow sensor shroud is in place
 - Downflow
 - Exhaust flow
- Verify configuration type selection for specific model
- Verify setpoints and alarm limits for specific model
- Perform BSC certification
 - At a minimum, the following tests should be performed:
 - HEPA filter leak test
 - Downflow velocity test with high/low alarm limits
 - Inflow velocity test with high/low alarm limits
 - Airflow smoke patterns

The testing methods and equipment required are specified on the factory inspection report included with this manual (see insert in back cover).

 **NOTE: IT IS RECOMMENDED THAT THESE TESTS BE PERFORMED BY A QUALIFIED TECHNICIAN WHO IS FAMILIAR WITH THE METHODS AND PROCEDURES FOR CERTIFYING BIOLOGICAL SAFETY CABINETS (SEE INSERT).**

 **NOTE: AFTER THE INITIAL CERTIFICATION, NUAIRE RECOMMENDS THAT THE CABINET BE RECERTIFIED AT A MINIMUM ON AN ANNUAL BASIS AND AFTER EVERY FILTER CHANGE OR MAINTENANCE ACTION OR ANY TIME THE OPERATOR FEELS IT IS NECESSARY.**

Note that the LABGARD cabinets, filters and seals provide premium performance; Quality Control in both design and manufacturing assure superior reliability. However, protection to both product and operator is so vital that certification to the performance requirements should be accomplished as stated to ensure biological safety established by the factory standards.

Labgard Class II, Laminar Flow Biological Safety Cabinet

Models NU-440-300E/400E/500E/600E
NU-440-300G/400G/500G/600G

Catalog Number	Catalog Number			
	NU-440-300E/G Nominal 3 foot (0.8m)	NU-440-400E/G Nominal 4 foot (1.2m)	NU-440-500E/G Nominal 5 foot (1.5m)	NU-440-600E/G Nominal 6 foot (1.8m)
Performance Specifications	NSF/ANSI 49 EN 12469**	NSF/ANSI 49 EN 12469**	NSF/ANSI 49 EN 12469**	NSF/ANSI 49 EN 12469**
DIN Std. Class	Class II	Class II	Class II	Class II
Style of Cabinet	Bench top/console w/base stand/storage cabinet	Bench top/console w/base stand/storage cabinet	Bench top/console w/base stand/storage cabinet	Bench top/console w/base stand/storage cabinet
Cabinet Construction	All welded stainless steel 16GA, Type 304 pressure tight design	All welded stainless steel 16GA, Type 304 pressure tight design	All welded stainless steel 16GA, Type 304 pressure tight design	All welded stainless steel 16GA, Type 304 pressure tight design
Diffuser for Air Supply (Metal)	Non-flammable	Non-flammable	Non-flammable	Non-flammable
HEPA Filter Seal Type: Supply Filter-99.99% Eff. on 0.3microns Exhaust Filter-99.99% Eff. on 0.3microns	HEPEX Seal Neoprene, Spring loaded	HEPEX Seal Neoprene, Spring loaded	HEPEX Seal Neoprene, Spring loaded	HEPEX Seal Neoprene, Spring loaded
Fumigation per EN 12469: 2000, Annex j	Yes	Yes	Yes	Yes
Standard Services: Service Coupling (3/8 inch NPT) Gas Valve/Service Coupling(3/8 inch NPT) Outlet	One, Right Sidewall One, Right Sidewall One, Backwall Center	One, Right Sidewall One, Right Sidewall Two, Backwall	One, Right Sidewall One, Right Sidewall Two, Backwall	One, Right Sidewall One, Right Sidewall Two, Backwall
Optional Services: Gas Valve/Service Coupling(3/8 inch NPT) Ultraviolet Light Standard/Cup Sinks	Up to 3 ea. Sidewall One, Backwall Left or Right Work Surface	Up to 3 ea. Sidewall One, Backwall Left or Right Work Surface	Up to 3 ea. Sidewall One, Backwall Left or Right Work Surface	Up to 3 ea. Sidewall One, Backwall Left or Right Work Surface
Cabinet Size Inches (mm): Height (Fully Assembled) Height (Minimum for Transport) Width Depth (with Control Center)	63 (1600) 60 (1524) 41 5/8 (1057) 32 7/8 (835)	63 (1600) 60 (1524) 53 5/8 (1362) 32 7/8 (835)	63 (1600) 60 (1524) 65 5/8 (1666) 32 7/8 (835)	63 (1600) 60 (1524) 77 5/8 (1972) 32 7/8 (835)
Work Access Opening Inches (mm): Standard Opening Height/Optional Standard Inflow Velocity	8 (203) 105 FPM/.53 mps	8 (203) 105 FPM/.53 mps	8 (203) 105 FPM/.53 mps	8 (203) 105 FPM/.53 mps
Work Zone Inches (mm): Height Width Depth	28 1/2 (724) 34 3/8 (873) 23 1/2 (597)	28 1/2 (724) 46 3/8 (1178) 23 1/2 (597)	28 1/2 (724) 58 3/8 (1482) 23 1/2 (597)	28 1/2 (724) 70 3/8 (1788) 23 1/2 (597)
Viewing Window: Standard is tempered sliding glass	Fully closed to 19 1/2 inches (495mm) open	Fully closed to 19 1/2 inches (495mm) open	Fully closed to 19 1/2 inches (495mm) open	Fully closed to 19 1/2 inches (495mm) open
Required Exhaust CFM/(CMH) Gas-Tight (NU-916/919) Thimble (NU-918/917) Thimble (NU-916)	171 / (291) 242 / (411) 279 / (475)	231 / (393) 317 / (535) 367 / (623)	291 (494) 407 (692) 437 (742)	351 / (597) 485 / (824) 519 / (883)
Plant Duct Static Pressure Eng/Metric	0.05-0.1" / 1.27-2.54mm H ₂ O	0.05-0.1" / 1.27-2.54mm H ₂ O	0.05-0.1" / 1.27-2.54mm H ₂ O	0.05-0.1" / 1.27-2.54mm H ₂ O
Heat Rejected, BTU, Per Hour (non-vented) (vented)	1181 791	1693 1110	2220 1320	2435 1460
Electrical: Volts, AC Amps: Blower/Lights Amps: Outlets (each) Amps: Total 12 ft. Power Cord (one)	230/220 3 3 6 14 GA - 3 Wire, 15A	230/220 4 3 10 14 GA - 3 Wire, 15A	230/220 5 3 11 14 GA - 3 Wire, 15A	230/220 5 3 11 14 GA - 3 Wire, 15A
Crated Shipping Weight:**** Net Weight	475 lbs./215 kg. 425 lbs./193 kg.	550 lbs./249 kg. 500 lbs./227 kg.	640 lbs./290 kg. 590 lbs./268 kg.	730 lbs./331 kg. 680 lbs./308 kg.
Sound Pressure Level per ISO 4871***	Not to Exceed 55 db ■	Not to Exceed 56 db ■	Not to Exceed 58 db ■	Not to Exceed 60 db ■

■Reference the customer test report for procedure and results.

**"E" Series Only

***Uncertainty is K = 2 db, measurement performed per ISO 11201 in normal running mode.

****Crated shipping weight does not include weight for accessories or options.

6.0 Operating the NU-440E/G

6.1 Biological Safety Cabinet Control

6.1.1 Overview

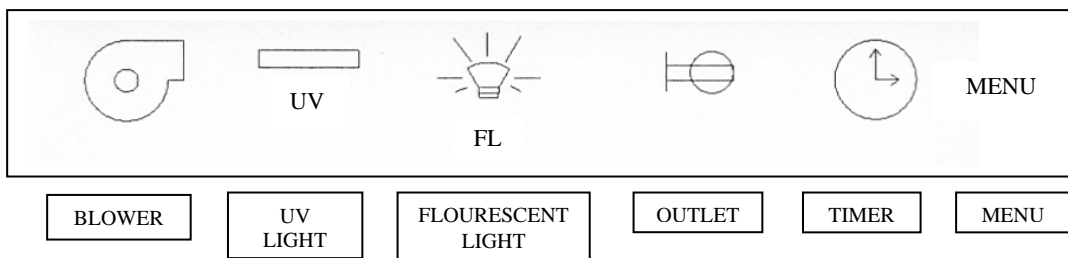
The Biological Safety Cabinet Control (BSCC) system is designed to service the control requirements of the NU-440E/G Biological Safety Cabinet. The control system is a self-contained microprocessor driven module that will perform the following functions:

- Easy user interface via **TOUCHLINK** LCD.
- Control blower motor via solid state triac.
- Monitor, display and control downflow, via digital dual thermistor airflow sensor.
- Monitor and display exhaust flow (inflow) via digital dual thermistor airflow sensor.
- Alarm setpoints, high/low for error conditions (downflow and exhaust flow).
- Date/Clock display and timer function.
- Control lights via solid state switch.
- Control outlets via solid state switch.
- Complete diagnostic functions.

The NU-440E/G BSCC system offers the latest digital microprocessor design technology for improved cabinet performance and safety. The control system uses a digital dual thermistor airflow sensor in the downflow stream to monitor and control airflow to setpoints. The control system automatically compensates for filter loading, voltage variances and other environmental effects. A second digital dual thermistor airflow sensor in the exhaust airstream monitors for inflow velocity. Both downflow and inflow are displayed on the **TOUCHLINK** LCD screen. The control system also monitors the sliding window position with a micro switch for both window height and window closed positions.

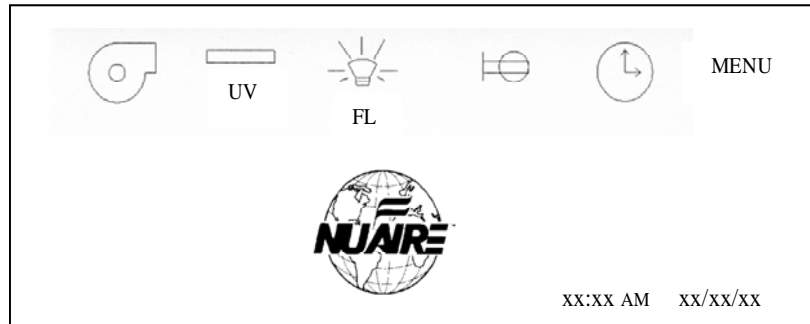
The control system through the use of the front panel controls the on/off function of the fluorescent and ultraviolet lights (optional), outlets and blower. The control system also allows contact closure outputs for interaction with HVAC systems to optimize environmental performance.

User interface to the BSCC system is accomplished via the **TOUCHLINK** LCD. Basic use of the BSC is accomplished via the icons located along the top of the screen as shown below. Touch an icon to turn on/off functions as indicated. Each icon will illuminate with color to indicate when the function is turned on. The menu icon will always prompt a menu screen to display. Selecting a menu item will continue the prompts until the desired parameter is achieved. To return to the main menu, press the menu icon repeatedly to reverse out of the parameter menus.



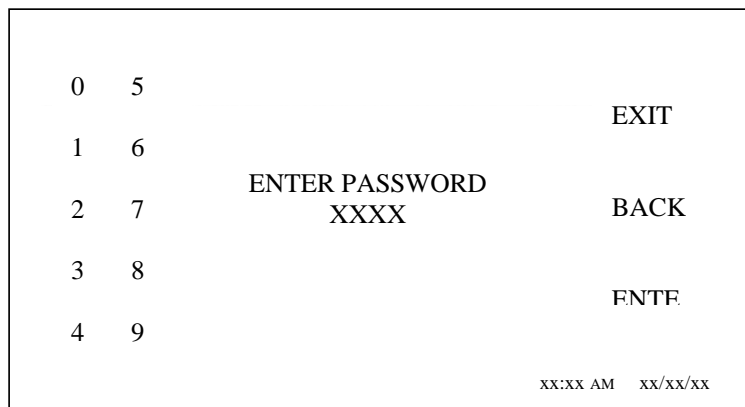
6.1.2 Standby Mode

When the BSC is not in use, the **TOUCHLINK** LCD screen will display a large NuAire logo, the icons along the top and the time and date at the bottom right as shown below. Any of the function icons, except the blower, that initiates Run Mode, may be turned on and off in standby mode. The timer and menu icons may also be accessed for additional user menus. The **TOUCHLINK** LCD does have a screen saver function built in for extended LCD life. The default screen saver time is 60 minutes. This means after 60 minutes when the blower is not on, the **TOUCHLINK** LCD will go dark. To bring back the **TOUCHLINK** LCD, just touch the screen and the screen saver will reset. To change the screen saver time, access **SCREEN SETUP** through the menu icon.

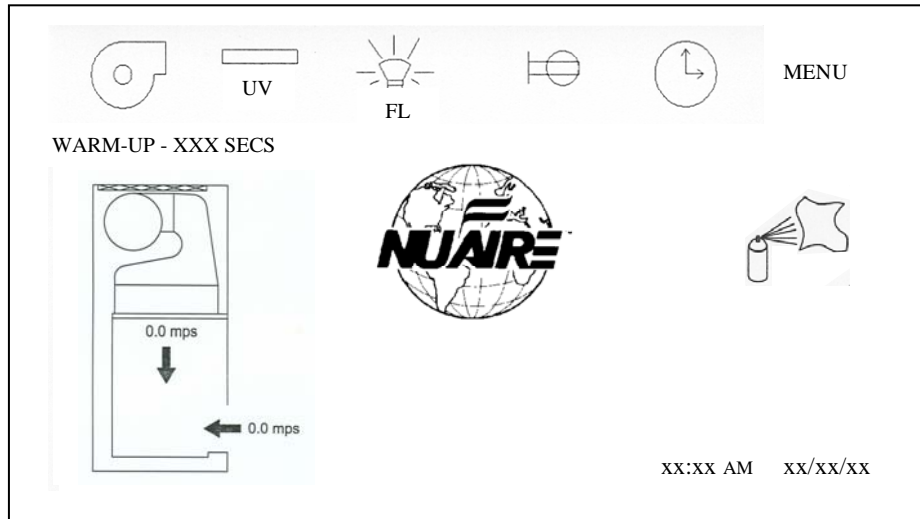


6.1.3 Run Mode

Anytime the blower icon is selected, a password must be used. After pressing the blower icon, a password screen will appear. The default password is "1234". Once the password is entered, the Run Mode screen will appear. If an entry error is made, press **BACK** to remove the error and continue with the entry process.



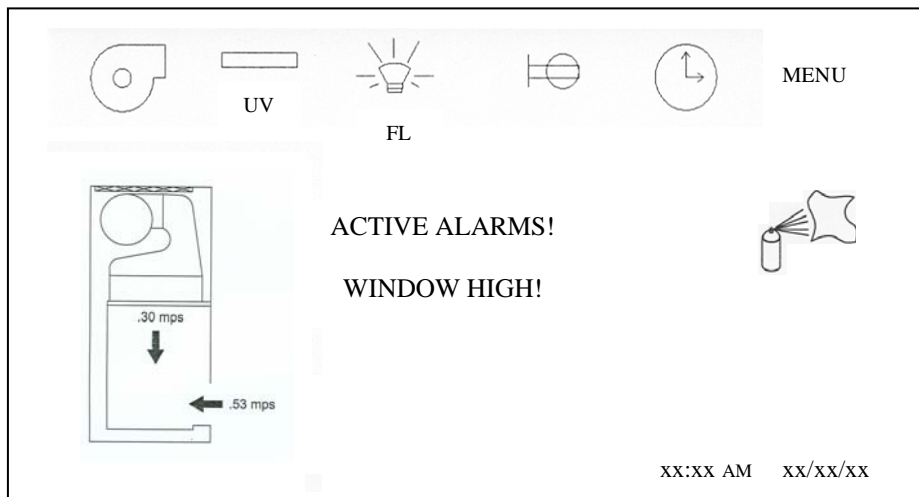
The Run Mode screen will display a BSC profile and initiate and display the countdown of a 150 second warm-up period. During the warm-up period, an audible and visual alarm is present to indicate the cabinet is not ready for use. However, the aseptic cleaning process may begin and by pressing the cleaning icon, once the cleaning icon is pressed, the password screen will again appear. Enter the same password as for the blower operation and the audible alarm will be silenced for the duration of the warm-up period. Airflow readings will not be displayed during warm-up period.



Once the warm-up period is complete, airflow readings and all system functions will operate and be displayed.

6.1.4 Standby/run mode alarms

If present standby/run mode alarms will be both visual and audible, the Red LED oval under the LCD display will turn on, and the **TOUCHLINK** LCD screen will also display a description of the alarm in place of the NuAire Logo. Depending upon the alarm type, the BSC profile will also indicate in red the alarm present. Audible alarms cannot be silenced and will produce an alarm tone for 30 seconds, then into a ring back cycle of once every 10 seconds with the only exception being window high alarm that can be silenced using the cleaning icon. Pressing the cleaning icon will silence the audible alarm for 2 minutes, then into a ring back cycle at of once every 10 seconds.



Alarm Types

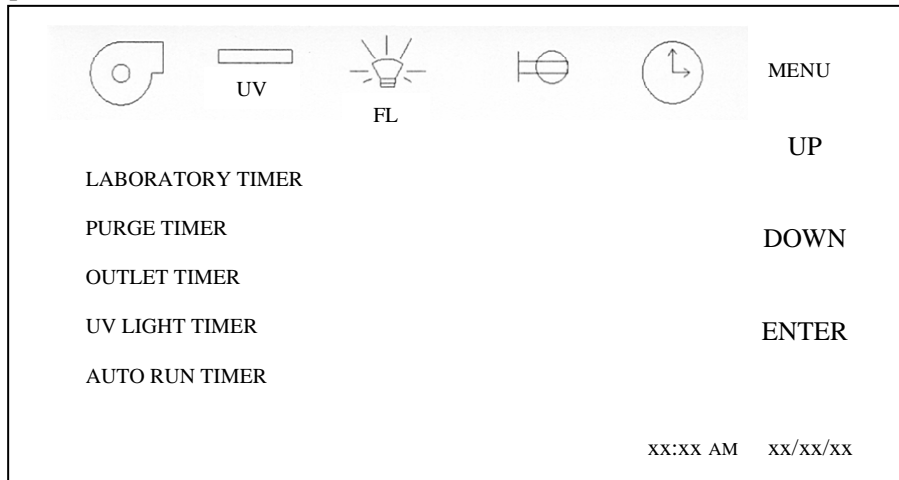
- Window High - window is raised above its nominal height
- Window Low - window is lowered below its nominal height

- Downflow High Limit- downflow is above the high alarm setpoint
- Downflow Low Limit - downflow is below the low alarm setpoint

- Inflow High Limit - inflow is above the high alarm setpoint
- Inflow Low Limit - inflow is below the low alarm setpoint

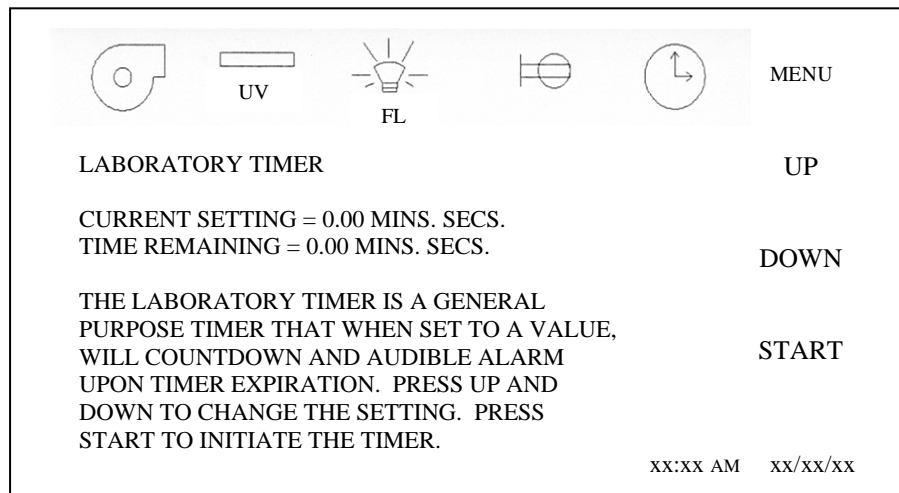
6.1.5 Timer Icons

The timer icon, when pressed will provide a list of time functions available for use. Below is a description of each timer function.

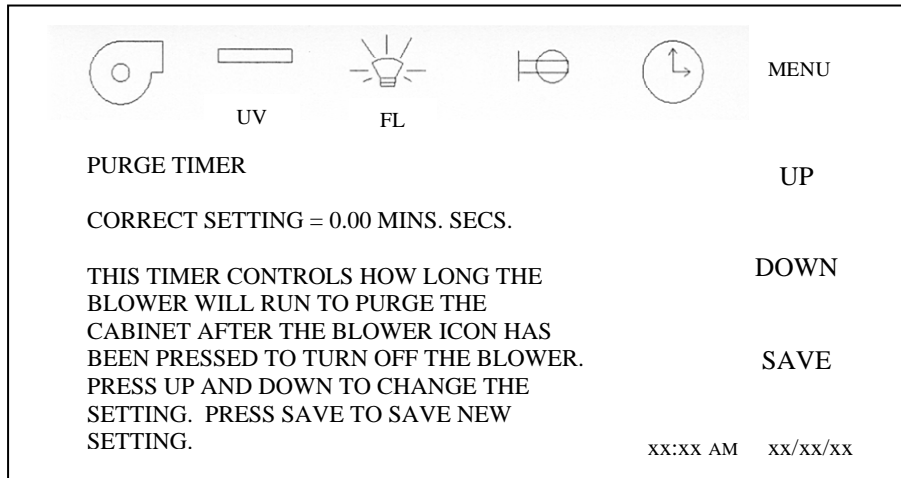


Timer Functions

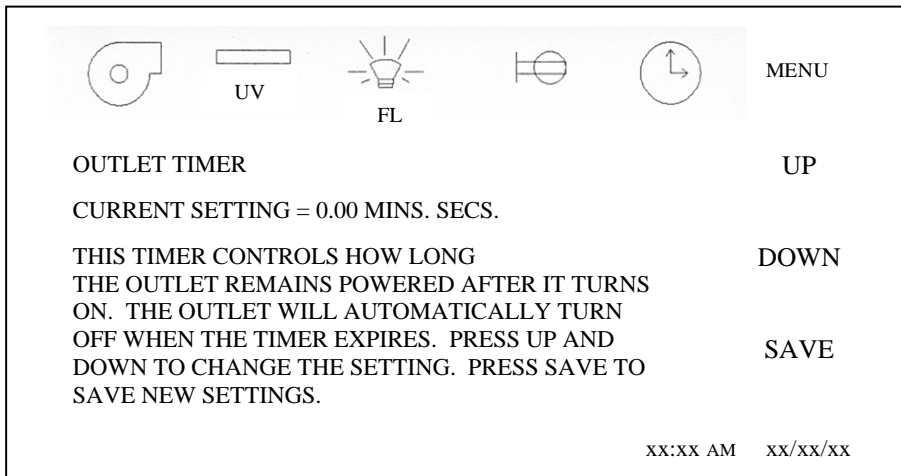
- Laboratory Timer - A general purpose timer that when set to a value, will countdown and alarm upon timer expiration.



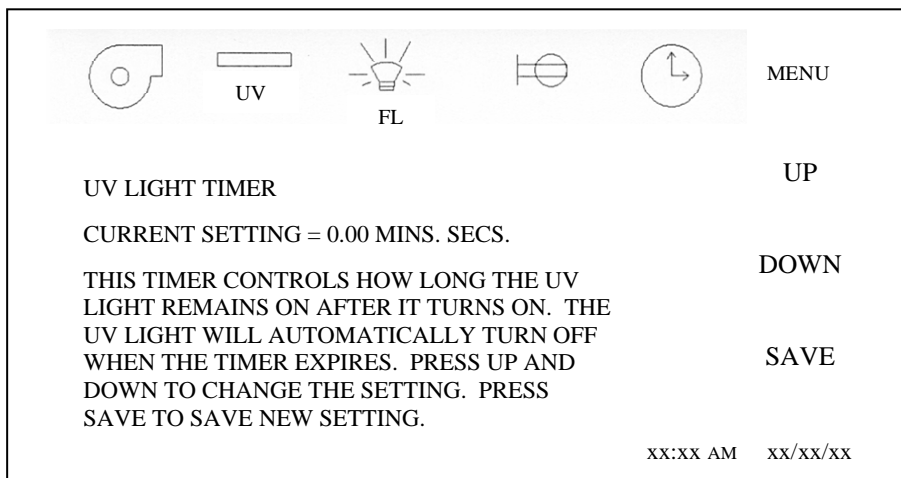
- Purge Timer - This timer controls how long the blower will run to purge the cabinet after the blower icon has been pressed to turn off the blower.



- Outlet Timer - This timer controls how long the outlet remains on after the outlet icon has been pressed to turn on the outlet. If timer is zero, the outlet will stay on until turned off.



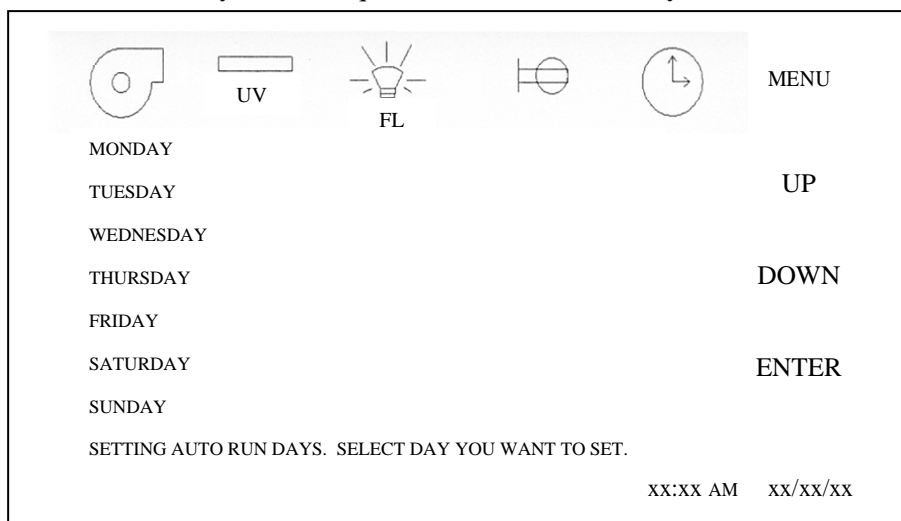
- UV Light Timer - This timer controls how long the UV light will remain on after the UV light icon has been pressed to turn on the UV light. If timer is zero, UV light will stay on until turned off.



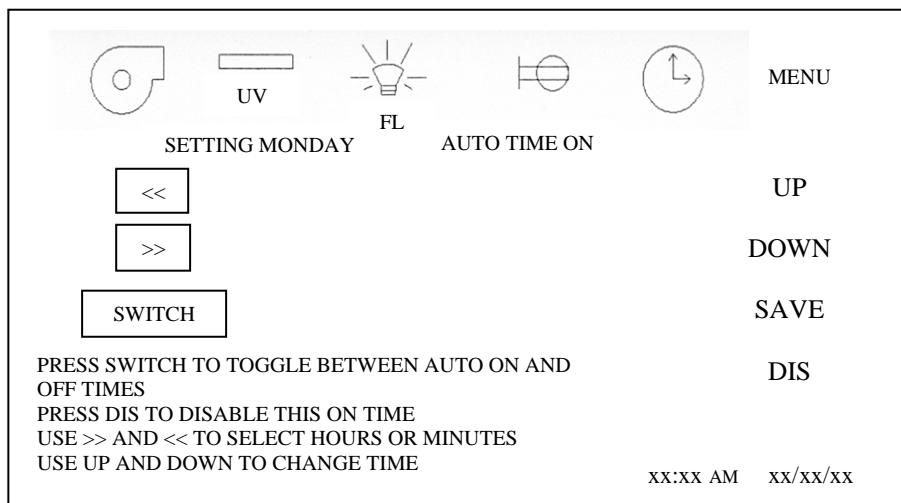
- Auto Run Timer - This timer provides the ability to program on a daily basis the start and stop time of the cabinet. To start and stop the cabinets menus that both the blower and fluorescent lights will automatically turn on and off together on a programmed schedule. Since the timer affects the cabinets function, a password is required for entry. Use the same password as the blower on and off function.



- Once into the auto timer menu, select the desired day for the auto timer to function. If multiple days are desired, each day will be required to be set individually.

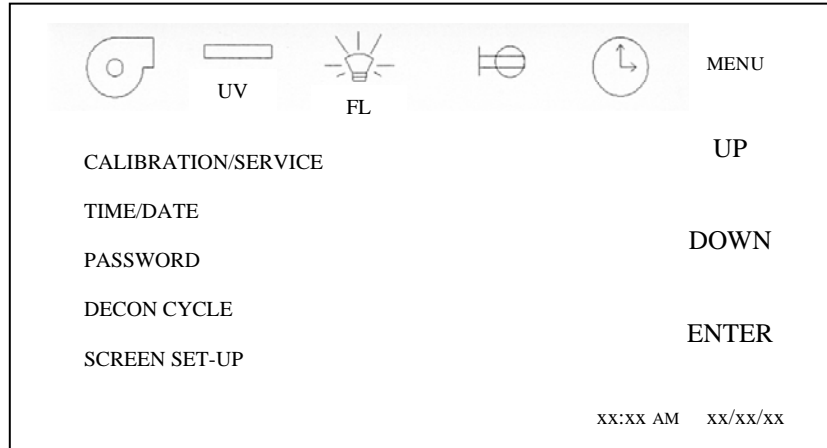


Once into the selected day, press UP or DOWN to enter the on/off times. Use the >> and << to select hours or minutes. Press SWITCH to toggle between auto time on and auto time off. Press SAVE after each time entry. Press DIS to disable auto timer for the day being reviewed. Repeat auto timer function for each day as desired.



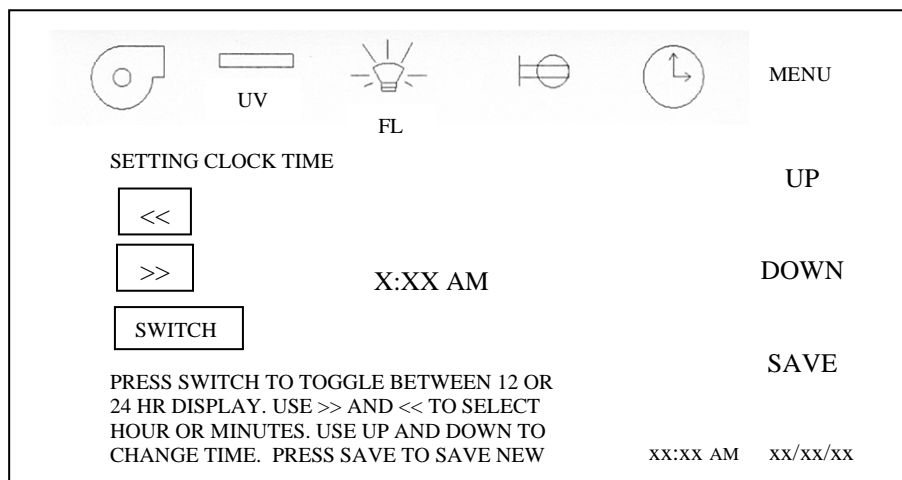
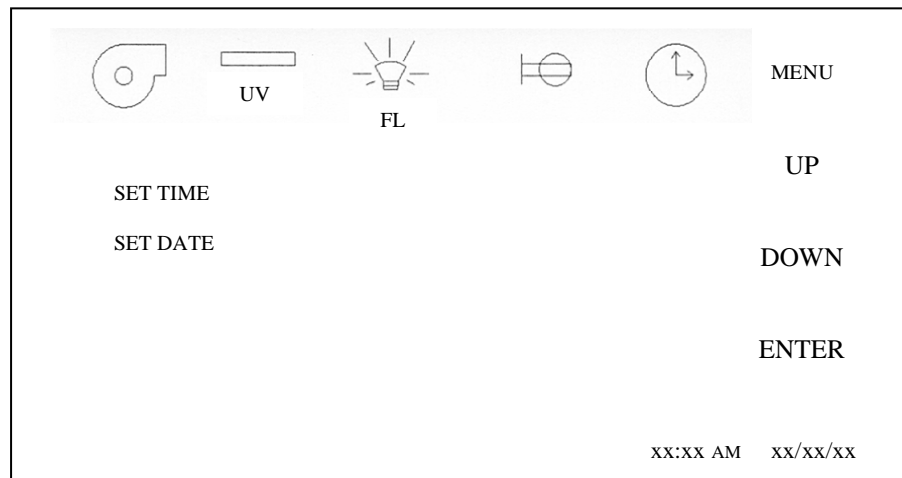
6.1.6 Menu Icon

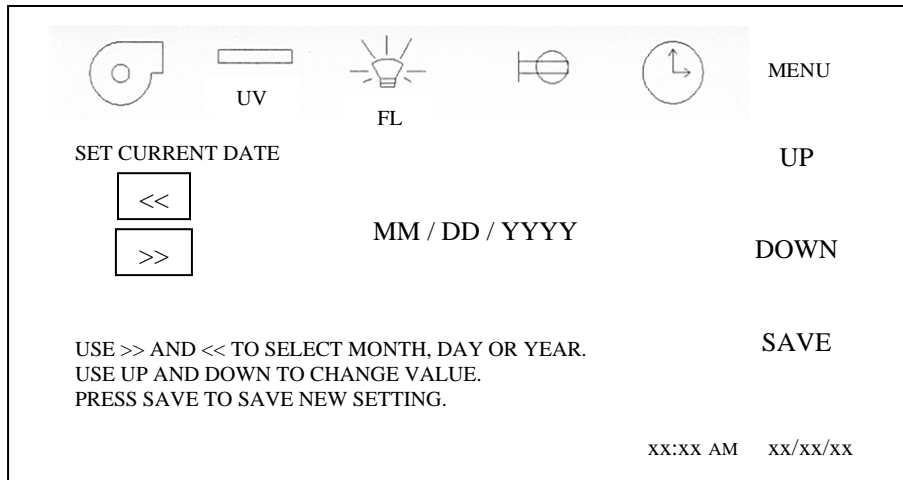
The menu icon, when pressed will provide a list of menu items for various BSCC functions.



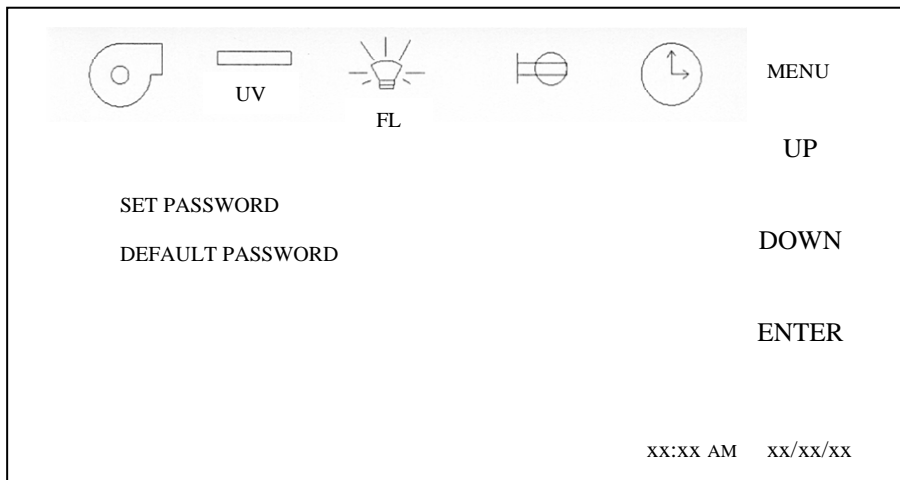
Menu Items

- Calibration/Service - A password protected area used by certification or service personnel to set up and calibrate the cabinet for certification or commissioning.
- Time/Date - This menu item provides the ability to set the time and date displayed on the LCD screen. Time displayed is real time and will not automatically adjust for day light saving time.

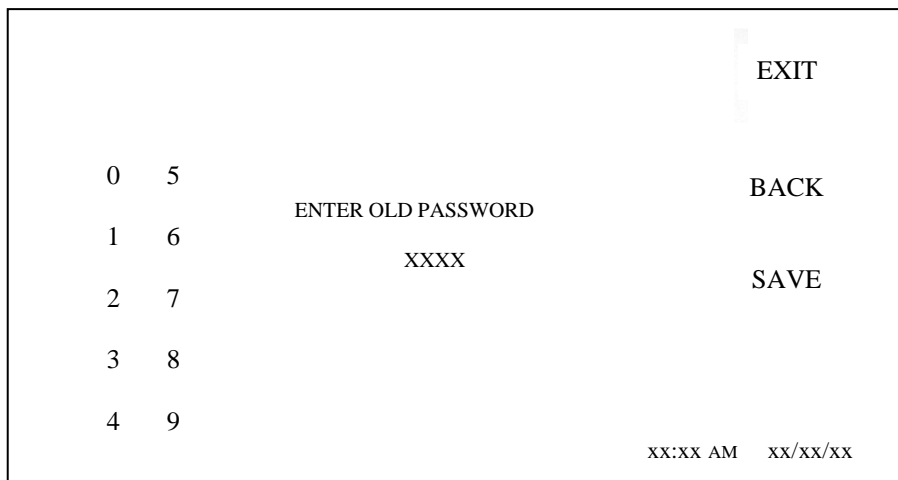




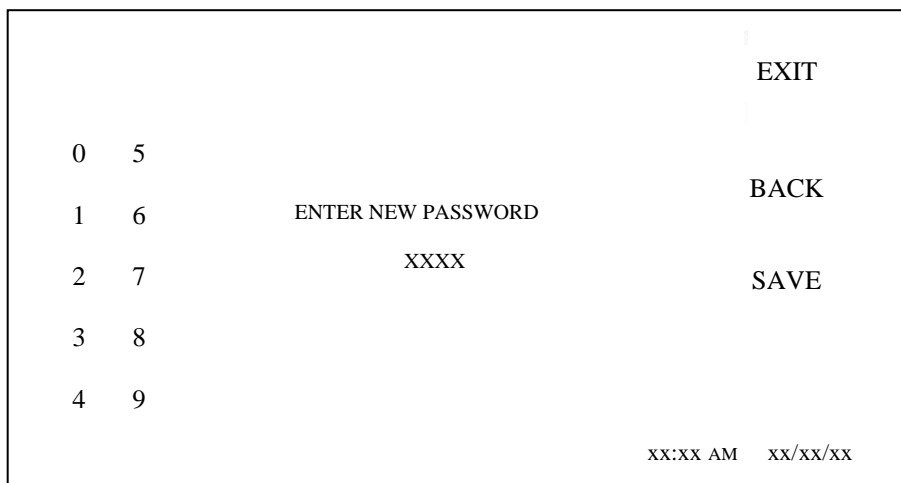
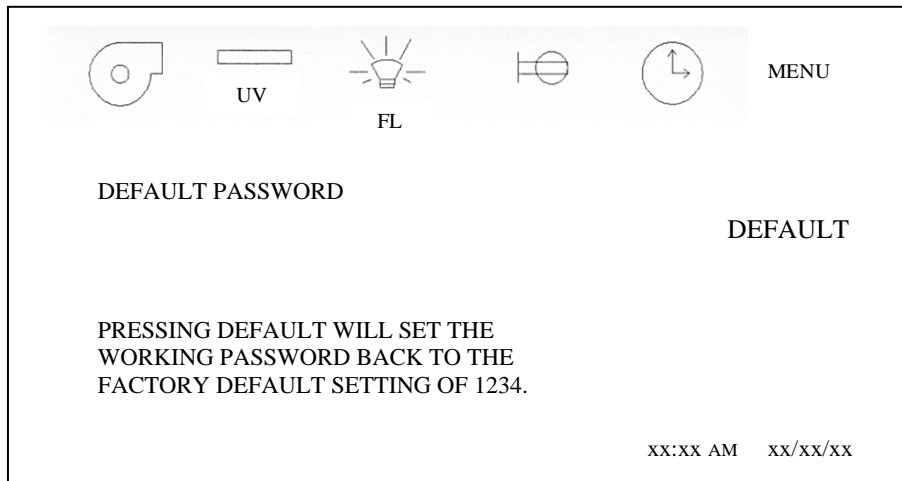
- Password - This menu item provides the ability to change the user password from the default value of 1-2-3-4.



- Set Password

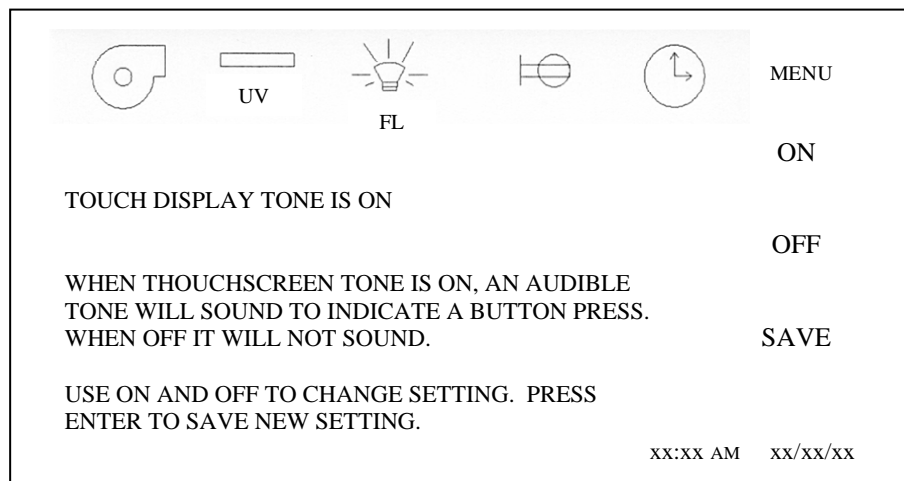
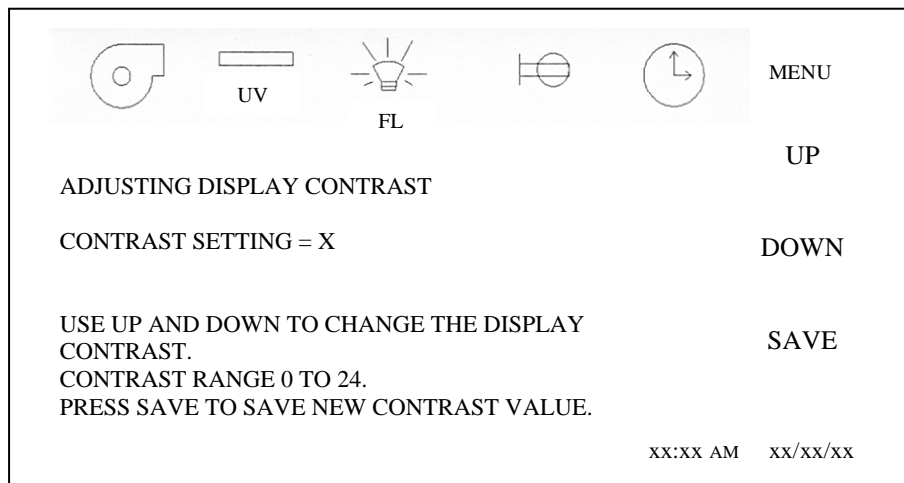
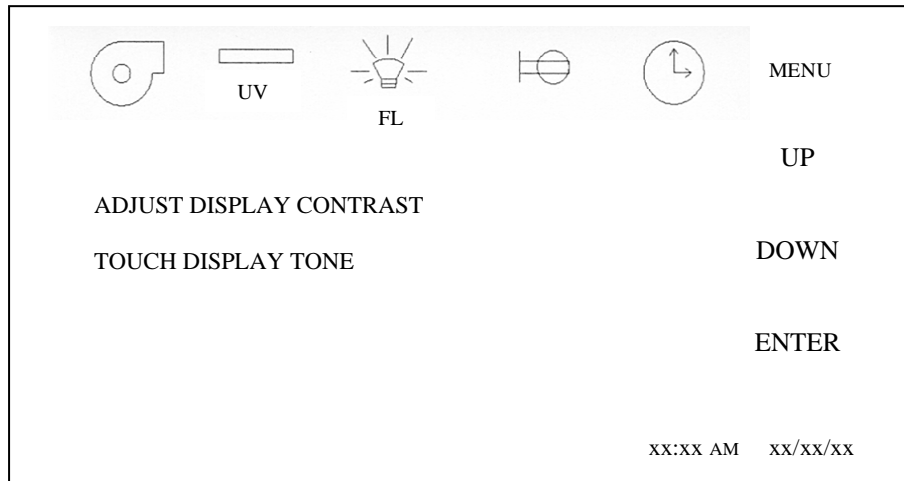


- Default Password



- Decon Cycle - This menu item provides the instruction to perform a manual decon procedure. (See decontamination section for additional instructions)

- Screen Set-Up - This menu item provides the ability to alter LCD screen display background contrast and audible touch screen tone.



6.2 Operating Guidelines


The intent herein is to present general operational guidelines that will aid in the use of the Laminar Flow Biological Safety Cabinet (LFBSC) to control airborne contaminants of low to moderate risk as stated in Technical Report No. FPS 56500000001 prepared by Dow Chemical U.S.A. for the National Cancer Institute, May 1, 1972.

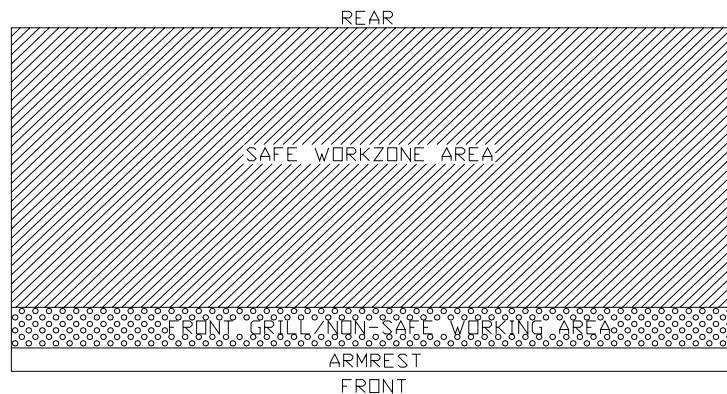
Procedure protocols defined in terms of the barrier or control concepts unique to LFBSC must be developed in order to obtain a maximum potential for safety and protection. The pre-planning necessary to develop these protocols is based on several fundamental considerations, each of which will contribute to optimum benefits from the equipment:

- a. Know your "safe working area"
- b. Minimize disruption of "air curtain"
- c. Minimize room activity
- d. Utilize unidirectional airflow
- e. Employ aseptic techniques

6.2.1 Know Your "Safe Working Area"

The LFBSC safe working area is basically the worktray or depressed area. All work should be performed on or above the worktray. The area on or above the front grill is a non-safe working area.


 NOTE: It is important to maintain an air gap on both sides of the worktray before fastening in place.



6.2.2 Minimize Penetration of "Air Curtain"

The minimum number of items necessary should be placed into the cabinet to prevent overloading, but the work should also be planned to minimize the number of times an operator's hands and arms must enter and leave the air curtain at the open face. The ideal situation is to have everything needed for the complete procedure placed in the hood before starting, so that nothing need pass in or out through the air barrier at the face until the procedure is completed. This is especially important in working with moderate risk agents.

Unnecessary raising of the hands inside the cabinet above the level of the work opening should be avoided. This presents an inclined plane from hands to elbows along which the downflow of air may run to, and possibly out, the open face.

 **Note:** When working with agents of lower risk, it is not as important for all materials to be placed in the cabinet before starting, or for the procedure to be completely finished before materials are removed. Also, the time period for a unit may be continued over a more extended period during which entries and withdrawals from the cabinet may be made.

6.2.3 Minimize Room Activity

Activity in the room itself should be held to a minimum. Unnecessary activity may create disruptive air currents as well as interfere with the work of the operator. A person walking past the front of a cabinet can cause draft velocities up to 175 fpm (.89 mps) which are sufficient to disrupt the air balance of the laminar flow unit.

6.2.4 Utilize Unidirectional Air Flow

The operator must keep two important facts in mind: (1) The air, as supplied to the work area through filters from the top, is contaminant free and (2) Airborne contamination generated in the work area is controlled by the unidirectional flow of parallel air streams in a top-to-bottom direction.

A solid object placed in a laminar air stream will disrupt the parallel flow and consequently, the capability of controlling lateral movement of airborne particulates. A cone of turbulence extends below the object and laminarity of the air stream is not regained until a point is reached downstream, approximately equal to three to six times the diameter of the object. Within the parameters of this cone, particles may be carried laterally by multidirectional eddy currents.

Transfer of viable materials and manipulations which may generate aerosols should not be performed above sterile or uninoculated materials. Items should be localized on the work surface in "clean" and "dirty" groups.

6.2.5 Employ Aseptic Technique

The operator must not assume an attitude of "let the cabinet do it" when performing procedures within a LFBSC. Properly balanced and properly used cabinets will do an excellent job of controlling airborne contamination and containing viable agents, but the cabinet will not eliminate contact transmission of contamination. Normal laboratory contamination control procedures and basic aseptic techniques are necessary to obtain maximum benefit from the cabinet. For example, open bottle, tube or flask mounts should be kept as parallel as possible to the downflow to minimize capture of chance particulates. This precaution is merely an extension of good aseptic technique as practiced on open bench tops. The good laboratory practices designed to minimize creation and/or release of aerosols to the environment should not be discontinued.

Items of equipment in direct contact with the etiologic agent must remain in the cabinet until enclosed or until surface-decontaminated. Trays of discard pipettes must be covered before removal from the cabinet (aluminum foil may substitute for fabricated covers).

If an accident occurs which spills or splatters suspensions of etiologic agent around the work area, all surfaces and items in the cabinet must be surface-decontaminated before being removed.


Applying a burner flame to flask and tube necks when mating surfaces of sterile assemblies is a conventional method of minimizing chance contamination. However, the efficiency of this operation is usually related to the removal of airborne contamination occurring while the item is uncovered. If the manipulation is carried out in an environment free of airborne particulates, then the need for the flaming operation is essentially removed. This is one of the additional advantages of the LFBSC - use of the gas burner is seldom necessary.

The gas burner flame in one of these units not only contributes significantly to the heat build-up, it also disrupts the laminar air streams which must be maintained for maximum efficiency. **IF THE PROCEDURE DEMANDS USE OF A FLAME, A BUNSEN BURNER WITH ON DEMAND IGNITION IS RECOMMENDED. DO NOT USE CONSTANT FLAME GAS BURNERS.** It should also be placed to the rear of the workspace where resulting air turbulence will have a minimal effect. If cabinet air is inadvertently turned off, the flame could damage the HEPA filters.

6.3 Operating Sequence

6.3.1 Start Up

Turn on cabinet blower and lights, check air intake and exhaust portals of the cabinet to make sure they are unobstructed.

 **Note:** Some cabinets are equipped with ultraviolet (UV) lights. Good procedure includes the decontamination or wipedown of cabinet surfaces with chemical disinfectant before work commences. This practice eliminates the need for UV lights, whose primary utility in this application is inactivation of surface contamination since the filters effectively remove all airborne contaminants. UV lights, therefore, are not recommended in the LFBSC.

Allow blowers to operate for a minimum of 15 minutes before aseptic manipulations are begun in the cabinet. If the filtered air exhausted from the unit is discharged into the room, as in some installations, an additional advantage is obtained from purification (filtration) of the room air circulated through the equipment. Because of this characteristic contributing to the quality of the laboratory environment, some owners of LFBSC leave them in operation beyond the time of actual use.

6.3.2 Wipedown

The interior surfaces of the workspace should next be disinfected (see cleaning procedures) by wiping them thoroughly with 70% alcohol or similar non-corrosive anti microbial agents. **USE OF CHLORINATED OR HALOGEN MATERIALS IN THE CABINET MAY DAMAGE STAINLESS STEEL.**

6.3.3 Materials & Equipment

The apparatus and materials should next be placed into the cabinet. Care must be exercised that no items be placed over the front intake grills. Materials should be arranged so that clean, dirty (used), and virus materials are well separated. Passage of contaminated materials over uninoculated cultures or clean glassware should be avoided and transfer of viable materials should be performed as deeply into the cabinet (away from open face) as possible.

6.3.4 Air Purge

Additional purging of the workspace without user activity should be allowed for 2-3 minutes after materials and apparatus have been placed in it. This will rid the area of all "loose" contamination that may have been introduced with the items.

6.3.5 Perform Work

The work can now be performed. The technician performing the work is encouraged to wear a long-sleeved gown with knit cuffs and rubber gloves. This will minimize the shedding of skin flora into the work area and concurrently protect the hands and arms from viable agent contamination. At a minimum, the hands and arms should be washed well with germicidal soap before and after work in the cabinet. For the preparation of antineoplastic drugs, the following procedures summarize those contained in OSHA Technical Manual TED 1-0.15A, Section VI, Chapter 2 “Controlling Occupational Exposure to Hazardous Drugs”. The above document should be thoroughly studied and reviewed prior to drug preparation in the cabinet. It may be found at this website. <http://www.osha.gov/dts/osta/>

- a. A sterile plastic-backed absorbent drape should be placed on the work surface during mixing procedures. The drape should be exchanged whenever significant spillage occurs, or at the end of each production sequence.
- b. Vials should be vented with a filter needle to eliminate internal pressure or vacuum.
- c. Before opening ampoules, care should be taken to insure that no liquid remains in the tip of the ampoule. A sterile gauze sponge should be wrapped around the neck of the ampoule while opening.
- d. Final drug measurement should be performed prior to removing the needle from the stopper of the vial.
- e. A non-splash collection vessel should be available in the biological safety cabinet to discard excess drug solutions.

6.3.6 Terminal Purging & Wipedown

Following completion of work, allow the cabinet to run for 2-3 minute period without personnel activity to purge the unit. The decontamination of the interior surfaces should be repeated after removal of all materials, cultures, apparatus, etc. A careful check of grills and diffuser grids should be made for spilled or splashed nutrients which may support fungus growth and resulting spore liberation that contaminates the protected work environment.

6.3.7 Paper Catch/Prefilter

A permanent paper catch is installed behind the rear divider panel of the work zone. This area forms the return air path to the motor/blower; and if the airflow is blocked, it could seriously affect the performance of the cabinet. Therefore, **THE PAPER CATCH SHOULD BE CHECKED AND CLEANED NO LESS THAN ON A WEEKLY BASIS; DAILY** basis if procedures dictate the use of paper products. Any paper removed must be properly disposed of as *Contaminated Hazardous Waste*. The above procedures also apply to all units configured with a prefilter.

6.3.8 Shut Down

Turn off blowers and lights. Do not use cabinet as a depository for excess lab equipment during periods of non-operation. If antineoplastic agents are being prepared in the cabinet, it is recommended to let the cabinet run 24 hours per day. This lessens the possibility that contaminants may escape.

6.4 Ergonomics

Ergonomics, the study or accommodation of work practices is extremely important for proper cabinet usage and user health and safety. An evaluation of normal work practices should be performed with each user when working in a cabinet. Evaluation criteria should be at a minimum:

- a. Proper user posture
- b. Effective workzone layout for work practice
- c. Vision or sightlines

For each of the above evaluation criterion, several aids may be supplied to accommodate the user.

- Ergonomic chair - A six-way articulating seat and back control for personalized adjustment to assure proper user posture. Be sure feet are resting on the floor, chair foot support or foot rest. Also be sure back is fully supported with proper chair adjustments.
- Forearm/armrest support - The cabinet is provided with a forearm support on the work access opening. Periodic mini-breaks during work practice should be taken resting forearm to avoid stress and fatigue.
- Effective workzone layout - Always prepare your work procedure to minimize reach to avoid neck and shoulder stress and fatigue. Rotating tables are optional to maximum workzone and minimize reach.

Vision and sightline - Always prepare your work procedure to eliminate glare and bright reflections on the window. Keep your window clean and sightlines clear to your effect workzone.

6.5 Cleaning Procedures

Cleaning the cabinet is an important function in terms of both containment and sterility. Use the following procedure to effectively clean or surface disinfect the cabinet workzone surfaces.

- a. Raise the sliding window to a full-open position, if desired.
- b. Press the audible alarm silence or cleaning key on the front control panel to silence the audible alarm during the cleaning process.
- c. Apply appropriate disinfecting solution (i.e. Coverage Plus™ (Calgon Corp.) or similar disinfectant) to cabinet surfaces. Most surface disinfectants require a specific contact time, depending upon the microbiological agents used within the cabinet. **CONSULT APPROPRIATE DISINFECTANT DOCUMENTATION FOR PROPER APPLICATION AND SAFETY PRECAUTIONS.**

CAUTION: DISINFECTANTS THAT USE CHLORIDES AND HALOGENS WILL CAUSE DAMAGE TO THE STAINLESS STEEL SURFACES IF LEFT ON FOR LONG PERIODS OF TIME.

- d. After the specified contact time, wipe up excess disinfectant. **IF THE DISINFECTANT USED CONTAINS CHLORIDES OR HALOGENS, RE-WIPE ALL SURFACES WITH 70% ALCOHOL OR SIMILAR NON-CORROSIVE ANTI-MICROBIAL AGENT TO PREVENT DAMAGE TO STAINLESS STEEL SURFACES.**