

**Labgard Reverse Horizontal Flow  
Safety Cabinet**

**Models NU-603-430/630**

**Operation and Maintenance Manual**

**Revision 3  
July, 2003**

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# Labgard Reverse Horizontal Flow Safety Cabinet Models NU-603-430/630 Operation and Maintenance Manual

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**Labgard Reverse Horizontal Flow Safety Cabinet**  
**Models NU-603-430/630**  
**Manufactured By:**  
**NuAire, Inc. – Plymouth, MN**

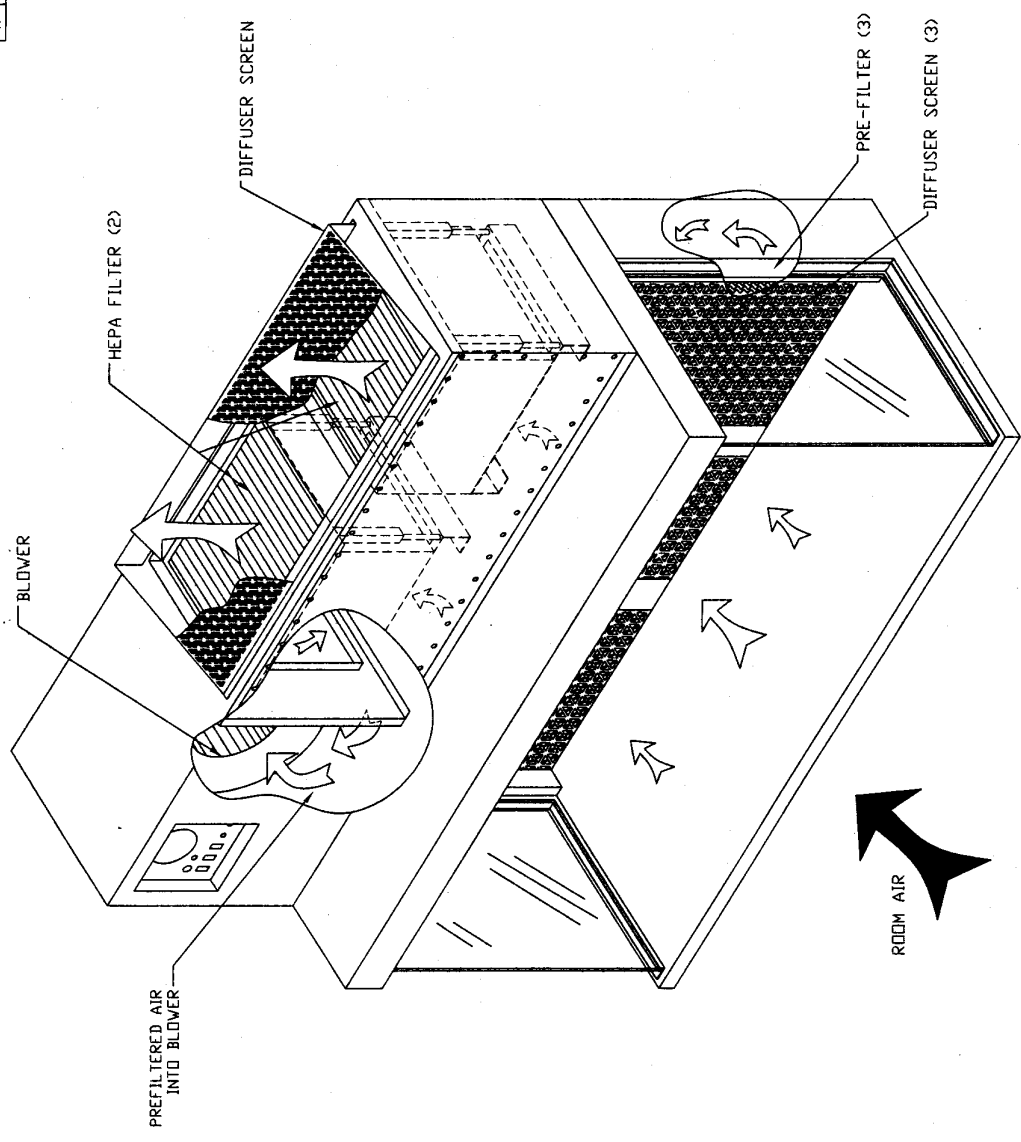
## **1.0 General Description**

The Labgard Model NU-603 Reverse Horizontal Flow Safety Cabinet (RHFSC) is a bench/table top model, optionally available with a base support stand.

The Reverse Horizontal Flow Safety Cabinet is a product resulting from the development of the “laminar flow” principle and the application of environment controls as required in the field of biological research or chemical containment. THE RHFSC, when used with proper techniques, is an effective laboratory aid in personnel protection from airborne biological or particulate chemical agents in low to moderate risk-hazard; as defined by the Center for Disease Control (CDC), Atlanta, Georgia.

Because the cabinet allows room air to flow over the work area, the cabinet does not provide a sterile environment for work in process. Air enters the cabinet flowing past the operator through the large access opening at a minimum of 90 LFPM, providing an air barrier which controls contaminants generated within the work zone from migrating into the room. The air then flows through a set of prefilters in the rear wall carrying contaminants with it, exiting through a HEPA filter removing 99.99% of all particulate matter 0.3 micron in diameter. This design permits the HEPA filter to be adequately challenged by D.O.P. to determine filtering efficiency without any extraordinary test equipment.

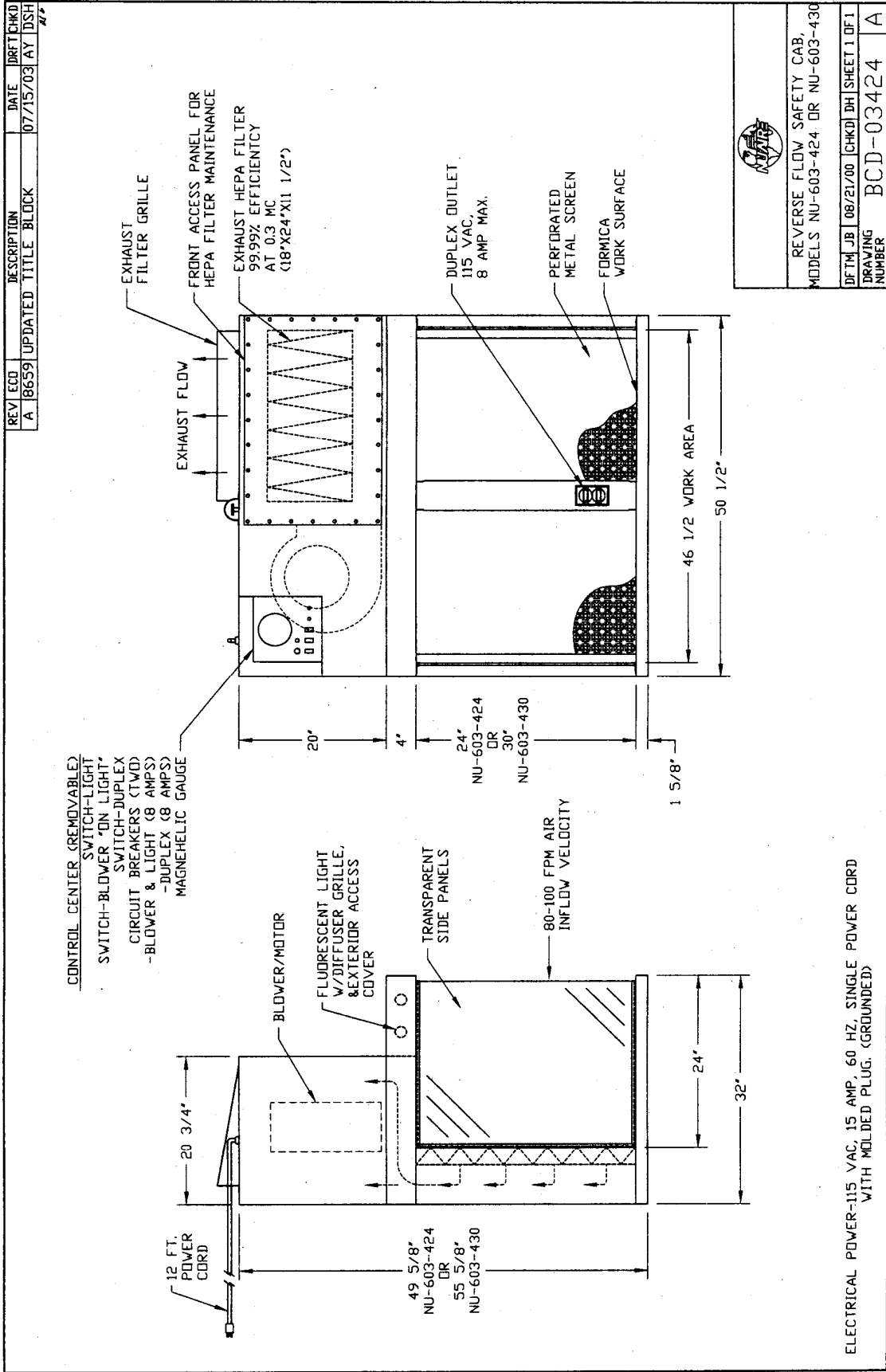
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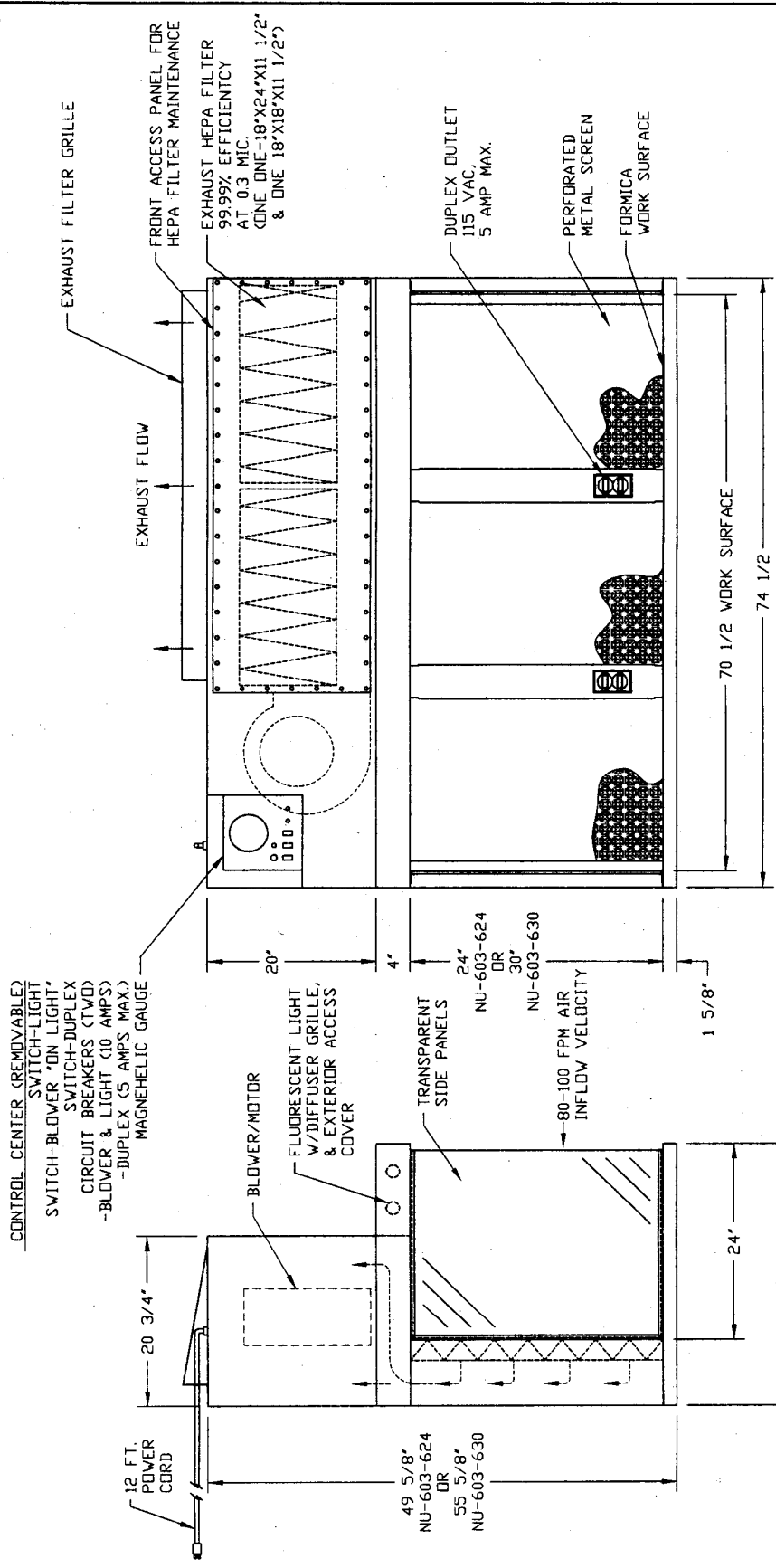
NU-603-400/600 AIRFLOW SCHEMATIC			
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DRAWING NUMBER			BCD-09740
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## **2.0 Models and Features**

The Model NU-603 Reverse Horizontal Flow Safety Cabinet is manufactured in two sizes, 430 and 630.



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- CONTROL CENTER (REMOVABLE)
- SWITCH-LIGHT
- SWITCH-BLOWER 'ON LIGHT'
- SWITCH-DUPLEX
- CIRCUIT BREAKERS (TWO)
- BLOWER & LIGHT (10 AMPS)
- DUPLEX (5 AMPS MAX.)
- MAGNETIC GAUGE

- BLOWER/MOTOR
- FLUORESCENT LIGHT W/DIFFUSER GRILLE, & EXTERIOR ACCESS COVER
- TRANSPARENT SIDE PANELS

- 49 5/8" NU-603-624 OR 55 5/8" NU-603-630
- 24" NU-603-624 OR 30" NU-603-630
- 80-100 FPM AIR INFLOW VELOCITY

REVERSE FLOW SAFETY CAB, MODELS NU-603-624 & NU-603-630	
DTM JB	08/21/00 [CHKD] DH
DRAWING NUMBER BCD-03394	
A	

ELECTRICAL POWER-115 VAC, 15 AMP, 60 HZ, SINGLE POWER CORD WITH MOLDED PLUG. (GROUNDED)

### **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, Inc. 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**

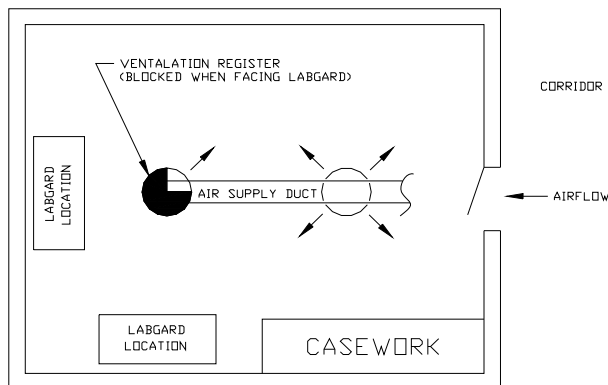
- 4.1.1** Terms are factory, unless stated otherwise. Therefore, it is important to check each shipment before acceptance.
- 4.1.2** If there is visible damage, the material can be accepted after the driver makes a notation on the consignee's copy of the freight bill. Then an inspection must be made 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 safety cabinet is away from personnel traffic lanes, air vents (in or out), doors and/or any other source of disruptive air currents.



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 12" (305mm) 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. A MINIMUM CLEARANCE OF 6" (152MM) IS REQUIRED FROM THE TOP OF THE CABINET TO THE CEILING FOR PROPER VENTILATION OF THE EXHAUST EFFLUX. HOWEVER, FOR CERTIFICATION OR COMMISSIONING, 18 INCHES (451MM) IS REQUIRED TO OBTAIN VALID EXHAUST MEASUREMENTS.

If it is desired to exhaust the cabinet 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 Transitions (with and without integral fan)
- Gas-Tight Exhaust Transitions

**CAUTION: 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 recommends a canopy or thimble exhaust for most applications. See separate instruction sheets for a discussion of exhaust transitions and installation requirements.

### 5.2 Set-Up Instructions

Remove outer shipping protection (carton or crating). If the cabinet is fastened to a base skid, it is usually best procedure to leave the skid in place until the cabinet is located in its approximate final position to facilitate ease in handling. It can then be removed by loosening the bolts located on each corner.

#### 5.2.1 Base Stand Assembly

The base stand is shipped knocked down in a separate carton requiring assembly. With a fork lift or other suitable lifting device, lift the NU-603 between the top of the skid and the bottom of the cabinet, slightly off of the floor and remove the four bolts holding the skid to the cabinet on top of the base and bolt the base stand to the cabinet using four 1/2" – 13 x 3" bolts and washers provided in the same holes as the skid was fastened.

### 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  $\pm 3/4"$  (20mm) adjustment.

### 5.2.3 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 toxic, 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 STRONGLY RECOMMENDED THAT AN EMERGENCY GAS SHUTOFF VALVE BE PLACED JUST OUTSIDE THE BSC ON THE GAS SUPPLY LINE.**

All NuAire BSC's meet the safety requirements of UL and CSA for Laboratory Equipment. To comply with these safety requirements, NuAire uses only certified gas valves. In addition, if external piping is required, only black pipe is used for this application.

As previously stated, NuAire doesn't 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 BURNER.** During use, the Bunsen burner should be placed to the rear of the workspace where resulting air turbulence will have a minimal effect.

### 5.2.4 Plumbing Services

Ground key cocks with the type of service specified by the snap-in button on the handle, are located in the work zone. The ground key cocks are not recommended for pressures over 30 p.s.i. (2.0 Bar). Reducing valves should be installed external to the cabinet if necessary. Ground key cocks 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.

The external connection is made via the 3/8 NPT nipple that is clearly visible from side of the unit. Connection to plant utilities should be made with proper materials for the individual service according to national and/or local codes. Observe all labels pertaining to the type of service and operating pressure.

### 5.2.5 Electrical Services

The NU-603 Class I Safety Cabinet may be "hardwired" (optional) or connected via an electrical power cord which is standard. The unit requires 115 Vac, 60 Hz, single phase (current rating varies per cabinet size, reference Electrical/Environmental Requirements). It is recommended that power to the unit be on its own branch circuit, protected with a circuit breaker or fuse at the distribution panel.

**PLEASE NOTE, THIS UNIT CONTAINS ELECTRONIC BALLASTS FOR THE FLUORESCENT LIGHTING. ELECTRONIC BALLASTS OPERATE WITH HIGH INRUSH CURRENT. IT IS NOT RECOMMENDED TO USE THIS PRODUCT WITH GROUND FAULT CIRCUIT INTERRUPTERS (GFCI'S) BECAUSE THE BALLASTS MAY CAUSE THE GFCI TO TRIP.**

### 5.2.6 Final Assembly

**REMOVE THE PROTECTIVE CARDBOARD COVER OVER THE EXHAUST HEPA,** located under the protective screen. The exterior surfaces 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 several minutes before using it as a BSC.

### 5.3 Certification

After installation and prior to use, NuAire recommends that the cabinet be recertified to factory standards. At a minimum, the following tests should be performed:

1. HEPA filter leak test
2. Inflow velocity test
3. 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).

**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.**

**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 the operator is so vital that certification to the performance requirements should be accomplished as stated to insure biological safety established by the factory standards.

## 6.0 Operating the NU-603

### 6.1 Operator Controls and Indicators

The following is a description of the controls and indicators left-to-right on Drawing BCD-03430.

#### 6.1.1 Fluorescent/U.V. Lights Switch

This switch provides on/off control for the fluorescent light and/or the ultraviolet (UV) light is present (optional). With the UV light option, the switch provides for on-center of-on operation so that both the fluorescent light and the U.V. light cannot be energized at the same time. Proper care should be exercised when the U.V. light is on.

#### 6.1.2 Airflow Control

Airflow inside the unit is controlled by a recessed potentiometer that is located behind a chrome hole plug above the light switch. Remove the hole plug with a standard screwdriver. The potentiometer controls the operating voltage applied to the motor/blower. The potentiometer is adjustable over 270 degrees with a slotted screwdriver, which varies the applied voltage from 70 to 115 VAC. **THIS ADJUSTMENT SHOULD ONLY BE MADE BY A QUALIFIED TECHNICIAN EMPLOYING THE PROPER INSTRUMENTS IN ORDER TO INSURE PROPER AIRFLOWS.**

#### 6.1.3 Blower Switch

The blower switch applies power to the internal blower/motor when in the ON position. In addition, power is applied to the accessory outlet located on the upper left of the Control Panel.

The purpose of the outlet is to provide “switched” power for the following:

- (1) To provide a control signal if a remote exhaust blower system is installed; or
- (2) To power a low-power appliance, such as a low airflow alarm.

The rating of the outlet is 115 Vac at 2 amp maximum.

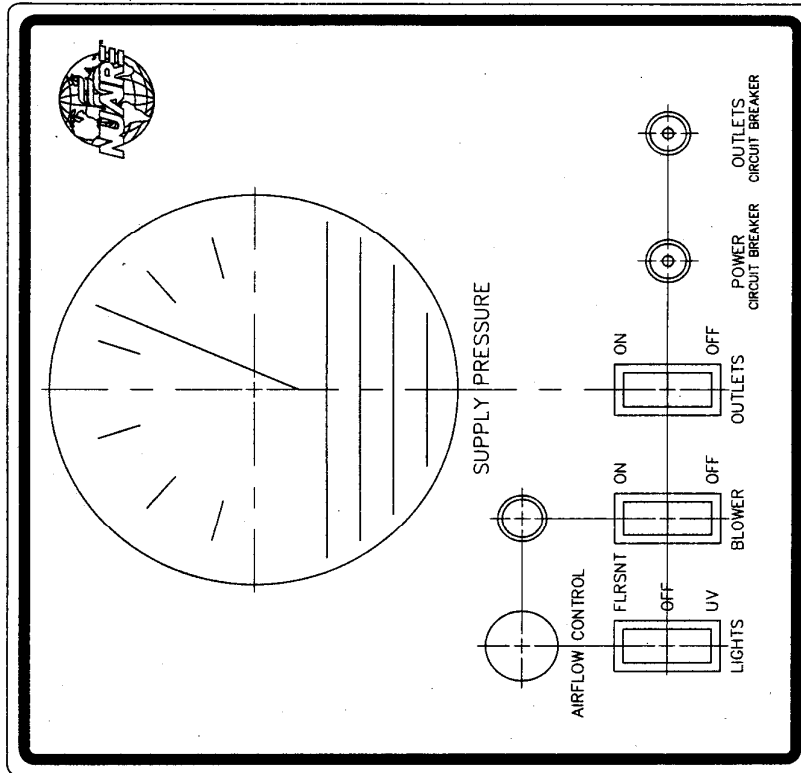
#### 6.1.4 Indicator Light

An indicator light is located above the Blower on/off switch and lights when power is applied to the motor blower.

#### 6.1.5 Outlet Switch

This switch provides on/off control for the 115 Vac power available in the outlet within the interior of the cabinet.

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NU-603 CONTROL PANEL	
DFTM TV	03/19/96
CHKD	
SHEET 1 OF 1	
DRAWING NUMBER	BCD-03430
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### **6.1.6 Circuit Breaker-Blower**

The Blower Motor is protected with a circuit breaker. The circuit breaker, in conjunction with the motor's thermal protector, is designed to open under locked rotor or half-wave power conditions. Should the circuit breaker open (pop-out button will appear) merely depress to reset. If the circuit breaker continually opens, a failure has occurred in the motor or solid state speed controller. Consult a qualified repair technician or NuAire, Inc. for replacement.

### **6.1.7 Circuit Breaker – Outlets**

The duplex outlet located in the rear of the work area is protected with a 3 Amp circuit breaker. The circuit breaker may trip at 110% of load rating but will trip at 145% of load rating in less than 2 seconds. Should the circuit breaker open, (pop-out button will appear), unplug the appliance plugged into the outlet and merely depress the pop-out button to reset.

### **6.1.8 The Magnehelic Gauge**

The unit is equipped with a magnehelic gauge. The magnehelic gauge displays the static pressure within the pressure plenum exhausting cabinet air. The gauge is calibrated in “inches of water gauge” pressure. As the HEPA filter(s) load with particulate matter, the amount of static pressure will increase, giving an indication of “health” of the cabinet. The initial pressure reading will be approximately .75” w.g.  $\pm 0.5$ ” w.g. (18mm w.g.  $\pm 2.5$ mm w.g.)

## **6.2 Operating Guidelines**

The intent herein is to present general operating guidelines that will aid in the use of the reverse flow safety cabinet to control airborne contaminants of low risk.

Procedure protocols defined in terms of the barrier of control concepts unique to the cabinet must be developed in order to obtain the 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. Minimize disruption of the work access opening.
- b. Minimize room activity.
- c. Employ aseptic techniques.

### **6.2.1 Minimize Penetration of the Work Access Opening**

The minimum number of items necessary should be placed into the cabinet to prevent overloading and unnecessary air turbulence around the objects. Arrange work materials to allow space between for reverse flow to offer containment. The work should also be planned to minimize the number of times an operator's hands and arms must enter and leave the work access opening. The ideal situation is to have everything needed for the complete procedure placed in the cabinet before starting, so that nothing need pass in or out through the air barrier at the face until the procedure is completed.

- a. Always work and have work materials at a minimum of 4 inches behind the worksurface front edge.
- b. Always allow space (minimum of 2 inches) between the worksurface front edge and the cabinet user.

### **6.2.2 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 the cabinet can cause draft velocities up to 175 fpm, which are sufficient to disrupt the air barrier provided by the work access opening.

### 6.2.3 Employ Aseptic Technique

The operator must not assume an attitude of “let the cabinet do it” during his procedure in the cabinet. Properly used, the cabinet will do an excellent job of containing viable agents. Normal laboratory contamination control procedure and basic aseptic techniques are necessary to obtain maximum benefit from the cabinet. This precaution is merely an extension of good aseptic technique as practiced on open bench tops. The good laboratory practices designed to minimize creating 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. Tray 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 PROCEDURE DEMANDS USE OF A FLAME, A BUNSEN BURNER WITH ON DEMAND IGNITION IS RECOMMENDED. DO NOT USE CONSTANT FLAME GAS BUNERS.**

In brief, the consideration which should be made in order to obtain optimal personnel safety and product protection may be reiterated:

- a. Pre-plan the procedures carefully.
- b. Minimize disruption of the work access opening.
- c. Employ aseptic techniques.

## 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. Many of the cabinets are provided with gauges which indicate pressure and indicate to the maintenance technician when to replace the filters, dependent upon the blower fan capacity. Blower speed must only be readjusted by qualified maintenance technicians.

#### **NOTE:**

Some cabinets are equipped with ultraviolet (UV) lights. These must be turned off during the day while the laboratory personnel are occupying the room. 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 .

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 safety cabinets leave them in operation beyond the time of actual use.

### **6.3.2 Wipedown**

The interior surfaces of the workspace should next be disinfected 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 and Equipment**

The apparatus and materials should next be placed into the cabinet. Care must be exercised that no items are placed close (within 4 inches) to the front edge of the worksurface. 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 work space 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 (if necessary). At a minimum, the hands and arms should be washed well with germicidal soap before and after work in the cabinet.

### **6.3.6 Terminal Purging and Wipedown**

Following completion of the work, allow the cabinet to run for a 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 the 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 Shut Down**

Turn off blowers and lights. Do not use cabinet as a depository for excess lab equipment during periods of non-operation.



## 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/elbow support - The cabinet is provided with a forearm support on the front of the worksurface. 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 you work procedure to eliminate glare and bright reflections on the window. Keep your window clean and sightlines clear to 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. Apply appropriate disinfecting solution 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.**

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

- b. 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.**

## 7.0 General Maintenance

**CAUTION:** All maintenance actions on this equipment must be performed by a qualified technician who is familiar with the proper maintenance procedures required for this equipment. This includes both certification as well as repair.

### 7.1 Decontamination

No maintenance should be performed on the interior of the Labgard cabinet (area behind access panels) unless the cabinet has been microbiologically decontaminated, is known to biologically clean, or known to be chemically inert. Surface disinfection is performed as specified in the cleaning procedures.

If microbiological decontamination is necessary, use the following procedure:

1. Place decontamination equipment inside the work area. Reference decontamination procedure, per NSF Standard 49, Annex G, using the following chart to calculate chemical requirements.

Cabinet Size	-400	-600
<b>Blower Cabinet Dimensions</b>	20 x 20-3/4 x 50-1/2 (.51 x .53 x 1.28m)	20 x 20-3/4 x 74-1/2 (.51 x .53 x 1.89m)
<b>Workzone Dimensions</b>	34 x 32 x 50-1/2 (.86 x .81 x 1.28m)	34 x 32 x 74-1/2 (.86 x .81 x 1.89m)
<b>Total Cabinet Volume</b>	43.93 cu. ft. (1.24 cu.m)	64.80 cu. ft. (1.84 cu.m)

Note, the outlets in the work area are energized as long as the cabinet is plugged in and switched on the front panel. Unplug the cabinet before decontamination equipment is plugged into these outlets or run the decontamination power cords under the front seal area.

2. Use duct tape and plastic to seal the entire cabinet.

**CAUTION: BE SURE CABINET IS TOTALLY SEALED TO PREVENT ANY LABORATORY EXPOSURE TO DECONTAMINATION GAS.**

3. Perform decontamination procedure per NSF Standard 49, Annex G.

Normally, no preventive maintenance is required on the interior of the cabinet (i.e., the area behind the access panel containing the HEPA filters and motor (blower assembly). All required adjustments in order to maintain proper cabinet airflows are external to the cabinet interior. The motor is lubricated for life and is thermally protected with automatic reset.

### 7.2 Lamp Replacement, Fluorescent

The two (T8) fluorescent lamps are cool white, rapid start and placed external to the cabinet to aid maintenance and minimize heat build-up within the cabinet. The life rating of the lamp is 9000 hours based on three-hour burning cycles.

To replace a lamp, it is necessary to remove the lamp assembly.

1. First, switch Cabinet Light Switch off.
2. Second, remove the screws at each upper side of the front top access panel and raise panel to expose the lamps.
3. The lamp is now directly exposed for replacement.
4. The lamp bulb is removed by displacing the lamp to one side against the compressible lamp holder and lifting out the lamp.

### 7.3 HEPA Filter Replacement

- 1 The HEPA filters under normal usage and barring an accident, do not need replacement until the supply efflux velocity cannot be maintained.
- 2 The HEPA filters should not be replaced until the entire cabinet has been decontaminated. See Section 9.0 General Maintenance.
- 3 The normal HEPA filters for the Labgard cabinets employ a closed cell neoprene gasket material as described in MIL-F-51068C, Paragraph 3.2.2. Constant pressure spring-type clamps are used to hold the filters tightly in place and to counteract seal relaxation.
- 4 The exhaust filter can be pulled from the exhaust chamber section after loosening the hold-down devices.
- 5 The exhaust HEPA filter is located in back of the front access cover. Remove all stainless steel acorn nuts and washers and remove by pulling directly forward on the pull-strap fastened to the filter frame after the hold-down devices are loosened.
- 6 The stainless steel nuts holding the access cover in place should be torqued just enough to displace the visible rubber slightly.

### 7.4 Prefilter Replacement

- 1 Replacement interval depends on the containment (large particles or lint) in the room – a typical period is every 3 months. Decontaminate unit before replacing filter.
- 2 To remove prefilter, simply remove the screws holding the prefilter screens and remove screens. This exposes the prefilter which can be removed by pulling filter forward.

### 7.5 Blower Motor Replacement

- 1 Access plate is on the back side of unit. Decontaminate before opening unit.
- 2 To remove, simply remove the blower, motor or both as required. Reverse order to re-install.

### 7.6 Airflow Calibration

The NU-603 Airflow Calibration consists of adjusting the airflow within the cabinet. **THIS WORK SHOULD BE DONE ONLY BY A QUALIFIED TECHNICIAN WHO CAN MEASURE THE AIRFLOW FROM THE FILTERS WITH A SUITABLE VELOMETER.** NuAire provides one adjustment to set the airflow within the cabinet. This is:

- a. Blower speed adjustment via motor voltage regulator.

The blower speed control system adjusts the cabinet's total volume of airflow as well as makes up for filter resistance tolerances.

The cabinet is considered to be certifiable if the following airflow measurements are present:

- a. Inflow average: 100 LFPM  $\pm$  10 LFPM (.51 m/s  $\pm$  .50 m/s) using the inflow velocity measurement method.

**BEFORE STARTING AIRFLOW CALIBRATION PROCEDURE, LET THE CABINET RUN FOR AT LEAST 10 MINUTES.**

**7.6.1 Inflow Calibration**

Step 1: Measure the inflow velocity using the recommended procedure found in Table 7.0. If necessary, adjust to achieve the correct average inflow velocity within the stated range of  $100 \pm 10$  LFPM ( $.51 \pm .50$  m/s).

Step 2: If necessary, adjust airflow control potentiometer, located under the removable cap plug on front panel, to the above stated airflow requirements.

**Filter Integrity Check**

The filter must be scan tested before installation into the HEPA clean airflow module. Once installed, a gross leak test can be performed to assure a proper installation was performed.

**7.7 Filter Integrity Check**

In order to check filter and filter seal integrity, the HEPA filter media and seals must be directly accessible by the measuring instrument.

The exhaust filter is typically more difficult to check, since charcoal filters, or exhaust transitions could cover the filter. Access panels are usually provided and should be removed. If an air gap exhaust transition is provided, the air gap must be sealed with duct tape or other suitable means to prevent contaminated air from migrating into the exhaust efflux. All exhaust blowers/fans should be turned off during the check.

**Table 7.0  
Recommended Measurement Methods for Cabinet Inflow**

**Inflow Measurement**

The inflow velocity is measured by using the calculated inflow measurement method. Exhaust filter efflux is measured using an Alnor 8500 or TSI 8355 Thermoanemometer on a 4 by 4 inch (102mm) grid, 4 inches (102mm) above the exhaust filter. The average access opening inflow velocity can be calculated from these measurements, since the exhaust CFM is equal to the inflow CFM.

**Inflow Velocity Measurement**

- A. Instrument: Alnor 8500 Thermoanemometer or TSI 8355
- B. Procedure: Airflow readings are to be taken on a grid as specified below 6" from prefilters in a vertical plane defined within the prefilter frame.
- C. Test Data

	4	9	14
6			
13.50			
21			

	4	9	14
6			
13.50			
21			

	4	9	14
6			
13.50			
21			

Number of Readings:
Average Velocity:     fpm

Number of Readings:
Average Velocity:     fpm

Number of Readings:
Average Velocity:     fpm

- D. Acceptance Criteria:
  - 1. Average Velocity = 90 to 110 fpm (.46 to .56 m/s)
- E. Meets Acceptance Criteria:     Yes\_\_\_\_\_ No\_\_\_\_\_

## 8.0 Optional Equipment

### 8.1 The Ground Fault Circuit Interrupter (GFI)

**8.1.1** The GFI (if ordered) replaces the duplex outlet located on the back wall of the work area. If the unit has more than one duplex, the duplex is wired in the GFI by the hood leads in the GFI. The GFI sensor detects a “leakage” of 5 milliamperes between power and ground and interrupts current flow in 1/40 of a second; fast enough to prevent injury to personnel.

**8.1.2** The GFI duplex in the Labgard control center contains a “reset” button that pops out, showing a red line which indicates that power to the protected circuit has been discontinued. The GFI circuit should be tested at least once a month for maximum protection against electrical shock hazard.

To Test:

1. Push “test” button. The “reset” button should pop up, showing a red line which indicates that power to the protected circuit has been discontinued.
2. If the “reset” button does not pop up when test button is pushed, a loss of ground fault protection is indicated. Do not use, call a qualified electrician.
3. To restore power, push the “reset” button.

**8.1.3** The GFI is so dependable that the Labgard can be used to verify the integrity of electrical circuitry in any appliance simply by plugging it into a Labgard electrical outlet.

### 8.2 Ultraviolet Lamp

#### 8.2.1 Overview

The germicidal ultraviolet is primarily intended for the destruction of bacteria and other micro-organisms in the air or on directly exposed surfaces. Approximately 95% of the ultraviolet radiants from germicidal tubes are in the 253.7 nanometer region. This is the region in the ultraviolet spectrum which is near the peak of germicidal effectiveness. The exposure necessary to kill bacteria is the product of time and intensity. High intensities for a short period of time, or low intensities for a longer period are fundamentally equal in lethal dosage on bacteria (disregarding the life cycle of bacteria). The intensity of light falling on a given area is governed by the inverse law; that is the killing intensity decreases as the distance increases from the tube. Approximate killing intensity is 120 microwatts per centimeter falling on a horizontal plane defined by the bottom of the work surface.

**8.2.2** The UV light on/off switch is located in the Service Control Center and is wired with the fluorescent light switch so that the UV light cannot be used when the fluorescent light is on.

#### 8.2.3 Precaution

The rays from germicidal tubes may cause a painful but temporary irritation of eyes and reddening of the skin, if of sufficiently high intensity, or if exposure covers a prolonged period of time. For this reason, one should avoid direct eye and skin exposure to ultraviolet light. If exposure cannot be avoided, it is necessary for personnel to wear eye goggles or face shields, and long sleeve gowns with rubber gloves.

#### **8.2.4 Maintenance**

The output of an ultraviolet lamp deteriorates with burning age. The useful life of the lamp is approximately 7500 hours under specific test conditions. If the tube is turned on every day for 12 hours, the tube will last approximately two years.

It is recommended that either a time schedule be established or the tube's output be measured periodically and the tube replaced when its output falls below 40 microwatts per square centimeter or exceeds 7500 hours of operation. Lamps should be allowed to operate approximately 5 to 10 minutes (longer when the lamp is in low temperatures) to warm up sufficiently and wiped clean of dust or dirt before reading the output with a meter. Even minute amounts of dust will absorb ultraviolet energy.

The lamp may be cleaned with a lint-free cloth dampened with alcohol or ammonia and water.

## 9.0 Electrical/Environmental Requirements

### 9.1 Electrical

NU-603-430 115V, 60Hz, 1 Phase, 10 Amps

NU-603-630 115V, 60Hz, 1 Phase, 11 Amps

### 9.2 Operational Performance (for indoor use only)

Environment Temperature Range: 60°F-85°F (15°C - 30°C)

Environment Humidity: 20% - 60% Relative Humidity

Environment Altitude: 6562 Feet (2000 meters) maximum

### 9.3 Light Exposure

Standard Fluorescent Lighting @ 150 ft. candles (1614 LUX) maximum intensity.

### 9.4 Installation Category: 2.0

Installation category (overvoltage category) defines the level of transient overvoltage, which the instrument is designed to withstand safely. It depends on the nature of the electricity supply and its overvoltage protection means. For example, in CAT II, which is the category used for instruments in installations supplied from a supply comparable to public mains such as hospital and research laboratories and most industrial laboratories, the expected transient overvoltage is 2500 V for a 230 V supply and 1500 V for a 120 V supply.

### 9.5 Pollution Degree: 2.0

Pollution degree describes the amount of conductive pollution present in the operating environment. Pollution degree 2 assumes that normally only non-conductive pollution such as dust occurs with the exception of occasional conductivity caused by condensation.

### 9.6 Chemical Exposure

Chemical exposure should be limited to antibacterial materials used for cleaning and disinfecting.

**CHLORINATED AND HALOGEN MATERIALS ARE NOT RECOMMENDED FOR USE ON STAINLESS STEEL SURFACES.** Chamber decontamination can be accomplished by paraformaldehyde, vapor phased Hydrogen Peroxide or Ethylene Oxide without degradation of cabinet materials.

### 9.7 EMC Performance (classified for light industrial)

Conducted Emissions: CISPR 11, Class B & EN55011

Radiated Emission: CISPR 11, Class B & EN55011

Radiated Immunity: EN50082-1, IEC 801-3, Level 2

ESD Immunity: EN50082-1, IEC 801-2, Level 2

EFT/BURST Immunity: EN5082-1, IEC 801-4, Level 2

(Note: The EMC performance requirements are generated within the product enclosure. The enclosure will be all metal grounded to earth. In addition, the membrane front panel will also include a ground plane for maximum protection and an electrostatic shield.



## Energies Required to Destroy Some Microorganisms by Ultraviolet Radiations

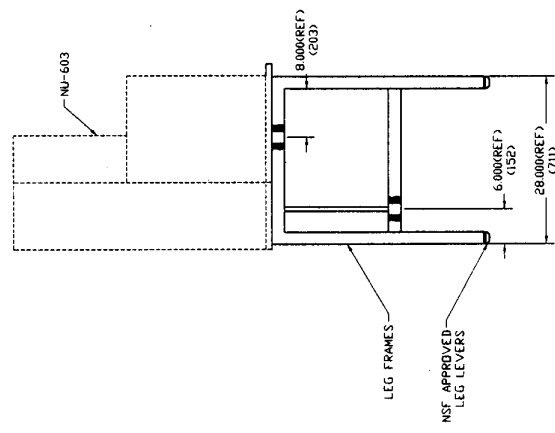
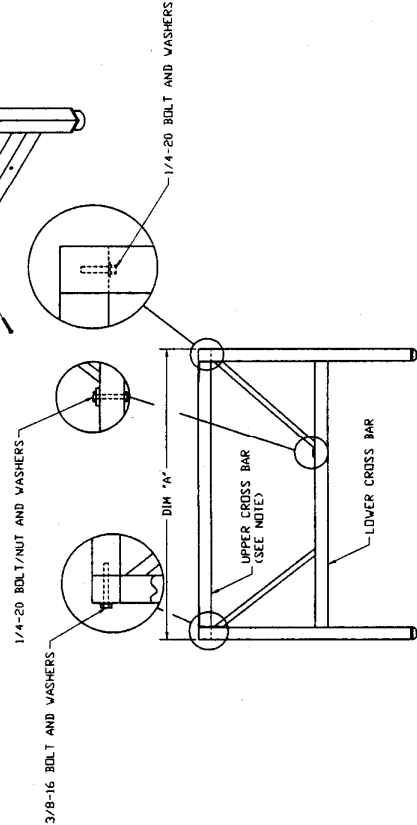
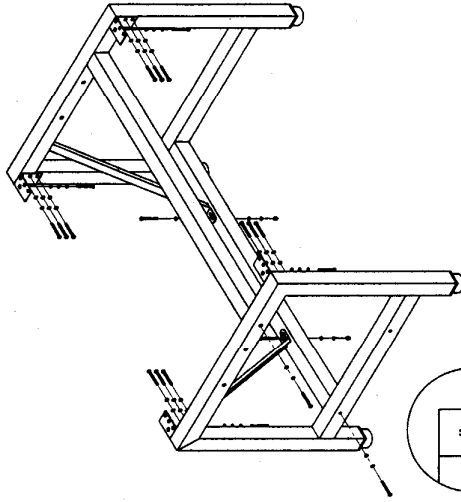
<u>Yeast</u>	<u>Microwatt Seconds Per cm/2</u>	<u>Protozoa</u>	<u>Microwatt Seconds Per cm/2</u>
Saccharomyces	13,200	Paramecium	200,000(a)
Ellipsoideus	17,600		
Saccharomyces cerevisiae	13,200	<u>Nematode Eggs</u>	40,000(b)
Brewer's yeast	6,600		
Baker's yeast	8,800	<u>Algae</u>	22,000(c)
Common yeast	13,200		
		<u>Virus</u>	
<u>Bacteria</u>		Bacteriophage (E. Coli)	6,000
Strep. Lactis	8,800	Tobacco mosaic	440,000
Strep. Hemolyticus	5,500	Influenza	3,400(b)
Staph. Aureus	6,600		
Staph. Albus	5,720	<u>Mold Spores</u>	
Micrococcus sphaeriodes	15,400	Penicillium roqueforti	26,400
Sarcina lutea	26,400	Penicillium expansum	22,000
Pseudomonas fluorescens	7,040	Penicillium digitatum	88,000
Escherichia coli	7,040	Aspergillus glaucus	88,000
Protues vulgaris	7,480	Aspergillus flavus	99,000
Serratia marcescens	6,160	Aspergillus niger	330,000
Bacillus subtilis	11,000	Rhizopus nigricans	220,000
Bacillus subtilis spores	22,000	Mucor racemosus A	35,000
Spirillum rubrum	6,160	Mucor racemosus B	35,200
		Oospora lactis	11,000

### References

- (a) Luckiesh, Matthew (1946)  
Application of Germicidal, Ethyemal and Infrared Energy  
D. Van Nostrand o., New York, New York. pp. 253
- (b) Hollaender, Alexander (1942)  
Aerobiology, A.A.A.S. (for 90% inactivation). pp. 162
- (c) Ellis, C. and Wells, O.O. (1941)  
The Chemical Action of Ultraviolet Rays  
Reinhold Publishing Corp. pp. 713-714
- (d) Hollaender, A., Olphant, J.W. (1944) The inactivation effect of monochromatic ultraviolet.  
Radiation on influenza virus (for 90 ½ inactivation) Jour. Of Bact. 48, pp. 447-454
- (e) This table, "Energies Required to Destroy Some Microorganisms by Ultraviolet Radiations"  
comes from the Westinghouse brochure entitled "Westinghouse Sterilamp Germicidal Ultraviolet  
Tubes"

REV	ECD	DESCRIPTION	DATE	DF	CHKD
B	8037	MOVED NOTE	6/6/01	JR	DSH

MODEL	DIM "A"
NU-603-430	46.500 (1181)
NU-603-630	70.500 (1791)



NOTE:  
1. UPPER CROSS BAR FOR 4 FT., AND 6 FT. UNITS

INCHES  
MILLIMETERS

NU-603	
BASE STAND ASSEMBLY	
DF TML SJ	7/10/98
CHKD	JR
SHEET 1 OF 1	
DRAWING NUMBER	BCD-074251B

**CRITICAL**

