Labgard Class II, Type B2 Laminar Flow Biological Safety Cabinet

Models
NU-430-400/600
NU-430-400E/600E
NU-430-400G/600G
Bench/Console

Operation & Maintenance Manual

Revision 1
May 2005
(Series 40 or Higher)

(115 VAC Only)

(115 VAC Only)

(115 VAC Only)

Manufactured By:
NuAire, Inc.
2100 Fernbrook Lane
Plymouth, MN 55447
Toll-Free: 1-800-328-3352
In Minnesota: (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 49:2002. Please read this manual carefully to familiarize yourself with proper installation, maintenance, and operation of the cabinet.

Acknowledgment

NuAire, Inc. acknowledges that some material in this manual reflects information supplied by the National Institutes of Health personnel both in verbal and written specifications. In particular, NuAire acknowledges that information in Section 8 was obtained from the following sources:

1. Technical Report No. FPS 56500000001. Prepared by Dow Chemical Co., for the National Cancer Institute, May 1, 1972.
2. Stolar MH, Power LA, Vielo CS: Recommendations for handling cytotoxic drugs in hospitals. Am J Hosp Pharm 1983; 40: 1163 1171.
3. Anderson R.W., Director of Pharmacy, University of Texas, M.D. Anderson Hospital and Tumar Institute at Houston.

ABOUT THIS OPERATION & MAINTENANCE 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. Calling or writing NuAire, Inc. stating the model number and serial number and a brief description of the information desired can obtain a replacement copy.

Labgard Class II, Type B2
Laminar Flow Biological Safety Cabinet

Models NU-430-400/600
NU-430-400E/600E / NU-430-400G/600G
Operation & Maintenance Manual

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Labgard Class II, Type B2
Laminar Flow Biological Safety Cabinet

Models
NU-430-400/600
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NU-430-400G/600G

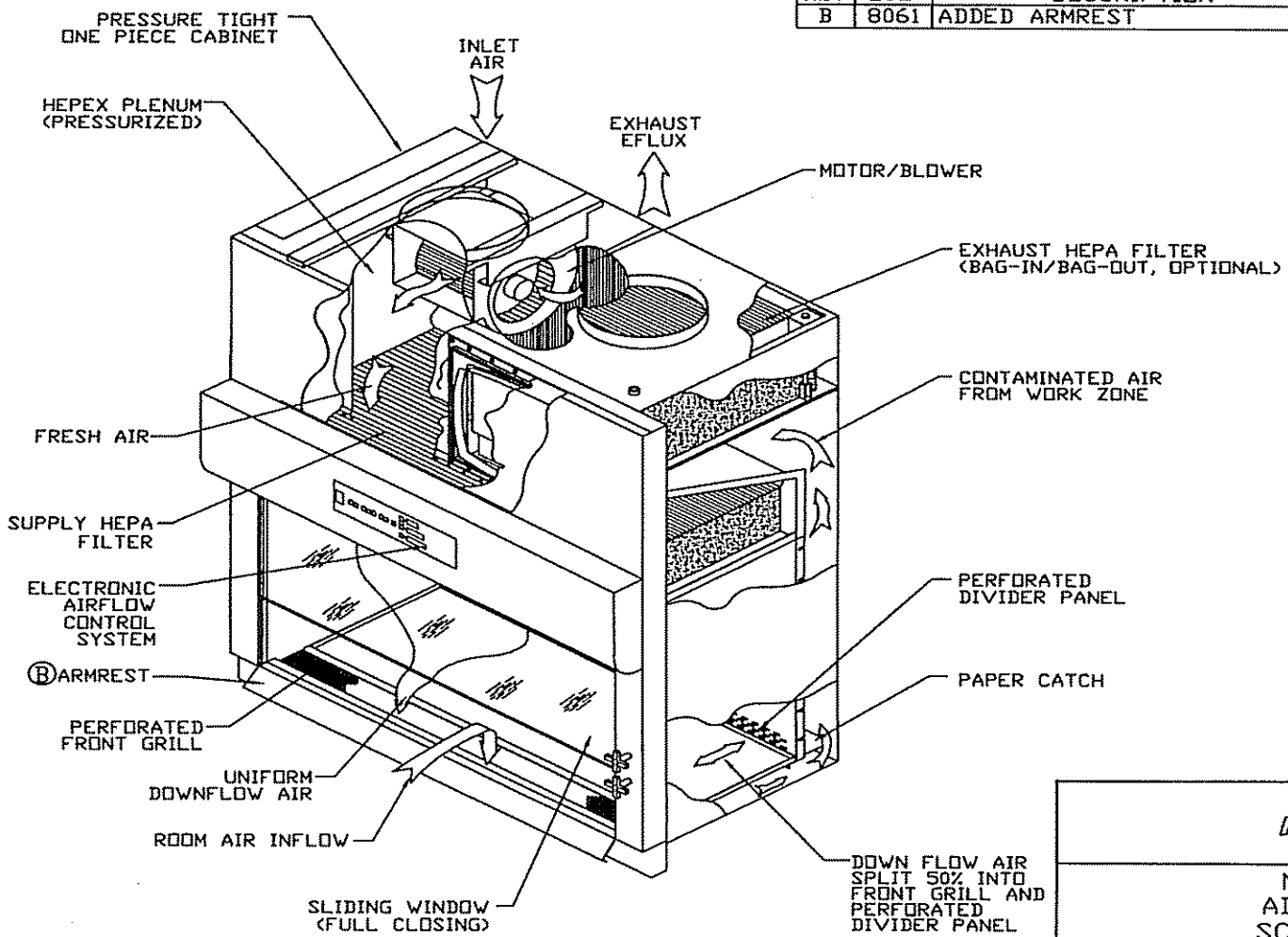
MANUFACTURED BY:
NuAire, Inc. - Plymouth, Minnesota, U.S.A.

1.0 General Description

The Labgard Model NU-430 Laminar Flow Biological Safety Cabinet (BSC) 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, (BSC) 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 BSC, 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 use of the BSC to work with chemicals and trace amounts of radio nuclides required as an adjunct to microbiological studies, as prescribed by the Center for Disease Control (CDC) Atlanta, Georgia.

REV	ECO	DESCRIPTION	DATE	DRFT	CHKD
B	8061	ADDED ARMREST	6/20/01	JR	DSH



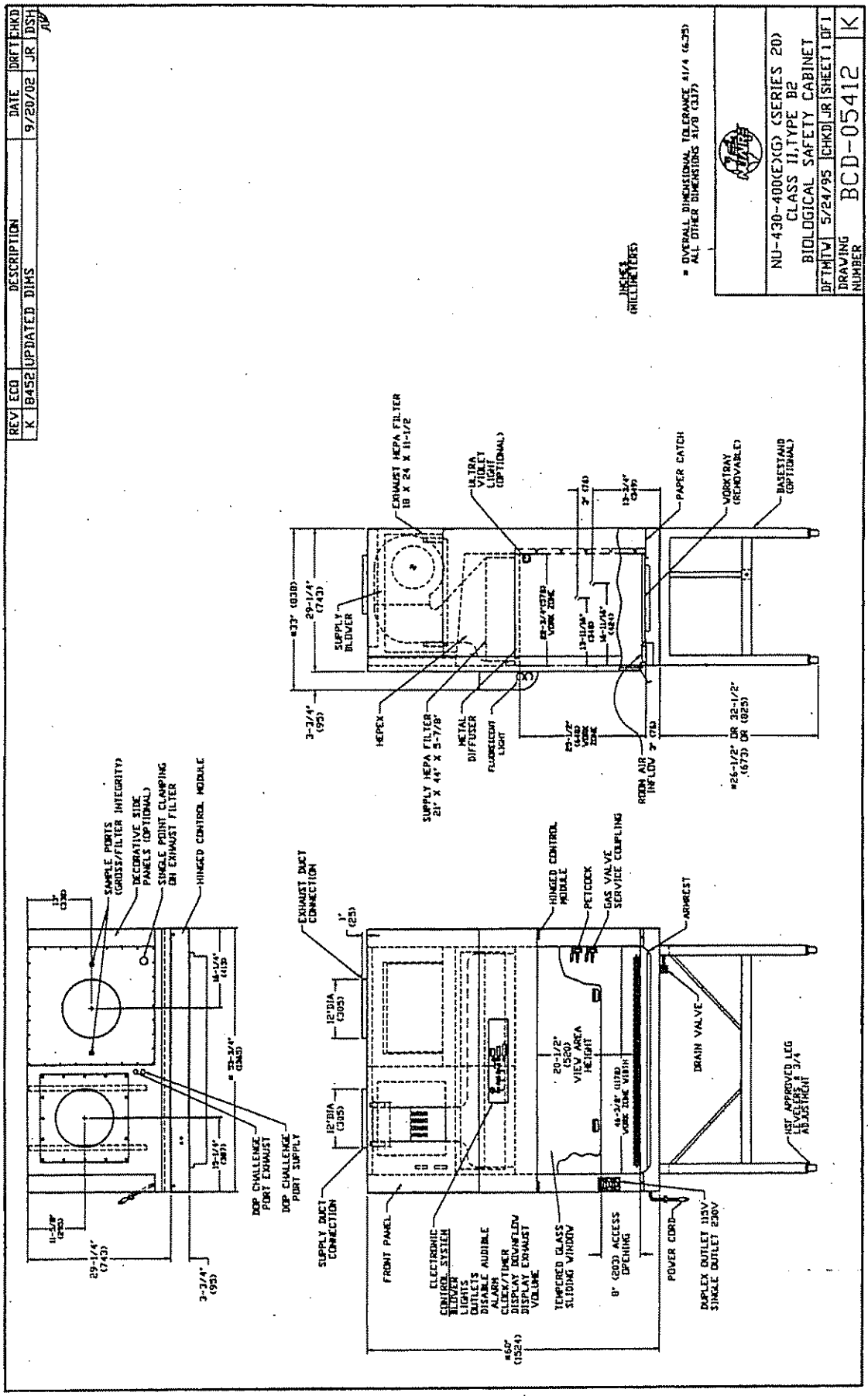
NU-430
AIR FLOW
SCHEMATIC

DFTM	AS	4/17/98	CHKD	JR	SHEET 1 OF 1

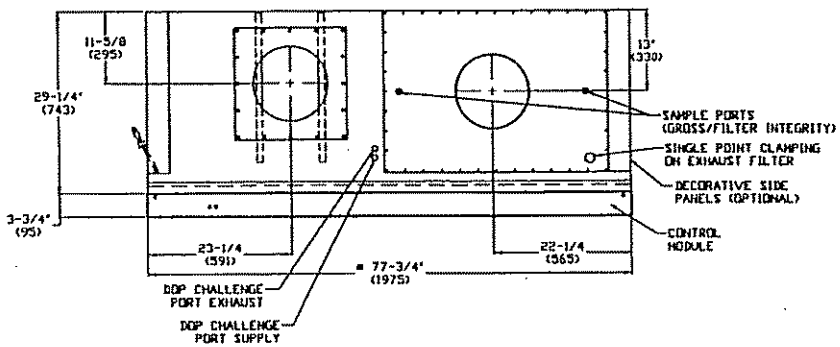
DRAWING NUMBER ACD-05651 B

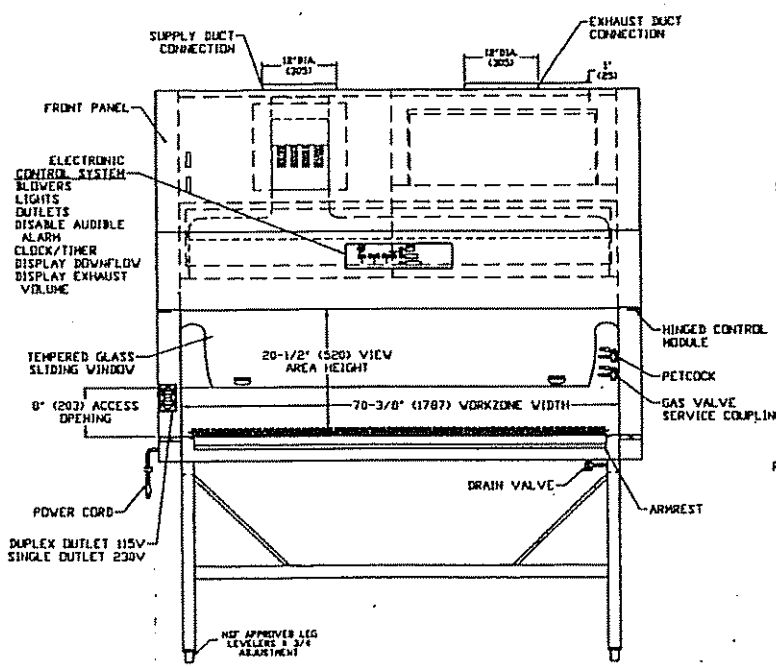
2.0 Models & Features

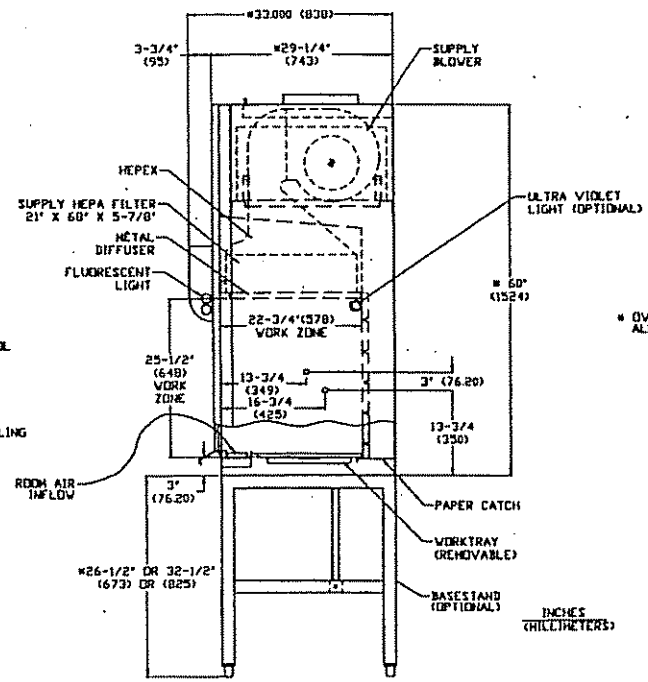
The model NU-430, Class II, Type B2 Laminar Flow Biological Safety Cabinet is manufactured in two sizes: 4 ft. and 6 ft. (1.2m and 1.8m).


REV | ECO | DESCRIPTION | DATE | DRFT | CHKD
K | 8452 | UPDATED DIMS | 9/20/02 | JR | DSH
NU-430-400(E)(G) (SERIES 20)
CLASS II,TYPE B2
BIOLOGICAL SAFETY CABINET
DFTM TV | 5/24/95 | CHKD JR | SHEET 1 OF 1
DRAWING NUMBER BCD-05412 K
* OVERALL DIMENSIONAL TOLERANCE ±1/4 (6.35) ALL OTHER DIMENSIONS ±1/8 (3.17)
UNITS (MILLIMETERS)
SAMPLE PORTS (GROSS/FILTER INTEGRITY)
DECORATIVE SIDE PANELS (OPTIONAL)
SINGLE POINT CLAMPING ON EXHAUST FILTER
HINGED CONTROL MODULE
DOP CHALLENGE PORT EXHAUST
DOP CHALLENGE PORT SUPPLY
EXHAUST DUCT CONNECTION
SUPPLY DUCT CONNECTION
FRONT PANEL
ELECTRONIC CONTROL SYSTEM
BLOWER
LIGHTS
OUTLETS
DISABLE AUDIBLE ALARM
CLOCK/TIMER
DISPLAY DOWNFLOW
DISPLAY EXHAUST VOLUME
TEMPERED GLASS SLIDING WINDOW
8" (203) ACCESS OPENING
POWER CORD
DUPLEX OUTLET 115V
SINGLE OUTLET 230V
DRAIN VALVE
HST APPROVED LEG LEVELERS ± 3/4 ADJUSTMENT
ARMREST
GAS VALVE SERVICE COUPLING
PETCOCK
HINGED CONTROL MODULE
VIEWING AREA HEIGHT
WORK ZONE VIEW
EXHAUST HEPA FILTER 18 X 24 X 11-1/2
ULTRA VIOLET LIGHT (OPTIONAL)
SUPPLY BLOWER
HEPEX
SUPPLY HEPA FILTER 21" X 44" X 5-7/8"
METAL DIFFUSER
FLUORESCENT LIGHT
ROOM AIR INFLOW
PAPER CATCH
WORKTRAY (REMOVABLE)
BASESTAND (OPTIONAL)
WORK ZONE

REV	ECO	DESCRIPTION	DATE	DRFT	CHKD
G	8452	UPDATE DIMS	9/20/02	JR	DSH







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

INCHES
(MILLIMETERS)

NU-430-600(E)(G) (SERIES 20)
CLASS II,TYPE B2
BIOLOGICAL SAFETY CABINET

DFTM	TV	5/24/95	CHKD	JR	SHEET 1 OF 1

DRAWING NUMBER BCD-05413 G

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.

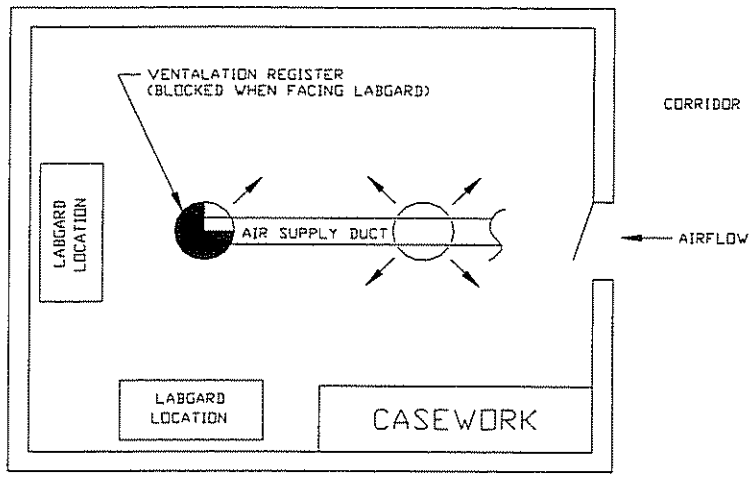
4.1.2 If there is visible damage, the material can be accepted after the driver makes a notation on the consignee's copy of the freight bill. Then an inspection must be made to verify the claim against the carrier. This inspection is the basis of your filing the claim against the carrier.

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.



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. If the outlet is inaccessible, such as a conduit (hardwired) connection, then an appropriate warning label should be applied near the cabinet's on/off switch, to indicate the circuit breaker on the power distribution panel to be used.

More than any other biological safety cabinet, the NU-430 requires careful site-planning and preparation, due to the total exhaust nature of the cabinet. Proper sizing of the exhaust and make up supply systems are critical to the successful installation of the cabinet. In addition, the cabinet provides for the choice of make-up air for the supply (downflow) air. The following are airflow requirements.

Air Volume (CFM/CMH)	Supply Air	Inflow	Exhaust Air*
NU-430-400(E)(G)	484/822	270/459	754/1281
NU-430-600(E)(G)	690/1172	410/697	1100/1869

*Exhaust air volume at 2.0 inches (50.8mm) w.g. negative.

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 holding the cabinet to the skid. It may be necessary to remove the Control Center in order to gain passage through a doorway. It may easily be removed by following the instructions on drawing BCD-05145.

5.2.1 Base Stand Assembly

The base stand is shipped knocked down in a separate carton and is assembled per drawing BCD-05147 if accompanied with the unit. 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. If it is shipped unassembled, it can be assembled per drawing BCD-05146. 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.

Remove the cap protecting the drain valve threads and install the drain valve, on the bottom right front of the cabinet using Loctite 242 furnished to the threads and rotate the valve body until it is secure (see BCD-05154).

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 ± 3/4" (20mm) adjustment.

5.2.3 Bench Installation (BCD-05154)

Place the cabinet on the bench with approximately a 2" (50mm) 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 caulk, 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, 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 1-1/2" (38mm) overhang and seal the interface of the bench and cabinet, using RTV caulk 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 toxic, explosive or flammable substances in this cabinet
should be evaluated by your appropriate safety personnel.

Once the appropriate safety personnel have made the determination, 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.**

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; is 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 valves with the type of service specified by the removable button on the handle are located in the work zone. The service valves are not recommended for pressure over 30 p.s.i. (2.0 BAR). Reducing valves should be installed external to the cabinet if necessary. Service 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.

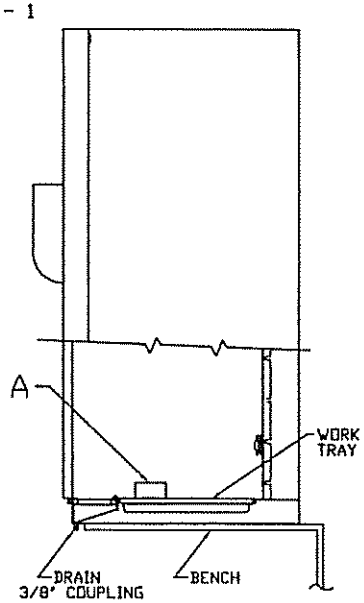
External connection is to 3/8 inch NPT coupling in the inner sidewalls. Connection to plant utilities should be made with proper materials for the individual service and according to national and/or local codes. Observe all labels pertaining to the type of service and operating pressure.

Remote controlled needle-valve plumbing fixtures can be optionally provided within the interior sidewalls. Control handles are located externally on the vertical airfoil. Service outlets within the interior have serrated tapered fittings designed for hose connections with the remote controlled needle valve plumbing fixtures. NuAire provides for either rear, bottom or top connections of plumbing services to plant utilities. Connection from the needle valve assembly to the welded exit coupling is accomplished with the supplied 3/8 inch soft copper tubing as standard (alternative materials to meet local codes are available upon request). The needle valves are not recommended for working pressure in excess of 100 p.s.i. (7.0 BAR).

REV	ECO	DESCRIPTION	DATE	DRFT	CHKD
D	7924	ADDED 437 TO TITLE BLOCK	2/13/01	JR	DSH

THE NUAIRE BIOLOGICAL SAFETY CABINET HAS A DRAIN PAN BELOW THE WORK TRAY DESIGNED TO SUBSTANTIALLY DRAIN SPILLS THAT ACCIDENTIALLY OCCUR IN THE WORK ZONE. A 3/8" BALL DRAIN VALVE IS LOCATED ON THE FRONT OF THE CABINET FOR CONVENIENCE. THE CABINET BASE MEETS THE NSF OBJECTIVE WITH THE CAPABILITY OF BEING SEALED TO THE BENCH UPON WHICH IT RESTS.

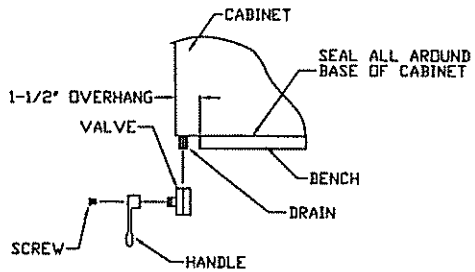
FIGURE - 1



1.) PLACE THE CABINET ON A BENCH WITH APPROXIMATELY 2 INCHES OVERHANG CLEARANCE FOR INSTALLATION OF DRAIN VALVE.

2.) REMOVE CARTON - A AND CONTENTS FROM WORK AREA, AND INSTALL THE DRAIN VALVE AS SHOWN IN FIGURE 2.

FIGURE - 2



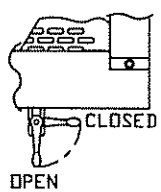
3.) REMOVE HANDLE FROM VALVE STEM TO GAIN CLEARANCE FOR VALVE BODY ROTATION. FOR INSTALLATION OF DRAIN VALVE.

4.) ADD LOCTITE 242 FURNISHED TO THREADS AND ROTATE VALVE BODY UNTIL SECURE WITH VALVE STEM ON LEFT SIDE AS SHOWN.

5.) RE-INSTALL HANDLE TO VALVE STEM.

6.) ADJUST THE CABINET ON THE BENCH, WITH A 1-1/2" OVERHANG AND SEAL INTERFACE WITH BENCH TOP, USING RTV SILICON SEALANT.

FIGURE - 3



NU-425/427/430/435/437/440
DRAIN VALVE
INSTALLATION

DFTM	TH	11/29/94	CHKD	JR	SHEET 1 OF 1

DRAWING NUMBER BCD-05154 D

5.2.6 Electrical Services

The NU-430 series Biological Safety Cabinets may be "hardwired" (optional) or connected via an electrical power cord, which is standard. The unit requires 115or 230 VAC, 60 or 50Hz single phase (correct 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.

5.2.7 Exhaust/Supply Duct Installation Guidelines

The exhaust/supply systems must provide conditions similar to that under which the cabinet was certified to meet its stated performance. The following guidelines should be observed when installing exhaust/supply air ductwork for either existing plant exhaust systems, or a new exhaust system.

1. Adequate room make-up air inflow to replace exhausted air. Air diffusion rate not to exceed velocity of 100 LFPM (.51 m/s) to minimize disruptive air currents.

Room Make-Up Air Requirements (CFM/CMH)

Model	With Supply Duct	Without Supply Duct
NU-430-400(E)(G)	270/459	754/1281
NU-430-600(E)(G)	410/697	1100/1869

2. Adequate plant exhaust system capability. The exhaust system is usually adequate if it can provide the rated exhaust flow at 2.0 inches (50.8mm) water gauge.

3. Adequate supply air capability (if used). The supply air system is usually adequate if it can provide the rated supply air at 0.0 inches water gauge positive.

4. The supply air must be interlocked with the operation of the cabinet's internal downflow blower in order to prevent downflow air from being forced out of the front of the cabinet when powered off or during nite setback conditions. NuAire provides fan relay contacts for this purpose.

5. All duct losses must be considered and added to the cabinet loss in selecting the exhaust blower, for a new exhaust system (i.e. duct diameter, length and number of elbows, etc.).

6. All ductwork should be securely anchored to the building construction in manner to be free from vibration and swaying under all conditions of operations.

7. Sheet metal gauges and seams should be in accordance with the current edition of the ASHRAE guide. A minimum of 20 gauge for round duct is required to prevent duct collapse due to high static pressure conditions (square duct will require heavier gauge material).

8. All ductwork should be maintained at a negative pressure within the building (i.e. externally located exhaust blower).

9. The exhaust blower and duct work should be a sealed system that can hold 2.0 inches w.g. pressure for 30 minutes with no more than a 10% drop in pressure, and be properly vented to the atmosphere to disperse exhausted air.

10. A local exhaust flow damper should be readily accessible for the maintenance technician/certifier to adjust the total flow through the cabinet. Dampers should be installed with a locking quadrant with markings to indicate damper position. NuAire Model NU-940 manual butterfly or NU-951 automatic butterfly for full-automated volume air control is suitable for this purpose.

11. It is recommended that the cabinet operation be interlocked with the exhaust blower. Fan relay contacts are provided for this purpose. However, it is also recommended to have a manual exhaust override switch near the cabinet for certification and service. For multi-ganged systems, this switch could be used to interface with a building automated airflow control system. NuAire also provides several different optional interlocks that will sequence the operation of the cabinet and the exhaust blower.

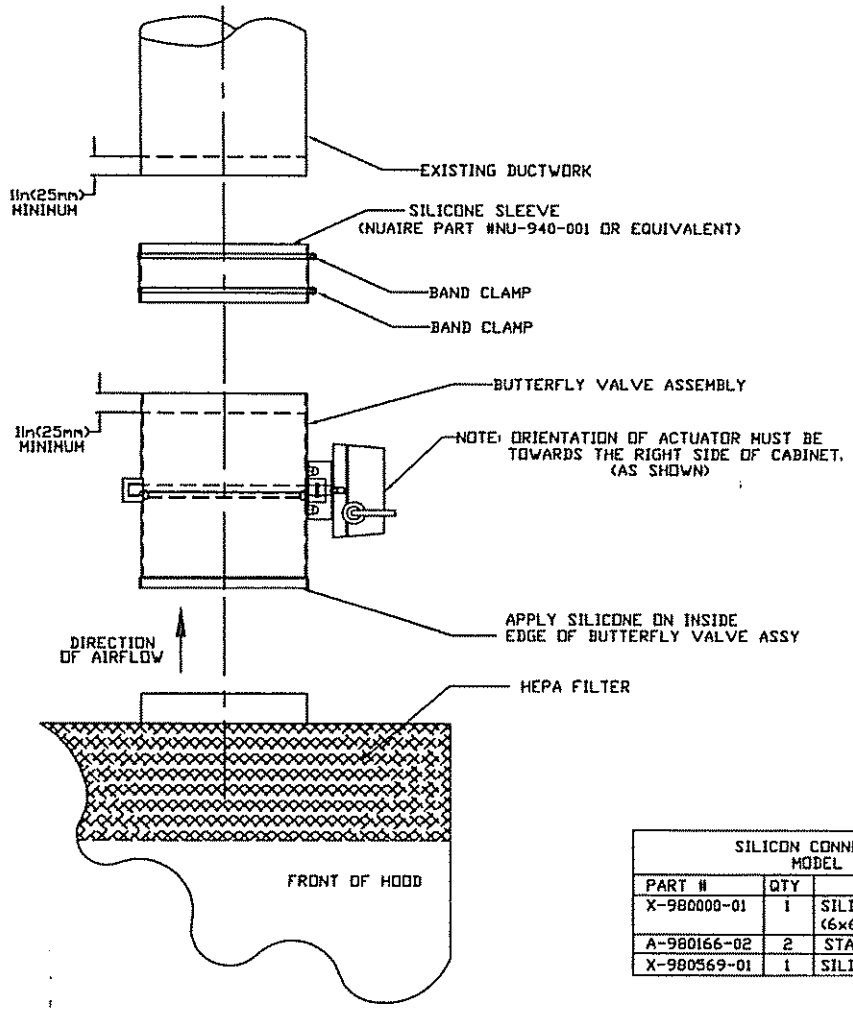
12. It is recommended that when using the NU-951-012 automatic butterfly valve, the system air volume must remain within ten percent of the given nominal setpoint volume. Variations greater than ten percent will result in incorrect air volume measurements on the electronic airflow control system.

13. It is not recommended to hard connect (i.e. weld) the exhaust connection to the cabinet. This may damage the exhaust filter and/or the butterfly valve (if present). A silicon sleeve (NuAire Part No. NU-940-001), banded between the cabinet's exhaust duct and the plant exhaust duct is recommended, with no more than a two-inch gap between the ducts, for a 1/8 inch (3mm) thick silicone sleeve. If NuAire damper valves are present, see Drawing BCD-05572 for installation.

14. If duct diameter reduction is required, it is recommended that the reduction occurs at least 12 inches (305mm) from the cabinet duct connection and that the reduction is smooth and gradual to reduce air turbulence that results in noise and loss of static pressure.

15. **IT IS NOT RECOMMENDED TO CONNECT THE CABINET DUCT CONNECTION DIRECTLY INTO A 90-DEGREE BEND.** The cabinet's exhaust airflow sensor could be affected by airflow turbulence created by 90-degree bends. If a 90-degree bend is required, it is recommended that the 90-degree bend occur at least 12 inches (305mm) from the cabinet duct connection.

REV	ECO	DESCRIPTION	DATE	DFTH	CHKD
D	7766	UPDATE TO SILICON MAT'L COMPONENTS	11/12/99	LS	BP



INSTRUCTIONS:

1.) CLEAN INSIDE RING OF BUTTERFLY VALVE ASSEMBLY AND OUTSIDE RING OF CABINET WITH ALCOHOL OR ACETONE.
2.) APPLY 1/4 INCH (6mm) BEAD OF SILICONE (DOW CORNING 732) RTV AROUND INSIDE EDGE OF BUTTERFLY VALVE ASSEMBLY.
3.) PRESS FIT BUTTERFLY VALVE ASSEMBLY ONTO CABINET RING NOTING POSITION OF HANDLE OR ACTUATOR. TAPPING DOWN BUTTERFLY VALVE ASSEMBLY WITH RUBBER MALLET WILL ASSURE A TIGHT FIT. ADDITIONAL USE OF DUCT TAPE MAY BE REQUIRED DEPENDING UPON INSTALLATION.
4.) CONNECT EXISTING DUCTWORK TO BUTTERFLY VALVE USING A SILICONE SLEEVE. WRAP THE SLEEVE AROUND THE VALVE AND DUCT EXTENDING THE SLEEVE A MINIMUM OF 1 in (25mm). OVERLAP THE SLEEVE A MINIMUM OF 1 in (25mm) AND REMOVE REMAINING SLEEVE MATERIAL. GLUE THE OVERLAPPED SEAM WITH SILICON SEALANT PROVIDED, RESULTING IN A GAS-TIGHT SEAL. USING THE BAND CLAMPS, CLAMP SLEEVE INTO PLACE TO ASSURE A TIGHT SEAL.

CAUTION

DO NOT DRILL OR USE MECHANICAL FASTENERS THAT WILL DROP METAL PARTICLES ONTO THE HEPA FILTER JUST BELOW THE ATTACHMENT AREA OR CAUSE CONFLICT WITH OPERATION OF BUTTERFLY VALVE ASSEMBLY.

NOTE

POSITION OF VALVE ASSEMBLY WITH IN BIO-SAFETY LEVEL THREE FACILITIES MAY BE ALTERED TO ACHIEVE MAXIMUM CONTAINMENT FOR THE INDIVIDUAL DESIGN REQUIREMENTS.

SILICON CONNECTION SLEEVE KIT
MODEL # NU-940-001

PART #	QTY	ITEMS
X-980000-01	1	SILICON SLEEVE (6x60 IN)(152x1524mm)
A-980166-02	2	STAINLESS STEEL BAND CLAMPS
X-980569-01	1	SILICON SEALANT

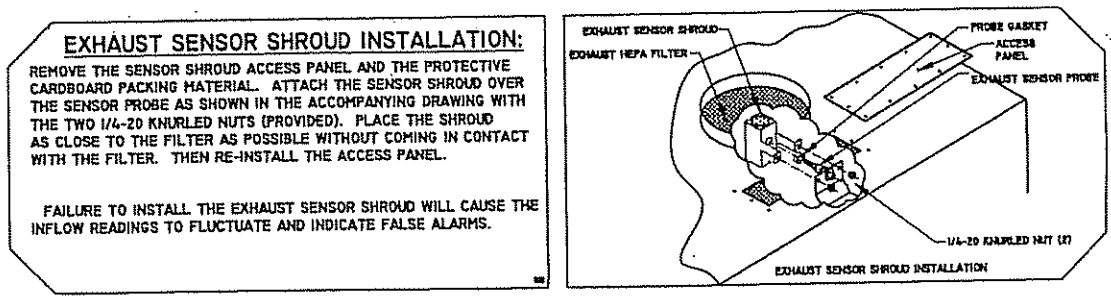
DATE	9/12/95
DFTH	TW
CHKD	LS
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES -TOLERANCES- DECIMALS ±.032 ANGLES ±2°	

TITLE: RECOMMENDED GAS-TIGHT BUTTERFLY VALVE INSTALLATION
MATERIAL: AS NOTED
NUMBER: BCD-05572 D
DO NOT SCALE DRAWING | SHEET 1 OF 1

5.2.7 Final Assembly

Remove the protective cardboard cover over the supply and exhaust connections on top of the cabinet. Attach the exhaust sensor shroud over the exhaust sensor. Access is provided either through the 12-inch (305mm) exhaust connection or the filter/sensor access panel. The shroud should be placed as close as possible to the exhaust HEPA filter without coming in contact. The probe gasket should be tightly against the sensor shroud to prevent sneak 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.



FRONT OF TAG BACK OF TAG

5.3 Exhaust/Supply Air Checks

NOTE: THE INTERNAL SUPPLY BLOWER IS INTERLOCKED WITH THE EXHAUST SENSOR, TO PREVENT OPERATION UNLESS ADEQUATE EXHAUST FLOW IS PRESENT.

5.3.1 Exhaust Volume

The exhaust volume is displayed on the front panel. Preset lower and upper alarm limits are factory set but can be field verified at any time. To insure that adequate exhaust is available for a dirty exhaust HEPA filter, condition, the nominal exhaust readings should be attainable with the butterfly valve or damper set at 60 percent open, with all other dampers in the system (duct) open.

5.3.2 Supply Volume

The supply volume is controlled by the electronic airflow control system. The control system uses a dual thermistor airflow probe in the downflow air stream to monitor and control airflow to setpoint. The control system automatically compensates for filter loading, voltage variances and other environmental effects. However, excessive variances caused by remote butterfly valves or dampers, insufficient supply air and dirty prefilters may cause an airflow alarm condition to occur.

NOTE: THE SUPPLY AIR, IF INTEGRALLY DESIGNED, MUST BE INTERLOCKED WITH THE INTERNAL FAN RELAY TO ASSURE PROPER OPERATION.

5.4 Certification Testing Methods and Equipment

After installation and prior to use, NuAire recommends that the cabinet be certified or commissioned to factory standards. As a 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
  - Damper valve installed correctly with label toward front
  - BSC base stand level

- Verify airflow probe shroud is in place
  - Downflow
  - Exhaust (Note, NU-430) Exhaust shroud has flow adjustment plate. For initial certification, the plate should be approximately 40-50% open, but may require fine adjustment due to the installation. However, fine adjustment cannot be determined until the total flow measurement, during the certification process.

- Verify configuration switch for specific model * (see section 7.8)

- Verify setpoints and alarm limits for specific model * (see section 7.5.2)

- Perform BCS certification
  - At a minimum, the following tests should be performed:
    - HEPA filter leak
    - Downflow velocity test
    - Inflow velocity test
    - Airflow smoke patterns
  - Note, During the certification process of total flow measurement, verify exhaust airflow probe performance (Exhaust diagnostic value, see section 8.3).

- Perform Site Assessment Tests
  - The NU-430 requires verification of the supply fan interlock and back-up pressure switch operation utilizing independent exhaust volume measurement instrument (DIM). Per NSF/ANSI 49-2002 a 20% loss of exhaust volume must produce an airflow alarm within 15 seconds.

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 (SEE INSERT).

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.

* If the specific model is a special product with non-standard setpoints and alarm limits, the new values will be located on the factory Inspection Report.

Labgard Class II, Type B2
Laminar Flow Biological Safety Cabinet
Models NU-430-400/600
NU-430-400E/600E
NU-430-400G/600G

Catalog Number	Catalog Number	
	NU-430-400 (E)(G) **Nominal 4 foot (1.2m)**	**NU-430-600 (E)(G)** **Nominal 6 foot (1.8m)**
Performance Specifications 1. Personal Protection 2. Product Protection	NSF/ANSI 49:2002	NSF/ANSI 49:2002
NSF Std. No. 49 Class	Class II, Type B2	Class II, Type B2
Style of 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
Diffuser for Air Supply (Metal)	Non-Flammable	Non-Flammable
HEPA Filter Seal Type: Supply Filter-99.99% Eff. on 0.3 Microns Exhaust Filter-99.99% Eff. on 0.3 Microns	 HEPEX Seal Neoprene, Spring loaded	 HEPEX Seal Neoprene, Spring loaded
Fumigation per NIH/NSF Procedure	Yes	Yes
Standard Services: Service Coupling (3/8 inch NPT) Gas Valve/Service Coupling (3/8 inch NPT) Duplex Outlet	 None Two, Right Sidewall One, Left Front Faring	 None Two, Right Sidewall One, Left Front Faring
Optional Services: Gas Cocks 3/8" NPT Remote Controlled Valves** Ultraviolet Light Standard/Cup Sinks	 Up to 3 ea. Sidewall Up to 3 ea. Sidewall One, Backwall Left or Right Work Surface	 Up to 3 ea. Sidewall 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)	 61 (1549) 61 (1549) 53 5/8 (1362) 32 7/8 (835)	 61 (1549) 61 (1549) 77 5/8 (1972) 32 7/8 (835)
Work Access Opening Inches (mm): Standard Opening Height Standard Inflow Velocity	 8 (203) 105 FPM (.53 m/s)	 8 (203) 105 FPM (.53 m/s)
Work Zone Inches (mm): Height Width Depth	 25 1/2 (648) 46 3/8 (1178) 23 1/2 (597)	 25 1/2 (648) 70 3/8 (1788) 23 1/2 (597)
Viewing Window Inches (mm): Standard is Tempered Sliding Glass Hinged Tempered Glass (optional)	Fully Closed to 18 1/2 (470) Open 8 (203) Access Opening	Fully Closed to 18 1/2 (470) Open 8 (203) Access Opening
Required Exhaust CFM/CMH Standard:	754/2181	1100/1869
Plant Duct Static Pressure Eng/Metric	2.0" w.g./50.8mm w.g.	2.0" w.g./50.8mm w.g.
Heat Rejected, BTU, Per Hour	Negligible	Negligible
Electrical: 115V/(230V) Volts, AC (Hz) Amps: Blower/Lights Amps: Outlet Amps: Total 12 ft. Power Cord (one)	U.L./U.L.-C Listed (115V only) 115, 60/(230, 50/60) 5/(3) 3/(3) 8/(6) 14 GA - 3 Wire, 15A	U.L./U.L.-C Listed (115V only) 115, 60/(230, 50/60) 7/(4) 3/(3) 10/(7) 14 GA-3 Wire, 15A
Crated Shipping Weight: Net Weight	570 lbs./259 kg. 520 lbs./236 kg.	760 lbs./345 kg. 710 lbs./322 kg.

**Remote controlled valve handles project through front fairing. Decorative side panels are available to cover plumbing.

6.0 Operating the NU-430

6.1 Electronic Airflow Control System

6.1.1 Overview

The electronic airflow control system is designed to service the control requirements of the NU-430 Biological Safety Cabinet. The control system is a self-contained microprocessor driven module that will perform the following functions:

- Control blower motor via solid-state triac.
- Monitor, display and control downflow via dual thermistor airflow probe.
- Monitor and display exhaust flow (inflow) via dual thermistor airflow probe.
- Alarm setpoints high/low for error conditions (downflow and exhaust flow).
- Clock display (24 hours) and timer function.
- Control lights via solid-state switch.
- Control outlets via solid-state switch.
- Complete diagnostic functions.

The NU-430 incorporating the use of the electronic airflow control system offers improved cabinet performance. The control system uses a dual thermistor airflow probe in the downflow air stream to monitor and control airflow to setpoints. The control system automatically compensates for filter loading, voltage variances and other environmental effects. A second dual thermistor airflow probe in the exhaust air stream monitors for exhaust volume. Both downflow and exhaust are displayed on the front panel. 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. All the above functions are shown in a system block diagram (see Figure 1).

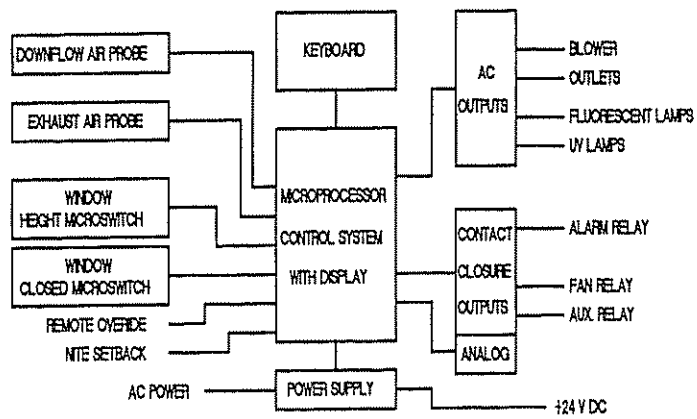


Figure 1. System Block Diagram

6.1.2 Front Panel

The control system front panel contains the following functions described in detail (see Drawing BCD-05432 and BCD-05737).

6.1.2.1 Blower Switch

The blower switch indicates and controls ON/OFF power to the blower.

6.1.2.2 Light Switch

The light switch indicates and controls ON/OFF power to the fluorescent and optional ultraviolet light.

6.1.2.3 Outlet Switch

The outlet switch indicates and controls ON/OFF power to the outlets.

6.1.2.4 Window Alarm LED

The window alarm red LED indicates when the sliding window is raised above its proper operating height.

6.1.2.5 Arrow Adjustment Keys

The arrow adjustment keys allow user interaction for various functions.

6.1.2.6 Airflow Alarm LED

The airflow alarm red LED indicates when a downflow or inflow high/low deviation from setpoint occurs in normal run mode.

6.1.2.7 Select Key

The select key allows user interaction to select functional display for various other functions.

6.1.2.8 Set Time Key

The set time key allows user interaction with the clock/timer as well as various other functions.

6.1.2.9 Downflow Display

The downflow display indicates the present downflow airflow value in its respective unit of measure.

6.1.2.10 Exhaust Display

The exhaust display indicates the present exhaust volume value in its respective unit of measure.

6.1.2.11 Clock/Timer Display

The clock/timer display indicates the present time as well as a user interactive timer function.

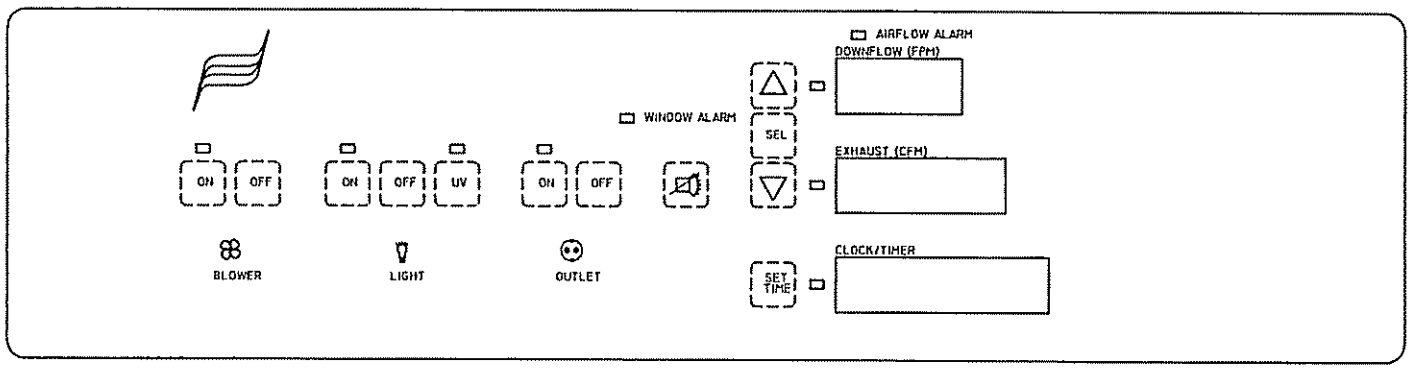
6.1.2.12a Audible Alarm Silence

The audible alarm silence key allows user interaction to silence any audible alarm for a period of fifteen minutes for standard units. After the time limit, if the alarm condition still exists, the audible will again sound.

6.1.2.12b Cleaning Keys (E) and (G) Units Only

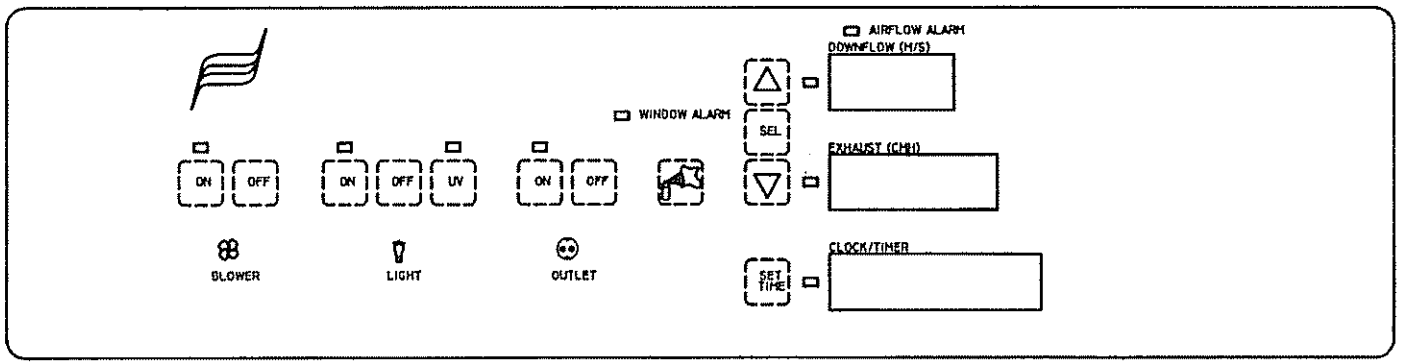
The cleaning key may be pressed to silence the audible alarm for cleaning/loading purposes only. It may also be pressed during the cabinet warm-up cycle to silence the audible airflow alarm.

REV	ECO	DESCRIPTION	DATE	DRFT	CHKD
C	7885	REMOVED KEY SWITCH	11/17/00	LS	DSH



FRONT PANEL NU-427/430/435-400/600					
DFTM	TH	12/5/94	CHKD	LS	SHEET 1 OF 1
DRAWING NUMBER	BCD-05432				C

REV	ECO	DESCRIPTION	DATE	DRFT	CHKD
C	8394	ADDED CLEAN KEY	6/27/02	JR	DSH



FRONT PANEL
NU-427/430/435-400E/600E

DFTM	TH	12/5/94	CHKD	LS	SHEET 1	OF 1

DRAWING NUMBER BCD-05737 C

6.1.3 Run Mode Operations

The run mode of the control system is very simple and user friendly with all interaction performed on the front panel. Calibration and set up functions performed **ONLY BY A QUALIFIED TECHNICIAN** during the certification or commissioning are discussed in Section 7.0 General Maintenance. As well as the electronics system master reset.

Operation of the cabinet is initiated by plugging the power cord into the appropriate line power. In the power OFF condition (cabinet is unplugged), all calibration and running parameters will be stored in the microcomputers EEPROM memory. However, the clock will not maintain the correct time, only remembering the time when the power was turned off. When power is turned on, the downflow and inflow displays will indicate dashes and the clock display will indicate "POWR" and the time last known by the system. To clear the "POWR" indicator, which means a power interruption has occurred; press the [SET TIME] key.

The cabinet has a full counter-balanced and removable sliding glass window with two operational features. As the window is raised above its specified operating height, an audible and visual alarm alerts the operator of possible compromised personnel protection. If the window is closed, it will perform an interlock function that will allow the ultraviolet light, if installed, to be turned on. The fluorescent light may be turned on or off in any window position. However, only one light may be turned on at a time.

Remember, the NU-430 E, G version has a motor blower lockout function. To turn on or off the blower function, the correct sequence of the [↑] [↓] and [SEL] keys must be used before the blower on/off key. The default sequence for a new cabinet is [↑] [SEL] [↓] keys. It is possible to customize the access code by performing the following:

- Press and hold [↑] key until clock indicates alternate blink code/clock time.
- Press the [↑] [SEL] [↓] keys in any three consecutive keys.
  i.e.: [↑][↑][↑]
  [SEL][↑][↑]
  [↓][↓][SEL]
- Press [SET TIME] to enter the new code.

Once the blower is turned on, the display will continue to indicate dashes for approximately two minutes during a warm up period and the clock will alternate with time and "WM.UP". Also, during the warm up period, an airflow alarm will occur, (230V option only) both audible and visual. The audible may be silenced by entering into a cleaning cycle by pressing the cleaning key. After the warm up period, the displays will actively indicate the current running parameters. If an alarm condition occurs, the clock/timer will indicate the error message as well as the parameter LED will blink.

6.1.4 Clock/Timer Operation

6.1.4.1 Time of Day Clock

The time of day clock is displayed in the HH.MM and 24 hour format. To enter the correct time of day, perform the following:

- Press and hold [SET TIME] until, display blinks "S.TIM" and "00.00". Continue to hold [SET TIME] until the display blinks "S.CLK" and time, then release.
- Press the [↑] or [↓] arrows to the correct time.
- Press [SET TIME] to enter the corrected time.

The time of day clock may also run on a 12-hour format. This can be altered in the Option Mode by performing the following:

- Press and hold [SET TIME] and [SEL] simultaneously until downflow display indicates "OPt", exhaust display indicates "OFF" and the clock display indicates "12HR".
- Press [↑] or [↓] to turn the 12 hour clock on or off. (Note, if 12-hour clock operation is desired, select "ON").
- Press [SET TIME] to enter desired operation.
- Press and hold [SET TIME] and [SEL] simultaneously until downflow and exhaust display indicates dashes "----".

The 12-hour clock uses decimal points for various points of information. The center decimal point "XX.XX" blinks elapsed time in seconds. The far right decimal point "XX.XX." indicates PM time of day. No far right decimal point indicates AM time of day.

6.1.4.2 Timer

The timer function is available as a second function to the time of day clock. The timer can be set for an elapsed time of up to 12 hours and 00 minutes. WHEN THE TIMER ELAPSES TO ZERO, IT WILL SOUND THE AUDIBLE ALARM FOR 5 SECONDS. To set the timer, perform the following:

- Press [SET TIME], display blinks "S.TIM" and "00.00".
- Press the [↑] or [↓] arrows to the desired time.
- Press [SET TIME] to start the timer.

The timer will display MM.SS for times less than one hour and HH.MM for times in excess of one hour. To view the clock when the timer is running, simply press the [SEL] key. The time of day will be displayed for a period of 5 seconds, then return to the timer. To reset timer, press the [SET TIME] key.

If the timer is used when the ultraviolet light is turned on, the timer will act as an ultraviolet timer and run the ultraviolet light for the length of time set on the timer.

6.1.4.3 User Mode

The user mode allows the cabinet user to select the operation of the following parameters.

- 12.HR - 12 or 24 hour clock (on/**off**)
- UV.SY - Ultraviolet light sync w/timer (**on**/off)
- UV.TM - Ultraviolet light time limit (minutes - hours/**0.00**)
- UV.RT - Ultraviolet light run time (hours/**0000**)

Default conditions printed in **bold**

To enter into the user mode, perform the following:

- Press and hold [SEL] until downflow display indicates "USr", exhaust display indicates "off" and the clock display indicates "12.HR".

The parameters may be altered using the ↑ and ↓ arrows to their desired condition. Pressing [SEL] will advance through the above parameters in a round-robin fashion. Once the parameter is selected and altered to the desired state, pressing [SET TIME] will enter the desired condition into memory. To exit the user mode, perform the following:

- Press and hold [SET TIME] and [SEL] simultaneously until downflow and inflow/exhaust display indicates dashes "---". Clock display will indicate "WM.UP".

User Mode Parameter Descriptions

12.HR - 12 or 24-Hour Clock
This parameter allows for the selection of a 12 or 24-hour clock. As the clock display indicates "12.HR", the exhaust display can be toggled "on" for a 12-hour clock and "off" for a 24 hour clock.

UV.SY - Ultraviolet Light Sync W/Timer
This parameter allows for the selection of the ultraviolet light option to run in sync or not in sync with the timer. As the clock display indicates "UV.SY", the exhaust display can be toggled "on" for the ultraviolet light to run in sync with the timer and "off" for the ultraviolet light not to run in sync with the timer.

UV.TM - Ultraviolet Light Time Limit
This parameter allows for the selection of the ultraviolet light timer to limit, to a specified time period, or not limit the length of time once turned on. As the clock display indicates "UV.TM", the exhaust display can be adjusted for length of time limit. When the exhaust display indicates "0.00", there is no time limit. When a time limit is entered, the display will start with minutes "0.00 - 99.50" and then go to hours "1.40 - 12.00.".

UV.RT - Ultraviolet Light Run Time
This parameter allows the cabinet technician to review how many hours the ultraviolet light has been running. The time is displayed in hours up to 9,999. However, once the time exceeds 7000 hours, a replace UV light message will appear in the clock display "RP.UV". To clear the run time back to zero and replacement message, press ↑ and ↓ arrows simultaneously.

6.1.5 Night Setback (Optional)

The optional feature night setback is used to reduce the exhaust air volume during non-usage periods resulting in conditioned air energy savings. For the night setback to operate, the NU-951-012 motorized air-tight butterfly valve must be installed to provide the means for reduction of exhaust airflow. The night setback is initiated by closing a contact on the main control board. Once the contact is closed and night setback is initiated, the internal blower and fluorescent lights will be turned off and remain inoperable. The exhaust butterfly valve will close to a percentage of the original setpoint. The clock display will blink "NITE" and the time of day. Once the nite setback contacts are broken, normal operation will resume.

6.1.6 Remote Override (Optional)

The optional feature remote override is used to remotely control the operation of the cabinet. A typical application would be in a Bio Safety Level three facility that had a room exhaust system failure.

The failure mode could signal the remote override contacts to close and not allow any usage of the cabinet. Once the remote override contacts are closed, the internal blower and fluorescent lights will be turned off and remain inoperable. If an exhaust motorized airtight butterfly valve (NU-951-012) is present, the valve will close to seal the exhaust system.

The clock display will blink "RM.OV" and the time of day. Once the remote override contacts are broken, normal operation will resume.

6.2 Operating Guidelines

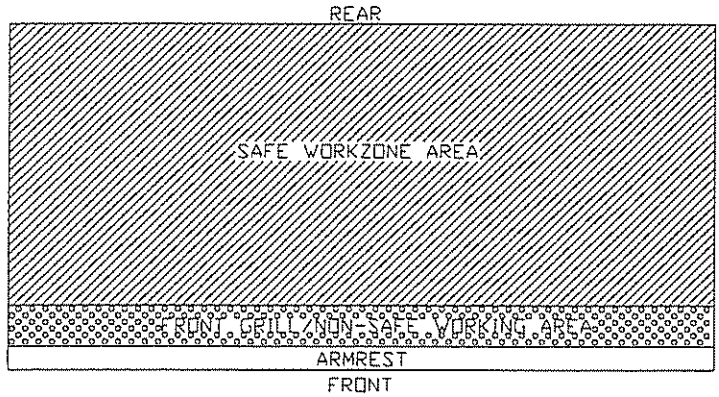
The intent herein is to present general operational guidelines that will aid in the use of the Laminar Flow Biological Safety Cabinet (LFBSC) to control airborne contaminants of low to moderate risk as stated in Technical Report No. FPS 56500000001 prepared by Dow Chemical U.S.A. for the National Cancer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



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 rising 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 m/s), which are sufficient to disrupt the air balance of the laminar flow unit.

6.2.4 Utilize Unidirectional Airflow

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 examples, 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 only used from the center of the work surface to the right rear where resulting air turbulence will have a minimal effect. **DO NOT USE GAS BURNER ON THE LEFT OF THE WORK SURFACE DUE TO ITS INFLUENCE ON THE ELECTRONIC AIRFLOW CONTROL SYSTEM.** 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. The electronic airflow control system will automatically control airflows to specified setpoints.

Note: Some cabinets are equipped with ultraviolet (UV) lights. Good procedure includes the decontamination or wipe down 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's leave them in operation beyond the time of actual use.

6.3.2 Wipe down

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 apparatuses 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 Instruction PUB 8-1.1.

"Work Practice Guidelines for Personnel Dealing with Cytotoxic (Antineoplastic) Drugs." The above document should be thoroughly studied/reviewed prior to drug preparation in the cabinet.

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 & Wipe down

Following completion of 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, apparatuses, 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 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 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.

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.**

6.6 Antineoplastic Decontamination Procedures

This procedure should be executed following a spillage and/or periodic maintenance, testing or relocation of the cabinet. In addition, if the cabinet is being relocated or turned off for an extended period, the work access opening and exhaust HEPA filter opening should be sealed with plastic.

6.6.1 Preparation

Prior to beginning decontamination activity, personnel should put on a Tyvek[1] isolation gown, 2 pair of vinyl gloves and a full-faced HEPA filtered respirator. All protective garments should be contained in 4 mil plastic bags and labeled for disposal as chemotherapy waste after completion of the. For the purpose of this procedure, the term **CLEANING** is defined as the operation of wiping down with a cloth wetted with a clean, hot (above 60°C) detergent solution, followed by wiping down repeatedly with sterile water to rinse. All cloths shall be contained in 4 mil plastic bags and labeled for disposal as chemotherapy waste.

6.6.2 Procedure

a. Make sure that the cabinet remains in operational mode with internal blower on.
b. Open the hinged or sliding view screen and secure in the full open position.

CAUTION: With the view screen in the full open position, personnel protection is compromised and a full faced HEPA filtered respirator must be worn.

c. Clean all readily accessible surfaces of the cabinet.
d. Remove perforated metal diffuser screen from the underside of the supply HEPA filter and place on the cabinet work tray.

Note: Depending on the model, the diffuser screen is secured to the cabinet by #8-32 screws or 1/4" - 20 acorn nuts, 3 places. It is purposely a tight fit and is secured to the back wall with projecting thread less studs.

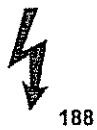
e. Clean both sides of the perforated metal diffuser screen and remove it from the cabinet.
f. Lift the cabinet worktray, clean both sides and remove it from the cabinet.
g. Remove the front perforated grill, place on the cabinet floor and clean both sides. Remove from cabinet.
h. Clean work tray supports.
i. Working from top to bottom, clean all inside surfaces of the cabinet. Take care **not** to wet the HEPA filter. If liquid has collected in the plenum drain, aspirate it using an IV tubing into an evacuated container. Label the evacuated container for disposal as chemotherapy waste.
j. Clean the plenum drain area and wipe dry.
k. If the cabinet requires maintenance and/or replacement of the HEPA filters, the operation should be halted at this point to allow trained personnel to complete replacement of the HEPA and/or maintenance action required.

6.6.3 Assembly

a. Replace front (if removed) grill.
b. Replace the work tray and carefully tighten the thumbscrews.
c. Replace perforated metal diffuser screen over the underside of the supply HEPA filter.
d. Wipe down all exposed surfaces of the work area with 70% isopropyl alcohol.
e. Prepare for aseptic operation.

7.0 General Maintenance

ATTENTION ACCOMPANY'S INFORMATION OR IMPORTANT SYMBOL



POTENTIAL ELECTRICAL HAZARD ONLY QUALIFIED PERSON TO ACCESS

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. Remove screws at each upper side of the control center and allow the control center to rotate down, resting on the safety straps. Remove control center by disconnecting safety straps and moving control center to the left off the slip hinges.
2. Remove the front decorative panel via top/front fasteners.
3. Remove left and right window farings via fasteners.
4. Remove armrest via fasteners.
5. Place decontamination equipment inside the work area. Reference decontamination procedure, per NSF Standard 49, Annex G, or EN12469: 2000, Annex J, using the following chart to calculate chemical requirements.

Cabinet Size	-400	-600
Cabinet Dimensions	60 x 29-1/8 x 46-3/8 (1.52 x .739 x 1.18 m)	60 x 29-1/8 x 70-3/8 (1.52 x .739 x 1.88 m)
Cabinet Volume	46.9 cu. ft. (1.328 cu. m)	71.2 cu. ft. (2.016 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.

6. Use duct tape and plastic to seal the front and exhaust area.

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

7. Perform decontamination procedure per NSF Standard 49, Annex G, or EN12469:2000, Annex J

If the cabinet has been used to prepare Antineoplastic drugs, (chemotherapy), or other toxic chemicals, decontamination of the cabinet **cannot** be accomplished by the above procedure. It is recommended that the following protective measures be taken:

1. **Gloves**
   Gloves must be worn. Care must be taken not to cut, puncture, or tear the gloves. No one glove material is impervious to all CYTA's; disposable surgical or polyvinyl chloride (PVC) gloves provide substantial but not complete protection. PVC gloves are probably more protective than surgical gloves, but they are stiffer and less tactile. Gloves should be discarded after each use. Gloves should be tucked into the cuffs of the gown. Double gloving should be considered.

2. **Face & Eye Protection**
   A disposable dust and mist respirator and either a plastic face shield (preferred) or chemical splash goggles must be worn. The face shield or goggles should be wiped clean with a suitable tissue and water after each use.

3. **Gowns**
   A protective garment must be worn. The garment should be made of lint-free, low-permeability fabric and must have a closed front, leg sleeves, and elastic or knit closed cuffs. Tyvek[1] isolation gowns are one example of an acceptable garment. The garment must be worn outside the work area. Disposable gowns are preferred over reusable. Front-buttoned coats are not recommended.

4. **Hair & Shoe Covers**
   Disposable hair and shoe covers should be worn.

5. **Motion**
   Slow and deliberate motions are necessary when working in the interior of the cabinet, in order to minimize the generation of particulates.

Please consult with NuAire, Inc. about any unique contamination problems.

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.

[1] Available from Lab Safety Supply, Janesville, WI 53547-1368, or other laboratory, industrial, or hospital supply distributor

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 Control Center and allow the Control Center to rotate down, resting on the safety straps.

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.

5. Reverse the procedure to reinstall the lamp assembly being careful not to pinch the safety straps, cable or tubing during closure of the control center.

7.3 HEPA Filter/Motor Replacement

The HEPA Filters under normal usage and barring an accident (a puncture), do not need replacement until the exhaust volume cannot be maintained or the access inflow velocity cannot be maintained at 100 LFPM (min.)(.51 m/s). This may permit the average downflow velocity to be as low as 55 LFPM (.28 m/s) as long as no point falls below 20 percent of the average downflow velocity.

The HEPA Filters should not be replaced until the entire cabinet has been decontaminated or known to be biologically "clean". Constant pressure spring-type clamps are used to hold the exhaust filter tightly in place to counteract seal relaxation, while the supply filter employs NuAire's HEPEX pressure plenum. **USE ONLY REPLACEMENT FILTERS OF THE SAME RATED FLOW AND SIZE AS ORIGINALLY INSTALLED, TO INSURE PROPER AIRFLOW BALANCE CAN BE ACHIEVED.**

It is not always necessary to replace both the supply and exhaust filters at the same time. In fact, it is highly likely that the exhaust filter will need replacement far more often than the supply filter, due to (1) the larger volume of air passing through it, (2) its much smaller size, and (3) the capability of the exhaust system.

7.3.1 Supply Filter Replacement (see Drawing BCD-05659)

CAUTION: Disconnect electrical power from the unit before attempting any maintenance action.

Step 1: Remove screws at each upper side of the control center and allow the control center to rotate down, resting on the safety straps. Second, remove the front decorative panel, which is held into position by (3) knurled nuts on the top edge and (6) knurled screws on the front.

Step 2: Place sliding window into lowest position and remove front filter panel, which is held into position by Phillips pan head screws. Once the screws are removed, remove the panel.

CAUTION: Screws are used in lieu of acorn nuts, and lockwashers. The screws have O-rings and should be replaced if damaged or badly deformed.

Step 3: Remove blower access panel, which is held into position by 1/4-20 acorn nuts. Once the acorn nuts are removed, remove the panel.

The interior of the cabinet is now fully exposed for replacement of the filter.

Step 4: Remove the 2 hold-down clips (1 each side) holding the filter to the frame.

Step 5: Remove the HEPEX pressure plenum from the mount of the motor/blower assembly. The HEPEX is clamped to the blower mouth via a band clamp.

Note: Double sticky-backed gasket is to seal the plenum to the blower mount, and should be replaced when reassembling.

Step 6: Carefully remove the supply filter and HEPEX. The HEPEX can be folded neatly to seal the dirty side of the HEPA. **DIRECT EXPOSURE SHOULD BE AVOIDED, EVEN THOUGH THE FILTER IS IN AN UNCONTAMINATED PLENUM.**

When installing new filters, use only filters of the same rated flow and size as originally installed. It is recommended that a new HEPEX/
supply filter be installed since the HEPEX is factory installed to the filter; however, field installation kits are available separately from the filter.

Step 7: To install the supply filter, simply reverse the procedure outlined in the steps above.

7.3.2 Exhaust Filter Replacement

Step 1: Remove exhaust filter access panel, which is held into position by 1/4-20 acorn nuts. Once the acorn nuts are removed, remove the panel.

Step 2: Locate the external single point release bolt on the top right hand side of the cabinet. Use a 5/16-inch (8mm) wrench to release the exhaust filter rotating counter clockwise.

Step 3: Carefully remove the exhaust filter.

CAUTION: Dispense of spent HEPA filters properly. Avoid direct contact to "dirty side" of the filters. Label toxic waste.

When installing the new filter, apply a thin layer of silicone grease to the gasket of the filter and carefully insert into exhaust chamber. Tighten HEPA seal frame (clockwise) until the gasket is visually depressed by 1/8 inch (3mm). The procedure for replacing the exhaust filter with the Bag-in/Bag-out option is shown on Drawing BCD-05660.

7.3.3 Motor/Blower Assembly Removal

a. It is recommended that the motor/blower to be removed as a single unit. To remove, disconnect electrical connections to the motor, remove the HEPEX pressure plenum and unbolt the motor/blower assembly from the roof of the cabinet (4 places). Always inspect the rubber isolation motor mounts and replace those that are cracked or visibly show stress.

b. Replace the motor exactly as originally installed in the blower housing, paying particular attention to the correct electrical connections (see Electrical Schematic).

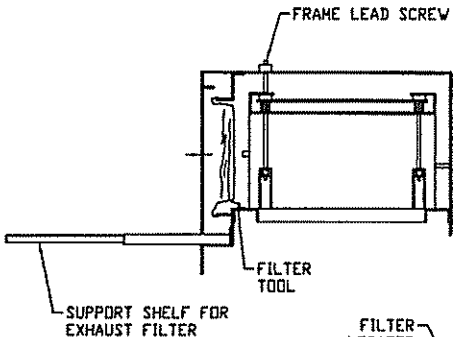
c. Re-install the new motor/blower assembly.

7.4 Sliding Window Replacement & Adjustment

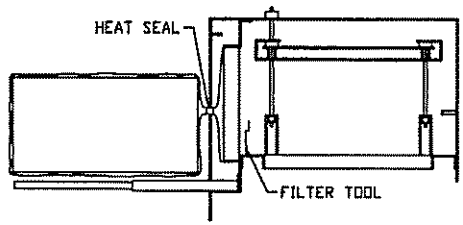
The sliding window replacement is accomplished by removing the front decorative panel, control center and window glide assemblies (see BCD-05144). The sliding window adjustment may be required due to everyday use over the life of the cabinet. The left window glide is stationary since it contains the micro switches that monitor window height. The right window glide is adjustable by a set screw and tension screw method (see Drawing BCD-05144). When adjusting the sliding window, be sure to verify proper micro switch operation. If the sliding window is too loose, the window will not properly activate the micro switches, thus causing potential operational malfunctions to occur.

REV	ECO	DESCRIPTION	DATE	INL	INL
A	4900	RELEASED TO PRODUCTION	11/28/95	TW	

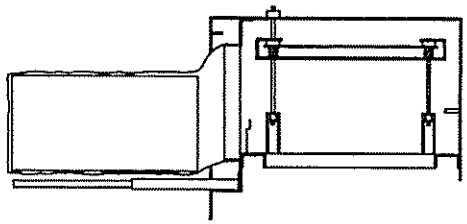
STEP 1. REMOVE THE FRONT COVER AND THE EXHAUST FILTER COVER. NEXT, LOOSEN THE EXHAUST FILTER PRESSURE FRAME USING THE LEAD SCREW TO DO SO. USE ENCLOSED TOOL TO PRY AND LOOSEN FILTER. REMOVE SHELF SUPPORTS FROM INNER FRONT COVER AND ATTACH TO COVER MOUNTING STUDS AT FILTER END. PULL THE OLD FILTER INTO THE BAG OUTSIDE THE CABINET ONTO A SUPPORT SHELF. NOTE: BE SURE BAG IS SECURELY ON FRAME. IF NEEDED USE DUCT TAPE TO SECURE.

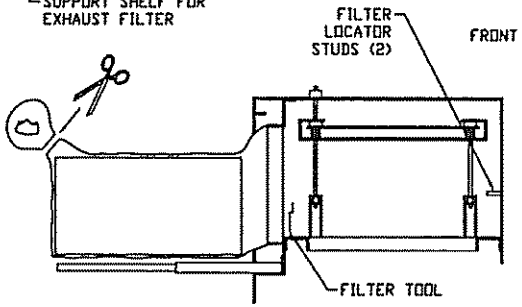


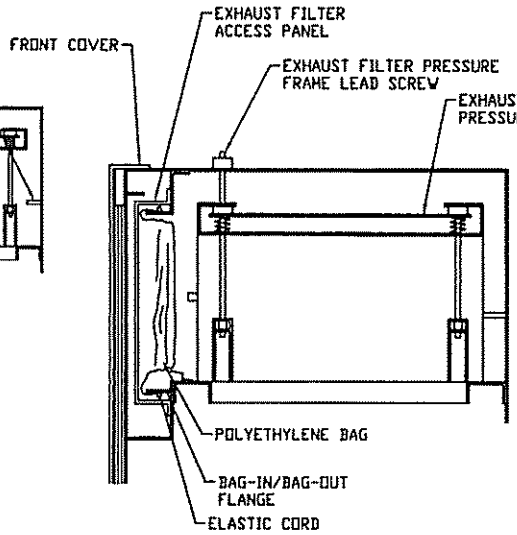
STEP 2. HEAT SEAL AT A POINT BETWEEN THE OLD FILTER AND THE BAG-IN/BAG-OUT FLANGE. HEAT SEALED AREA SHOULD BE WIDE ENOUGH SO THAT WHEN THE BAG IS CUT WITH THE SCISSORS, THE SEAL REMAINS INTACT ON BOTH SIDES OF THE CUT, OR HEAT SEAL TWO SEAMS AND CUT BETWEEN THE TWO. DISPOSE OF THE CONTAMINATED FILTER. RETAIN FILTER TOOL NEAR BAG-IN/BAG-OUT FRAME.



STEP 3. PUT THE NEW FILTER IN A CLEAN PLASTIC BAG. BE SURE TO ADD A SMALL AMOUNT OF SILICON GREASE TO FILTER GASKET BEFORE PUTTING IN PLASTIC BAG. SECURE THE NECK OF THE NEW BAG OVER THE OLD ONTO THE FLANGE OF THE BAG-IN/BAG-OUT RING. AGAIN USE DUCT TAPE AS NECESSARY TO SECURE.







THE BAG-IN/BAG-OUT PROCEDURE MAINTAINS A BARRIER BETWEEN THE OPERATOR AND DANGEROUS MATERIAL. THE CONTAMINATED FILTER CAN BE REMOVED FROM THE AREA AND A NEW FILTER INSTALLED WITHOUT EXPOSING PERSONNEL. SEAL CABINET AND DECONTAMINATE PER NIH/NSF PROTOCOL. BEFORE STARTING EXHAUST FILTER REPLACEMENT PROCEDURE. PLEASE NOTE THAT THE POLYETHYLENE BAG IS SECURED TO THE BAG-IN/BAG-OUT FLANGE WITH AN ELASTIC CORD. IT IS RECOMMENDED THAT DUCT TAPE BE ADDED TO THIS AREA TO AID IN HOLDING THE BAG ONTO THE BAG-IN/BAG-OUT FLANGE, DURING THE EXHAUST FILTER REPLACEMENT PROCEDURE. REFER TO STEP 1-4 FOR DETAILED INFORMATION.

STEP 4. PULL THE OLD BAG STUB AWAY FROM THE BAG-IN/BAG-OUT FLANGE AND WORK INTO THE REAR OF THE NEW BAG. HEAT SEAL AND CUT OFF THE PORTION CONTAINING THE OLD BAG STUB. PUSH NEW FILTER INTO THE CABINET UNTIL IT TOUCHES THE REAR FILTER LOCATOR STUDS AND RE-CLAMP THE EXHAUST FILTER PRESSURE FRAME. FOLD THE THE NEW BAG INSIDE CAVITY AND REPLACE THE EXHAUST FILTER COVER FILTER/SEAL INTEGRITY CHECK MAY NOW BE MADE.

NUAIRE
PLYMOUTH, MINNESOTA

NU-427,430,435 BAG-IN/BAG-OUT EXHAUST REMOVAL PROCEDURE

DFTH TW	11/27/95	SHEET 1 OF 1
DRAWING NUMBER	BCD-05660	A

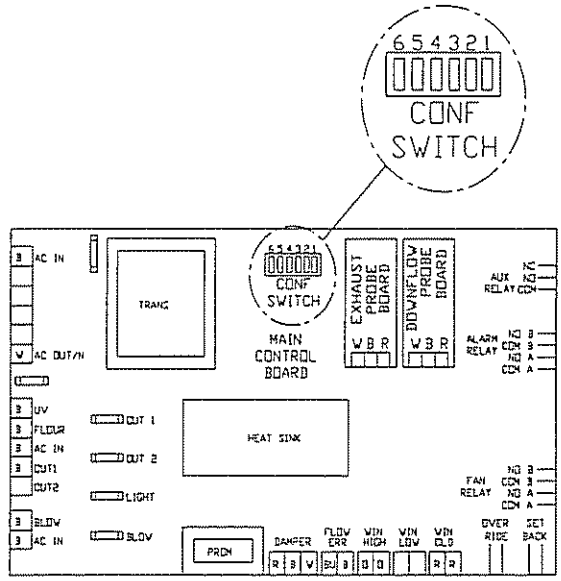
7.5 Airflow Control System Setup and Calibration

7.5.1 General

The operation of the NU-430 cabinet requires that the setup and calibration procedures be performed in order to certify or commission the cabinet for usage. The setup and calibration procedures **PERFORMED ONLY BY THE CABINET CERTIFIER** ensure that cabinet's setpoints are verified and that the airflow monitor probes are calibrated to read the correct values. Access to the setup and calibration functions requires the use of the hidden key to limit accessibility.

Please note: the current Prom chip firmware revision status is displayed upon power-up in the clock display. The revision status of the operating system could impact the calibration process and/or features of the system. If desired, please check with NuAire Technical Service for the latest revision level.

Please note, Software Rev. 4.0 or higher has the capability to lock out access to the calibration and option modes. This is performed using the configuration switch, position 6. If the switch is on, access to the calibration and option mode is denied. If the switch is off, access is possible.



Entry into the setup and calibration functions requires pressing the hidden key for a period of 3 seconds. Confirmation of being in the setup/calibration function will be indicated on the downflow display with the word "CAL", the clock display will indicate "B1 B2". To access the setup/calibration function, perform the following:

- Make sure the configuration switch position 6 on the main control board is off.
- Press and hold the green flag, downflow display will indicate "CAL" and clock display will indicate "B1 B2".

To exit setup/calibration function, press and hold the green flag until the clock display indicates time of day and the downflow and inflow displays indicate dashes. If necessary, change the configuration switch position 6 on to limit calibration access.

7.5.2 Setpoint and Alarm Limits

The setpoint and alarm limits can be verified or altered in the control system. Typically however, these default values are factory set and don't require alteration. The setpoint establishes the airflow values that are to be maintained. The high and low limits establish the alarm boundaries from the nominal setpoint. The default values have been established based upon the performance specifications and cabinet component tolerances.

To verify or alter any of these values, simply enter into the setup/calibration function and press the [SEL] key repeatedly until the desired display has the LED next to the display illuminated. Note, the blower switch must be off to access the setpoint and alarm limits.

7.5.2.1 Downflow Setpoint (Default Value, 60 FPM (.30 m/s))

- Press [SEL] to indicate LED next to downflow display.
- Press [SET TIME], clock display will blink "SET.P" and the setpoint value.
- Press [↑] or [↓] arrows to the desired setpoint.
- Press [SET TIME] to enter desired value.

7.5.2.2 Downflow Upper Alarm Limit (Default Value, 66 FPM (.34 m/s))

- Press [SEL] to indicate LED next to downflow display.
- Press [SET TIME] and [↑], clock display will blink "HI.LM" and the high limit value.
- Press [↑] or [↓] arrows to the desired high limit value.
- Press [SET TIME] to enter desired value.

7.5.2.3 Downflow Lower Alarm Limit (Default Value, 54 FPM (.26 m/s))

- Press [SEL] to indicate LED next to downflow display.
- Press [SET TIME] and [↓], clock display will blink "LO.LM" and the low limit value.
- Press [↑] or [↓] arrows to the desired low limit value.
- Press [SET TIME] to enter desired value.

7.5.2.4 Exhaust Setpoint (Default Value, 1100 CFM-600, 754 CFM-400) (1868 CMH-600(E)(G), 1276CMH-400(E)(G)

- Press [SEL] to indicate LED next to inflow display.
- Press [SET TIME] clock display will blink "SET.P" and the setpoint value.
- Press [↑] or [↓] arrows to the desired setpoint
- Press [SET TIME] to enter desired value.

7.5.2.5 Exhaust Upper Alarm Limit (Default Value, 1216 CFM-600, 832 CFM-400) (2064 CMH-600(E)(G), 1372 CMH-400(E)(G)

- Press [SEL] to indicate LED next to inflow display.
- Press [SET TIME] and [↑], clock display will blink "HI.LM" and the high limit value.
- Press [↑] or [↓] arrows to the desired high limit value.
- Press [SET TIME] to enter desired value.

7.5.2.6 Exhaust Lower Alarm Limit (Default Value, 984 CFM-600, 676 CFM-400) (1672 CMH-600(E)(G), 1196 CMH-400(E)(G)

- Press [SEL] to indicate LED next to inflow display.
- Press [SET TIME] and [↓], clock display will blink "LO.LM" and the low limit value.
- Press [↑] or [↓] arrows to the desired low limit value.
- Press [SET TIME] to enter desired value.

7.5.3 Airflow Calibration

The NU-430 Airflow Calibration Consists of internal and external adjustments to balance the airflow within the cabinet and the calibration of the airflow monitor probes. **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 internal adjustment to balance the supply airflow within the cabinet. This is:

a. Blower speed adjustment via control system

The blower speed control system adjusts the cabinets supply volume of airflow while the customer supplied exhaust system controls the exhaust volume of airflow. Since it has been NuAire's experience that the filters may not "load" evenly, both adjustments are necessary for proper cabinet performance.

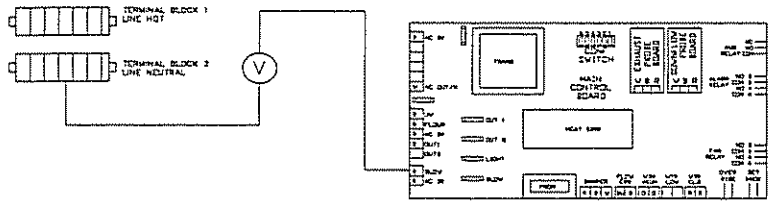
The cabinet is considered to be certifiable if the following airflow measurements are present:

a. Downflow average: 60 LFPM ± 5 LFPM (.30 m/s ± .025 m/s).

b. Inflow average: 105 LFPM ± 5 LFPM (.53 m/s ± .025 m/s) using the direct inflow measurement method or alternate 3" constricted inflow velocity measurement method. Both values are published in the NSF listing.

The calibration of the airflow monitor probes occurs during the cabinet airflow balancing procedure. The calibration procedure consists of using the downflow (supply volume) and inflow (exhaust volume) averages achieved and entry of those values into the control system.

Motor/blower voltage should also be monitored and recorded upon final calibration. The motor voltage may be monitored using a digital voltmeter in the VAC mode. The two test points to measure motor voltage is the blower out (Hot) position on the main control board and any position in terminal block 2 (Neutral)(see sketch below).



MOTOR VOLTAGE TEST POINTS

7.5.3.1 Exhaust Volume Calibration w/o NU-951-012 Motorized Butterfly Valve

Step 1:
- Block off supply duct connection using cardboard and duct tape.
- Activate power to the cabinet, but don't turn on motor/blower.
- Turn on exhaust system.

Step 2: Now, measure exhaust volume using the recommended procedure found in Table 7.0. If necessary, adjust the exhaust system to achieve the correct exhaust volume. Use Table 7.1 to relate downflow and inflow volumes and corresponding average airflow velocities. It is always desirable to achieve airflow values that are set as close as possible to nominal. This is especially applicable to the exhaust volume, since the exhaust probe only monitors the exhaust airflow. If the exhaust volume is calibrated at the outer edge of the range, a greater chance for alarm conditions would exist due to its closer proximity to the alarm limits.

Note #1, When the exhaust volume is correct, verify exhaust probe diagnostic value is steady and within the acceptable range (see section 8.3).

Note #2, Verify the operation of the manual mode pressure switch at this point. Lower the exhaust volume to 100 CFM (170 CMH) lower than the standard exhaust lower alarm limit (Section 7.5.2.6) (i.e. NU-430-400 standard low alarm limit 676 CFM (1196 CMH), 676-100 = 576 CFM (1196-170 = 1026 CMH) pressure switch low trip point). Remove pressure switch cap by loosening fastener on side: activate the blower switch at the same time. Adjust as necessary with adjustment screw (opposite side of the wire outlet) until the internal supply blower/motor is deactivated. Then, raise the exhaust CFM back up to the standard lower alarm limit to be sure the internal supply blower/motor is turned back on.

Step 3:
- Remove cardboard and duct tape from supply duct connection.
- Press and hold the green flag until the downflow display indicates "CAL" and the clock display indicates "B1.B2".
- Press [SEL] to indicate the LED next to the exhaust display.
- Turn on blower switch (allow motor/blower to warm up for 5 minutes).

Step 4:
- Press [SET TIME], clock display will indicate "CAL.P".
- Press [↑] or [↓] arrows to the exhaust volume value just found.
- Press [SET TIME] to enter the exhaust volume value.
- If present, remove direct reading instrument from window access open area.

7.5.3.2 Exhaust Volume Calibration w/NU-951-012 Motorized Butterfly Valve

If desired, activate exhaust control/auto zero.
The exhaust control auto zero option allows the NU-951 automatic damper to check itself once every 24 hours from its original calibration point. The first time the option is turned on, an airflow calibration must occur. During the airflow calibration procedure, once the certifier calibrates the exhaust volume (presses "CAL.P"), the control system will remember the damper position in degrees at that point. Then after the first power-up, 12 hours later, the exhaust system will perform the following auto-zero sequence. First, freeze the exhaust display to its setpoint and turn on the LED next to the exhaust display. Then move the damper back to its original calibration point. Allow the damper to control normally for one minute, then unfreeze the display and turn off the LED. This sequence will then be performed once every 24 hours after the initial 12-hour period. The auto-zero sequence can be checked at anytime by pressing the [↑] and [↓] key simultaneously for three seconds to initiate a two minute test sequence.

To activate the exhaust control/auto zero, perform the following:

- Press and hold [SET TIME] and [SEL] simultaneously until downflow display indicates "Opt", exhaust display indicates "off" and the clock display indicates "12.HR".
- Press [SEL] to advance through parameters until the clock display indicates "EC.AO" and the exhaust display indicates "OFF".
- Press [↑] to turn "ON" option in exhaust display
- Press [SET TIME] to enter into memory
- Press and hold [SET TIME] and [SEL] simultaneously until downflow and inflow/exhaust display indicates dashes "---" to exit option mode. Clock display will indicate "WM.UP".

Step 1:
- Block off supply duct connection using cardboard and duct tape.
- Activate power to the cabinet, but don't turn on motor/blower.

Step 2:
- Press and hold the green flag until the downflow display indicates "CAL" and the clock display indicates "B1.B2".
- Press [SEL] to indicate the LED next to the clock display.
- Press [SET TIME] and [↓] arrow simultaneously, clock display will blink "D.POS" and the position of the damper in degrees (00°=closed, 90°=open). Set damper position to 00° on the display.
- If damper is not fully closed, manually close damper by pressing the black spring loaded disengage button on the activator. Move the damper fully closed, "0" on the activator scale.
- Set damper position to 60° on the display. NuAire recommends using the damper position at 60° to minimize static loss and maximum controllability of the system. However, **THE DAMPER CAN RANGE FROM 35° TO 75° FOR ITS NOMINAL SETPOINT. ANY POSITION OUTSIDE THIS RANGE WILL SEVERELY LIMIT THE CONTROL SYSTEMS ABILITY TO ACCURATELY CONTROL THE EXHAUST VOLUME.**

Step 3:

- Turn on exhaust system.

Now, measure exhaust volume using the recommended procedure found in Table 7.0. If necessary, adjust the exhaust system to achieve the correct exhaust volume. Use Table 7.1 to relate downflow and inflow volumes and corresponding average airflow velocities. It is always desirable to achieve airflow values that are set as close as possible to nominal. This is especially applicable to the exhaust volume, since the exhaust probe only monitors the exhaust airflow. If the exhaust volume is calibrated at the outer edge of the range, a greater chance for alarm conditions would exist due to its closer proximity to the alarm limits.

Note #1, When the exhaust volume is correct, verify exhaust probe diagnostic value is steady and within the acceptable range (see section 8.3).

Note #2, Verify the operation of the manual mode pressure switch at this point. Lower the exhaust volume to 100 CFM (170 CMH) lower than the standard exhaust lower alarm limit (Section 7.5.2.6) (i.e. NU-430-400 standard low alarm limit 676 CFM (1196 CMH), 676-100 = 576 CFM (1196-170 = 1026 CMH) pressure switch low trip point). Remove pressure switch cap by loosening fastener on side. Adjust as necessary with adjustment screw (opposite side of the wire outlet) until the internal supply blower/motor is deactivated. Then, raise the exhaust CFM back up to the standard lower alarm limit to be sure the internal supply blower/motor is turned back on.

Step 4:

- Remove cardboard duct tape from supply duct connection.
- Press [SEL] to indicate the LED next to the exhaust display.
- Turn on blower switch (allow motor/blower to warm up for 5 minutes).
- Press [SET TIME], clock display will indicate "CAL.P".
- Press [↑] or [↓] arrows to the exhaust volume value just found.
- Press [SET TIME] to enter the exhaust volume value.
- If present, remove direct reading instrument from window access open area.

7.5.3.3 Downflow Calibration

Step 1:

- Access setup/calibration function. If already accessed, proceed to step 2. If not, perform the following:
- Press and hold the green flag until downflow display indicates "CAL" and clock display indicates "B1.B2".

Step 2:

- Press [SEL] to indicate LED next to clock display.
- Press [SET TIME] and [↑] simultaneously, clock display will blink "BLOW" and the blower duty cycle percentage "XXX.X".

Step 3:

- Press blower switch to ON.

  Allow blower to run for one minute or until downflow and inflow displays become steady.
- Place a velometer in the cabinet workzone on the horizontal plane defined by 4 inches (102mm) above the bottom edge of the viewing window. Spot check several points on the recommended downflow velocity test grid found in table 7.0.

Step 4:

- Press [↑] or [↓] arrows to adjust blower speed. The objective of this spot check is to obtain the desired downflow average velocity as close as possible to the stated goal of 60 LFPM (.30 m/s).

  DON'T SPEND MORE THAN 5 MINUTES SPOT CHECKING. FINAL ADJUSTMENTS WILL BE MADE IN THE FOLLOWING STEPS.

Step 5:

- Press [SEL] to indicate LED next to downflow display (blower should remain on).
- Press [SET TIME], clock display will indicate "CAL.P".

  In the "CAL.P" mode, the system will automatically control the blower to maintain the downflow monitor probe value as indicated when the [SET TIME] key was pressed.

  Now, measure the average downflow velocity over the entire workzone using the recommended downflow velocity test grid (see Table 7.0).

Step 6:

- Press [↑] or [↓] arrows to the average downflow velocity just found.
- Press [SET TIME] to enter the average downflow velocity value.

  Now the downflow monitor probe has been calibrated to the actual measured average downflow velocity. The cabinet will now control to the downflow setpoint.

Step 7:

- Supply volume may now be measured and calculated. Using the grid scale of 4 inches by 4 inches (102mm by 102mm), 2 inches away from all perimeter walls and 6 inches (152mm) from the diffuser, measure supply velocity in the same manner as the downflow velocity. Once the average supply velocity is obtained, calculate the supply volume and corresponding inflow volume and velocity using the Tables 7.0 and 7.1.

Note: Since NuAire cabinets use a full supply diffuser, resulting in uniform airflow velocities, NuAire has found that the average supply velocity and the average downflow velocity are typically found to be the same value or can be related with a small correction factor. Using the average downflow velocity or a corrected average downflow velocity (see individual model numbers below) to calculate the supply volume is considered acceptable to certify a NuAire cabinet.

Model Number	Supply Volume Correction Factor
NU-430-400	Average downflow velocity plus (4fpm)
NU-430-600	Average downflow velocity

- Now, the calibration procedure is complete. If desired, a spot check in the downflow velocity may be performed if felt necessary.
- To exit setup/calibration functions, press and hold the green flag. Upon exit, the downflow and inflow displays will indicate dashes and the clock will display the current time of day.

7.5.3.4 Night Setback Calibration

The night set back calibration is performed within the calibration mode after the inflow and downflow calibration procedure is complete.

Step 1:
- Access setup/calibration function. If already accessed, proceed to step 2. If not, perform the following:
- Press and hold the green flag until downflow display indicates "CAL" and the clock display indicates "B1.B2".

Step 2:
- Press [SEL] to indicate LED next to clock display.
  Press [SET TIME], [↑] and [↓] simultaneously, clock display will blink "NITE" and percentage "XX.X".

Step 3:
- At this point, the night setback is active and the butterfly valve will begin to close. Now, measure the inflow volume using either a Direct Reading Instrument or inflow velocity measurement method. The goal is to reduce the inflow volume to following values, which represents approximately 100 fpm (.51m/s) inflow.

NU-430-400 (E)(G)	270 CFM/459 CMH
NU-430-600 (E)(G)	410 CFM/697 CMH

To alter the inflow volume in night setback calibration, press [↑] or [↓] arrow to increase or decrease the air volume to the desired night setback operating percentage value.

Please note, in the night setback operation, the electronic airflow control system will cause the butterfly valve actuator to hunt more operating at lower airflow volumes. So, when taking the inflow volume measurements, average several readings to obtain the most accurate results.

Step 4: When the desired night setback operating percentage value is obtained.
- Press [SET TIME] to enter the night setback operating percentage value.
- To exit setup/calibration functions, press and hold the green flag. Upon exit, the downflow and inflow displays will indicate dashes and the clock will display the current time of day.

7.5.4 Electronic System Master Reset

A master reset function is available to clear the microprocessor's non-volatile memory in the event the memory develops an error in operation. These types of errors can be caused by poor electricity and inadvertent operational parameters being exposed to the system. The master reset function should only be performed by a qualified service technician. **All setup and calibration data will be lost**, the memory reinitialized to the default values and all control functions reset to an initial cabinet power on condition. If possible before the master reset function is performed. It would be preferred to know the operational parameters of the cabinet (i.e. motor/blower voltage, setpoints, airflow data from previous certification). To perform the master reset function, perform the following:

- Press and hold the [green flag] until downflow display indicates "CAL" and the clock display indicates "B1.B2".
- Press and hold [SEL] and [SET TIME] simultaneously, then press the [green flag] until the clock display indicates "M.RST".
- Press [SET TIME] to complete the master reset function, the clock display will indicate a new reset time and normal run mode will be the current status (Note: if it is not desired to proceed with the master reset, press the flag to exit).

This completes the master reset function. Now the system requires to be set up and calibrated per Section 7.5. Enter into calibration mode and check setpoint and alarm limits. Continue to airflow calibration and use the previous certification data to set motor volts and to spot check airflows. Then, exit the calibration mode and verify performance in normal run mode.

7.5.5 Airflow Display Multiplier

The airflow display multiplier is a function that relates the actual measured airflow velocity rate of change to the display velocity rate of change. For the Model NU-430, the multiplier is four. This means that for every unit of change as measured by the airflow probe, the display is changed by four. This function should only be changed by a **qualified technician directed by a NuAire Technical Customer Service Technician.**

To change the airflow display multiplier, enter into calibration function and perform the following:

- Press and hold the green flag until the downflow display indicates "CAL" and the clock display indicates "B1.B2".
- Press [SEL] to indicate LED next to the exhaust display.
- Press and hold the [SET TIME] [↑ or ↓] arrows simultaneously, clock display will indicate "MULT", the exhaust display will indicate the current airflow display multiplier.
- Press the [↑ or ↓] arrows to change the airflow display multiplier to the desired value.
- Press [SET TIME] to enter desired value.

To exit the calibration function, press and hold the green flag until the clock display indicates time of day and the downflow and inflow displays indicate dashes.

7.6 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 diffuser plate placed below the HEPA to protect the filter during normal usage may be removed as follows: The diffuser is secured to the cabinet shell by #1/4-20 acorn nuts located immediately behind the front viewing window. After removing the fasteners, drop the front of the diffuser plate several inches and pull forward gently. Note, that the diffuser is purposely a tight fit - it is secured to the back wall of the cabinet interior by a light push - fit with projecting studs.

To avoid the window high alarm during the filter integrity check, it is desirable to enter the calibration mode and turn on the blower. To accomplish this, perform the following;

- Press and hold the green flag until the downflow display indicates "CAL" and the clock display indicates "B1.B2".
- Press [SEL] to indicate the LED next to the clock display.
- Press [SET TIME] and [↑] simultaneously, clock display will blink "BLOW" and a blower duty cycle percentage "XXX.X".
- Press blower switch to on.

Now, the filter integrity check can be performed. After the filter integrity is complete. Press and hold the green flag to exit the calibration mode. Upon exit, the downflow and exhaust displays will indicate dashes and the clock will display the current time of day.

The exhaust filter is checked using a gross leak method, since the exhaust filter is not easily scanned when connected to an exhaust system. Access ports are located next to the exhaust duct connection.

7.7 Cabinet Leak Tightness Test

The cabinet leak tightness test can be performed by several different methods. However, to perform the test, the window access area, supply and exhaust duct connections must be sealed to pressurize the cabinet. The window access area may be sealed by a custom plate or plastic and duct tape. The supply and exhaust duct connections may also be sealed by a custom plate or plastic and duct tape. Sealing should be accomplished on the cabinet face and cabinet top to assure a flat sealable surface.

7.8 Cleanliness Classification Test for Pharmacy Application

If this cabinet is going to be used within pharmacy, per USP797, the cabinet must be tested to assure compliance to ISO 14644-1, Cleanrooms and Associated Controlled Environments, Part 1: of the Air Cleanliness. The cleanliness classification test is performed using a particle counter to measure particle counts within the cabinet workzone. Turn on cabinet and let warm up for several minutes. Turn on particle counter and flush out sample tubing line to remove latent particles. Set the particle counter to measure 0.5 micron or larger particles at the appropriate measuring rate.

Take 5 test points in 1-minute intervals on a grid, in a horizontal plane as measured approximately 6 inches above the worksurface. The grid location is designated as the workzone centerpoint and each corner measured 6-inches (152mm) from the inside perimeter.

Record the 5 particle count values for each of the test points over the 1-minute sample time. All final count particle concentrations and calculated 95% upper confidence limit shall not exceed 100 particles per cubic feet (ppcf) or 3520 particles per cubic meter (ppcm).

Table 7.0
Recommended Measurement Methods for Cabinet Downflow & Inflow.

A. Downflow Measurement

a. Instruments: Alnor 8500 or TSI 8355 Thermoanemometer

b. Procedure: Supply filter efflux is measured on a grid, in a horizontal plane defined by 4 inches (102mm) above the bottom edge of the window. No reading should be taken closer than 6 inches (152mm) from the inside perimeter.

c. Test Data - Inches (mm):

400	6 (152)	11.729 (298)	17.458 (443)	23.187 (589)	28.916 (735)	34.645 (880)	40.375 (1026)				
600	6 (152)	11.838 (301)	17.676 (449)	23.514 (597)	29.352 (746)	35.190 (894)	41.028 (1042)	46.866 (1190)	52.704 (1339)	58.542 (1487)	64.375 (1635)
6 (152)											
11.750 (298)											
17.5 (445)											

Number of Readings:	Average Velocity ft./min.(m/s)

d. Acceptance Criteria:

1. Average downflow velocity = **55 to 65 fpm (.28 to .33 m/s)**
2. Individual readings must be within ±20 percent or +/- 16 fpm; which ever is greater from the average downflow velocity.

B. Inflow/Exhaust Volume Measurement

a. Instrument: Shortridge Flowhood ADM-870 or Alnor 8500 or TSI 8355 Thermoanemometer.

b. Procedure: The exhaust airflow (customer supplied) shall draw air from the cabinet. Any one of a number of airflow controlling and measuring means may be used to establish airflow/exhaust volume. The inflow/exhaust volume is established for the cabinet having the workzone downflow average velocity at its nominal value. To measure the exhaust volume, the internal blower should be turned off, thus, all exhaust flow is being drawn through the front work access opening.

The inflow/exhaust volume is measured by using a Direct Inflow Measurement (DIM) instrument (i.e. Shortridge Flowhood). The DIM instrument can be used directly on the cabinet with NO CORRECTION FACTORS REQUIRED. The DIM instrument should be equipped with a flowhood that is as close as possible to the width of the cabinet (i.e. NU-430-400 should use 1 x 4 foot flowhood). The DIM instrument should also be duct taped to the cabinet's front work access opening to prevent any sneak air paths from occurring. The DIM instrument will read inflow volume (i.e. CFM). Use the area table to calculate the exhaust volume based upon the DIM measurement.

Alternate Procedure:
The alternate procedure to determine inflow velocity uses a themoanemometer in a constricted window access opening of 3 inches (67mm) with the downflow blower on and the armrest removed. Inflow air velocity is measured in the center of the constricted opening 1-1/2 inches (38mm) above the work access opening on the following specified grid. Use the correction factor table to calculate the inflow velocity.

Note: Since NuAire cabinets use a full supply diffuser, resulting in uniform airflow velocities, NuAire has found that the average supply velocity and the average downflow velocity are typically found to be the same value or can be related with a small correction factor. Using the average downflow velocity or a corrected average downflow velocity (see individual model numbers below) to calculate the supply volume is considered acceptable to certify a NuAire cabinet.

Model Number	Supply Volume Correction Factor
NU-430-400	Average downflow velocity plus (4fpm)
NU-430-600	Average downflow velocity

I.E. NU-430-400
Average downflow velocity = 60 fpm
Average supply volume velocity = 60 + 4 = 64 fpm
Supply volume = 64 x 7.57 = 484 CFM

I.E. NU-430-600
Average downflow velocity = 60 fpm
Average supply volume velocity = 60 fpm
Supply volume 60 x 11.48 = 689 CFM

c. Test Data – Inches (mm):

1. DIM Measurement

Inflow Volume	$ft.^3/min.$ (m^3/s)	÷ Access Opening Area	$ft.^2$ (m^2)	= Inflow Velocity	ft./min (m/s)
Inflow Volume	$ft.^3/min.$ (m^3/s)	+ Supply Volume	$ft.^3/min.$ (m^3/s)	= Total Exhaust Volume	$ft.^3/min.$ (m^3/s)

2. Constricted 3 inch (76mm) high access opening measurement - Inches (mm):

400	4 (102)	8.264 (210)	12.528 (318)	16.792 (426)	21.056 (535)	25.320 (643)	29.584 (751)	33.848 (860)	38.112 (968)	42.375 (1076)						
600	4 (102)	8.158 (207)	12.316 (313)	16.474 (418)	20.632 (524)	24.790 (630)	28.948 (735)	33.106 (841)	37.264 (946)	41.422 (1052)	45.580 (1158)	49.738 (1263)	53.896 (1369)	58.054 (1475)	62.212 (1580)	66.375 (1686)

Number of Readings:	Average Velocity of Constricted Area ft./min. (ms)

Average Velocity of Constricted Area	fpm X Constricted Area	ft^2 = Constricted Area Volume	CFM
Constricted Area Volume	CFM ÷ 8" Access Window Area	ft^2= Average Velocity of 8" Access Window Area	fpm
Average Velocity of 8" Access Window Area	fpm X Correction Factor	=Average Inflow Velocity	fpm
Average Inflow Velocity	fpm X Access Opening Area	$ft.^2$ (m^2) = Inflow Volume	$ft.^3/min.$ (m^3/s)
Inflow Volume $ft.^3/min.$ (m^3/s)	+ Supply Volume $ft.^3/min.$ (m^3/s)	=Total Exhaust Volume	$ft.^3/min.$ (m^3/s)

d. Acceptance Criteria:

1. Access opening inflow velocity = **100 to 110 fpm (.51 to .56 m/s)**

Areas/Correction Factors for Calculations

Cab. Size	3" Constricted Window Access Area	8 Inch (203mm) Window Access Opening Area ft^2, (m^2)	Correction Factor for 8" Window	Work Zone Area ft^2, (m^2)
400	.97	2.58 (.239)	1.0	7.57 (.703)
600	1.47	3.91 (.363)	1.05	11.48 (1.066)

Table 7.1

The following are recommended minimum/maximum cabinet airflow setpoints per NSF Standard #49. NuAire recommends, however, operation at the stated average flow, for ease of maintenance and annual certification.

THE FOLLOWING EXHAUST FLOWS ARE FOR AN 8 INCH WORK ACCESS OPENING:

Parameter	Minimum Acceptable Flow	Stated Nominal Average Flow	Maximum Acceptable Flow
NU-430-400(E)(G)			
1. Inflow Avg. Velocity	100 (.51 m/s) FPM	105 (.53 m/s) FPM	110 (.56 m/s) FPM
2. Inflow Volume	258 (438 CMH) CFM	271 (460 CMH) CFM	284 (483 CMH) CFM
3. Supply Avg. Velocity	55 (.27 m/s) FPM	60 (.30 m/s) FPM	65 (.33 m/s) FPM
4. Supply Volume	446 (758 CMH) CFM	484 (822 CMH) CFM	522 (887 CMH) CFM
5. Total Volume	704 (1196 CMH) CFM	754 (1281 CMH) CFM	806 (1370 CMH) CFM
NU-430-600(E)(G)			
1. Inflow Avg. Velocity	100 (.51 m/s) FPM	105 (.53 m/s) FPM	110 (.56 m/s) FPM
2. Inflow Volume	391 (664 CMH) CFM	411(698 CMH) CFM	430 (731 CMH) CFM
3. Supply Avg. Velocity	55 (.27 m/s) FPM	60 (.30 m/s) FPM	65 (.33 m/s) FPM
4. Supply Volume	631 (1072 CMH) CFM	689 (1171 CMH) CFM	746 (1268 CMH) CFM
5. Total Volume	1023 (1738 CMH) CFM	1100 (1869 CMH) CFM	1177 (2000 CMH) CFM

Note 1: NuAire recommends the cabinet be set up and certified at the stated nominal average inflow.

7.9 Main Control Board Description & Replacement

The main control board consists of two interconnected Printed Circuit Board (PCB) assemblies. The front PCB contains the displays, microprocessor and Programmable Read Only Memory (PROM) components. The back PCB contains the power supply, configuration switch, sensor inputs/outputs and control inputs/outputs components. The mechanical and electrical interconnects for the two PCB's all occur within the assemblies and are fastened together with standoffs and screws.

CAUTION: Disconnect electrical power from the unit before attempting any maintenance action.

The main control board is fastened to the control center with (6) 6-32 studs, lockwashers and nuts. All electrical connections are made with removable terminals and/or Faston connectors except for the motor/blower connector, which uses a screw terminal. All AC circuits are fuse protected and when replacement is necessary, **USE ONLY FUSES OF SAME TYPE AND RATING FOR PROTECTION AGAINST RISK OF FIRE.**

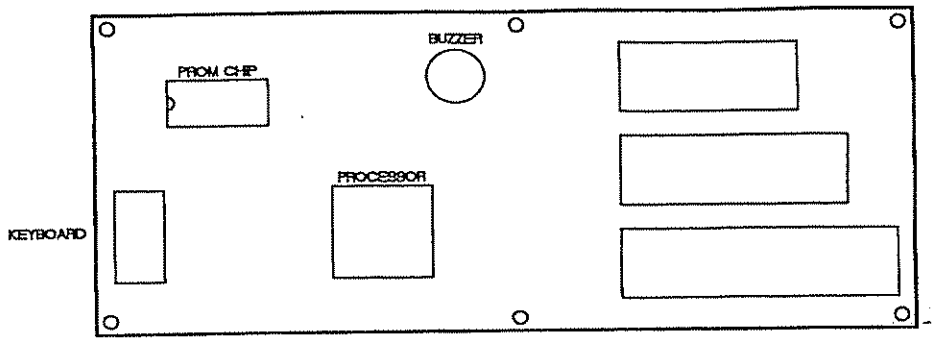
The configuration switch, located on the back PCB, has six switches. The first four switches dictate the type of cabinet operation. The fifth switch is not used. The sixth switch is used to prevent access to the calibration and option mode. Listed below, is the configuration switch number with its associated type of cabinet operation function.

NOTE, EACH TIME THE CONFIGURATION SWITCHES 1 THROUGH 4 ARE CHANGED, A MASTER RESET MUST BE PERFORMED TO INITIALIZE THE CONTROL SYSTEM TO THE CABINET TYPE/MODEL. This is not true of switch 6. It can be switched at anytime to limit access to the calibration and option mode.

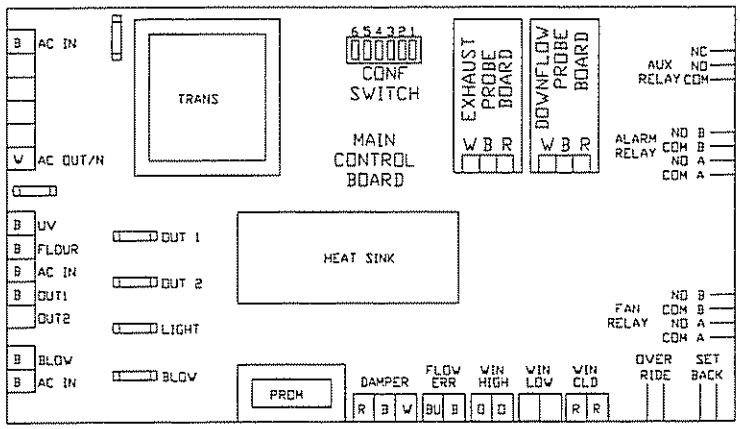
Configuration Switch Number						
S1	**S2**	**S3**	**S4**	**S5**	**S6**	**Type of Cabinet**
off	off	off	off	off	on/off	NU-440-3/4/6
off	off	off	on	off	on/off	N-440-3/4/6(E)(G)
off	**off**	**on**	**off**	**off**	**on/off**	**NU-430-/435-400**
off	**off**	**on**	**on**	**off**	**on/off**	**NU-430-/435-400(E)(G)**
off	**on**	**off**	**off**	**off**	**on/off**	**NU-430/435-600**
off	**on**	**off**	**on**	**off**	**on/off**	**NU-430/435-600(E)(G)**
off	on	on	off	off	on/off	NU-427-400
off	on	on	on	off	on/off	NU-427-600
on	off	off	off	off	on/off	NU-427-400(E)(G)
on	off	off	on	off	on/off	NU-427-600(E)(G)
on	off	on	off	off	on/off	NU-440-3/4/6(D)
on	off	on	on	off	on/off	NU-430-400(D)
on	on	off	off	off	on/off	NU-430-600(D)
on	on	off	on	off	on/off	NU-441-400(E)

Note, that each type of cabinet operation will automatically convert to the correct units of measure (feet per minute, meters per second, etc.) In addition, all the default setpoint values will be automatically updated to their respective values.

Please note, the current Prom chip firmware revision status is displayed upon power up in the clock display. The revision status of the operating system could impact the calibration process and/or features of the system. If desired, please check with NuAire Technical Service for the latest revision level.



FRONT PCB



When replacing the main control board, if possible, it's desirable to note the operational parameters of the cabinet (i.e. motor/blower voltage, setpoints, airflow data from previous certification). The exhaust and downflow probe calibration boards should be removed and transferred to the replacement main control board. All other connectors can be removed and reattached to the replacement main control as necessary.

Note, Perform electronic system master reset to clear the control board's memory to assure proper cabinet operation. To perform the master reset function, perform the following:

- Make sure the configuration switch position 6 on the main control board is off.
- Press and hold the [green flag] until downflow display indicates "CAL" and the clock display indicates "B1.B2".
- Press and hold [SEL] and [SET TIME] simultaneously, then press the [green flag] until the clock display indicates "M.RST".
- Press [SET TIME] to complete the master reset function, the clock display will indicate a new reset time and normal run mode will be the current status (Note: if it is not desired to proceed with the master reset, press the flag to exit).

This completes the master reset function. Now the system requires to be set up and calibrated. Enter into calibration mode and check setpoint and alarm limits. Continue to airflow calibration and use the previous certification data to set motor volts and to spot check airflows. Then exit the calibration mode and verify performance in normal run mode.

7.10 Airflow Probe Description & Replacement

THE AIRFLOW PROBE AND ITS ASSOCIATED CALIBRATION BOARD ARE A MATCHED SET and serialized to assure they always remain together. The airflow probes are located in the downflow and exhaust flow airstreams respectively. The airflow probe calibration boards are located on the main control within the control center.

The airflow probe function utilizes two thermistors that are provided a constant current source. One thermistor is a reference that uses a very low current source. The other thermistor is the airflow measurer that uses a very high current source. As airflow passes over the thermistors, the airflow removes heat from the airflow measurer thermistor. The loss of heat from the thermistor causes the voltage from the thermistor to increase. This increase subtracted from the reference thermistor output voltage is what directly relates to airflow velocity. A repeatable curve can be generated (voltage vs. airflow velocity).

The thermistors used are glass bead coated and can be cleaned by gently using a cotton swab and alcohol. Formaldehyde gas or vapor phased Hydrogen Peroxide has no effect on the airflow probes, however, the formaldehyde/Ammonium bicarbonate residue that remains after decontamination should be removed from the airflow probe thermistors.

CAUTION: Disconnect electrical power from the unit before attempting any maintenance action.

The airflow probes are removed by turning the locking ring counterclockwise and gently pulling probe away from connector. To reattach the airflow probe, turn probe in keyed connector until key matches, push in and turn the locking ring clockwise until ring locks. The airflow probe calibration board is removed by unfastening (2) 6/32 screws and removing connector, then gently pull up calibration board until free. To reattach, reverse the above procedure.

8.0 Error Indicators, Troubleshooting, Option-Diagnostics, & Airflow Probe Performance Verification

Audible alarms and error messages occur for a variety of reasons. Whenever an alarm condition has been present for a period of at least 10 seconds, the audible alarm/error message will be presented and stay on until the error is cleared. The audible alarm will be on for 30 seconds upon initial alarm condition, then on once every ten seconds. When presented with an error indicator, please perform the following:

Step 1: NOTE ALL ERROR INDICATORS. When the cabinet is running, any and all red LED's indicate an error.

Step 2: VERIFY ERROR INDICATORS. Error indicators can be verified by turning the errored function on/off.

Step 3: MONITOR RE-OCCURRENCE OF ERROR INDICATORS. If re-occurrence of the error indicator is immediate or daily, use guide below to correct the situation.

8.1 Error Indicator Troubleshooting Guide

Error Indicator	Indicator	Correction
– Window Alarm (clock display indicates "WN.HI")	Sliding window is above its standard working height or micro switch is not operating properly.	Verify standard working height and window micro switch operation.
– Airflow Alarm – Downflow Display LED (clock display indicates "LO.FL")	Downflow airflow fell below its lower limit alarm setpoint.	Recertify cabinet to proper airflow setpoints.
– Airflow Alarm – Downflow Display LED (clock display indicates "HI.FL")	Downflow airflow went above its high alarm setpoint.	Recertify cabinet to proper airflow setpoints.
– Airflow Alarm – Inflow Display LED (clock display indicates "LO.FL")	Inflow airflow fell below its lower limit alarm setpoint.	Check orientation of exhaust sensor shroud. Recertify cabinet to proper airflow setpoints.
– Airflow Alarm – Inflow Display LED (clock display indicates "HI.FL")	Inflow Airflow went above its high alarm setpoint.	Check orientation of exhaust sensor shroud. Recertify cabinet to proper airflow setpoints.
Clock Display Indicates "VOLT"	The control system runs on 24 VAC, if the voltage drops below the acceptable level, the "VOLT" display occurs.	Verify voltage to cabinet. Check control circuit fuse on main control board. Replace main control if above items are properly verified.
Cabinet fluorescent lights won't turn on.		Check light fuse on main control board. Check fluorescent lamps. Check voltage coming out of main control board to light ballasts. Check ballast.

Error Indicator	Indicator	Correction
Cabinet Blower Won't Turn On.		Check to assure there is adequate exhaust air volume. Check blower fuse on main control board. Check voltage coming out of main control board. Check wiring to blower. Check blower motor. (Note, blower motor has internal thermal protector. Let blower motor cool off for a minimum of 30 minutes to assure thermal protector is not open.)
(downflow display indicates "ERR") (inflow display indicates "LOSt") (clock display indicates "SYNC")	Indicates a power loss to main control has occurred.	
(clock display indicates "RM.OV")	Indicates that the remote override is activated, preventing the usage of the cabinet (see remote contacts section for remote override operation).	
(clock display indicates "POWR")	Indicates a power interruption has occurred.	Press [set time] key to clear indicator.
Cabinet outlets won't turn on.		Check outlet fuse located on main control board. Check voltage coming out of main control board.
Cabinet ultraviolet light won't turn on.		Check sliding window position so that it's fully closed. Check blower/lights fuse on main control board. Check voltage coming out of main control board to ultraviolet light ballast. Check ballast.
Blower or light fuse continues to blow after replacement.		Check for short on output of fuse. Isolate output of fuse by disconnecting light circuit, blower circuit, etc. to isolate short.
(Clock display indicates "RP.UV")	Indicates that the UV light needs replacement	Replace UV light and clear UV run time clock (see User Mode).
(Clock display indicates "LO.PR")	Indicates that the pressure switch monitoring the blower doesn't recognize pressure.	Check to verify if blower is functioning or check pressure switch itself.

8.2 Option - Diagnostics Mode

The option mode allows **A QUALIFIED TECHNICIAN** to configure several different operational parameters. The option mode parameters are the following:

8.2.1 12.HR - 12 or 24-hour clock (on/**off**)
8.2.2 UV.SY - Ultraviolet light sync w/timer (**on**/off)
8.2.3 EX.OV - Exhaust Override (on/**off**)
8.2.4 EC.DF - Exhaust Control Damper Freeze (on/**off**)
8.2.5 EC.DO - Exhaust Control Damper Open (on/**off**)
8.2.6 EC.DC - Exhaust Control Damper Closed (on/**off**)
8.2.7 EC.AO - Exhaust Control Auto Zero (on/**off**)
8.2.8 AF.DA - Airflow Display Averaging (**on**/off)
8.2.9 RO.DO - Remote Override Damper Open (on/**off**)
8.2.10 WN.IN - Window Interlock (**on**/off)
8.2.11 CN.AL - Control/Alarm (manual control) (on/**off**)
8.2.12 AL.SL - Alarm Silence (**ON, STD/OFF, E,G**)
8.2.13 MB.LO - Motor Blower Lockout (**OFF, STD/ON, E, G**)
8.2.14 UV.TM - Ultraviolet light time limit (minutes - hours/**0.00**)
8.2.15 EX.UP - Exhaust Update (seconds/**30**)
8.2.16 EX.AC - Exhaust Airflow Control (seconds/**10**)
8.2.17 MB.RT - Motor blower run time (hours/**0000**)
8.2.18 UV.RT - Ultraviolet light run time (hours/**0000**)
8.2.19 DIAG - Diagnostic Interactions
Note: Default conditions printed in **bold**.

To initiate the option mode, perform the following:

- Press and hold [SET TIME] and [SEL] simultaneously until downflow display indicates "Opt", exhaust display indicates "off" and the clock display indicates "12.HR".

The parameters may be altered using the ↑ and ↓ arrows to their desired condition. Pressing [SEL] will advance through the above parameters in a round-robin fashion. Once the parameter is selected and altered to the desired state, pressing [SET TIME] will enter the desired condition into memory. To exit the option mode, perform the following:

- Press and hold [SET TIME] and [SEL] simultaneously until downflow and inflow/exhaust display indicates dashes "---". Clock display will indicate "WM.UP".

Option Mode Parameter Descriptions

8.2.1 12.HR - 12 or 24 Hour Clock

This parameter allows for the selection of a 12 or 24-hour clock. As the clock display indicates "12.HR", the exhaust display can be toggled "on" for a 12-hour clock and "off" for a 24 hour clock.

8.2.2 UV.SY - Ultraviolet Light Sync W/Timer

This parameter allows for the selection of the ultraviolet light option to run in sync or not in sync with the timer. As the clock display indicates "UV.SY", the exhaust display can be toggled "on" for the ultraviolet light to run in sync with the timer and "off" for the ultraviolet light not to run in sync with the timer.

8.2.3 EX.OV - Exhaust Override

(CAUTION: THIS PARAMETER SHOULD ALWAYS BE TURNED OFF FOR SAFE FUNCTION OF A TYPE B2 CABINET.)

This parameter allows for the selection to activate the blower interlock when in the B1.B2 configuration based upon the amount of exhaust airflow. As the clock display indicates "EX.OV", the exhaust display can be toggled "on" for the blower to function without sufficient exhaust airflow and "off" for the blower to not function without sufficient exhaust airflow.

8.2.4 EC.DF Exhaust Control Damper Freeze

This parameter allows for the selection to disable the exhaust control/alarm and freeze the damper when the blower switch is in the "off" position on the front panel. Normally, when the blower is turned "off", the exhaust control and alarm function remains active in the B1.B2 configuration. However, if the cabinet is tied into the exhaust blower circuit, it is desirable to turn off the exhaust control and alarm function when the blower switch is turned off. This will avoid having a constant exhaust alarm when the exhaust system is turned off. To program, as the clock display indicates "EC.DF", the exhaust display can be toggled "on" to disable the exhaust control function and "off" for the normal exhaust control and alarm function.

8.2.5 EC.DO Exhaust Control Damper Open

This parameter allows for the selection to disable the exhaust control/alarm and open the damper when the blower switch is in the "off" position on the front panel. Normally, when the blower is turned "off", the exhaust control and alarm function remains active in the B1.B2 configuration. However, if the cabinet is tied into the exhaust blower circuit, it is desirable to turn off the exhaust control and alarm function when the blower switch is turned off. This will avoid having a constant exhaust alarm when the exhaust system is turned off. To program, as the clock display indicates "EX.OF", the exhaust display can be toggled "on" to disable the exhaust control function and "off" for the normal exhaust control and alarm function.

8.2.6 EC.DC Exhaust Control Damper Close

This parameter allows for the selection to disable the exhaust control/alarm and close the damper when the blower switch is in the "off" position on the front panel. Normally, when the blower is turned "off", the exhaust control and alarm function remains active in the B1.B2 configuration. However, if the cabinet is tied into the exhaust blower circuit, it is desirable to turn off the exhaust control and alarm function when the blower switch is turned off. This will avoid having a constant exhaust alarm when the exhaust system is turned off. To program, as the clock display indicates "EX.OF", the exhaust display can be toggled "on" to disable the exhaust control function and "off" for the normal exhaust control and alarm function.

8.2.7 EC.AO Exhaust Control Auto Zero

This parameter allows the exhaust control system when using the NuAire NU-951 Automatic Damper to once every 24 hours perform a check from its original calibration point. The first time the option is turned on, an airflow calibration must occur. During the airflow calibration procedure, once the certifier calibrates the exhaust volume (presses "CAL.P"), the control system will remember the damper position in degrees at that point. Then after the first power-up, 12 hours later, the exhaust control system will perform the following auto-zero sequence. First, freeze the exhaust display to its setpoint and turn on the LED next to the exhaust display. Then move the damper back to its original calibration point. Allow the damper to control normally for one minute, then unfreeze the display and turn off the LED. This sequence will then be performed once every 24 hours after the initial 12-hour period. The auto-zero sequence can be checked at anytime by pressing the [↑] and [↓] key simultaneously for three seconds to initiate a two minute test sequence. To program, as the clock display indicates "EC.AO", the exhaust display can be toggled "on" to initiate the auto-zero sequence or "OFF" to not.

8.2.8 AF.DA - Airflow Display Averaging

This parameter allows for the selection of the airflow display averaging function to operate. As the clock display indicates "AF.DA", the exhaust display can be toggled "on" for airflow averaging to occur and "off" for no airflow averaging. When airflow averaging is "on", the downflow display will always indicate the airflow setpoint (ex. 60 fpm) if the airflow is valid and within its alarm limits. The exhaust display will use the exhaust update averaging function.

8.2.9 RO.DO Remote Override Damper Open

This parameter allows for the NU-951 damper to open during a remote override contact closure. Normally, the NU-951 damper function will close during a remote override contact closure. However, this option allows the opposite damper function. To program, as the clock display indicates "RO.DO", the exhaust display can be toggled "ON" to indicate the damper will open during a remote override contact closure or "OFF" to close the damper.

8.2.10 WN.IN - Window Interlock

This parameter allows for the selection of the lower window switch to be interlocked with the ultraviolet light option. As the clock display indicates "WN.IN", the exhaust display can be toggled "ON" for the ultraviolet light option to be interlocked with the sliding window and "off" for the sliding window not to be interlocked.

8.2.11 CN.AL - Control/Alarm (Manual Control)

This parameter allows **ONLY THE CABINET TECHNICIAN** to run the cabinet in manual mode. This means with no controls or alarms activated. As the clock display indicates "CN.AL", the exhaust display can be turned "ON" to run the cabinet in manual mode. When the exhaust display is "OFF", the cabinet will run normally with controls and alarms. If the function is turned on, and out of the option mode and into the run mode, the LED next to the clock display will be on. The downflow and inflow displays will indicate the nominal setpoints. Airflow adjustments can be made in the manual mode by going into the calibration mode and adjusting the blower duty cycle. The blower duty cycle will remain constant in manual mode. To adjust the blower duty cycle in manual mode, perform the following:

- Make sure the configuration switch position 6 on the main control board is off.
- Press and hold the green flag until downflow display indicates "CAL" and the clock display indicates "B1.B2".
- Press [SEL] to indicate LED next to clock display.
- Press [SET TIME] and [↑] keys simultaneously, clock display will blink "BLOW" and the blower duty cycle percentage "XXX.X".
- Press blower switch to on.
- Press [↑] or [↓] keys to desired airflow rate.
- Press [SEL] to indicate LED next to downflow display.
- Press [SET TIME], clock display will indicate "CAL.P".
- Press [SET TIME] **two times** to enter airflow value, clock display will still indicate "CAL.P".
- Press the green flag to exit calibration mode.

8.2.12 AL.SL - Alarm Silence

This parameter allows for the selection of the alarm silence key function. As the clock display indicates "AL.SL", the exhaust display can be turned "ON" for the alarm silence key function to silence all current and future alarms for 15 minutes. When the exhaust display is "OFF", the alarm silence key function will silence current alarms for 2 minutes. If a new alarm is present, the audible alarm will again be turned on.

8.2.13 MB.LO - Motor Blower Lockout

This parameter allows the access to turn the blower on or off to be restricted by the use of a password. As the clock display indicates "MB.LO", the exhaust display can be toggled "on" for password protection or "off" for normal operation. **PLEASE NOTE, WHEN TOGGLING THE OPTION "OFF", YOU MUST PRESS [SET TIME] TWO TIMES TO TURN OFF THE OPTION.** If the motor blower lockout option is "on". Upon exiting the option mode, the default sequence of [↑] [SEL] [↓] keys will allow the user to turn the blower on or off. When the lockout function is used, an audible alarm will be present during the warm-up period. Press the alarm silence key to silence. To customize the access code, perform the following:

- Press and hold [↑] key until clock indicates alternate blink code/clock time.
- Press the [↑] SEL [↓] keys in any three consecutive keys.
  i.e.: [↑][↑][↑]
  [SEL][↑][↑]
  [↓][↓][SEL]
- Press [SET TIME] to enter the new code.

8.2.14 UV.TM - Ultraviolet Light Time Limit

This parameter allows for the selection of the ultraviolet light timer to limit, to a specified time period, or not limit the length of time once turned on. As the clock display indicates "UV.TM", the exhaust display can be adjusted for length of time limit. When the exhaust display indicates "0.00", there is no time limit. When a time limit is entered, the display will start with minutes "0.00 - 99.50" and then go to hours "1.40. - 12.00.".

8.2.15 EX.UP - Exhaust Update

This parameter allows for the selection of time to determine how much exhaust airflow data is averaged before being displayed. The time is displayed in seconds with a programmable range of 1 to 60.

8.2.16 EX.AC - Exhaust Airflow Control

This parameter allows for the selection of time, programmable to (1 to 60 seconds) to determine how often the exhaust controller updates the control signal to the automatic damper (i.e. NU-951-012) if installed. Reducing the time will cause the damper to react quicker to changes, but may result in control overshoot and oscillations. Increasing the time will cause the damper to react slower to changes, but may not keep up with normal systems fluctuations. Depending upon the HVAC system, changing this parameter allows control flexibility for exhaust system stability optimization.

8.2.17 MB.RT - Motor Blower Run Time

This parameter allows the cabinet technician to review how many hours the motor blower has been running. The time is displayed in hours up to 99,999. The display time has two elements (0-9999) and (1000. - 9999.). The decimal point in the second element means multiply the value times (10). To clear the run time back to zero, press ↑ and ↓ arrows simultaneously.

8.2.18 UV.RT - Ultraviolet Light Run Time

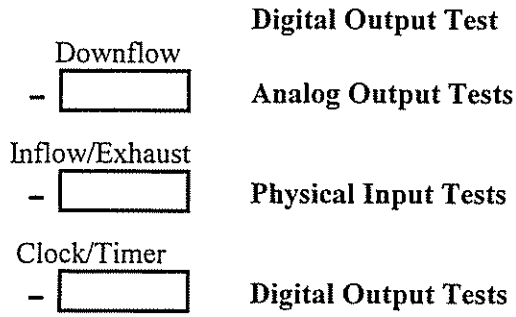
This parameter allows the cabinet technician to review how many hours the ultraviolet light has been running. The time is displayed in hours up to 9,999. However, once the time exceeds 7000 hours, a replace UV light message will appear in the clock display "RP.UV". To clear the run time back to zero and replacement message, press ↑ and ↓ arrows simultaneously.

8.2.19 DIAG - Diagnostic Interactions

This parameter allows the cabinet technician to verify all inputs and outputs. This can be a valuable aid for troubleshooting or verifying cabinet performance. The diagnostic mode is entered by the following:

- Press [↑] arrow key, display test will be in process.

During this test, each display output will be cycled in order. Visually inspect all the displays to assure proper function. The [SEL] key is used to advance to other diagnostic test modes in a repetitive sequence. Each diagnostic test mode is indicated by the LED to the left of the displays.



To exit diagnostics, press the green flag and the display will return to the option mode. The downflow display will indicate "Opt", the exhaust display indicates "off" and the clock display indicates "12.HR". To exit the option mode, perform the following:

- Press and hold [SET TIME] and [SEL] simultaneously until downflow and inflow/exhaust display indicates dashes "---". Clock display will indicate "WM.UP".

8.2.19.1 Analog Output Test

The analog output test only has two test items. The analog output to the blower and damper motors. The [SET TIME] key is used to advance between the tests.

When the output is accessed, the clock/timer display indicates one of the abbreviated outputs below. The ↑ or ↓ arrow keys increase or decrease the output value.

Blow Blower analog output value. The value indicated in the downflow display indicates the current output level (0-255). The blower can be turned on to verify operation and to increase and decrease voltage to blower.

Damp Damper analog output value. The value indicated in the downflow display indicates the current output level (0-255). The damper can be opened and closed to verify operation.

8.2.19.2 Physical Input Test

The physical input test has eighteen test items. The [SET TIME] key is used to advance between each test. When the input is accessed, the clock/timer display indicates one of the abbreviated inputs below. Each test item is checked by exercising the actual device (i.e. switch on/off). When in the downflow and exhaust flow input, with the blower turned on, the downflow display will indicate the current output level (0-255). The ↑ and ↓ arrow keys raise or lower the blower voltage.

DN.FL Downflow Analog Input - The value in the exhaust display indicates actual flow rate (fpm).

EX.FL Exhaust Flow Analog Input - The value in the exhaust display indicates actual flow rate (fpm).

DN.CT	Downflow Digital Count - The value in the display indicates a digital count value of actual flow rate.
EX.CT	Exhaust Flow Digital Count - The value in the display indicates a digital count value of actual flow rate.
WN.HI	Window High Switch - Monitors high point of sliding window. Switch will close when sliding window is above correct operational height.
WN.CL	Window Closed Switch - Monitors closed point of the sliding window. Switch will close when the sliding window is lowered down to the bottom of the access-opening.
WN.LO	Window Low Switch (only used on some 230 Vac models)- Monitors low point of sliding window. Switch will open when sliding window is lowered past the standard opening height.
NIGHT	Night Setback Switch - A contact closure used with the B1/B2 configuration that closes the exhaust damper when not in use to save energy.
FL.ER	Flow Error Switch - A contact closure that allows an external signal to indicate an airflow error.
RM.OV	Remote Override Switch - A contact closure that allows an external signal to shut down the cabinet operation.
V.MON	Power Monitor Input - Monitors line voltage to controller. Value indicated is an associated value in line voltage. Any value above 350 is considered acceptable.
SYNC	Power SYNC Rate (cycles per second) - Monitors line power cycle rate, either 50 or 60.
SW_1	Configuration Switch Position 1 - Monitors position of switch ON or OFF.
SW_2	Configuration Switch Position 2 - Monitors position of switch ON or OFF.
SW_3	Configuration Switch Position 3 - Monitors position of switch ON or OFF.
SW_4	Configuration Switch Position 4 - Monitors position of switch ON or OFF.
SW_5	Configuration Switch Position 5 - Monitors position of switch ON or OFF.
SW_6	Configuration Switch Position 6 - Monitors position of switch ON or OFF.

8.2.19.3 Digital Output Testing

The digital output test has seven test items. The [SET TIME] key is used to advance between each test. When the output is accessed, the clock/timer display indicates one of the abbreviated outputs below. The ↑ and ↓ arrow keys can turn the output tests on and off.

A.ALM	Airflow Alarm LED - Turns the red airflow alarm LED on front panel.
W.ALM	Window Alarm LED - Turns the red window alarm LED on front panel.
X.RLY	Auxiliary Relay - Turns the auxiliary relay contacts on and off.
F.RLY	Fan Relay - Turns the fan relay contacts on and off.
A.RLY	Alarm Relay - Turns the alarm relay contacts on and off.
BEEP	Audible Alarm - Turns the audible alarm on and off.

S.MEM System Memory - Performs an internal check on the system memory. The system memory should only be performed by a qualified service technician. All setup and calibration data will be lost, the memory reinitialized to the default values and all control functions reset to an initial cabinet power on condition. If possible, before the system memory function is performed. It would be preferred to know the operational parameters of the cabinet (i.e. motor/blower voltage, setpoints, airflow data from previous certification).

8.3 Airflow Probe Performance Verification

The individual airflow probes can be checked in diagnostics. In the run mode performance verification, the airflow probe is checked for responsiveness to changing airflow conditions. In the diagnostic mode, the airflow probe is checked for calibration in the raw airflow velocity measurement. Both verifications are used to assure maximum performance of the airflow control system.

8.3.1 Run Mode

To check the airflow probe in run mode, first allow the cabinet to operate normally for a minimum of 5 minutes. Then, place a rolled piece of paper over the downflow probe in the workzone and leave the paper on the probe for at least 2 minutes and then remove. This action will cause the cabinet to go into a downflow alarm condition. The exhaust airflow reading should increase during this test. However, the downflow reading should go down to dashes on the display "---". There should also be a noticeable increase in motor/blower noise. It would also be recommended to monitor motor/blower voltage during the test. The motor/blower voltage should be monitored from when the cabinet is running normally. During the test, when the downflow probe is covered, the motor/blower voltage should be steadily increasing to slightly under line voltage. When the downflow probe is uncovered, the motor/blower voltage should decrease and return to its original reading.

If the motor/blower voltage does not change or does not return to the original voltage, an airflow probe problem could exist. Please consult with NuAire Technical Service.

8.3.2 Diagnostic Mode (downflow comparison is not required on software rev. 4.0 or higher)

To check the airflow probe in diagnostic mode, first use a velometer placed near the airflow probe which determines what the actual airflow is near the probe during the verification process. Then, proceed to access the diagnostic mode by the following procedure:

- Enter Option Mode
- Press and hold [SET TIME] and [SEL] simultaneously until downflow display indicates "Opt", exhaust display indicates "off" and the clock display indicates "12.HR".
- Press [SEL] to advance through option mode until "DIAG" appears in display.
- Press [↑] arrow key to enter into diagnostics, display test will be in process.
- Press [SEL] to advance through diagnostics until "DN.FL" appears in the clock/time display and the exhaust display indicates actual flow rate.
- Press blower [ON] key and allow blower to warm up for a minimum of 2 minutes.

Compare diagnostic value in exhaust display to a velometer measurement next to the downflow airflow probe. Press [SET TIME] to advance display to "EX.FL". The exhaust flow comparison verification is not possible to obtain in this cabinet. However, with no exhaust flow present, the airflow probe should read less than 20 and with exhaust present at its nominal average flow should read between 60 and 150. The exhaust diagnostic value should also be steady varying +/- 3. If value varies more or has rapid movement, adjust exhaust shroud adjustment plate as necessary to steady exhaust diagnostic value. Record values and exit diagnostics. The downflow measured value should be within ±30 fpm of the diagnostic value. If the measured values are not within the above requirements, return airflow probe and calibration board to NuAire for recalibration. Once test is completed, press [SEL] to advance back to display test, then press the hidden key (flag) to exit back into option mode. Then press [SEL] and [SET TIME] simultaneously to exit back into normal run mode.

9.0 Remote Contacts

The NU-430 has several contact closures for remote sensing of various functions.

9.1 Fan Relay

The fan relay contacts are dual pole normally open contact closure outputs which are activated whenever the blower is turned on. Contact ratings are 250 VAC maximum at 2 Amps.

9.2 Alarm Relay

The alarm relay contacts are dual pole normally open contact closure outputs which are activated whenever an airflow alarm condition occurs. Contact ratings are 250 VAC maximum at 2 Amps.

9.3 AUX Relay

The AUX relay contacts are single pole normally open or closed contact closure outputs which are activated whenever the blower is turned on or off used in the options cabinet off override and delay off exhaust airflow. Contact ratings are 250 VAC maximum at 2 Amps.

9.4 Remote Override

The remote override contacts are **(NO POWER) SHORTING CONTACTS ONLY**, which when closed, indicates to the control system to shut down the cabinet. The blower and fluorescent light would be turned off, an audible alarm would be turned on for several seconds and the clock display will indicate "RM.OV".

9.5 Night Setback

The night setback contacts are **(NO POWER) SHORTING CONTACTS ONLY**, which when closed, indicates to the control system to enter the night setback mode. The blower and fluorescent light would be turned off and the exhaust damper, if controlled by the system, will close at a percentage of setpoint. The clock display will indicate "NITE".

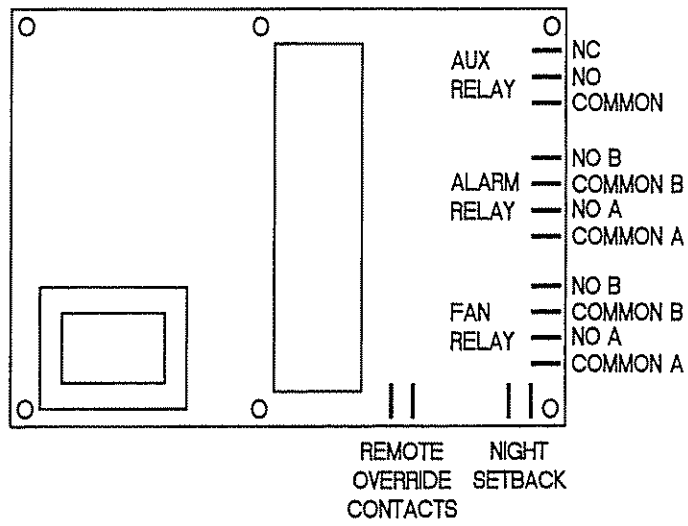


FIGURE 2. MAIN CONTROL BOARD REMOTE CONTACTS

10.0 Optional Equipment

10.1 Ultraviolet Light

10.1.1 Overview

The germicidal ultraviolet is primarily intended for the destruction of bacteria and other microorganisms in the air or on directly exposed surfaces. Approximately 95% of the ultraviolet radiations from germicidal tubes are in the 253.7 manometer region. This is a 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.

The germicidal tube is placed in the cabinet to provide an average intensity of 100 microwatts per square centimeter (for a new tube) falling on a horizontal plane defined by the bottom of the work surface. The minimum requirement per paragraph 5.12 of NSF Standard 49 is 40 microwatts per square centimeter (ref. NSF Std. #49, June, 1976).

Since ultraviolet rays will not penetrate ordinary glass, it is recommended that the sliding window be closed while the ultraviolet light is on within the cabinet; or that personnel leave the cabinet face area.

10.1.2 Operation

The operation of the ultraviolet light is accomplished by closing the sliding window and pressing the UV switch location on the front panel. The sliding window is interlocked to the ultraviolet light so, when the sliding window is raised, the ultraviolet light will turn off. If an operational time duration is known, the timer can be used in conjunction with the ultraviolet light to time out the ultraviolet light operation. This can be accomplished by first turning on the ultraviolet light. Then, set the timer to the desired length of ultraviolet light operation time. Upon timer expiration, the ultraviolet light will turn off.

10.1.3 Precaution

The rays from germicidal tubes may cause a painful but temporary irritation of the 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.

Since ultraviolet rays will not penetrate ordinary glass, it is recommended that the sliding window be closed while the ultraviolet light is on within the cabinet; or that personnel leave the cabinet face area.

10.1.4 Maintenance

The output of an ultraviolet light deteriorates with burning age. The useful life of the light is approximately 7000 hours under specific test conditions. If the tube is turned on every day for 12 hours, the tube will last approximately one year.

It is recommended that either a time schedule is established or the tube's output is measured periodically and the tube replaced when its output falls below 40 microwatts per square centimeter or exceeds 7000 hours of operation. Lights should be allowed to operate approximately 5 to 10 minutes (longer when the light 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 light may be cleaned with a lint-free cloth dampened with alcohol or ammonia and water.

Energies Required to Destroy Some Microorganisms by Ultraviolet Radiations(e)

Mold Spores	Microwatt seconds per cm/2	Protozoa	Microwatt seconds per cm/2
Penicillum roqueforti	26,400	Paramecium	200,000(a)
Penicillium expansum	22,000		
Penicillium digitiatum	88,000	**Nematode Eggs**	40,000(b)
Aspergillus glaucus	88,000		
Aspergillus flavus	99,000	**Algae**	22,000(c)
Aspergillus niger	330,000		
Rhizopus nigricans	220,000	**Virus**	
Mucor racemosus A	35,200	Baceriophage (E. Coli)	6,600
Mucor racemosus B	35,200	Tobacco Masaic	440,000
Oospora lactis	11,000	Influenze	3,400(d)
Yeasts			
Saccharomyces	13,200		
ellipsoideus	17,600		
Saccharomyces cerevisiae	13,200		
Brewers' yeast	6,600		
Baker's yeast	8,800		
Common yeast cake	13,200		
Bacteria			
Streptococcus lactis	8,800		
Strep. hermolyticus (alpha type)	5,500		
Staphylococcus aureus	6,600		
Staphylococcus albus	5,720		
Micrococcus sphaeroides	15,400		
Sarcina lutea	26,400		
Pseudomonas fluorescens	7,040		
Escherichia coli	7,040		
Proteus vulgaris	7,480		
Serratia marcescens	6,160		
Bacillus subtilis	11,000		
Bacillus subtilis spores	22,000		
Spirillum rubrum	6,160		

References:

(a) Luckiesh, Matthew (1946) Application of Germicidal, Ethyemal and Infrared Energy, D.Van Nostrand o., New York, New York, pp 253

(b) Hollaender (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., Oliphant, J.W. (1944) The inactivation effect of monochromatic ultraviolet. Radiation on Influenze Virus (for 90% inactivation) Jour. of Bact. 48, pp. 447-454

(e) This table, "Energies Required to Destroy Some Microorganisms by Ultraviolet Radiations" comes from Westinghouse brochure entitled - "Westinghouse Sterilamp Germicidal Ultraviolet Tubes"

11.0 Electrical/Environmental Requirements

11.1 Electrical

*NU-430-400	115VAC, 60Hz, 1 Phase, 8 Amps
*NU-430-600	115VAC, 60Hz, 1 Phase, 10 Amps
**NU-430-400E	230VAC, 50Hz, 1 Phase, 6 Amps
**NU-430-600E	230VAC, 50Hz, 1 Phase, 7 Amps
NU-430-400G	220VAC, 60Hz, 1 Phase, 6 Amps
NU-430-600G	220VAC, 60Hz, 1 Phase, 7 Amps

**UL/UL-C Listed ** CE Certified*

11.2 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:	(2000 meters) maximum

11.3 Light Exposure

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

11.4 Installation Category: 2.0

Installation category (over voltage category) defines the level of transient over voltage, which the instrument is designed to withstand safely. It depends on the nature of the electricity supply and it's over voltage 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 over voltage is 2500 V for a 230 V supply and 1500 V for a 120 V supply.

11.5 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.

11.6 Chemical Exposure

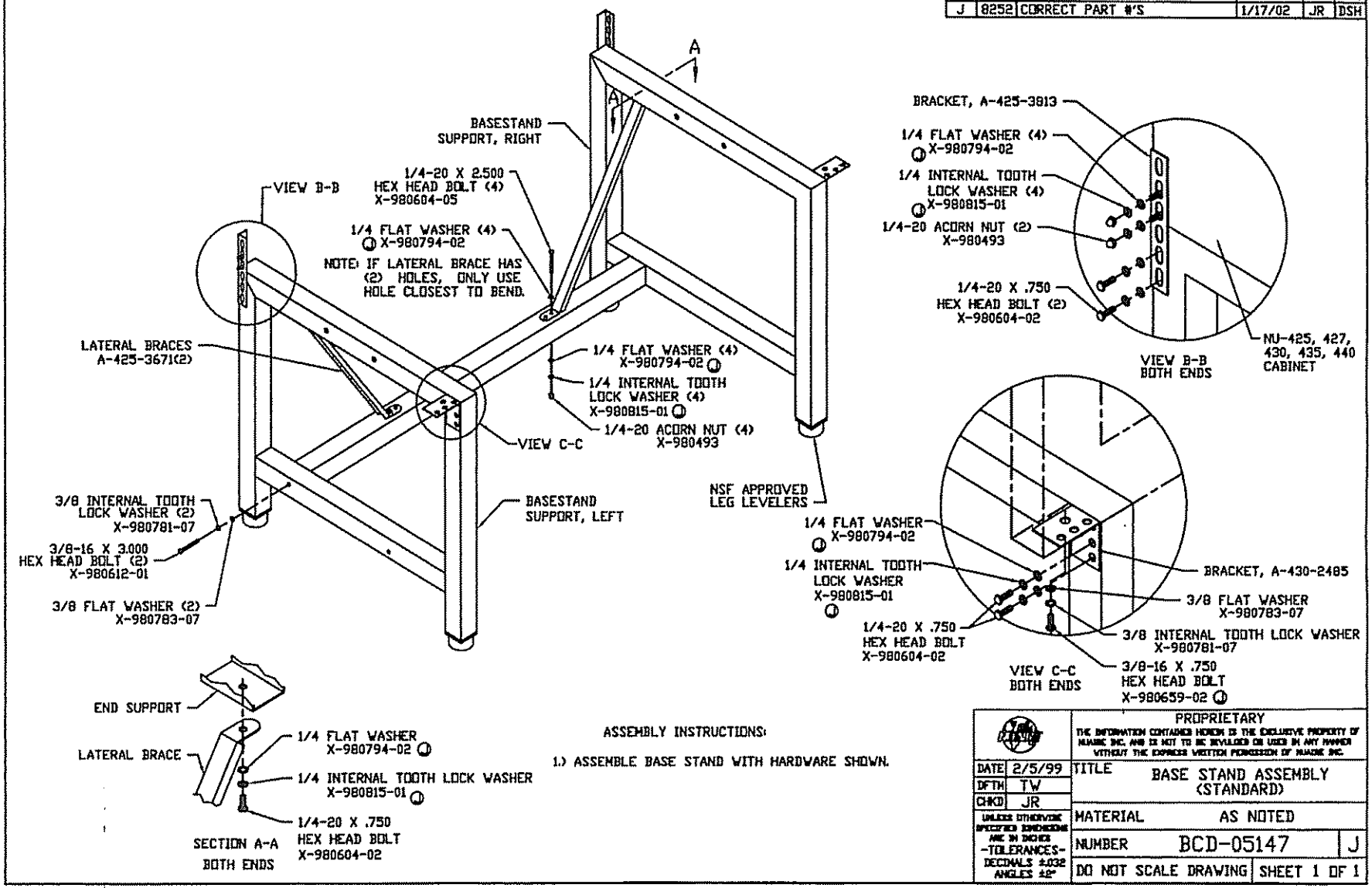
Chemical exposure should be limited to antibacterial materials used for cleaning and disinfecting. **CHLORINATED AND HALOGEN MATERIALS ARE NOT RECOMMENDED FOR USE ON STAINLESS STEEL SURFACES.** Chamber decontamination can be accomplished by paraformaldehyde, vapor phased Hydrogen Peroxide or Ethylene Oxide without degradation of cabinet materials.

11.7 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.

REV	ECO	DESCRIPTION	DATE	DFTM	CHKD
J	8252	CORRECT PART #'S	1/17/02	JR	DSH



ASSEMBLY INSTRUCTIONS:

1.) ASSEMBLE BASE STAND WITH HARDWARE SHOWN.

DATE	2/5/99
DFTH	TW
CHKD	JR
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES -TOLERANCES- DECIMALS ±.032 ANGLES ±2°	

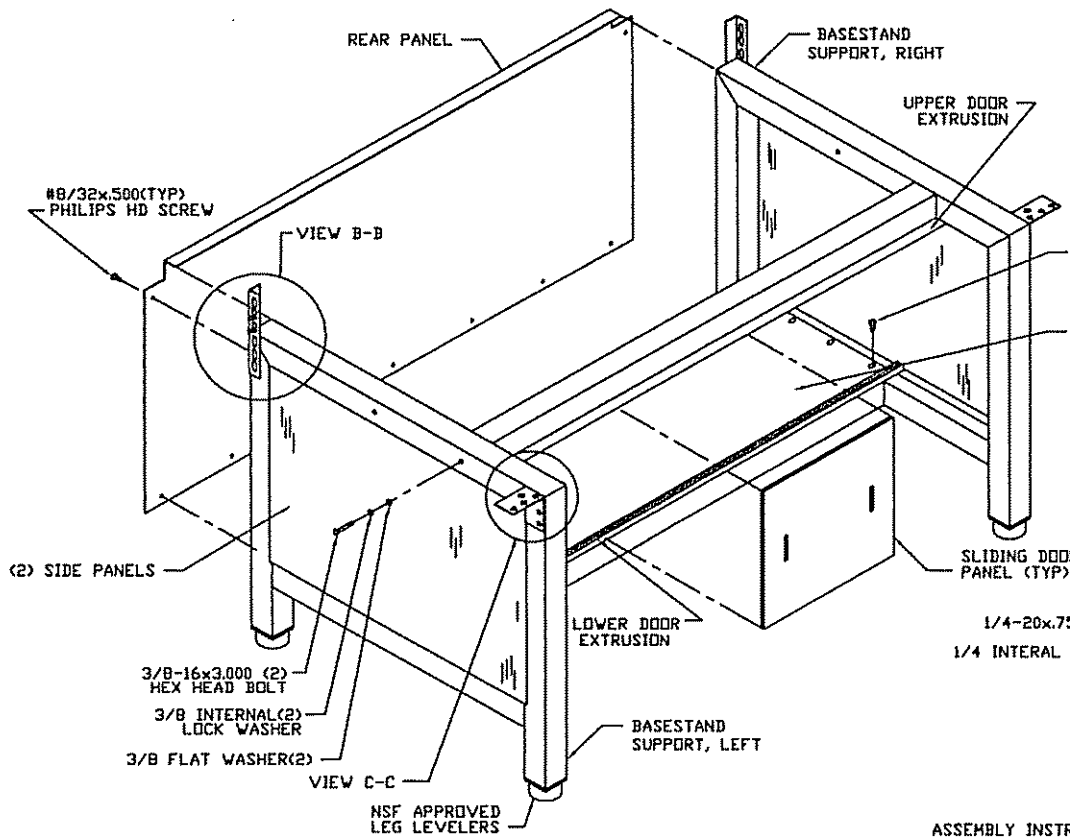
TITLE: BASE STAND ASSEMBLY (STANDARD)

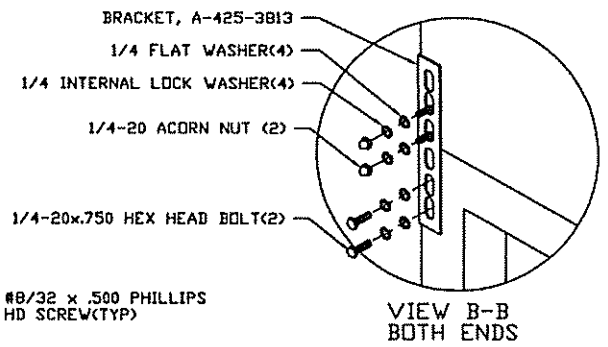
MATERIAL: AS NOTED

NUMBER: BCD-05147 J

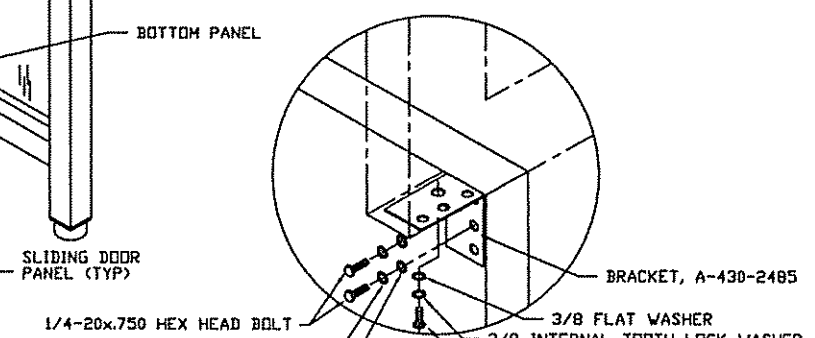
DO NOT SCALE DRAWING | SHEET 1 OF 1

REV	ECO	DESCRIPTION	DATE	DRFT	CHKD
F	7924	UPDATED TITLE BLOCK	2/13/01	JR	DSH





VIEW B-B
BOTH ENDS



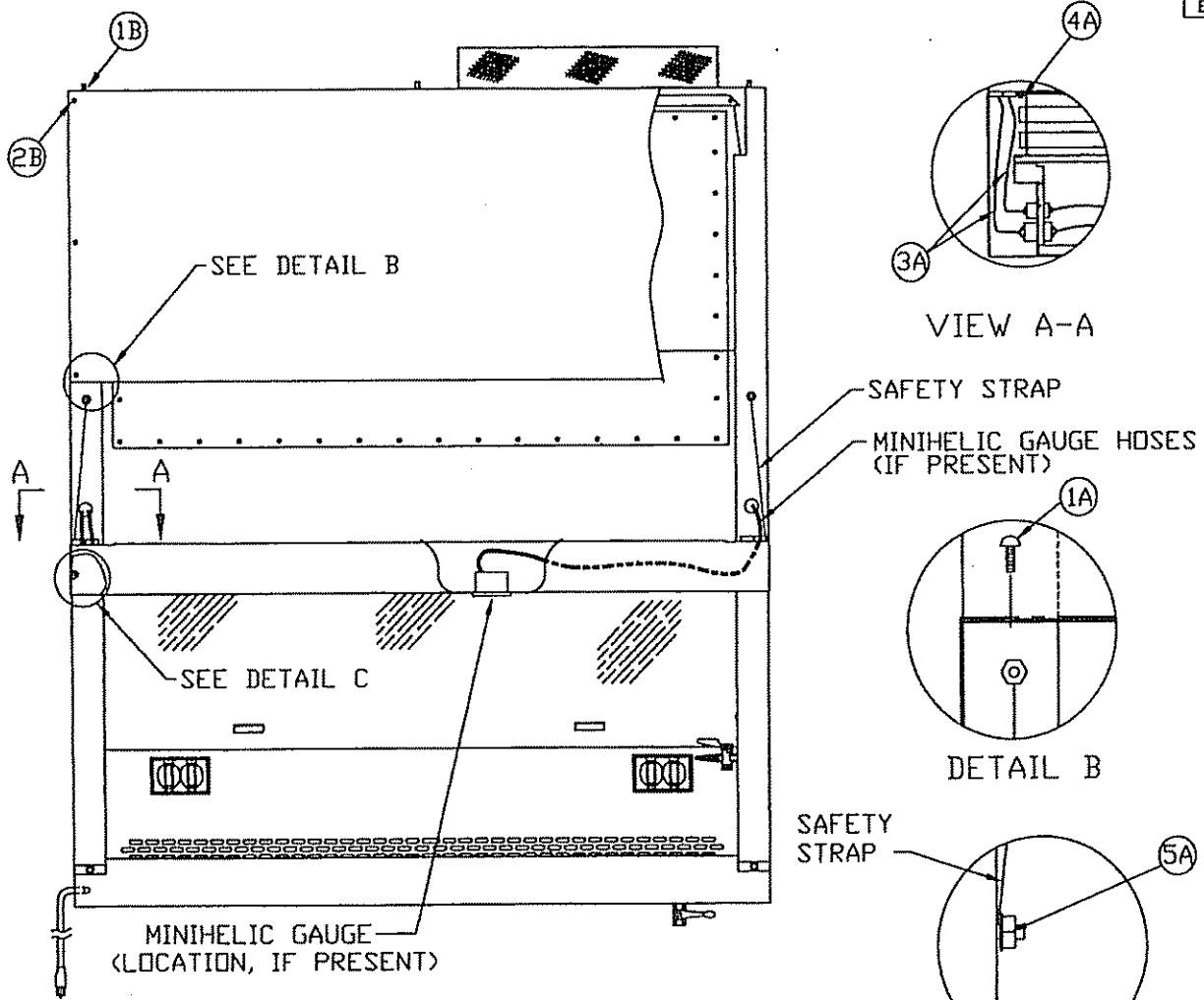
VIEW C-C
BOTH ENDS

ASSEMBLY INSTRUTIONS

1.) ASSEMBLE BASE STAND STORAGE CABINET WITH HARDWARE AS SHOWN

BASE STAND STORAGE CABINET ASSY B					
DFTM	TH	11/22/94	CHKD	JR	SHEET 1 OF 1
DRAWING NUMBER	BCD-05146				F

REV	ECO	DESCRIPTION	DATE	DRFT	CHKD
E	8770	UPDATED PRINT	01/14/04	AY	DSH



VIEW A-A

DETAIL B

DETAIL C

CONTROL CENTER REMOVAL PROCEDURE

CAUTION
DISCONNECT ALL ELECTRICAL SERVICE TO UNIT BEFORE STARTING PROCEDURE

1A.) REMOVE (2) #8-32 SCREWS FROM TOP OF CONTROL CENTER AND GENTLY LET CONTROL CENTER OPEN ON SAFETY STRAPS.
2A.) REMOVE MINIHELIC GAUGE HOSE (IF PRESENT) (HOSE CLAMP/MAG GAUGE).
3A.) DISCONNECT ELECTRICAL CONNECTORS AND CABLE CLAMPS SO THEY ARE LOOSE TO THE MAIN CABINET (BOTH SIDES).
4A.) LOOSEN NUT (HINGE STOP) AND MOVE METAL TAB 90°
5A.) REMOVE A 1/4-20 NUT FROM CONTROL CENTER HOLDING THE SAFETY STRAP.(BOTH ENDS)
6A.) SLIDE CONTROL CENTER TO LEFT UNTIL FREE.
7A.) TO ATTACH CONTROL CENTER REVERSE THE ABOVE STEPS.

FRONT DECORATIVE PANEL REMOVAL PROCEDURE

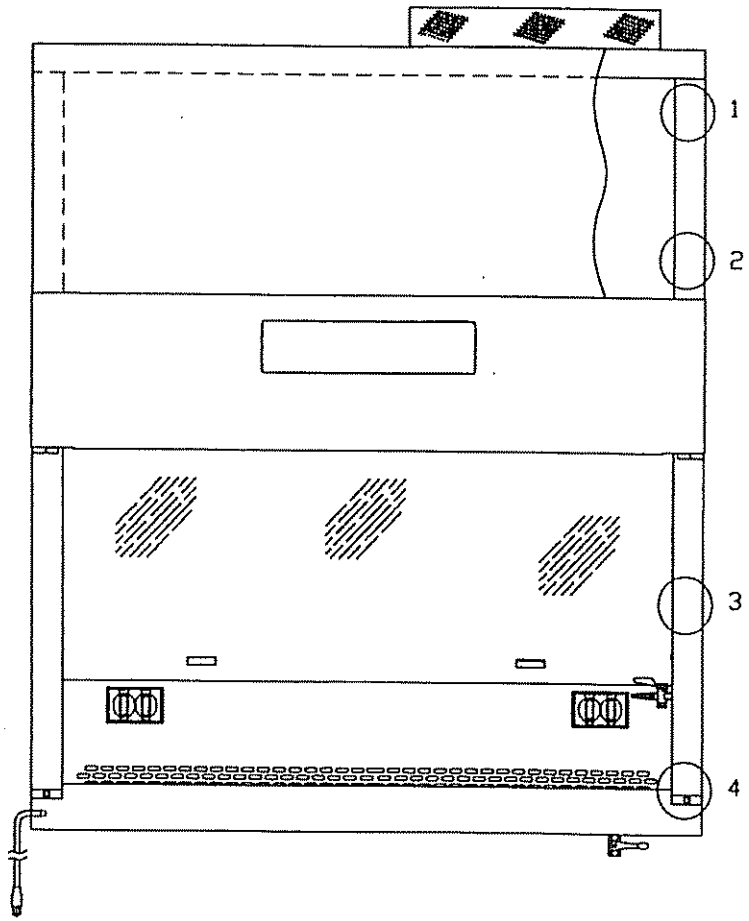
1A.) REMOVE (2) #8-32 SCREWS FROM TOP OF CONTROL CENTER AND GENTLY LET CONTROL CENTER OPEN ON SAFETY STRAPS.
1B.) REMOVE (3) NUTS FROM TOP EDGE OF PANEL.
2B.) REMOVE (6) KNURLED SCREWS FROM FRONT OF PANEL, IF PRESENT.
3B.) TO ATTACH FRONT DECORATIVE PANEL REVERSE THE ABOVE STEPS.

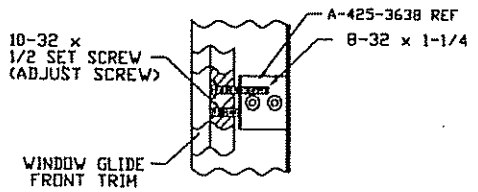
NU-425,427,430,435,437,440,629
CONTROL CENTER & FRONT DECORATIVE PANEL

DFTM	TH	11/23/94	CHKD	JR	SHEET 1 OF 1

DRAWING NUMBER BCD-05145 E

REV	ECO	DESCRIPTION	DATE	DRFT	CHKD
C	8476	ADDED 629 IN TITLE BLOCK	11/06/02	JR	DSH



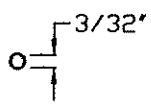


DETAIL A

WINDOW GLIDE ADJUSTMENT

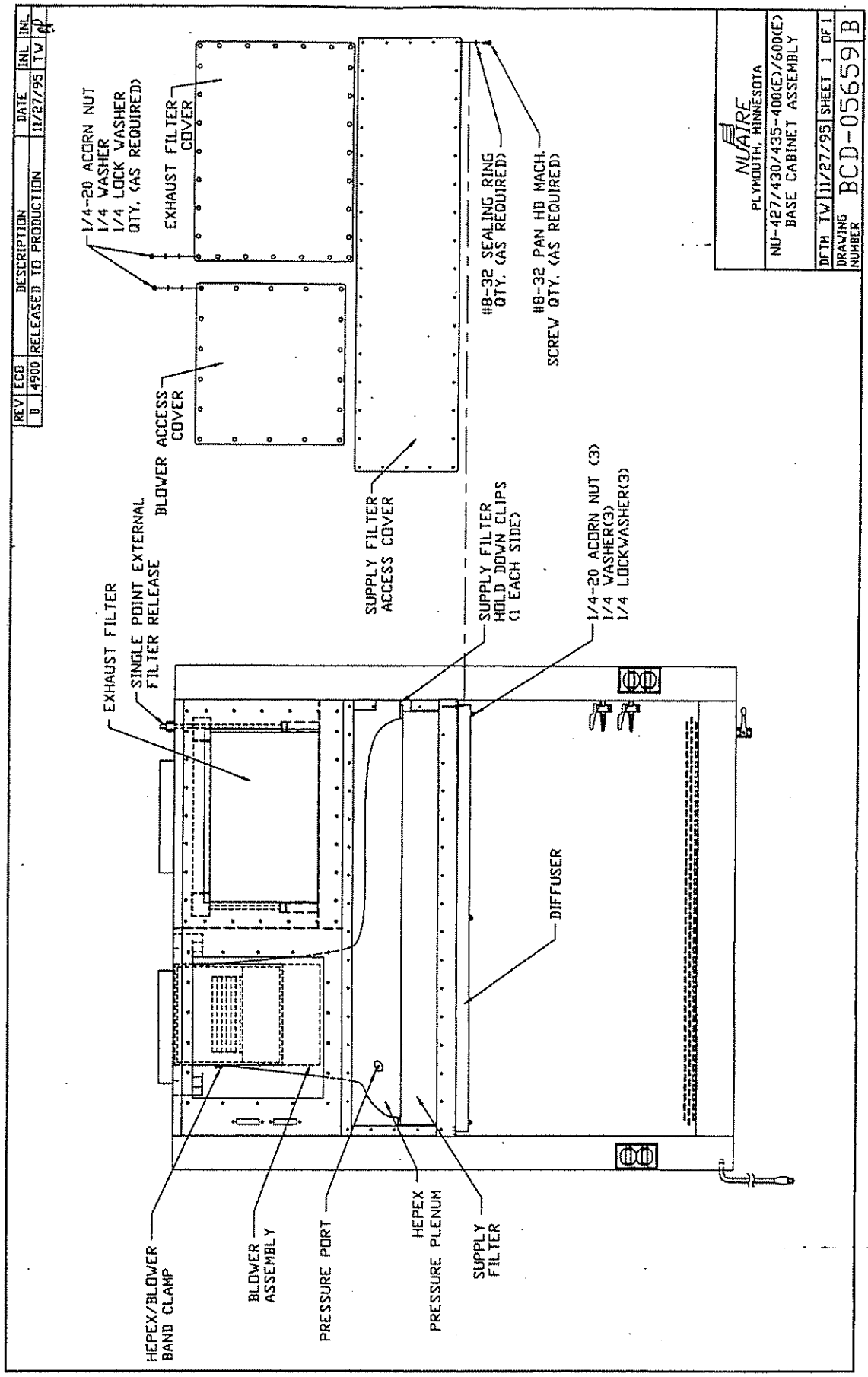
THE LEFT WINDOW GLIDE IS STATIONARY AND HAS NO ADJUSTMENTS. THE RIGHT WINDOW GLIDE HAS ADJUSTMENTS THAT ARE LOCATED AT THE CIRCLED POSITIONS 1 THRU 4. TO ACCESS POSITIONS 1 AND 2, REMOVAL OF THE FRONT DECORATIVE PANEL IS NECCESSARY. IF THE WINDOW IS TOO LOOSE AT ANY OF THE FOUR POSITIONS LOOSEN THE PHILLIPS HEAD TENSION SCREW AND TURN THE ALLEN HEAD SET SCREW CLOCKWISE A FULL TURN OR UNTIL YOU ACHIEVE THE POSITION THAT IS MOST COMFORTABLE FOR THE WINDOW TO SLIDE. THEN RETIGHTEN THE TENSION SCREW. TURN ADJUST SCREW COUNTERCLOCKWISE IF THE WINDOW IS TOO TIGHT.

TOOLS REQUIRED:
1.) 3/32" ALLEN WRENCH
2.) PHILLIPS SCREW DRIVER



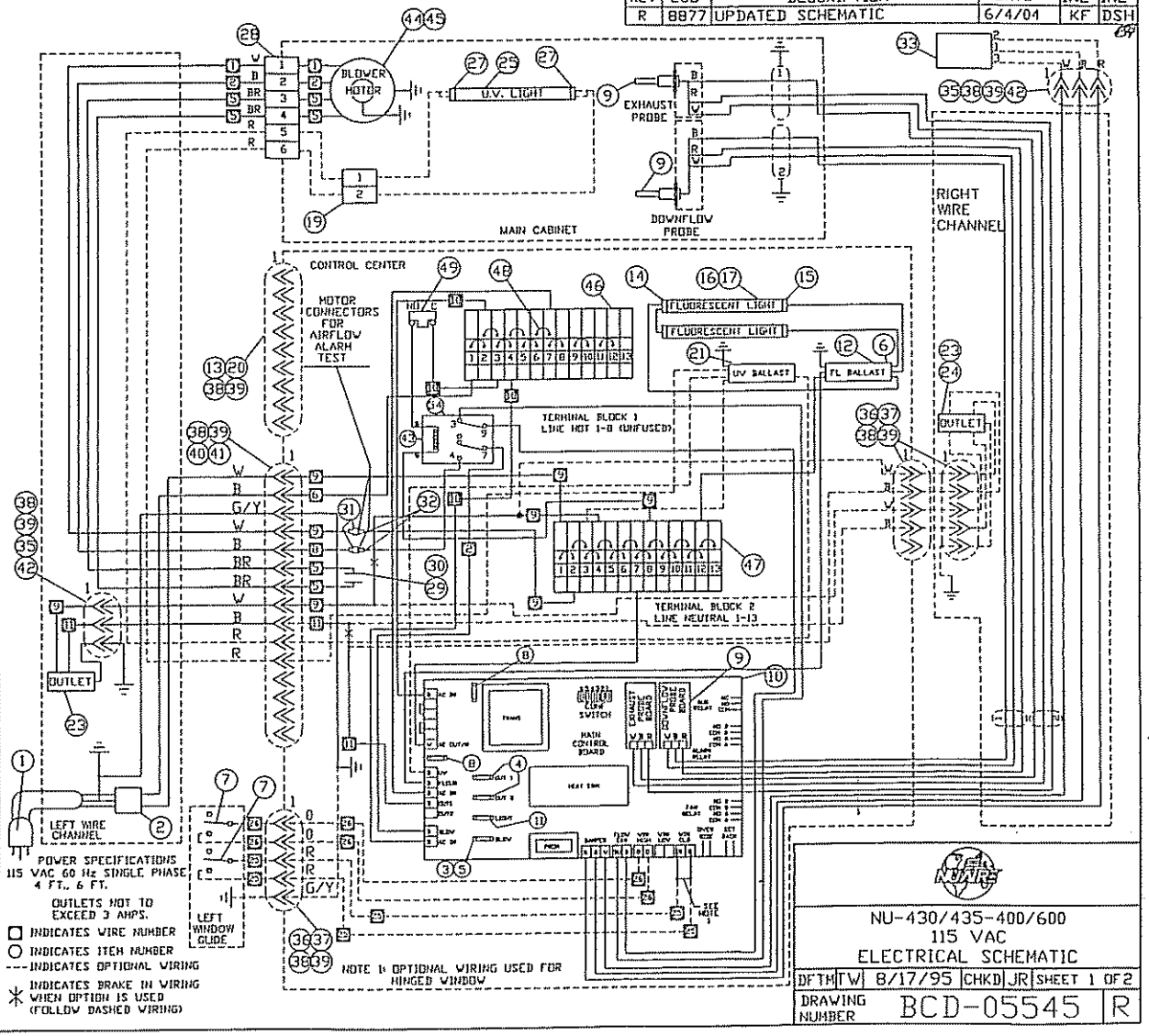
NU-425,427,430,435,437,440,629
SLIDING WINDOW ASSY
& ADJUSTMENT

DFTM	TH	11/22/94	CHKD	JR	SHEET 1 OF 1
DRAWING NUMBER	BCD-05144				C


REV | ECO | DESCRIPTION | DATE | INL
B | 4900 | RELEASED TO PRODUCTION | 11/27/95 | TW
NUAIRE
PLYMOUTH, MINNESOTA
NU-427/430/435-400(E)/600(E)
BASE CABINET ASSEMBLY
DFTM TW | 11/27/95 | SHEET 1 OF 1
DRAWING NUMBER BCD-05659 B
1/4-20 ACORN NUT
1/4 WASHER
1/4 LOCK WASHER
QTY. (AS REQUIRED)
EXHAUST FILTER COVER
#8-32 SEALING RING
QTY. (AS REQUIRED)
#8-32 PAN HD MACH.
SCREW QTY. (AS REQUIRED)
BLOWER ACCESS COVER
SUPPLY FILTER ACCESS COVER
SUPPLY FILTER HOLD DOWN CLIPS (1 EACH SIDE)
1/4-20 ACORN NUT (3)
1/4 WASHER(3)
1/4 LOCKWASHER(3)
EXHAUST FILTER
SINGLE POINT EXTERNAL FILTER RELEASE
DIFFUSER
HEPEX/BLOWER BAND CLAMP
BLOWER ASSEMBLY
PRESSURE PORT
HEPEX PRESSURE PLENUM
SUPPLY FILTER

ITEM	QTY	DESCRIPTION	NUAIRE P/N
1	1	POWER CORD 12 FT. MOLDED PLUG	X-999543
2	1	EMI FILTER	X-999319-02
3	1	FUSE (10 A)(1/4 x 1-1/4) (BLOWER/6FT)	X-999052-01
4	2	FUSE (3 A) (5 x 20 mm) (OUTLET)	X-999039-03
5	1	FUSE (8 A) (1/4 X 1-1/4) (BLOWER/4 FT)	X-999311-07
6	1	BALLAST FLUORESCENT (6 FT)	X-999184-06
7	2	SWITCH ROLLER SPDT (BLOWER)(WIN. HEIGHT)	X-999690-03
8	2	FUSE (.5 A) (5 x 20 mm) (CONTROL BOARD)	X-999039-02
9	2	AIRFLOW PROBE ASY (PROBE & BOARD)	A-440-6998
10	1	MAIN CONTROL BOARD	A-440-5952-A
11	1	FUSE (1 AMP) (5X20mm) (LIGHTS)	X-999039-13
12	1	BALLAST FLUORESCENT (4 FT)	X-999184-05
13	1	CONNECTOR, RECEPTACLE 9 PIN	X-999234-02
14	2	LAMPHOLDER FIXED BASE BI-PIN	X-999418-02
15	2	LAMPHOLDER SPRING BASE BI-PIN	X-999418-01
16	2	LAMP FLUORESCENT 60", 40W (6 FT.)	X-999428-04
17	2	LAMP FLUORESCENT 48", 32W (4 FT.)	X-999428-03
18			
19	1	BULKHEAD CONNECTOR 2 TAB	A-407-1088-01
20	1	CONNECTOR, PLUG 9 PIN	X-999235-02
21	1	BALLAST UV LAMP	X-999184-04
22			
23	1	CONVENIENCE OUTLET	X-999511
24	1	G.F.I. OUTLET	X-999330
25	1	U.V. LAMP	X-999442-01
26	A/R	PIN CONTACT	X-999243-01
27	2	U.V. SOLID BASE	X-999163-02
28	1	BULKHEAD CONNECTOR 6 TAB	A-425-3654-01
29	1	CAPACITOR 7.5 MFD 370V (6 FT)	X-999215-06
30	1	CAPACITOR 15 MFD 370V (4 FT)	X-999215-09
31	2	INSULATED TERMINAL - MALE	X-999817-01
32	2	INSULATED TERMINAL - FEMALE	X-999826-02
33	1	DAMPER ACTUATOR (NU-951-012)	X-999111
34	A/R	SOCKET CONTACT	X-999243-02
35	1-2	CONNECTOR PLUG 3 PIN	X-999237
36	2	CONNECTOR PLUG 5 PIN	X-999046-02
37	2	CONNECTOR RECEPTACLE 5 PIN	X-999046-01
38	A/R	SOCKET CONTACT	X-999244-02
39	A/R	PIN CONTACT	X-999244-01
40	1	CONNECTOR PLUG 15 PIN	X-999295
41	1	CONNECTOR RECEPTACLE 15 PIN	X-999296
42	1-2	CONNECTOR RECEPTACLE 3 PIN	X-999236
43	1	RELAY (DPDT)	X-999562
44	1	MOTOR PSC 1/3 HP 1625 RPM (4 FT.)	A-999408
45	1	MOTOR PSC 1/2 HP 1625 RPM (6 FT.)	A-999409
46	1	TERMINAL BLOCK ASSY CONTAINING:	A-425-4099-01
	*	END,NO PLACE, TERMINAL BLOCK	X-999921-01
	*	END, 4 PLACE, TERMINAL BLOCK	X-999921-03
	*	TERMINAL BLOCK 2 PLACE NON-END	X-999919-01
	*	TERMINAL BLOCK 4 PLACE NON-END	X-999919-02
47	1	TERMINAL BLOCK ASSY CONTAINING:	A-425-4099-02
	*	END,NO PLACE, TERMINAL BLOCK	X-999921-01
	*	END, 4 PLACE, TERMINAL BLOCK	X-999921-03
	*	TERMINAL BLOCK 2 PLACE NON-END	X-999919-01
	*	TERMINAL BLOCK 4 PLACE NON-END	X-999919-02
	*	JUMPER, TERMINAL BLOCK	X-999920-01
48	3	JUMPER, TERMINAL BLOCK	X-999920-01

REV	ECO	DESCRIPTION	DATE	INL	INL
R	8877	UPDATED SCHEMATIC	6/4/04	KF	DSH



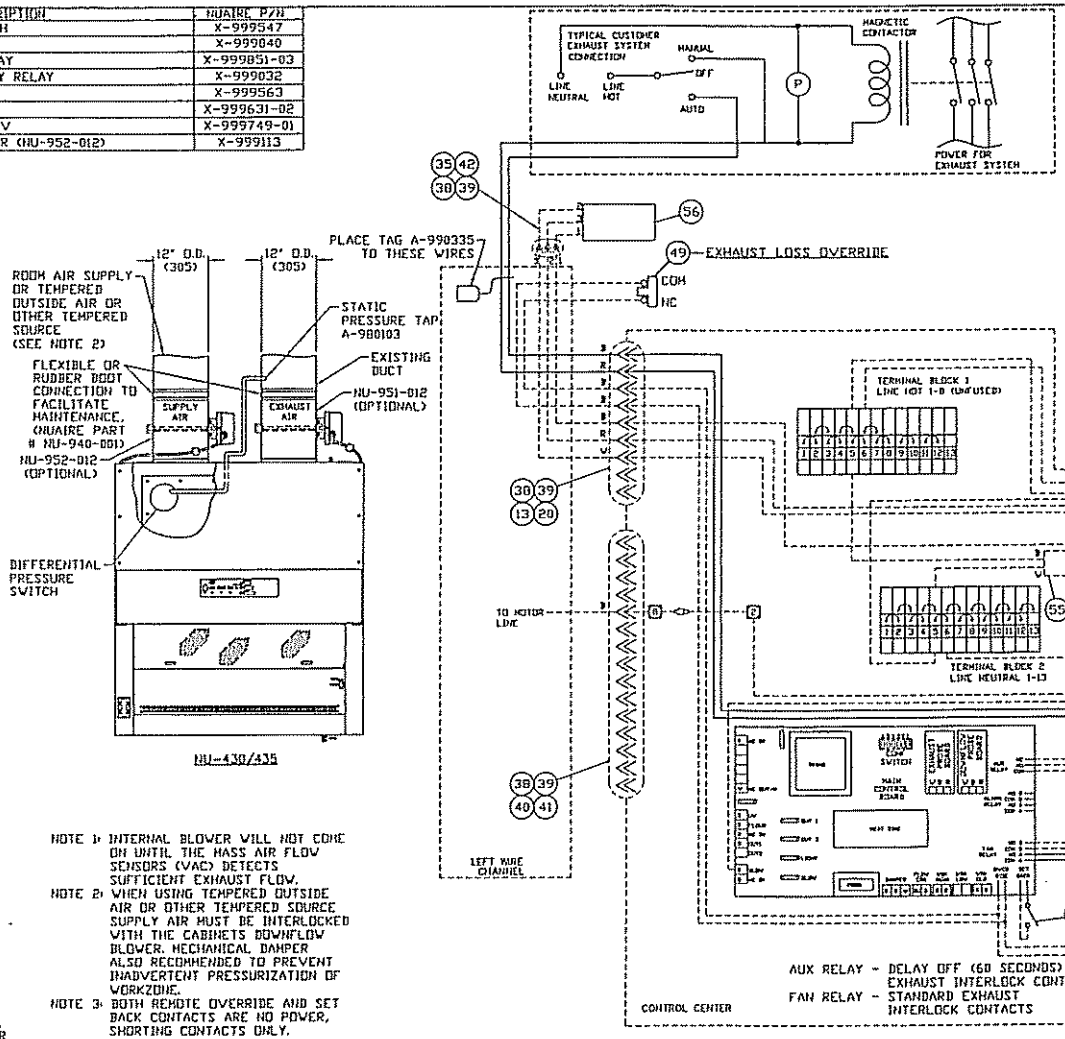
NU-430/435-400/600
115 VAC
ELECTRICAL SCHEMATIC

DFTM	TW	8/17/95	CHKD	JR	SHEET 1 OF 2

DRAWING NUMBER BCD-05545 R

ITEM	QTY	DESCRIPTION	NUAIRE P/N
49	2	PRESSURE SWITCH	X-999547
50	1	SWITCH SPST	X-999040
51	1	TIME DELAY RELAY	X-999851-03
52	1	BASE TIME DELAY RELAY	X-999032
53	1	RELAY	X-999563
54	2	BASE RELAY	X-999631-02
55	1	TRANSFORMER 24V	X-999749-01
56	1	DAMPER ACTUATOR (NU-952-012)	X-999113

REV	ECO	DESCRIPTION	DATE	INL	INL
		SEE SHEET 1 OF 2			



NOTE 1: INTERNAL BLOWER WILL NOT COME ON UNTIL THE MASS AIR FLOW SENSORS (VAC) DETECTS SUFFICIENT EXHAUST FLOW.

NOTE 2: WHEN USING TEMPERED OUTSIDE AIR OR OTHER TEMPERED SOURCE SUPPLY AIR MUST BE INTERLOCKED WITH THE CABINETS DOWNFLOW BLOWER. MECHANICAL DAMPER ALSO RECOMMENDED TO PREVENT INADVERTENT PRESSURIZATION OF WORKZONE.

NOTE 3: BOTH REMOTE OVERRIDE AND SET BACK CONTACTS ARE NO POWER, SHORTING CONTACTS ONLY.

NOTE 4: RELAY CONTACTS(AUX, ALARM AND FAN) RATED FOR 250 VAC, 2 AMPS MAXIMUM.

□ INDICATES WIRE NUMBER
○ INDICATES ITEM NUMBER
--- INDICATES OPTIONAL WIRING
* INDICATES BREAK IN WIRING WHEN OPTION IS USED (FOLLOW DASHED WIRING)

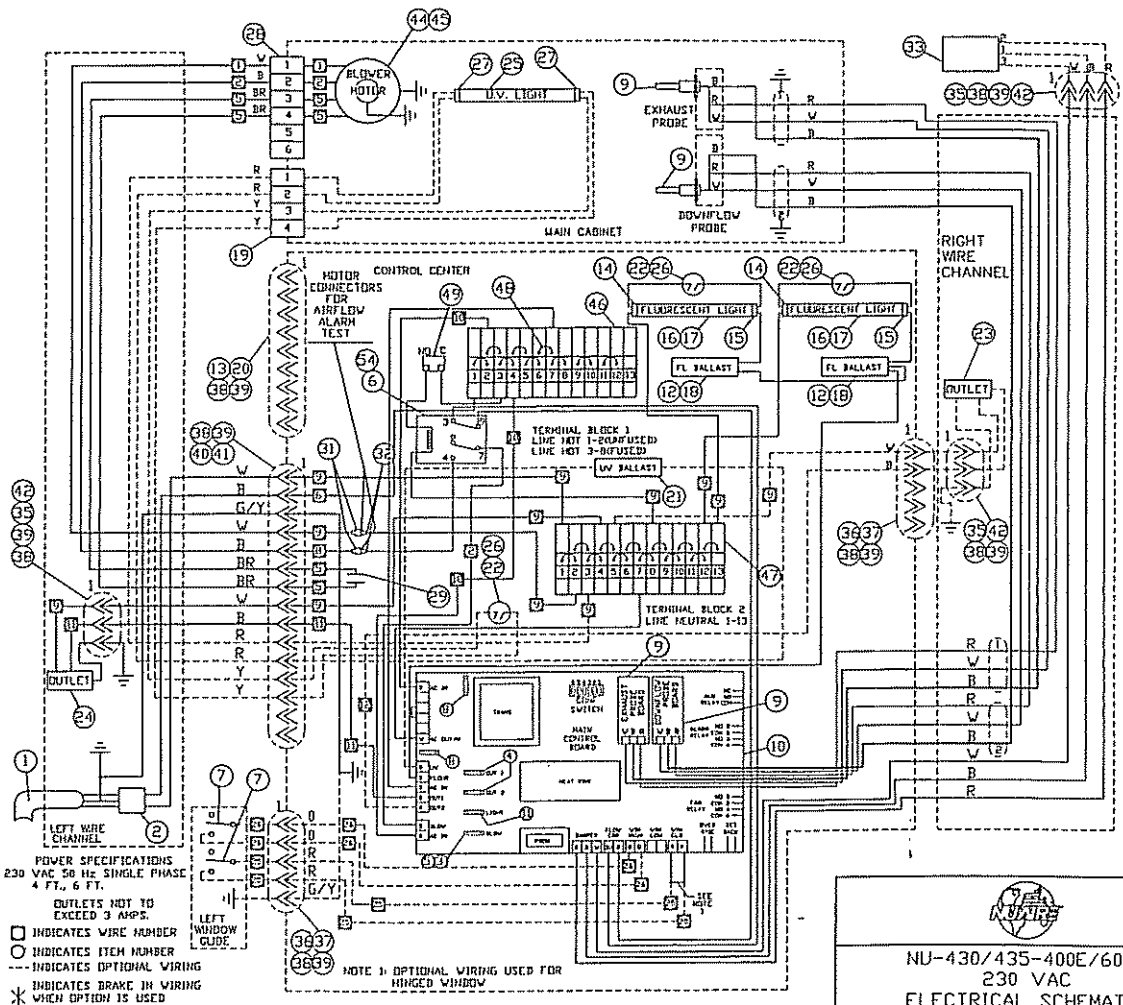
NU-430/435-400/600
115 VAC
ELECTRICAL SCHEMATIC

DFTM	TW	8/17/95	CHKD	JR	SHEET 2 OF 2

DRAWING NUMBER BCD-05545 R

ITEM	QTY	DESCRIPTION	NUAIRE P/N
1	1	POWER CORD	A-425-3926
2	1	EMI FILTER	X-999319-02
3	1	FUSE (6.3A) (1/4 X 1-1/4) (BLOWER, 600E)	X-999052-01
4	2	FUSE (3 A) (5 x 20 mm) (OUTLET)	X-999039-03
5	1	FUSE (5A) (1/4 X 1-1/4) (BLOWER, 400E)	X-999311-07
6	1	RELAY (DPDT) 230V	X-999610-02
7	2	SW. ROLLER SPDT (BLOWER)(WINDOW HEIGHT)	X-999690-03
8	1	FUSE (.25 A) (5 x 20 mm) (CONTROL BOARD)	X-999039-01
9	2	AIRFLOW PROBE ASY (PROBE & BOARD)	A-440-6998
10	1	MAIN CONTROL BOARD	A-440-5952-A
11	1	FUSE (2 AMP) (5X20 MM) (LIGHTS)	X-999039-14
12	2	BALLAST FLUORESCENT (400E)	X-999175-02
13	2	CONNECTOR, RECEPTACLE 9 PIN	X-999234-02
14	2	LAMPHOLDER FIXED BASE BI-PIN	X-999418-02
15	2	LAMPHOLDER SPRING BASE BI-PIN	X-999418-01
16	2	LAMP FLUORESCENT 60", 58W (600E)	X-999164-03
17	2	LAMP FLUORESCENT 48", 36W (400E)	X-999164-02
18	2	BALLAST FLUORESCENT (600E)	X-999175-03
19	1	BULKHEAD CONNECTOR 4 TAB	A-407-1088-03
20	2	CONNECTOR, PLUG 9 PIN	X-999235-02
21	1	BALLAST UV LAMP	X-999174-02
22	2-3	STARTER	X-999162-01
23	1	OUTLET	
24	1	GFI OUTLET	X-999330
25	1	U.V. LAMP	X-999442-01
26	2-3	STARTER BASE	X-999163-03
27	2	U.V. SOLID BASE	X-999163-02
28	2	BULKHEAD CONNECTOR 6 TAB	A-425-3654-01
29	1	CAPACITOR (7 MFD) (400/600E)	X-999132-09
30			
31	2	INSULATED TERMINAL - MALE	X-999817-01
32	2	INSULATED TERMINAL - FEMALE	X-999826-02
33	1	DAMPER ACTUATOR (NU-951-012)	X-999111
34	A/R	PIN - CONTACT	X-999243-01
35	1-2	CONNECTOR PLUG 3 PIN	X-999237
36	2	CONNECTOR PLUG 5 PIN	X-999046-02
37	2	CONNECTOR RECEPTACLE 5 PIN	X-999046-01
38	A/R	SOCKET CONTACT	X-999244-02
39	A/R	PIN CONTACT	X-999244-01
40	1	CONNECTOR PLUG 15 PIN	X-999295
41	1	CONNECTOR RECEPTACLE 15 PIN	X-999296
42	1-2	CONNECTOR RECEPTACLE 3 PIN	X-999236
43	A/R	SOCKET - CONTACT	X-999243-02
44	1	MOTOR PSC (400E)	A-999404
45	1	MOTOR PSC (600E)	A-999405
46	1	TERMINAL BLOCK ASSY CONTAINING:	A-425-4099-01
	*	END,NO PLACE, TERMINAL BLOCK	X-999921-01
	*	END, 4 PLACE, TERMINAL BLOCK	X-999921-03
	*	TERMINAL BLOCK 2 PLACE NON-END	X-999919-01
	*	TERMINAL BLOCK 4 PLACE NON-END	X-999919-02
47	1	TERMINAL BLOCK ASSY CONTAINING:	A-425-4099-02
	*	END,NO PLACE, TERMINAL BLOCK	X-999921-01
	*	END, 4 PLACE, TERMINAL BLOCK	X-999921-03
	*	TERMINAL BLOCK 2 PLACE NON-END	X-999919-01
	*	TERMINAL BLOCK 4 PLACE NON-END	X-999919-02
	*	JUMPER, TERMINAL BLOCK	X-999920-01
48	3	JUMPER, TERMINAL BLOCK	X-999920-01

REV	ECO	DESCRIPTION	DATE	INL	INL
P	8877	UPDATED SCHEMATIC	6/4/04	KF	DSH



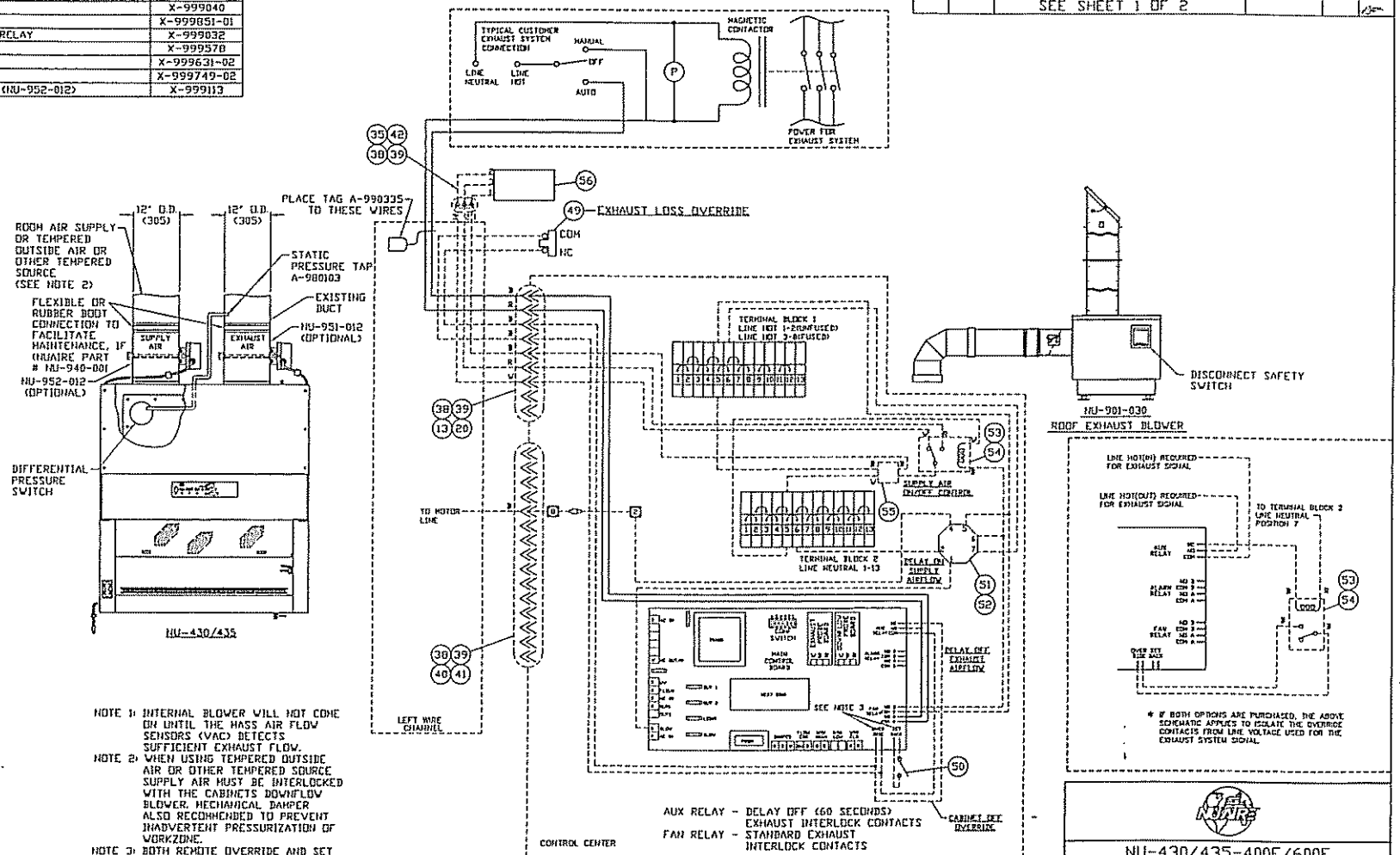
NU-430/435-400E/600E
230 VAC
ELECTRICAL SCHEMATIC

DFTM	TW	8/17/95	CHKD	LS	SHEET 1 OF 2

DRAWING NUMBER BCD-05739 P

ITEM	QTY	DESCRIPTION	NUAIRE P/N
49	2	PRESSURE SWITCH	X-999547
50	1	SWITCH SPST	X-999040
51	1	TIME DELAY RELAY	X-999851-01
52	1	BASE TIME DELAY RELAY	X-999032
53	1	RELAY	X-999578
54	1	BASE RELAY	X-999631-02
55	1	TRANSFORMER 24V	X-999749-02
56	1	DAMPER ACTUATOR (NU-952-012)	X-999113

REV	ECO	DESCRIPTION	DATE	INL	INL
		SEE SHEET 1 OF 2			



NOTE 1: INTERNAL BLOWER WILL NOT COME ON UNTIL THE MASS AIR FLOW SENSORS (VAC) DETECTS SUFFICIENT EXHAUST FLOW.

NOTE 2: WHEN USING TEMPERED OUTSIDE AIR OR OTHER TEMPERED SOURCE SUPPLY AIR MUST BE INTERLOCKED WITH THE CABINETS DOWNFLOW BLOWER. MECHANICAL DAMPER ALSO RECOMMENDED TO PREVENT INADVERTENT PRESSURIZATION OF WORKZONE.

NOTE 3: BOTH REMOTE OVERRIDE AND SET BACK CONTACTS ARE NO POWER, SHORTING CONTACTS ONLY.

NOTE 4: RELAY CONTACTS(AUX, ALARM AND FAN) RATED FOR 250 VAC, 2 AMPS MAXIMUM.

□ INDICATES WIRE NUMBER.
○ INDICATES ITEM NUMBER.
— INDICATES OPTIONAL WIRING
* INDICATES BREAK IN WIRING WHEN OPTION IS USED (FOLLOW DASHED WIRING)

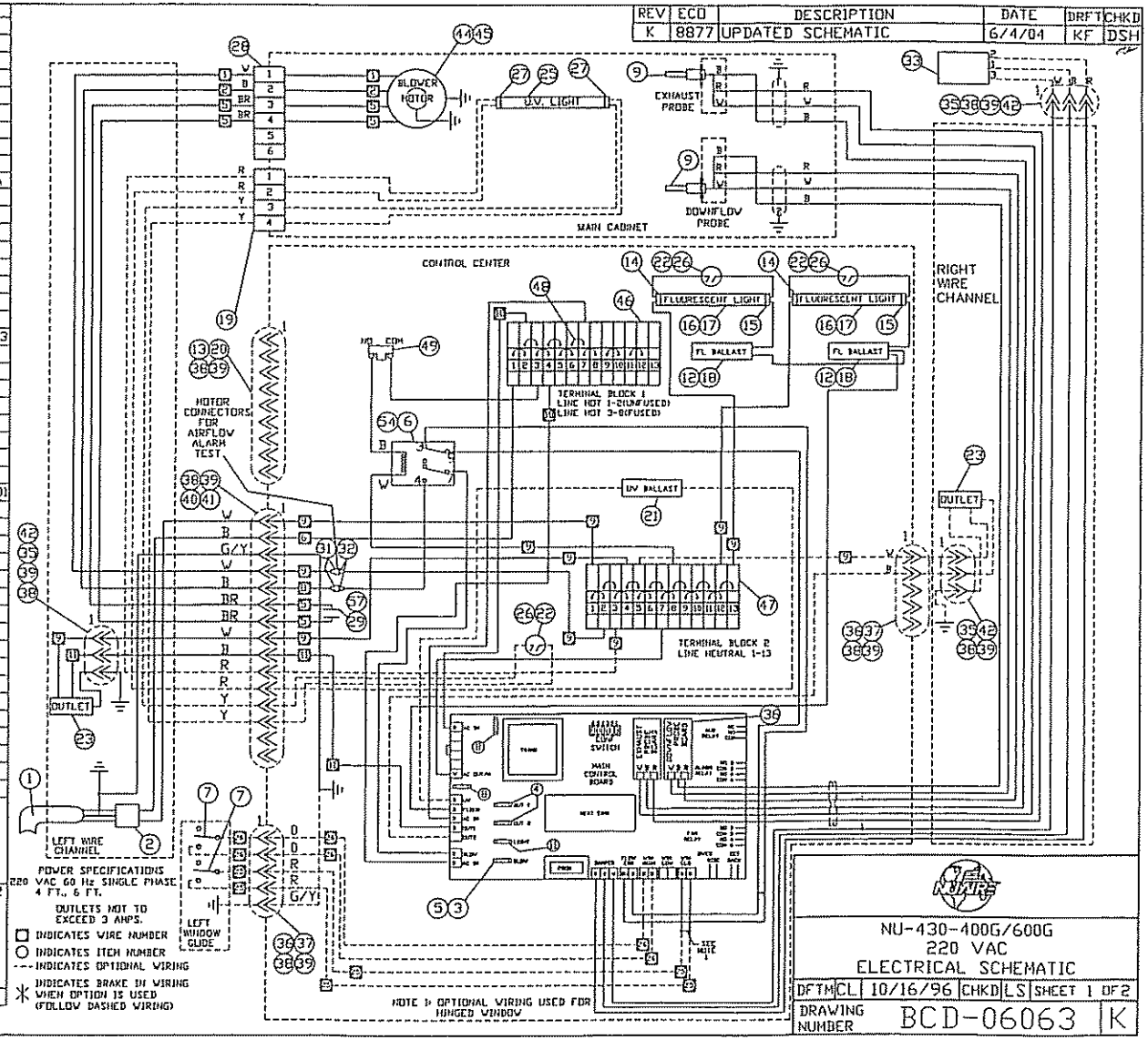
NU-430/435-400E/600E
230 VAC
ELECTRICAL SCHEMATIC

DFTH	TW	8/17/95	CHKD	LS	SHEET 2 OF 2

DRAWING NUMBER BCD-05739 P

ITEM	QTY	DESCRIPTION	NUAIRE P/N
1	1	POWER CORD	A-425-3926
2	1	EMI FILTER	X-999319-02
3	1	FUSE (6.3A) (5x20mm) (BLOWER 600G)	X-999039-07
4	2	FUSE (3 A) (5 x 20 mm) (OUTLET)	X-999039-03
5	1	FUSE (5A) (5x20 MM) (BLOWER 400G)	X-999039-06
6	1	RELAY (DPDT) 230v	X-999610-02
7	2	SW. ROLLER SPDT (BLOWER)(WINDOW HEIGHT)	X-999690-03
8	1	FUSE (.25 A) (5 x 20 mm) (CONTROL BOARD)	X-999039-01
9	2	AIRFLOW PROBE ASY (PROBE & BOARD)	A-440-6998
10	1	MAIN CONTROL BOARD	A-440-5952-A
11	1	FUSE (2 AMP) (5 x 20mm) (LIGHTS)	X-999039-14
12	2	BALLAST FLUORESCENT (400G)	X-999175-02
13	1	CONNECTOR, RECEPTACLE 9 PIN	X-999234-02
14	2	LAMPHOLDER FIXED BASE BI-PIN	X-999418-02
15	2	LAMPHOLDER SPRING BASE BI-PIN	X-999418-01
16	2	LAMP FLUORESCENT 60", 58W (600G)	X-999164-03
17	2	LAMP FLUORESCENT 48", 36W (400G)	X-999164-02
18	2	BALLAST FLUORESCENT (600G)	X-999175-03
19	1	BULKHEAD CONNECTOR 4 TAB	A-407-1088-03
20	1	CONNECTOR, PLUG 9 PIN	X-999235-02
21	1	BALLAST UV LAMP	X-999174-02
22	2-3	STARTER	X-999162-01
23	1	OUTLET	
24			
25	1	U.V. LAMP	X-999442-01
26	2-3	STARTER BASE	X-999163-03
27	2	U.V. SOLID BASE	X-999163-02
28	1	BULKHEAD CONNECTOR 6 TAB	X-425-3654-01
29	1	CAPACITOR (5 MFD) (400G)	X-999215-01
30			
31	2	INSULATED TERMINAL - MALE	X-999817-01
32	2	INSULATED TERMINAL - FEMALE	X-999826-02
33	1	DAMPER ACTUATOR (NU-951-012)	X-999111
34	A/R	PIN - CONTACT	X-999243-01
35	1-2	CONNECTOR PLUG 3 PIN	X-999237
36	2	CONNECTOR PLUG 5 PIN	X-999046-02
37	2	CONNECTOR RECEPTACLE 5 PIN	X-999046-01
38	A/R	SOCKET CONTACT	X-999244-02
39	A/R	PIN CONTACT	X-999244-01
40	1	CONNECTOR PLUG 15 PIN	X-999295
41	1	CONNECTOR RECEPTACLE 15 PIN	X-999296
42	1-2	CONNECTOR RECEPTACLE 3 PIN	X-999236
43	A/R	SOCKET - CONTACT	X-999243-02
44	1	MOTOR PSC (400G)	X-999913
45	1	MOTOR PSC (600G)	X-999476
46	1	TERMINAL BLOCK ASSY CONTAINING:	A-425-4099-01
	*	END,NO PLACE, TERMINAL BLOCK	X-999921-01
	*	END, 4 PLACE, TERMINAL BLOCK	X-999921-03
	*	TERMINAL BLOCK 2 PLACE NON-END	X-999919-01
	*	TERMINAL BLOCK 4 PLACE NON-END	X-999919-02
47	1	TERMINAL BLOCK ASSY CONTAINING:	A-425-4099-02
	*	END,NO PLACE, TERMINAL BLOCK	X-999921-01
	*	END, 4 PLACE, TERMINAL BLOCK	X-999921-03
	*	TERMINAL BLOCK 2 PLACE NON-END	X-999919-01
	*	TERMINAL BLOCK 4 PLACE NON-END	X-999919-02
	*	JUMPER, TERMINAL BLOCK	X-999920-01
48	3	JUMPER, TERMINAL BLOCK	X-999920-01

REV	ECO	DESCRIPTION	DATE	DRFT	CHKD
K	8877	UPDATED SCHEMATIC	6/4/04	KF	DSH



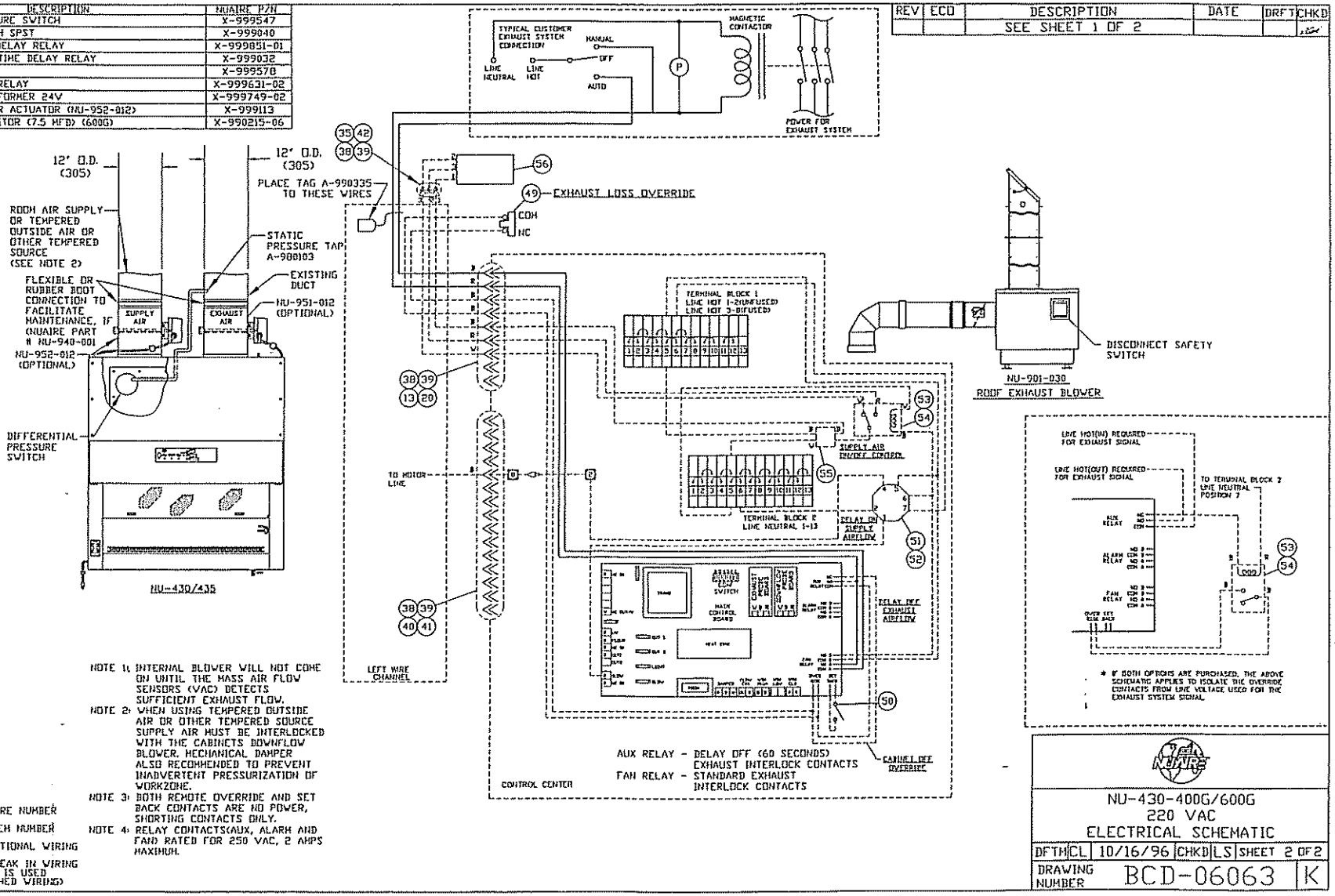
NU-430-400G/600G
220 VAC
ELECTRICAL SCHEMATIC

DFTM	CL	10/16/96	CHKD	LS	SHEET 1 OF 2

DRAWING NUMBER BCD-06063 K

ITEM	QTY	DESCRIPTION	NUAIRE P/N
49	2	PRESSURE SWITCH	X-999547
50	1	SWITCH SPST	X-999040
51	1	TIME DELAY RELAY	X-999851-01
52	1	BASE TIME DELAY RELAY	X-999032
53	1	RELAY	X-999578
54	2	BASE RELAY	X-999631-02
55	1	TRANSFORMER 24V	X-999749-02
56	1	DAMPER ACTUATOR (NU-952-012)	X-999113
57	1	CAPACITOR (7.5 MFD) (600G)	X-990215-06

REV	ECO	DESCRIPTION	DATE	DRFT	CHKD
		SEE SHEET 1 OF 2			



NOTE 1: INTERNAL BLOWER WILL NOT COME ON UNTIL THE MASS AIR FLOW SENSORS (VAC) DETECTS SUFFICIENT EXHAUST FLOW.

NOTE 2: WHEN USING TEMPERED OUTSIDE AIR OR OTHER TEMPERED SOURCE SUPPLY AIR MUST BE INTERLOCKED WITH THE CABINETS DOWNFLOW BLOWER. MECHANICAL DAMPER ALSO RECOMMENDED TO PREVENT INADVERTENT PRESSURIZATION OF WORKZONE.

NOTE 3: BOTH REMOTE OVERRIDE AND SET BACK CONTACTS ARE NO POWER, SHORTING CONTACTS ONLY.

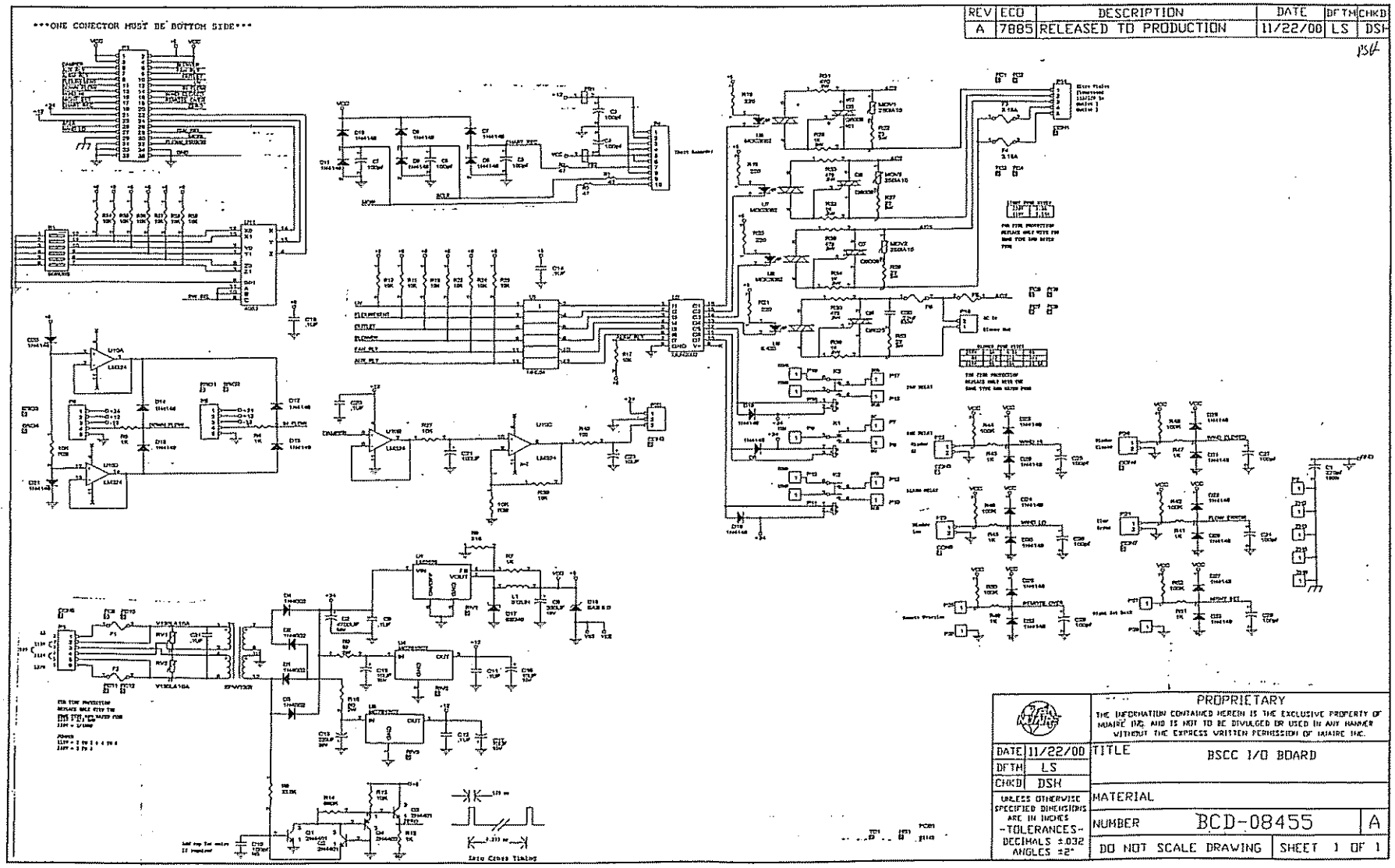
NOTE 4: RELAY CONTACTS(AUX, ALARM AND FAN) RATED FOR 250 VAC, 2 AMPS MAXIMUM.

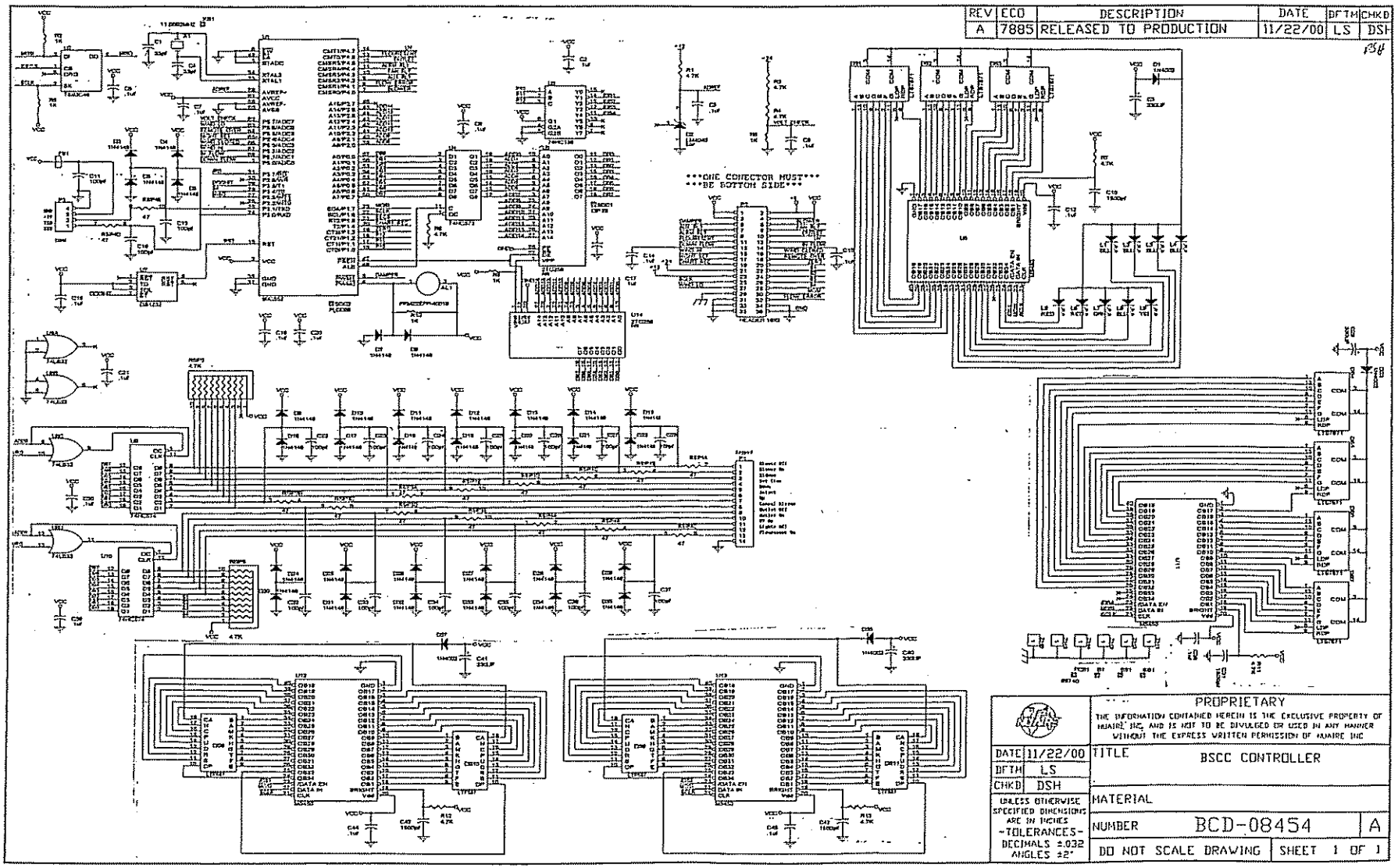
□ INDICATES WIRE NUMBER
○ INDICATES ITEM NUMBER
— INDICATES OPTIONAL WIRING
* INDICATES BREAK IN WIRING WHEN OPTION IS USED (FOLLOW DASHED WIRING)

NU-430-400G/600G
220 VAC
ELECTRICAL SCHEMATIC

DFTM	CL	10/16/96	CHKD	LS	SHEET 2 OF 2

DRAWING NUMBER BCD-06063 K


ONE CONECTOR MUST BE BOTTOM SIDE
REV | ECO | DESCRIPTION | DATE | DFTM | CHKD
A | 7885 | RELEASED TO PRODUCTION | 11/22/00 | LS | DSH
PROPRIETARY
THE INFORMATION CONTAINED HEREIN IS THE EXCLUSIVE PROPERTY OF MAIRE INC. AND IS NOT TO BE DIVULGED OR USED IN ANY MANNER WITHOUT THE EXPRESS WRITTEN PERMISSION OF MAIRE INC.
DATE 11/22/00
DFTM LS
CHKD DSH
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES -TOLERANCES- DECIMALS ±.032 ANGLES ±2°
TITLE BSCC I/O BOARD
MATERIAL
NUMBER BCD-08455 A
DO NOT SCALE DRAWING
SHEET 1 OF 1


REV | ECO | DESCRIPTION | DATE | DFTM | CHKD
A | 7885 | RELEASED TO PRODUCTION | 11/22/00 | LS | DSH
ONE CONECTOR MUST
BE BOTTOM SIDE
PROPRIETARY
THE INFORMATION CONTAINED HEREIN IS THE EXCLUSIVE PROPERTY OF MAIRE INC, AND IS NOT TO BE DIVULGED OR USED IN ANY MANNER WITHOUT THE EXPRESS WRITTEN PERMISSION OF MAIRE INC
DATE 11/22/00
DFTM LS
CHKD DSH
TITLE BSCC CONTROLLER
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES -TOLERANCES- DECIMALS ±.032 ANGLES ±2°
MATERIAL
NUMBER BCD-08454 A
DO NOT SCALE DRAWING
SHEET 1 OF 1