NuAire Clean Air Module
Model NU-114-424
Operation and Maintenance Manual

July, 2002
Revision 1

Manufactured By:
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Operation and Maintenance Manual
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NuAire, Inc. - Plymouth, Minnesota

Table of Contents

Manual Drawings

Assembly Drawings

Electrical Drawings

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1.0 General Description

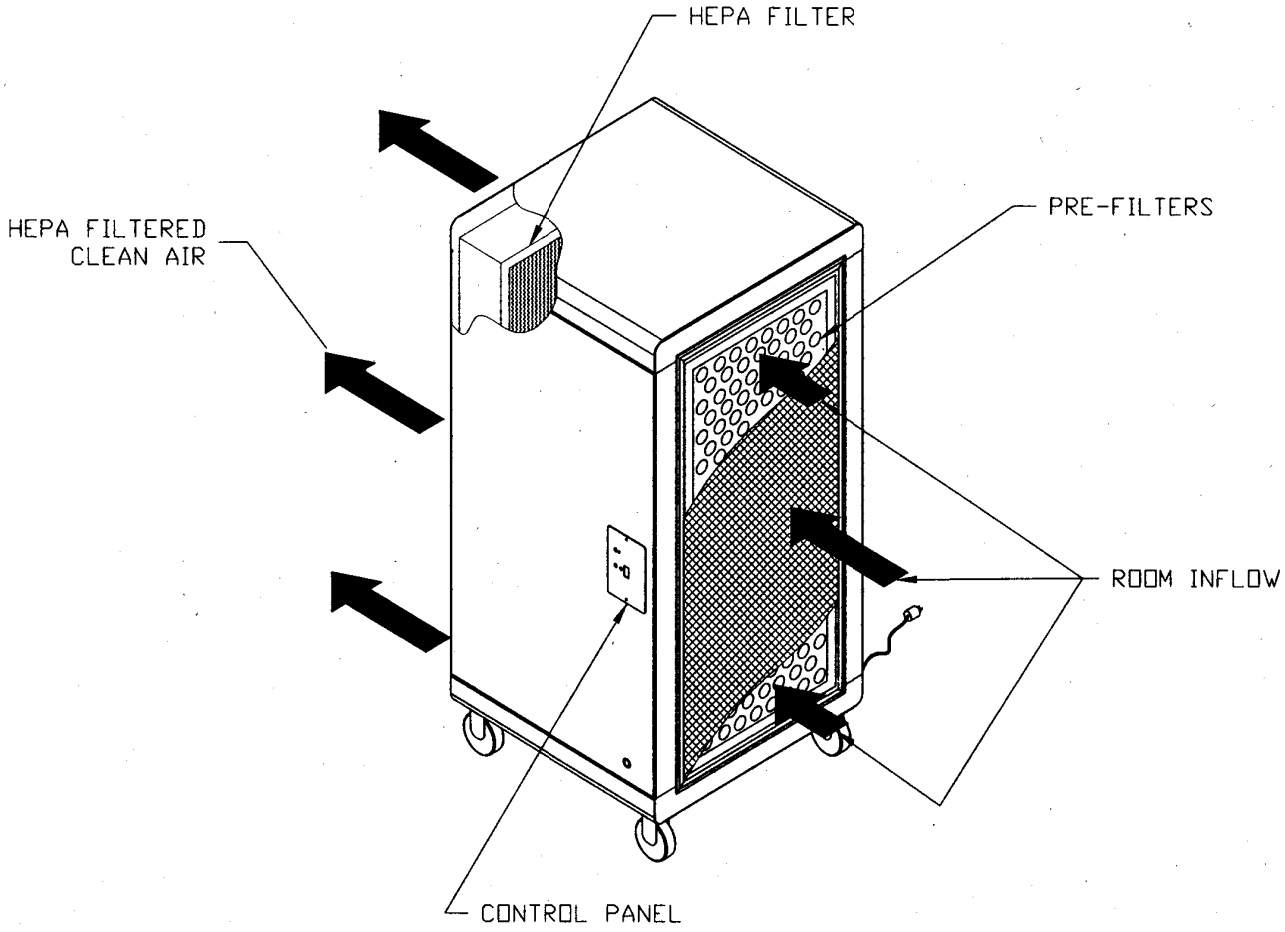
NuAire Laminar Airflow Equipment utilizes the newest technologies in Laminar Airflow design, materials and manufacturing processes. A significant number of design innovations give the NuAire Clean Air Modules superior performance qualities in laminar airflow (no turbulence and no back currents), low sound levels and low vibration levels, in addition to simplified adjustments and maintenance.

NuAire Laminar Airflow Equipment employs full size 6-inch deep HEPA filters for long filter life. Typical filter life is 5 years or more depending upon the environment used. NuAire Laminar Airflow Equipment is manufactured to the IEST-RP-CCOO2.2:1999 and UL Laboratory Equipment Standard for performance and safety.

2.0 Models & Features

The NU-114-424 Clean Air Module is manufactured in one size.

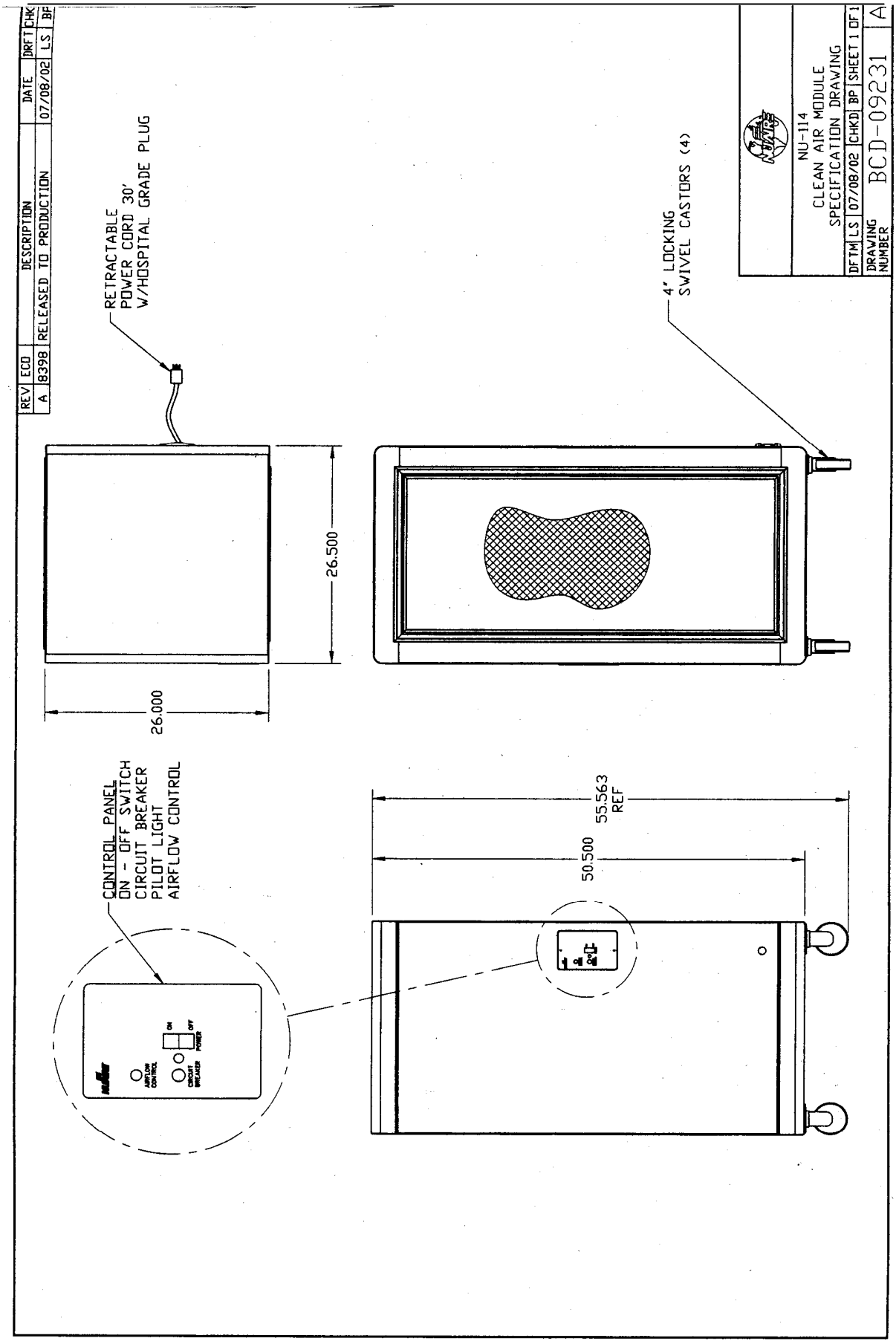
REV	ECO	DESCRIPTION	DATE	DRFT	CHKD
A	8398	RELEASED TO PRODUCTION	07/08/02	LS	BP



NU-114
CLEAN AIR MODULE
AIRFLOW SCHEMATIC

DFTM	LS	07/08/02	CHKD	BP	SHEET 1 OF 1

DRAWING NUMBER BCD-09230 A


REV | ECO | DESCRIPTION | DATE | DRFT | CHK
A | 8398 | RELEASED TO PRODUCTION | 07/08/02 | LS | BP
RETRACTABLE
POWER CORD 30'
W/HOSPITAL GRADE PLUG
4" LOCKING
SWIVEL CASTORS (4)
26.500
26.000
CONTROL PANEL
ON - OFF SWITCH
CIRCUIT BREAKER
PILOT LIGHT
AIRFLOW CONTROL
55.563
REF
50.500
NU-114
CLEAN AIR MODULE
SPECIFICATION DRAWING
DFTM | LS | 07/08/02 | CHKD | BP | SHEET 1 OF 1
DRAWING NUMBER BCD-09231 A

3.0 Warranty

NuAire, Inc. warrants that it will repair F.O.B. its factory or furnish without charge F.O.B. its factory a similar part to replace any material in its equipment within 36 months after the date of sale if proven 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 products shipped to NuAire without this number will be returned, refused shipment or collect freight.

4.0 Shipments

NuAire, Inc. takes every reasonable precaution to assure that your NuAire Clean Air Module arrives without damage. Motor carriers are carefully selected and shipping cartons have been specifically 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 Clean Air Module 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 F.O.B. 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.

6.0 Operating the Clean Air Module

6.1 Operator Controls and Indicators

The following is a description of the controls and indicators provided on the NU-114-424.

6.1.1 Blower Switch

The blower switch applies power to the internal blower/motor when in the ON position.

6.1.2 Indicator Light - Blower

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

6.1.3 Circuit Breaker - Blower

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

6.1.4 Airflow Control

The operating horizontal airflow within the cabinet (i.e. 90 LFPM (.475 m/s) airflow) is controlled by a potentiometer. The potentiometer controls the operating voltage applied to the motor/blower. The potentiometer is adjustable over 270 degrees with a slotted screwdriver, which varies the applied voltage from 70 to 115 VAC or 120 to 230 VAC. **The adjustment should only be made by a qualified technician employing the proper instruments in order to insure airflow.**

6.2 Operating Guidelines

The NU-114-424 may be run intermittently or continuously for specific clean air requirements.

6.2.1 General Air Quality Improvement

The NU-114-424 can be placed in any dry location within a facility. The NU-114-424 produces 720 CFM of 99.97% HEPA filtered airflow. If using the NU-114-424 module for general air quality improvement, the number of room air changes per hour can be calculated (see example below).

Room size in feet (H x W x D) = X cu.ft.

$$\frac{\text{NU-114-424 Air Volume (720)}}{\text{Room Size X cu.ft.}} = \text{Number of room air changes per minute.}$$

I.E. Room Size = 8ft. x 10ft. x 12ft. = 960 cu.ft.

$$\frac{720 \text{ CFM}}{960 \text{ cu.ft.}} = .75 \text{ Room air changes per minute}$$

.75 x 60 = 45 Room air changes per hour.

The NU-114-424 may also be used to create a negative pressure air space. Placing the NU-114-424 module between two spaces. The module will extract 720 CFM from one space and place it into the next. If the supply air to the first space were less than 720 CFM, the room would be under negative pressure. To seal the module between the two spaces, simply use plastic and tape.

6.2.2 Sterile Process Use

Allow only essential items in the modules air stream. Objects should not be placed between the module and any point where the clean environment must be maintained. New items introduced into the work area should be placed downstream of items already in the work zone for several minutes to allow contaminates to flush off. Note that plastic parts may carry a static charge which may require special handling in order to remove contaminants.

All work should be performed with the operator's hand or head downstream of the critical process points. Unnecessary movement with the work station should be kept to a minimum.

Operating Sequence

A. Start Up
Turn on module blower, check air intake ports of the cabinet to make sure they are unobstructed. Blower speed must only be re-adjusted by qualified maintenance technicians.

B. Allow blowers to operate for a minimum of 5 minutes before aseptic manipulations are begun in the cabinet. An additional advantage is obtained from purification (filtration) of the room air circulated through the equipment. Because of the characteristic contributed to the quality of the laboratory environment, some owners leave them in operation beyond the time of actual use.

C. Minimize Room Activity - Activity in the room itself should be held to a minimum. Unnecessary activity may create disruptive air currents, as well as interfere with the work of the operator. A person walking past the front of the cabinet can cause draft velocities up to 175 FPM, which are sufficient to disrupt the air balance of the Laminar Flow Unit.

D. Utilize Unidirectional Airflow - The operator must keep two important facts in mind: 1) The air, as supplied to the work area through the module contaminant-free. 2) Airborne contamination generated in the work area is controlled by the unidirectional flow of parallel air streams. A solid object placed in a laminar air steam will disrupt the parallel flow and consequently, the capability of controlling lateral movement of airborne particulates. A cone of turbulence extends behind 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.

7.0 General Maintenance

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

No maintenance should be performed on the interior of the cabinet (*area behind prefilters)* unless the cabinet has been sterilized, is known to be biologically clean, or known to be chemically inert. For biological contamination, the LABGARD can be decontaminated following NIH procedures: Obtain ***Formaldehyde Decontamination*** from the National Audiovisual Center (GSA), Washington, D.C. 20409 in the form of a tape cassette and slides for approximately $10.00.

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

7.1 HEPEX Replacement (Please refer to exploded parts drawing)
The HEPEX is removed from the front of the unit behind the perforated aluminum grill. First, remove the pressure plenum from the blower by loosing and removing the clamps securing the pressure plenum to the blower. Next, remove the perforated aluminum grill by removing the visible flat head screws securing the grill frame to the module shell. The HEPEX may now be lifted out of the shell - Note that the filter portion of the HEPEX is cradled in sponge rubber and will require gentle tugging to gain release.

7.2 Prefilter Replacement (please refer to the exploded parts drawing on your model)
Replacement interval depends on the contaminant (large particles or lint) in the room - a typical period is every 3 months.

7.3 Airflow Calibration
The NU-114 Airflow Calibration consists of adjustments to set the airflow. **THIS WORK SHOULD BE DONE ONLY BY A QUALIFIED TECHNICIAN WHO CAN MEASURE THE AIRFLOW FROM THE FILTER WITH A SUITABLE VELOMETER.** NuAire provides one adjustment to set the airflow. This is:

a. Blower speed adjustment via motor voltage regulator

The blower speed control system adjusts the cabinet's total volume of airflow.

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

b. Downflow average: 90 LFPM $\pm$10 LFPM (.46 m/s $\pm$.05 m/s).

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

7.3.1 Airflow Calibration

Step 1: Place a velometer parallel to and 6 inches from the diffuser surface. Spot check several points on the recommended downflow velocity test grid found in Table 7.0.

Step 2: If necessary, adjust airflow control potentiometer, located next to the on/off switch, to the above stated airflow requirements.

7.4 Filter Integrity Check

In order to check the filter integrity, the HEPA filter media must be directly accessible by the measuring instrument. A DOP upstream challenge port is provided.

The filter diffuser may be removed by the screws on the edge of the diffuser. Please note that the NU-114 unit has what is referred to as a soft seal between the HEPEX filter/bag and the side of the unit shell. This soft seal is under negative pressure and will not leak. However, when the measuring instrument is passed over this area, it may indicate a leak because it operates under a vacuum. Only the filter face area should be scanned and not the soft seal.

Table 7.0
Recommended Measurement Methods for NU-114-424

A. Airflow Velocity Profile

A. Instruments: Alnor 8500 Thermo-anemometer or TSI 8355

B. Procedure:
Air velocity readings are taken on a 12 inch (305mm) grid, in a plane parallel to and 6 inches (152mm) from the filter surface. No reading should be taken closer than 6 inches (152mm) from the inner edge of the filter frame.

C. Test Data:

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

D. Acceptance Criteria:

1. Average Velocity = **80 to 100 fpm** (.41 to .51 m/s)
2. Individual Readings must be within ±20 percent of the average velocity.

8.0 Errors & Troubleshooting

ERROR INDICATOR TROUBLESHOOTING GUIDE

Error Indicator	Indicator	Correction
Cabinet blower won't turn on**.**		Check blower circuit breaker on control panel. Check voltage regulator on terminal block. Check wiring to blower. Check blower capacitor. 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.)

9.0 Electrical/Environmental Requirements

9.1 Electrical

NU-114-424 115V, 60Hz, 1 Phase, 6 Amps

9.2 Operational Performance (for indoor use only)

Environment Temperature Range:	60°F-85°F (15°C - 30°C)
Environment Humidity:	20% - 60% Relative Humidity
Environment Altitude:	6562 Feet (2000 meters) maximum

9.3 Light Exposure

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

9.4 Installation Category: 2.0

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

9.5 Pollution Degree: 2.0

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

9.6 Chemical Exposure

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

9.7 EMC Performance (classified for light industrial)

Conducted Emissions:	CISPR 11, Class B & EN55011
Radiated Emission:	CISPR 11, Class B & EN55011
Radiated Immunity:	EN50082-1, IEC 801-3, Level 2
ESD Immunity:	EN50082-1, IEC 801-2, Level 2
EFT/BURST Immunity:	EN5082-1, IEC 801-4, Level 2

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

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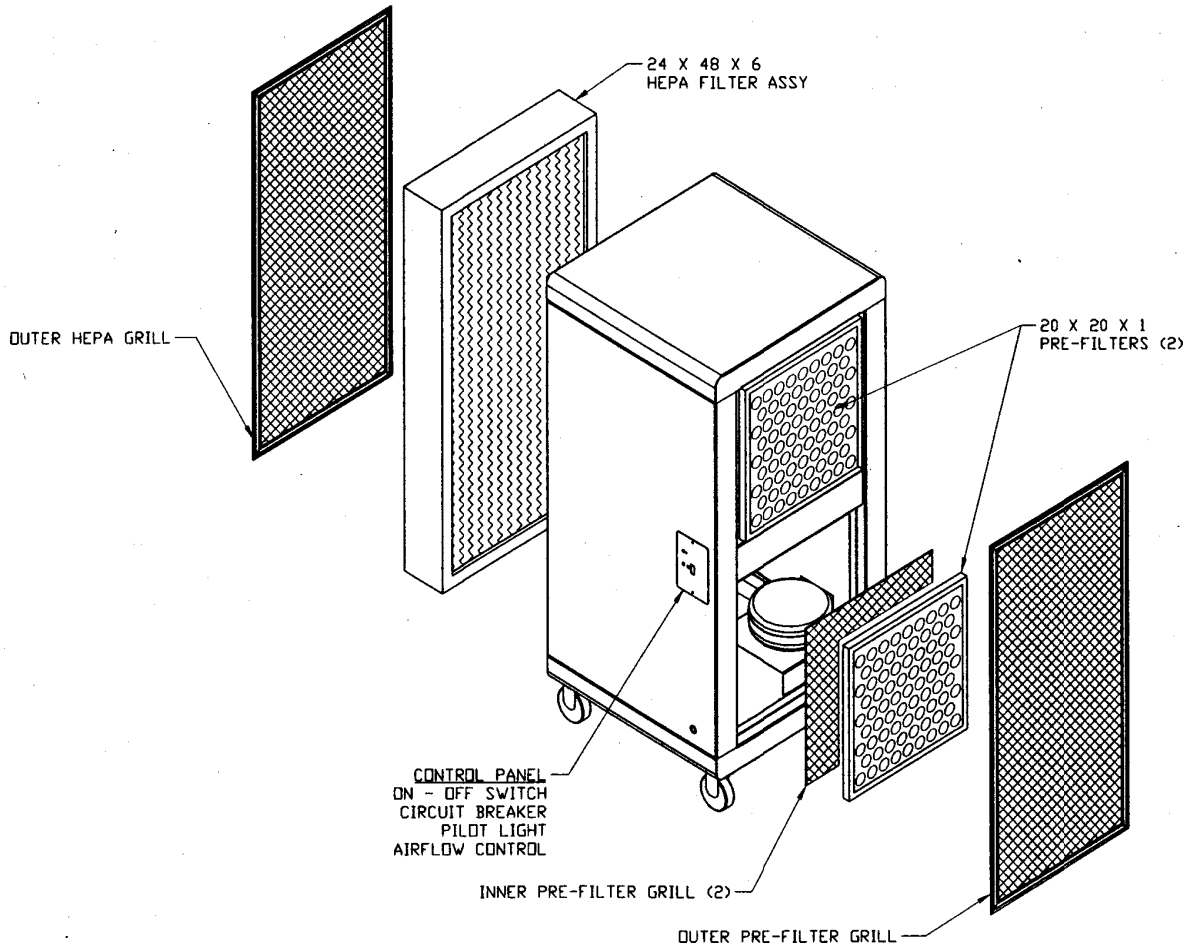
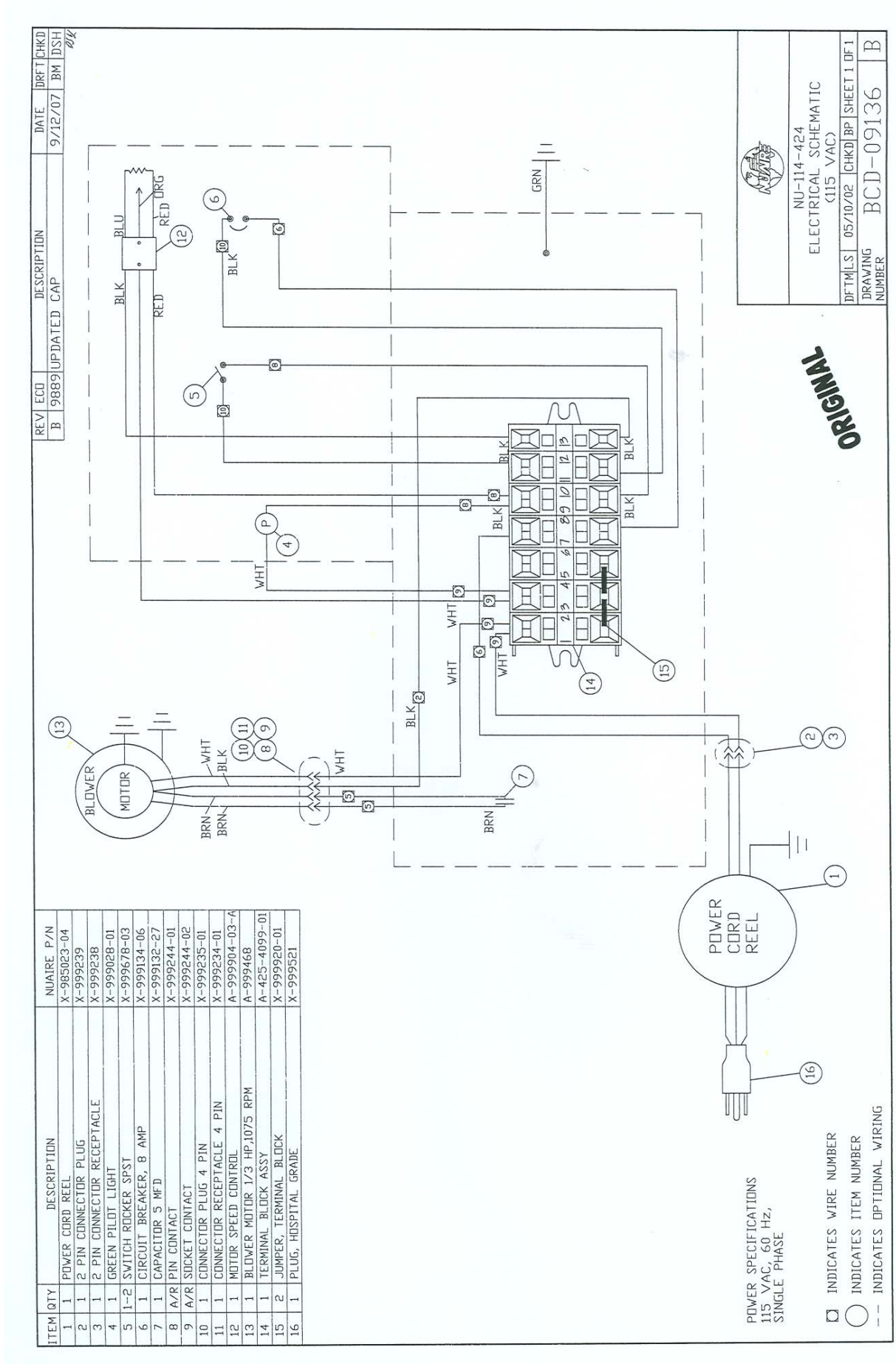


NU-114
CLEAN AIR MODULE
ASSY DRAWING

DFTM	LS	07/08/02	CHKD	BP	SHEET 1 OF 1

DRAWING NUMBER BCD-09234 A


REV | ECO | DESCRIPTION | DATE | DRFT | CHKD
B | 9889 | UPDATED CAP | 9/12/07 | BM | DSH
ITEM | QTY | DESCRIPTION | NUAIRE P/N
1 | 1 | POWER CORD REEL | X-985023-04
2 | 1 | 2 PIN CONNECTOR PLUG | X-999239
3 | 1 | 2 PIN CONNECTOR RECEPTACLE | X-999238
4 | 1 | GREEN PILOT LIGHT | X-999028-01
5 | 1-2 | SWITCH ROCKER SPST | X-999678-03
6 | 1 | CIRCUIT BREAKER, 8 AMP | X-999134-06
7 | 1 | CAPACITOR 5 MFD | X-999132-27
8 | A/R | PIN CONTACT | X-999244-01
9 | A/R | SOCKET CONTACT | X-999244-02
10 | 1 | CONNECTOR PLUG 4 PIN | X-999235-01
11 | 1 | CONNECTOR RECEPTACLE 4 PIN | X-999234-01
12 | 1 | MOTOR SPEED CONTROL | A-999904-03-A
13 | 1 | BLOWER MOTOR 1/3 HP,1075 RPM | A-999468
14 | 1 | TERMINAL BLOCK ASSY | A-425-4099-01
15 | 2 | JUMPER, TERMINAL BLOCK | X-999920-01
16 | 1 | PLUG, HOSPITAL GRADE | X-999521
POWER SPECIFICATIONS
115 VAC, 60 Hz,
SINGLE PHASE
INDICATES WIRE NUMBER
INDICATES ITEM NUMBER
INDICATES OPTIONAL WIRING
POWER CORD REEL
BLOWER
MOTOR
ORIGINAL
NU-114-424
ELECTRICAL SCHEMATIC
(115 VAC)
DFTM|LS | 05/10/02 | CHKD | BP | SHEET 1 OF 1
DRAWING NUMBER | BCD-09136 | B