



Air-Jacketed Automatic CO₂ Incubator

Models

NU-5810 and NU-5810E (Series 3)

NU-5820, NU-5830, NU-5831, NU-5840, NU-5841 (Series 1)

NU-5820E, NU-5830E, NU-5831E, NU-5840E, NU-5841E (Series 1)

Operation and Maintenance Manual

March 2013

Revision 3

Manufactured By:

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Air-Jacketed DHD Invitrocell CO₂ Incubator
 Operation & Maintenance Manual
NU-5810, NU-5820, NU-5830, NU-5831, NU-5840, NU-5841
NU-5810E, NU-5820E, NU-5830E, NU-5831E, NU-5840E, NU-5841E

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**DHD Direct Heat
Invitrocell CO₂ Incubator
Models: NU-5810, NU-5820, NU-5830, NU-5831, NU-5840 & NU-5841
NU-5810E, NU-5820E, NU-5830E, NU-5831E, NU-5840E & NU-5841E**

Operation and Maintenance Manual

General Description

The NuAire Direct Heat Decon (DHD) Automatic CO₂ Direct Heat Incubator has been designed to provide a reliable controlled in-vitro environment for optimum tissue cell culture growth. The chamber also provides an environment for the storage and preservation of gametes and animal tissue cell cultures intended for research at or near body temperature.

There are five parameters that contribute to optimum growth conditions, they are:

- Humidity
- Precise temperature control
- Precise CO₂ control
- Sterility
- Reliability

Like all NuAire equipment, this Incubator has been designed to provide the highest quality standards of performance with matching computer technology, precise temperature control, and CO₂ gas control system combining state-of-the-art technology with years of design, quality, and manufacturing experience.

1.1 Incubator Chamber

The design and size of the DHD inner chamber provides a large capacity (7 cu. ft.), and ease of use. The chamber walls are directly heated by physically attached foil heating elements on the sides, bottom, top, and back of the chamber, providing a temperature uniformity of $\pm 0.35^{\circ}\text{C}$. A space-age high-density insulation that has a high "R" rating covers the complete outer surfaces of the Incubator inner chamber.

1.2 Incubator Closed loop chamber sample circulation system & HEPA Filter

A continuous operating air pump draws environmental sample from the chamber and circulates it through a HEPA filter capsule then through sensors that measure CO₂ volume (as a percentage) in the chamber for monitoring and control.

1.3 Incubator Control Electronics

The NuAire Incubator Control Electronics is a state-of-the-art microcomputer based control system specifically designed to service the precise control requirements of the chambers environment, providing optimum programmable conditions for culture growth. The microcomputer is "user-friendly" and provides a 5x7 LCD screen which provides operating control parameters, status indicators, additional key operational parameters, and an imbedded touch panel to permit efficient operator entry of data.

The microcomputer is supported with Read Only Memory (ROM) containing executable software, Random Access Memory (RAM) for temporary storage, and Electronically Erasable Programmable Read Only Memory (EEPROM) for control set points and parameters. The EEPROM provides for indefinite storage of these values during periods of power off or power interruption (power fault tolerant).

1.4 Incubator CO₂ Control

The NuAire direct heat Incubator incorporates a microprocessor-based, non-dispersive infrared CO₂ induction sensor. The amount of energy received at the detector is an approximate logarithmic function of the CO₂ concentration in the gas between source and detector. The wavelengths used are absorbed only by CO₂ making the measurement insensitive to other components, such as water vapor. Detector linearization is performed with 32 bit digital accuracy. Advanced design provides a very stable output minimizing drift and requiring less frequent calibration. The output is digital, alleviating errors brought about by analog signals. Calibration of this control is accomplished by a zero & span calibration done on the sensor and a display off- set calibration. These calibrations are accessible through the *NuTouch LCD* located on the front of the unit.

1.5 Incubator Construction

The outer shell of the air-jacketed Incubator is cold-rolled steel with a powder coat paint finish. The front frame surface of the outer shell is heated with a foil type heater directly attached behind the front perimeter opening.

The front frame perimeter heater, as well as the outer front door heater is duty cycle controlled (manually adjusted for specific ambient conditions) to balance the heat that reaches the chamber and thus reduces the possibility of condensation forming on the inner glass door and the inner chamber walls.

The inner chamber is 16 gauge, type 304L, polished stainless steel using crevice-free construction, which provides an easily cleanable inert surface that does not in itself promote biological growth. In addition, all shelves, shelf supports, and guide rails are easily removable and can be autoclaved separately if so desired.

Remember: The chamber environment is not selective.
The growth environment is applied equally to all microorganisms (specimens and contaminants) within the chamber.

1.6 Incubator Humidity

Models NU-5800, NU5810, NU-5830 & NU-5831

A relative humidity level of up to 90% is achieved in the Incubator by the use of a stainless steel pan filled with distilled water no purer than 1 mega ohm, and placed on the bottom of the chamber. It is necessary to set the duty cycle of the door and front perimeter heater in proper proportions to reduce the possibility of condensation forming on the glass inner door and the chamber walls. It is also important to thoroughly wipe the walls and the glass door clean before adding the humidity water pan. Condensation will occur more readily at contamination points. There is no electronic sensing and thus no automatic control of the humidity level in the air jacketed Incubator. An air pump injects fresh air into the chamber at a preset duty cycle to reduce condensation forming on the chamber walls and front glass door. The air injections are settable by the user to help control condensation. (See section 8.8 for this option.)

Models NU-5820, NU-5840 & NU-5841 use a humidity monitoring / control system for chamber humidity, the system is external to the chamber. The chamber air is routed through the water vapor saturated air in an evaporator box to add humidity when the RH sensor indicates that more humidity is required maintain a set point.

1.7 Cabinet Ventilator Fan

An axial fan is mounted to the bottom cover panel of the Incubator and runs continuously when the unit is switched on. This fan pulls air into the cabinet shell thru the top panel louver openings and discharges it out of the bottom of the unit. The operation of this fan is necessary to assure accurate chamber temperature control over the 60°F to 85°F (15°C to 30°C) ambient temperature range that the equipment may see.










1.8 Safety Instructions




These safety instructions describe the safety features of the INVITROCELL Incubator.

The incubator has been manufactured using the latest technological developments and has been thoroughly tested before delivery. It may, however, present potential hazards if it is not used according to the intended purpose or outside of operating parameters. Therefore, the following procedures must always be observed:

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

1.9 Explanation of symbols

Symbol	Description
	<p>Safety alert symbol indicates a potentially hazardous situation which, if not avoided, could result in death of serious injury.</p>
	<p>Safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.</p>
	<p>Note:</p>
	<p>Biohazard</p>
	<p>Hazardous Gases! Personal Protection Equipment Required.</p>
	<p>Chemical Hazard</p>
	<p>Ground, Earth</p>
	<p>Attention accompanies information or important symbol</p>
	<p>Potential electrical hazard, only qualified person to access.</p>

	<p>Flammable Hazard</p>
	<p>Lead Free</p>
<p>CAUTION</p>	<p>CAUTION used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.</p>
	<p>Hot Surface Burn Potential</p>

Performance Parameters and Features

- Both the interior and exterior of the DHD are constructed of 18 to 16-gauge steel. The interior is highly polished type 304 L 16 gage stainless steel, using crevice-free construction. All exposed edges are deburred to insure no sharp edges. The exterior is cold rolled 16 & 18 gauge steel finished in a powder coated polyurethane finish, which is resistant to chemicals and easily cleaned using mild household detergents.
- The DHD's microcomputer temperature control system has two temperature sensors located inside the chamber at the back wall. The temperature sensors compare the values to a set point and execute a differential control algorithm that energizes a solid-state switch, supplying power to the heaters.
- Easily removable inner shelves and rails for sterilization.
- Up to 21 shelves can be placed inside the chamber (4 shelves are shipped with each DHD).
- Space-age high temperature material is used to insulate the inner chamber walls.
- Foil heaters are directly attached to the chamber walls and the top and bottom surfaces of the inner chamber.
- Most electronics, motors, pumps, and valves are fully accessible from the back of the unit.
- A CO₂ sample port is provided on the front panel just below the door to check the concentration of CO₂ in the chamber.
- The CO₂ percentage is controlled by a solid-state gas infrared sensor using a single light source with dual wave length detection, providing accurate monitoring of CO₂.
- Automatic recovery of the CO₂ level, after a 1minute door opening, to 5.0 +.02/- 0.5% is within a 5 minute period.
- The outer door includes an internal radiant heater in order to minimize condensation on the inner glass door. A magnetic outer door gasket helps to insure a tight seal against the cabinet.
- The inner glass door is 3/16" tempered with smooth-ground edges and seals are tight against a silicone rubber gasket.
The door latch is cam action.
A momentary switch monitors the door position, the position being opened or closed.
- All control electronics are protected with a circuit breaker that may trip at 110% of loading rating but will trip at 145% of load rating in less than 2 seconds. Should the circuit breaker open (pop-out button will appear), merely depress to reset.
- The Incubator has factory-installed adjustable leveling legs to compensate for uneven laboratory surfaces.

2.0 Models & Features

2.1 Invitrocell DHD (heated decontamination) all Models.

2.2 Dimensions (see also Specification Drawing BCD-14784)

Overall Dimensions - inches (mm): Model NU-5810/E

Height:	Exterior: 39.688 in (1008 mm)
Width:	26.500 in (673 mm)
Depth:	27.188 in (691 mm)
Foot print:	23.5 in (597 mm) wide x 20.75 in (527 mm) deep
Height:	Interior: 28.500 in (723.900mm)
Width:	21.257 in (539.928mm)
Depth:	20.053 in (509.346mm)

Shelf Capacity:

Size:	19.75 Inches (502mm) x 18.75 Inches (476mm)
Supplied:	4 Shelves
Max. Capacity:	21 Shelves
Max. Weight Capacity	20 lbs. per DHD shelf 50 lbs. per DHD Incubator

(Make sure self is empty before changing position or removing.)

Water Pan:

Dimensions:	Mean Length	12.0" (305mm)
	Mean Width	10.0" (254mm)
	Depth	2.5" (63mm)
Capacity:	Maximum	3.5 Liters
	Recommended Fill	3.0 Liters

2.3 Performance Parameters :

Temperature Control: Available on All Models

- Temperature Range: 5°C to 55°C (37°C default) (5°C above ambient to 30°C max. ambient)
- Temperature Uniformity: $\pm 0.3^{\circ}\text{C}$ @ 37°C.
- Temperature Accuracy: $\pm 0.1^{\circ}\text{C}$.
- Temperature Recovery: 0.12°C/minute Average
- Temperature Display Resolution: 0.1°C
- Temperature Sensor Type: Precision Integrated Circuit
- Min Qualifications for Decontamination/Sterilization:

145 DEG Cycle:	95 DEG Cycle
Temperature: 135°C	85°C
Time: 2 Hr.	9 Hr.
- Door and Perimeter: Proportional base duty cycle based on Temperature set point and 0-100% manually adjustable to adapt to ambient conditions.

CO₂ Control: Available on All Models

- CO₂ Range: 0.1 to 20% (default 5%). (0.0 set point idles system)
- CO₂ Accuracy: $\pm 0.1\%$
- CO₂ Recovery: Up to 5% $\pm 0.50\%$ in 5 minutes average.
- CO₂ Display Resolution: 0.1%
- CO₂ Control Logic: Fixed Algorithm/Manual Environmental Adaptable.
- CO₂ Sensor Type: Infrared single source dual wave length

Relative Humidity Control: Available on NU-5820, NU-5840 & NU-5841


- RH Range: Low is ambient dependent to 90% max (default 90%)
- RH Accuracy: $\pm 3\%$
- RH Recovery: 90% +5% / -3%: 25 minutes on Average
- RH water tank capacity: 3 Liters (approximate)

O₂ control and monitoring system w/ the Figaro Fuel Cell sensor Available on the NU-5830 & NU-5840

- O₂ set- point Range: 0.5 to 21%
- O₂ measuring range: 2.0 to 25 %
- Default Set-Point: 21.0%
- O₂ Accuracy: $\pm 2.0\%$
- O₂ Recovery: 5% $\pm 2\%$: 15 minutes on average

O₂ control and monitoring system w/ the Fujikura Zirconia sensor Available on the NU-5831 & NU-5841

- O₂ measuring range: 0 to 25 %
- Default Set-Point: 21%
- O₂ set- point Range: .5 to 21%
- O₂ Accuracy: $\pm .25\%$
- O₂ Recovery to 5% $\pm 2\%$: 15 minutes on average
- Connectors on rear panel are provided for Dry contact remote alarm, RS-485 2way communication, and 4-20 mA analog output signals for system performance.

 **NOTE:** Performance ratings apply ONLY when the Incubator is set up properly for the installation. See sections 8 and 9 for proper set up.

2.4 Standard Items Packed With Unit

- Four (4) stainless steel shelves
- Eight (8) stainless steel shelf brackets
- One (1) water pan
- Gas tube and filter
- Air intake hose and filter
- Access port plug with breather hole
- One (1), 2 meter (6.5 ft.) electrical cord
- Operation and Maintenance Manual
- Operating Instructions

2.5 Consult factory for additional Accessories (Ordered Separately)

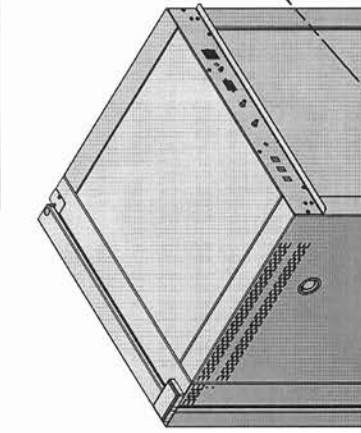
REV	ECO	DESCRIPTION	DATE	DFTM	CHKD
B	11891	ADDED RH AND O2 OPTIONS	01/31/13	AW	KCK

ITEM	DESCRIPTION
18	RH TANK
17	N2 SUPPLY FILTER
16	N2 INLET
15	FOOT SPACER
14	REMOTE ALARM
13	RS-45
12	4 - 20 mA
11	CO2 FILTER
10	AIR FILTER
9	CO2 INLET
8	AC POWER CORD CONNECTION
7	CIRCUIT BREAKER
6	ON / OFF SWITCH
5	USB CONNECTION PORT COVER
4	ACCESS PORT
3	CO2 SAMPLE PORT
2	DISPLAY SCREEN
1	POWER CORD

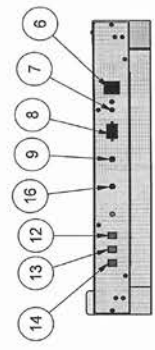
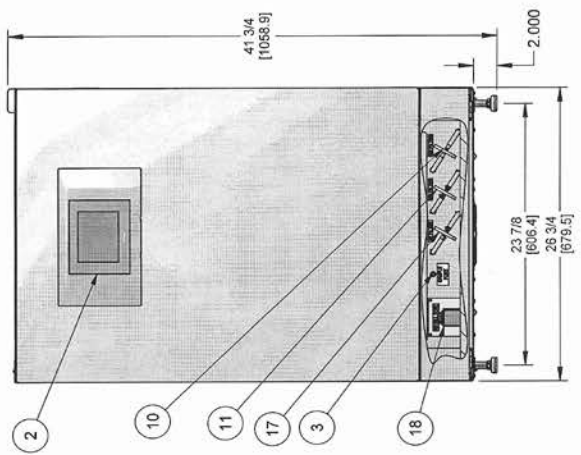
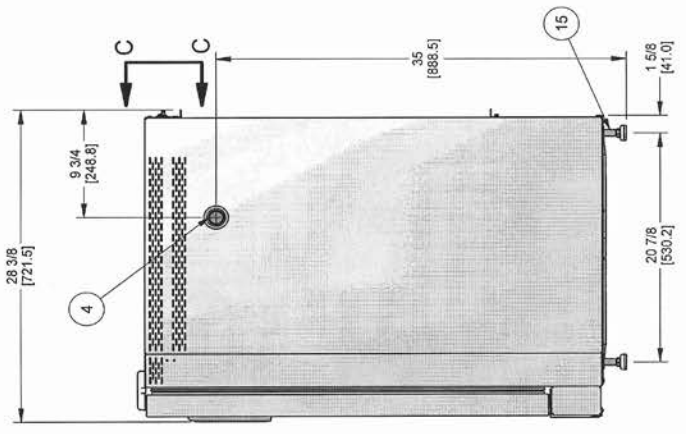
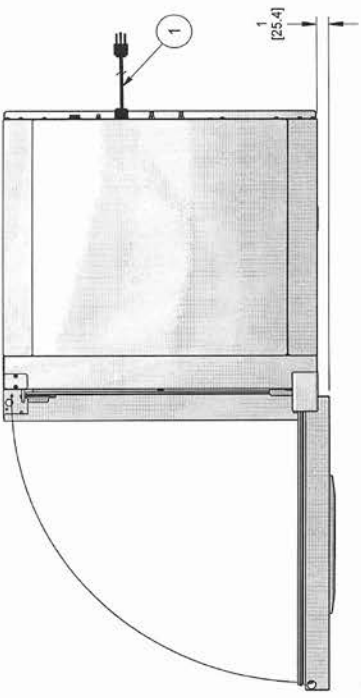
EXTERIOR DIMENSIONS	
39.688"	[1008.1mm] H
26.500"	[673.1mm] W
27.188"	[690.6mm] D

INTERIOR DIMENSIONS	
26.500"	[673.1mm] H
21.257"	[539.9mm] W
20.053"	[509.3mm] D

SHELF DIMENSIONS	
19.250"	[489.0mm] X
18.250"	[463.6mm] X



DETAIL D
 USB PORT ACCESS
 (COVER SHOWN IN PLACE)



VIEW C-C

ORIGINAL	
ASSEMBLY, NU-5800	
TITLE	ASSEMBLY, NU-5800
DFTM	DATE
LS	8/30/2011
DRAWING	CHKD
NUMBER	KCK
BCD-14784	1 OF 1
	OF 1
	B

3.0 Test Performance & Procedures

All equipment is thoroughly inspected at the NuAire Factory at the time of shipment. Quality control is maintained by constant surveillance over the product, beginning at the receipt of purchased material and concluding with a final inspection, which certifies the Incubator performance to the specifications. In all instances where product quality cannot be easily assessed on the end item, the product is inspected during sub-assembly fabrication. The following test procedures are conducted on every DHD Incubator and a copy of the test report is included with each Incubator.

4.1 Visual Inspection

- Each Incubator is visually inspected to insure that the interior is clean and free from scratches, nicks, and burrs and that all welds, both interior and exterior are finished.
- Painted surfaces are inspected to be free of scratches, nicks, insufficient covering, and noticeable paint runs.
- The doors open and close freely without binding of the hinges.
- The gasket seals the inner glass door to the Incubator tightly across its entire opening.
- The glass door is free of scratches.

3.1 Electrical Tests

- **Electrical Leakage Test**
All Incubators are required to have a primary-circuit filtering to meet EMC (electromagnetic compatibility) regulations. Electrical leakage does not exceed 1.0 milliamperes.
- **Dielectric Voltage – Withstand Test**
1200 VDC (115 volt units) or 1970 VDC (230 volt units) is applied between dead metal parts and the hot/neutral power source lead with no electrical breakdown using an Associated Research Model 7564SA Quadchek II, 8106 Omnia 6, or 8006 Omnia 6, or other models.
- **Grounding Continuity**
The resistance between the green bonding conductor of the supply cord and any dead metal part of the cabinet shall not exceed 0.10 ohms.

3.2 Functional Tests

These functional tests are performed on every Incubator over a minimum of a 48-hour /burn-in period. The results are recorded on the final Inspection report and a copy is included with each incubator that is shipped. All failures are noted, corrected, and any failed test is successfully repeated. Changes from any default value of the optional configuration parameters meant to improve performance are recorded on this report for your reference.

- **Control Systems**
All performance and diagnostic functions are exercised to insure proper operation of control systems, components, and alarms.
- **Temperature**
Each Incubator is monitored for stable temperature control over the 48-hour burn-in period at (37°C).
- **CO₂ Control**
Each Incubator is calibrated to function at a 5% CO₂ level.
The concentration is checked with an independent calibrated instrument.
Each unit is monitored during the 48-hour burn-in period and only accepted with zero failures.
- **CO₂ Recovery**
Each Incubator is exercised for CO₂ recovery time at the end of the 48-hour burn in period.
The door is opened for 1 minute to deplete the CO₂.
After the door is closed, the unit shall recover to 5% ± 0.5% within a 5 minute period.
- **Humidity**
Each unit has a default RH level intended to avoid condensation.
Door and perimeter duty cycles are determined by a Base duty cycle calculation based on the chamber Temperature set point. These are the set at the factory but can be adjusted if needed to control condensation and tune in the chamber temperature uniformity for the environment that the incubator is installed in.
If unit is master reset these settings will be changed to a default value of 100.
The factory default door and perimeter settings are: **Door: 95, Perimeter: 110.**

5.0 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 24 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 product shipped to NuAire without this number will be returned, refused shipment or collect freight.

6.0 Shipments

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

6.1 Damaged Shipments

- 6.1.1** Terms are F.O.B. factory, unless stated otherwise.
Therefore, it is important to check each shipment before acceptance.
- 6.1.2** 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.
- 6.1.3** 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.


7.0 Installation

The Incubator is fastened to the base skid and it is usually the best procedure to leave the skid attached until the Incubator is located in its approximate position to facilitate ease in handling. The base skid can then be removed by removing the four bolts holding the cabinet to the skid. Then screw the leveling feet in to the same nuts that were used to fasten the incubator to the skid. The incubator must be a minimum of 2.0 inches above the floor. Use the 1.0" spacers provided on the threaded stem of each leveling foot when they are installed to ensure this spacing. See BCD-14784.

Examine the Incubator carefully. INSPECT both the exterior and the interior for any transit damage before discarding the shipping crate.


7.1 Location

In locating the Incubator, consider all possible conditions that might affect its performance as well as laboratory procedures for its intended purpose. Do not locate near heating or cooling ducts, or next to equipment that generates heat (steam radiators, stoves, ovens, autoclaves, etc.). Avoid direct sunrays and rapidly moving air currents. These conditions adversely affect the even heat dissipation required from the exterior surfaces of the Incubator and may cause the temperature variation in the chamber to exceed specifications as stated in section 3.2. Since the Incubator needs even heat dissipation on all surfaces in order to maintain an internal temperature variation of less than $\pm 0.2^{\circ}\text{C}$, a minimum of 2 inches (50mm) must be allowed between the rear and sides of the Incubator and any walls, partitions or obstructions to facilitate adequate convection of air around the Incubator. Confirm clearance with a tape measure if needed. Adjust the Incubator location accordingly. In addition, the Incubator location should address access to its power cord for connection/disconnection if necessary. For maintenance and service purposes, the control center electronics should remain accessible. Leave at least 3 ft of clearance in front for the swinging door.

 **Note:** When locating Incubators side-by-side, they should be spaced at least 10" apart to permit one Incubator to be in a heated Decon Cycle with a minimal heating disturbance on adjacent Incubators running in their normal "run" mode.

7.2 Leveling

Prior to use the incubator should be leveled using a bubble level on a middle shelf in the chamber. The Incubator should have all 4 leveling feet firmly on the bench or floor. Level from side to side and front to back. By turning the adjustable leveling feet counter-clockwise, raises the Incubator. The leveling feet height should allow for a 2 inches (50mm) space between Incubator base and the floor. There is a 1 inch long Stainless Steel spacer supplied with each foot. Be sure that it is in place when you are leveling the incubator.

 **Note:** **It is important that the bottom of the incubator be off the floor by AT LEAST 2 inches (50 MM) to assure cabinet air flow relief.** Spacers are provided on the threaded stems of the feet to hold this distance. Confirm with a tape measure if needed.

7.3 Shelf & Water Pan Installation

Shelves

Before installation of the shelves, and water pan, NuAire recommends to decontaminate all surfaces within the interior chamber, glass door, and outer door with gasket. They can be wiped down with a disinfectant of 70 percent alcohol or similar non-corrosive antimicrobial agent. Use only disinfectants that are compatible with the vinyl gasket, the powder coat paint on the outer door and the 304L stainless steel in the chamber. See BCD-15169

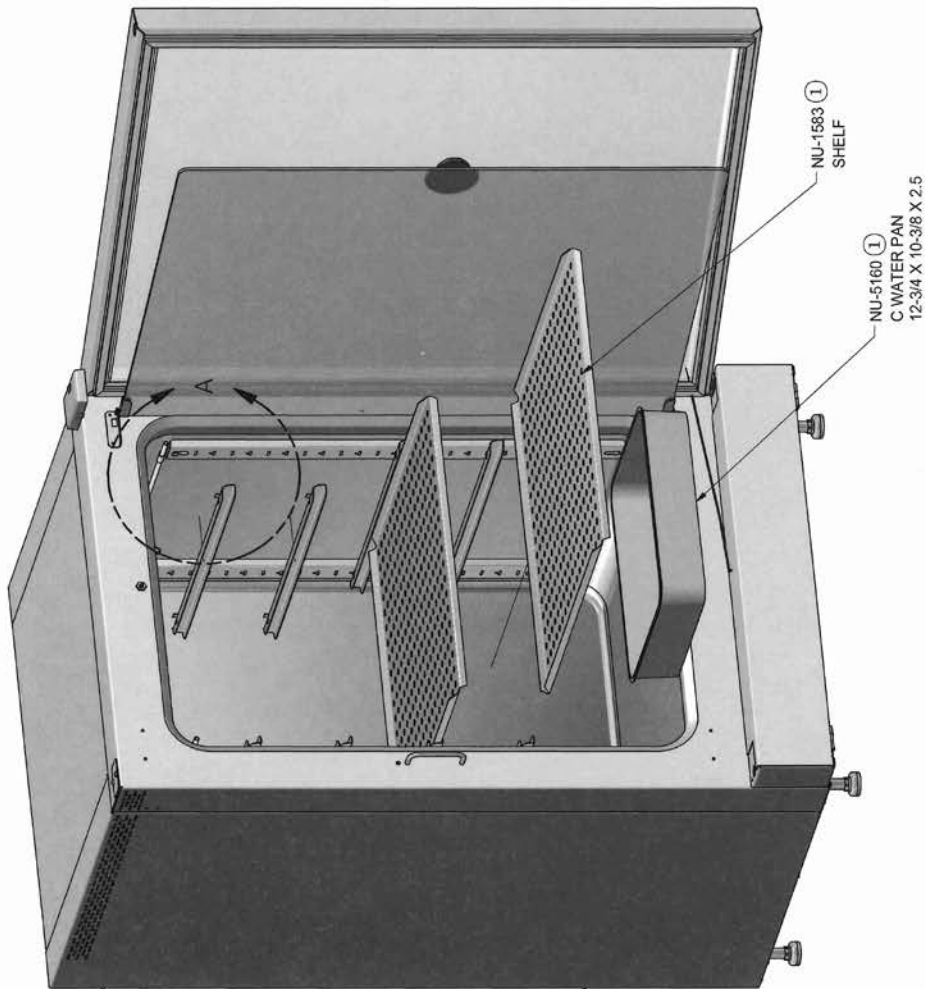
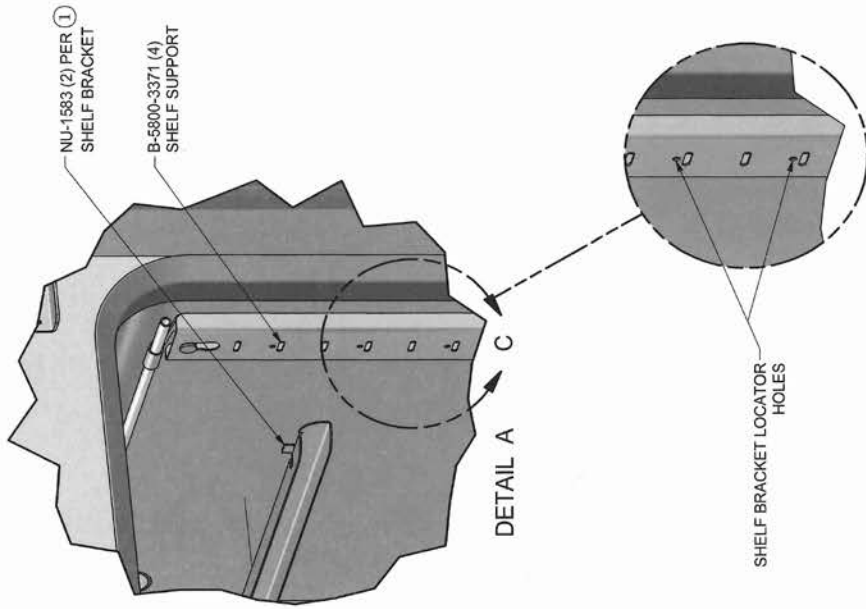
 **Note:** **Absolutely no chlorinated or halogen materials are to be used in the chamber.**

Four (4) shelves are provided with each Incubator. The shelves are easily installed by attaching the shelf brackets to the shelf supports. If the shelf does not bind or disengage from the horizontal bracket it is installed correctly. Additional shelves and shelf guides are available.

Water Pan

Place water pan in the center on the bottom of the chamber and fill with **Single distilled water no purer than 1 Mega Ohm.** It is recommended to fill the pan to a maximum of about 1/2 inch below the top rim. See Sections 3.1 and 8.2 for more specifications and operational details regarding proper maintenance instruction regarding the water.

REV	ECO	DESCRIPTION	DATE	DFTM	CHKD
A	11544	RELEASED TO PRODUCTION	2/21/2012	LS	KCK



TITLE		NU-5800 SHELF INSTALLATION	
DFTM	DATE	CRKD	SHEET
LS	2/21/2012	KCK	1 OF 1
DRAWING NUMBER		BCD-15169	
		A	

ORIGINAL

NOTE:
 (1) NU-1583 IS THE ACCESSORY NUMBER TO ADD SHELVES TO THE INCUBATOR CHAMBER. IT INCLUDES (1) SHELF AND (2) SHELF BRACKETS.

7.4 Electrical

The electrical supply circuit to the Incubator must conform to all national and local electrical codes.

Consult the serial-data plate, located at the front of the right side of the Incubator, for voltage, cycle, phase, and ampere requirements before making connection. Plug the power cord securely into a grounded power source. **VOLTAGE SHOULD NOT VARY MORE THAN 10% FROM SERIAL PLATE RATINGS.** Have a qualified technician check with the power source with a properly rated volt meter if needed. A separate branch circuit is recommended to prevent possible loss of product due to overloading or failure of other equipment on the same circuit. **A SURGE PROTECTOR IS STRONGLY RECOMMENDED** to avoid power-related faults.

7.5 Air Inlet Connection

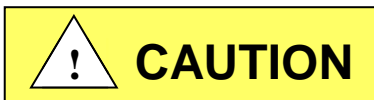
The air inlet is installed at the Factory and consists of flexible hose attached to bulkhead fittings in the bottom of the front panel and can be found under the hinged Valance that is beneath the door. One 50mm polypropylene .3-micron HEPA filter is connected to the hoses. The filter is labeled "Air filter". To open the valence the outer door must be open. Reach in under the front of the valence and pop it open by pulling it toward yourself.

See BCD-15180

CAUTION: This is a free air supply. DO NOT connect to a pressurized air source.

7.6 CO₂/ N₂ Gas Supply Setup

7.6.1 Gas and Air supply HEPA filtering is installed at the factory on the front of the incubator as illustrated in the picture. Each incubator is equipped with the filters required for the control systems available on that model.



- **CO₂/N₂ Pressure to the Invitrocell is rated at 20 PSIG or 1.4 BAR. Do not exceed 25 PSIG or 1.8 BAR to avoid damaging the incubator.**
- CO₂/N₂ of medical grade is recommended.
- A two-stage pressure regulator, Linde #19590 (NU-1564), or equal is recommended.
- **DO NOT USE a single stage regulator.**

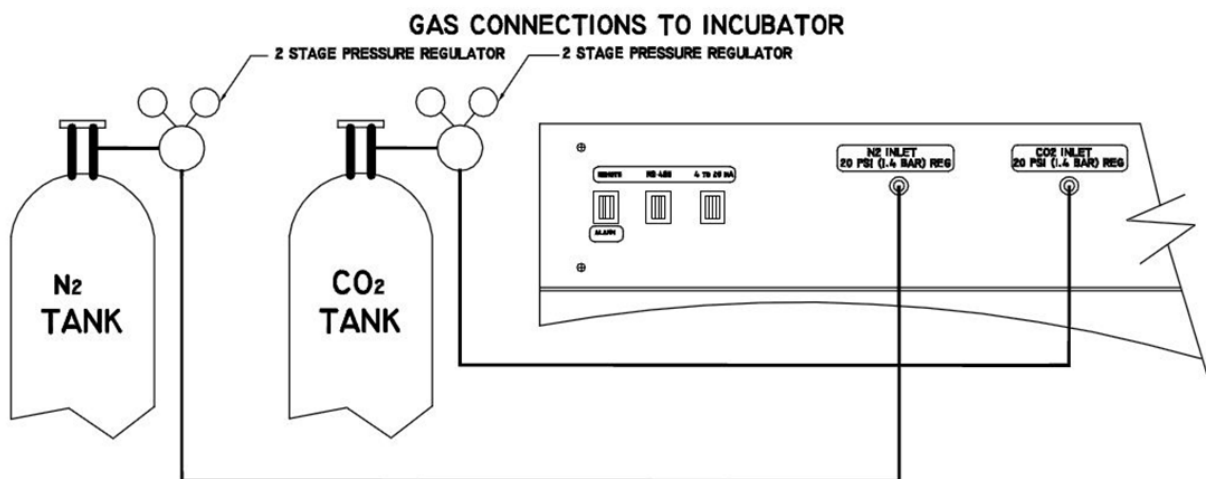
7.6.2 CO₂/ N₂ Gas Supply Tubing Connections

Included with this unit and for all models of the 5800 series is (1) six foot (2 m) of vinyl tube.

It connects between the low pressure side of the 2 stage regulator at the CO₂ supply and incubator fitting labeled **CO₂ INLET** (as shown in the following Figure). Next, secure each connection with the clamps supplied.

On Models NU-5830, NU-5831, NU-5840 & NU-5841 there is a second six foot (2 m) of vinyl tube.

It connects between the low pressure side of the 2 stage regulator at the N₂ supply gas and incubator fitting labeled **N₂ INLET**. Next, secure each connection with the clamps supplied.



Figure

illustrating CO₂ and N₂ gas supply connections

7.6.2 CO₂/ N₂ Supply

- CO₂/ N₂ of medical grade is recommended.
- A two-stage pressure regulator, Linde # 19590, or equal, is recommended.
- DO NOT USE a single stage regulator.

It will not give a stable output at 20 psi and exposes the Incubator to the gas cylinder pressure.



- **High concentrations of CO₂ gas can cause asphyxiation!**
- **Install Incubator in a well-ventilated area.**
- **Gas Supply pressure to the Invitrocell is rated at 20psi (1.4 bar).**
- **Do not exceed 25psi (1.8 bar) or damage to the incubator may occur.**

This Incubator is designed to be operated with CO₂ gas only.

Connecting a flammable or toxic gas can result in a hazardous condition.

Gases other than CO₂/ N₂ should not be connected to this equipment.

CO₂ gas cylinders have a UN1013 label on the cylinder and are equipped with a CGA 320 outlet valve.

Check the gas cylinder for the proper identification labels.

Do not use CO₂ gas cylinders equipped with siphon tubes.

A siphon tube is used to extract liquid CO₂ from the cylinder which can damage the pressure regulator.

Consult with your gas supplier to ensure that the CO₂ cylinder does not contain a siphon tube.

7.6.3 CO₂/ N₂ Pressure Regulators

The regulator's high-pressure stage direct from the supply cylinder must have a range of from 0 to 2000 PSI or 0 to 140 BAR. This gauge indicates actual tank pressure.

The low-pressure stage should have a range of 0 to 30 PSI or 0 to 2 BAR (100 PSI or 6 BARS maximum). This gauge will indicate the actual CO₂/N₂ pressure to the Incubator.

Some single stage CO₂/N₂ pressure regulators have two gauges. USE A TWO-STAGE REGULATOR.

All NuAire Incubators use CO₂/N₂ in such quantities that precise metering of CO₂/N₂ input pressure is important for maximum performance.

To connect the regulator:

First: Open the CO₂ cylinder slightly, for an instant (this is termed "cracking the valve.")

This will blow out dust or dirt that may have collected in the valve outlet.

BE SURE to keep your face away from the valve outlet to protect your eyes from dust or dirt.

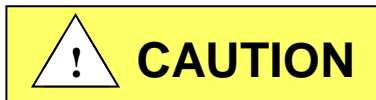
Second: Make sure the regulator pressure-adjusting screw is released by turning it counterclockwise until it turns freely.

Third: Attach the regulator to the cylinder valve and tighten the connection nut with a wrench.

BE SURE DISC SEAL IS IN PLACE BEFORE MAKING CONNECTION.

7.6.5 CO₂/ N₂ Supply Adjustment


With the regulator OFF (i.e. fully counterclockwise), open the cylinder valve slowly usually 1 to 2 turns is sufficient.



NEVER STAND IN FRONT OR BEHIND THE REGULATOR WHEN OPENING THE VALVE. ALWAYS STAND TO ONE SIDE.

The cylinder tank pressure should read: 700 to 800 PSI (48 to 55 BAR) for CO₂ or 2550 to 2650 PSI (176 to 183 BAR) for N₂ more or less depending on the temperature of the cylinder.

Next turn each regulator's pressure adjusting knob clockwise until the low-pressure gauge reads 20 PSI or 1.4 BAR. Both gas connections are now complete.

 **Note: OSHA requires the CO₂ tanks to be physically restrained (i.e. via chained to wall) to prevent accidental damage to cylinder.**

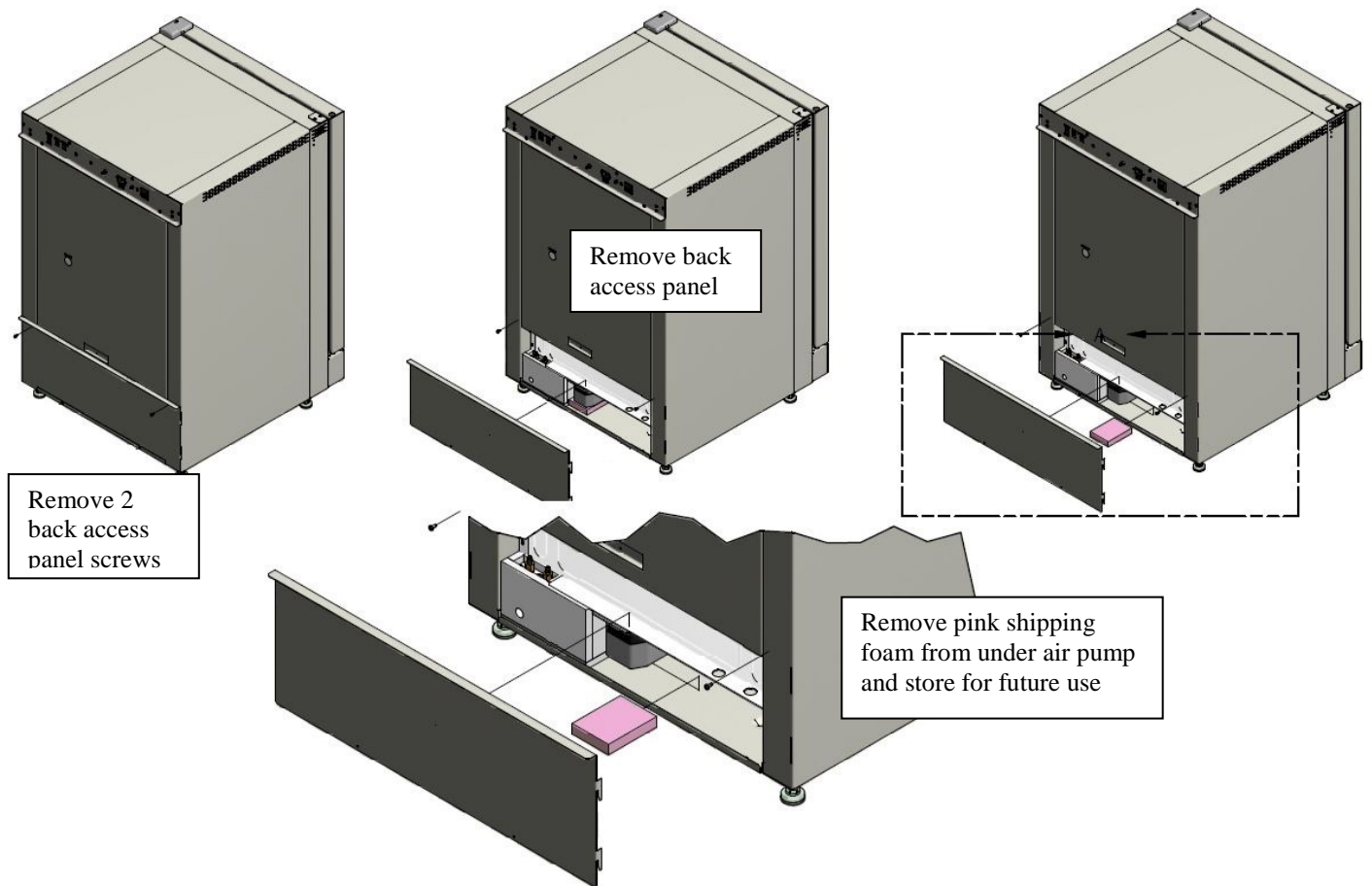
7.6.6 Checking the Connections

The connections can be checked for leakage by brushing a small amount of soapy water on each one.

Observe to see if any bubbles are blown. If not the connection is secured properly.

If it is, the cause of the leaking needs to be determined, (i.e. loose clamp or damaged hose) and corrected.

7.8 Removing packing foam from under Air pump:



7.9 Correct Installation

When the Incubator is installed correctly connected to the power source it is rated for gas connections made properly, the water pan filled, the shelves in place, and the unit is leveled. Read section 8 and follow all instructions for setting set points at the desired value. Then calibrate the Incubator control systems as explained in section 9. If the Incubator is installed and calibrated correctly it will meet the performance specs listed in section 3.2.

7.10 Reversing Incubator Hinges

Reversing the incubator hinges from the right to the left side SEE PTB0236 for instructions. This requires disassembly of the incubator and should be done by a qualified service technician.

8.0 DHD Operation



ATTENTION ACCOMPANY'S
INFORMATION OR IMPORTANT
SYMBOL

191



POTENTIAL ELECTRICAL
HAZARD ONLY QUALIFIED
PERSON TO ACCESS

188



HOT SURFACE
BURN POTENTIAL

564



Safety alert symbol indicates potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

CAUTION: A qualified technician who is familiar with the proper maintenance procedures required for this equipment, as well as repair must perform all maintenance actions on this equipment.

The Incubator is designed to provide a sterile, constant temperature, constant CO₂ level and naturally humidified atmosphere for optimum growth of tissue cell cultures and other organisms requiring this precise environment. To operate the Incubator properly, the following parameters must be reviewed, carefully set, and/or prepared.

8.1 Sterility

The chamber environment is not selective. The growth environment is applied equally to all microorganisms (specimens and contaminants) within the chamber. Therefore, before placing any cultures in the Incubator, the shelves and sidewall top plenums should be sterilized. The interior sidewalls, top, bottom, door, as well as the gasket should be wiped clean with a 70% solution of isopropyl alcohol or other disinfectant compatible with the chamber construction, to remove any contamination. Use mild detergent to clean the exterior of the Incubator. This Incubator provides the lab professional with a choice of 2 heated decontamination cycles. (See section 10.1 for further information.)

8.2 Humidity

Water Pan available on all Models

Humidification of the Incubator chamber is achieved through the process of water evaporation (vapor water pressure) from a stainless steel water pan placed on the bottom of the chamber. Materials of different thermal resistance (e.g., glass, plastic) do not offer sufficient thermal recovery and are not recommended for water pan usage. Although some metals offer better thermal coefficients than stainless steel, dissimilar metals cause electrolysis in the acid atmosphere (carbonic acid) and should never be used, or placed within the chamber.

Use only distilled or mineral-free water, **no purer than 1 mega ohm**, in the stainless steel pan. The water should be changed at least once a week. **FLOODING THE BOTTOM OF THE INCUBATOR IS NOT RECOMMENDED** since it is difficult to change the water weekly and almost always necessitates the use of chemicals, which are not recommended and may damage the stainless steel. Also, it promotes condensation on the inner walls because it steals the natural convection, heat flow through the inner chamber and condensation points occur.

 **NOTE: ABSOLUTELY NO CHLORINATED OR HALOGEN MATERIALS ARE TO BE USED IN THE CHAMBER.**

Humidity recovery to 90% of original level will occur in 20-40 minutes on average after a 15-second door opening with a water pan surface area of 120 square inches (774.2 sq. cm). Contamination in the water pan may be avoided by adding a small amount of copper sulfate to the water pan after each Incubator decontamination.

NOTE: Please contact the copper sulfate manufacturer to determine the proper amount of copper sulfate that should be added to the water pan.

Condensation on the glass door, walls, top, or bottom of the chamber indicates an incorrect balance of door and front perimeter heat. Both the door and front perimeter heaters operate on a duty cycle. A good starting point for these duty cycles is the default setting for the door & perimeter heaters in a room ambient temp of 22°C (72°F) at a temperature set point of 37.0°C. The fresh airflow that the air pump delivers to the chamber has been preset at the factory. If condensation starts forming on the sides or back wall in the chamber, the number and length of air injections into the chamber can be increased. (See section 8.8.1.2 for instructions.) To alleviate the condensation, increase the airflow. To increase RH in the chamber reduce the airflow. If airflow is decreased, some condensation may be unavoidable. The port plug with breather hole must be used on the back port.

Humidity Monitoring and control system are available on Models NU-5820, NU-5840 & NU-5841.

These models humidify the chamber by circulating the chamber air through heated water vapor saturated air in a tank located outside of the chamber. This gives the operator control over the amount of humidity in the chamber from an ambient dependent low value to 90%. After a door opening, the recovery time to 90% +5% / -3% is 25 minutes on average. The control system has a $\pm 3\%$ accuracy from any given set-point 90% and below. Much of the information regarding the water pan can be applied with the exception of the water pan.

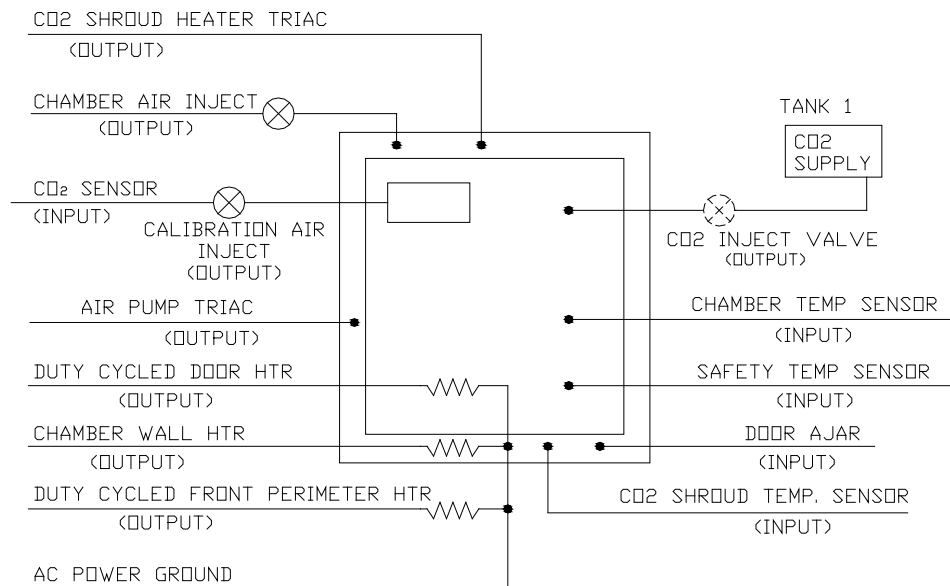
The control system uses a solid-state capacitance humidity sensor to monitor the relative humidity within the chamber. If humidity is required, the control system will activate a solenoid valve routing the chamber air through a humidified heated enclosure just before being returned to the chamber. The control will continue rout the chamber air through the water vapor saturated air until the set-point is achieved. Use only single distilled water, **NO PURER THAN 1 MEGA OHM** to fill the reservoir. The relative humidity display and control option offers an accurate and reliable method to control humidity when required. The alarm set-points are preset at 5% over the set-point and 3% below set-point to within 5% after 30 minutes and are settable in the Options menu for RH.

 **NOTE: DO NOT SEAL THE OPENING IN THE PORT PLUG EXCEPT WHERE INSTRUCTED TO DO SO. THIS IS A PRESSURE RELIEF FOR THE CHAMBER DURING THE HEATED DECON CYCLES.**

8.3 Control System Introduction

The NuAire Incubator Control Electronics system is designed to serve the control requirements of the Incubator chamber. Temperature, CO₂ levels in all models and RH & O₂ in available models are controlled by preset values to provide the optimum conditions for culture growth within a chamber. Operator input is coordinated through the NuTouch LCD keypad and status displays.

Figure 1 shows the various inputs and outputs of the system.



DIRECT HEAT CONTROL INPUTS AND OUTPUTS FIGURE

8.3.1 Chamber control in a single electronic package.

8.3.2 Enhanced information presentation on a NuTouch LCD

Main Screen Continuously displays:

- Measured Chamber Temperature
- Measured CO₂ %
- Measured RH % in Available models
- Measured O₂ % in available models
- Current Screen ID "MAIN SCREEN"
- A mode status indicator (RUN or STANDBY)
- Door ajar status displays when door is ajar
- Door Closed status displays when door is closed and flashes during the post door close delay time.
- NuAire Logo button Leads to the System settings (or Password) menu when pressed
- Date and Time
- Air, CO₂, RH, & O₂ inject indicators show when gas or RH is injecting.
- PIDT: CO₂, RH, & O₂ indicate that the system showing is in Post Inject Delay Time.
- A heated decon Cycle display
- An Alarm Status Menu
- Maintenance Required displayed



8.3.3 Active buttons on the MAIN SCREEN:

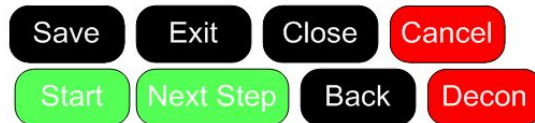
Button Description	Action when touched
Control system description (i.e.....TEMP or CO ₂)	Brings a pop up screen that describes the control system that was touched
Measured value of each control system	Goes to the Environmental Set Point Screen (Key pad to enter password will pop up if the password function is enabled)
NuAire Logo	Goes to "System Settings" Screen for access to more menus
Date & time display	Goes to screen for adjusting time and date

8.3.4 Accessing the Incubator Control Screens

Accessing the many Control screens, performing functions and diagnostic tests, and maneuvering through the NuTouch LCD menu system is accomplished through the following methods:

- Touching a "graphic" Icon like the NuAire Logo in the Main Screen which access the System Settings menu, or lead you to an Enter Password screen when a password has been established.
- Touching a "Button function" button command that is visible on the screen. The button will have text in it indication the function you are about to perform.

The following buttons are used on the NU-5810:



An explanation of these buttons is as follows:

- Save** – This command saves the changes you have made and returns you to the calling screen or, in some cases, back to the main menu.
- Exit** – This command exits you from the current screen and returns you to the calling screen.
- Close** – The command causes the current screen to be removed and returns back to the calling screen.
- Cancel** – This command will cancel the changes you have made, and in some circumstances, cancels the "set of requests" that you have entered and returns you back to the calling screen (e.g., Cancel in the middle of the Decon screen setup returns you to the calling screen).
- Start** – This command causes a main event to begin (e.g. Decon Cycle).


Next Step – This command causes another step (screen), in a list of steps (screens) to be displayed (e.g., Decon cycles and some CO₂ calibration screens).

Back – This command returns you to the previous screen.

Decon – This command begins the Decon sequence.

- Touching a “Text” button command. The text or numerical value will be in blue indicating that is a link similar to the computer or on the internet. The system settings menu screen shown below is a good example of both the Text commands and Button commands:



 **Note:** The Main Screen is the one exception for the above described buttons. The green clock text is and is a link to adjusting the time. The large white Control system measured values are also a “second” link to the “Environmental Set-Points” menu and the control system descriptions are a link to system description pop up screens when touched.

8.3.5 Functioning accessed from the System Settings screen:

The “System Settings” menu screen can be accessed from the “Main Screen” by touching the NUAIRE logo:

Environmental Set-Points: Allows adjustment of Temperature, CO₂, Door, and Perimeter heater power level settings.

Note: You can also access the Environmental set points by touching any control system numerical value in the MAIN SCREEN.

Performance Monitor: Views a function’s Set-Point and Measured values over the last seven days.

Service Settings: Protected by the password 9876, it facilitates Calibrations, Option settings, and access to Diagnostics.

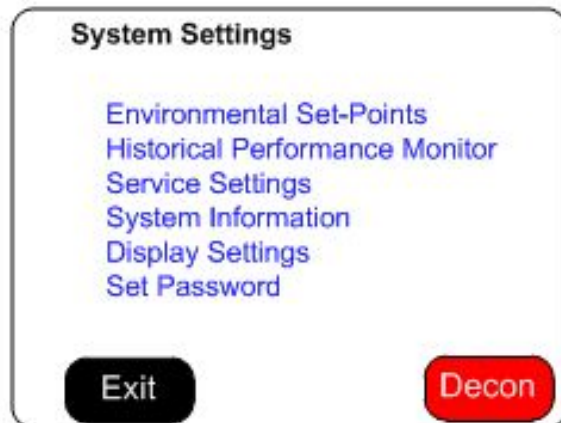
System Information: Views the units Model Number, Serial Number, Control board assembly (CCBA) Software Revision and the Display board assembly (LCBA) Software Revision.

Display Settings: Allows adjustment of the screen brightness.

Set Password: A 4 digit password can be set and will protect access to Environmental Set points, running Decon cycles, and changing the password. See section 8.3.7 for instructions to set the User Password.

Decon: Begins Decon setup instructions and starts the heated Decon Cycle when pressed. Also, it advances through the phases of the Decon Cycle.

System Settings Screen



8.3.6 Automatic notification of abnormal situations (See Section 11 for details)

The red “Alarm Status” text message (button) will appear on the Main

Screen to indicate a fault within the Incubator system. An audible alarm is also heard. The audible alarm is on for 10 seconds at the beginning of an alarm condition and thereafter, it will be on 1 second every 30 seconds.

By depressing (touching) the Alarm Status text on the Main Screen, you now reach the Incubator Alarm Status screen which will identify which Incubator sub-systems are in an alarm state (Temperature, CO₂, or General). You may exit the screen or touch any of the sub-system buttons which will give you more specific information on alarm conditions. See Section 11.0 for more specifics on alarm conditions.



8.3.7 Password Protection

There are 2 levels of password protection.

1. The permanent numerical password required for accessing the “Service Settings” menu screen. This screen is accessed by pressing the “Service Settings” text Icon in the “System Settings” menu screen.

The password is **9876** and it cannot be changed or deleted.

The functions in the “Service Settings” screen are intended to be used by qualified technicians to calibrate the control system sensors like Temperature and CO₂, adjust optional parameter settings to customize incubator performance, perform system diagnostics and to Factory or Master reset for returning the incubator to Default settings.

2. A selectable 4 digit numerical password that is entered by the Incubator user to prevent others that are not authorized to change the Incubator set points (CO₂%, Temp), running conditions of the Incubator, initiate a Decon Cycle or changing passwords. The password protection may be initiated by accessing the “Set Password” menu in the System Settings menu screen. Once initiated, a four digit number must be entered, then re-entered for verification.

8.3.8 Standard remote communication capability

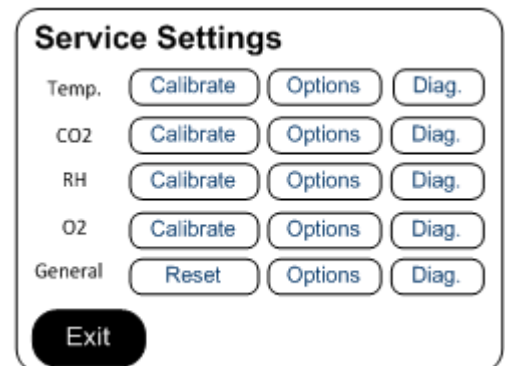
The NU-5810 Incubator comes equipped with the following remote communication tools:

- USB Output of daily, weekly & monthly performance logs and an event log that indicates when alarms, door openings and power interruptions occur.
- 4-20 milliamp analog Output
- RS-485 2 way communications
- A USB method of updating the software

8.3.9 Diagnostic and calibration assists.

To access the Service Settings Menu, perform the following steps: NuAire Logo → Service Settings → 9876 Enter. You are now in the Service Settings Menu (screen). This screen provides you the capability to review and analyze numerous Incubator functions including the following:

- Individual analog inputs may be displayed to assist calibration.
- Individual outputs may be forced to an on or off condition.
- Individual digital inputs may be displayed.
- Calibrated and Uncalibrated values are displayed.
- All options may be individually tested.



8.4 NuTouch Display Screen

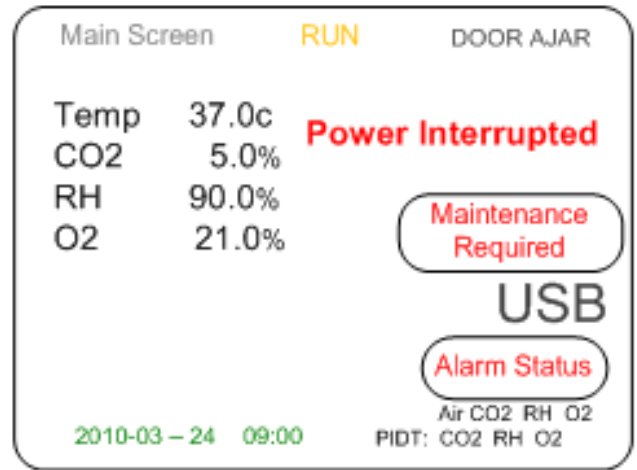
The system LCD touch screen has the following functions.

8.4.1 Front LCD touch screen Descriptions

The NuTouch LCD allows the user to access a wide variety of unit configurations and diagnostic menus by touching the NuAire logo icon.

The Main Screen displays:

- Power Interrupted message displayed when power is lost and then re-connected
- current Calibrated values of control systems that have been enabled
- Current operating mode (run or standby)
- Door Ajar, Alarms, and Maintenance notices



8.4.2 Inject CO₂ / O₂ / RH Status

On the bottom right of 'Main' screen, "CO₂ / O₂ / RH" text indicates when the inject valve is open and the gas or RH is flowing into the chamber maintain set point for each of the control systems.

Each text icon appears independently when that System is actively injecting.

8.4.3 Post Inject Delay Time (PIDT)

On the bottom right of the 'Main' screen just below the inject status icons from 8.4.2, "CO₂ / O₂ / RH" text indicates when these systems are in post inject time after the injection is done.

Each text icon appears independently when that system is in the delay time.

8.4.4 Inject Air Status

On the bottom right of the Main screen "Air" text indicates that fresh air is currently being injected into the chamber.

8.4.5 Door Ajar Status

The door ajar white text message indicates when the inner glass door is not closed and latched; the inner glass door is open. The door ajar status is a result of the pressure switch (open/closed) located along the top middle of the front panel. After the door is closed, the text will display "Door Closed Delay" indicating the delay time (60 sec adjustable).

8.4.6 USB status

The USB status icon appears in the lower right side of the Main screen when a memory stick is placed in the USB port at the back of the unit while down loading performance and event history. This icon disappears when the memory stick is removed from the port.

CAUTION: When a memory stick is placed in the USB port it can interfere with the RS-485 communication output. The RS-485 communication may have to be restarted after the memory stick is removed from the port.

8.4.7 Maintenance Required Notice

The Maintenance required notice appears in the middle of the right side of the screen indicating that either the RH water tank needs to be filled or that it is time to check the capsule filter in the Sensor bay.

Press the notification button to bring up the screen that indicates the maintenance that is required.

8.4.8 Alarm Status Notice

The "Alarm Status" button indicates an abnormal status condition.

This text appears just above the AIR CO₂ status messages (paragraph 8.4.2 and 8.4.3). The "Alarm Status" button and audible alarm indicates the abnormality. A catastrophic temperature control condition will de-energize the safety relay and cause the chamber to cool below the set point. The unit will resume heating when it has recovered from the abnormality. See section 8.3.5 and 11.0 for more details on Alarms.

8.5 Rear Component Panel Detail

The rear control panel contains the following functions (see also BDC-15170)

8.5.1 Power Cord

The power cord is 6.5-foot (2 m) in length, type "SVT" molded plug, allowing for long life and easy cleaning.

8.5.2 Circuit Breaker

All control electronics are protected with a circuit breaker that may trip at 110% of load rating, but will trip at 145% of load rating in less than 2 seconds.

Should the circuit breaker open (pop-out button will appear), merely depress to reset.

8.5.3 N₂ Inlet an NU- 5830, NU-5831, NU5840 & NU-5841

The N₂ inlet provides a fitting for vinyl tubing for oxygen control.

Be sure to follow the recommended inlet pressure to insure proper flow rates and consistent O₂ percentage readings.

8.5.4 CO₂ Inlet All models

The CO₂ inlet provides a fitting for vinyl tubing.

Be sure to follow the recommended inlet pressure to insure proper flow rates and consistent CO₂ percentage readings.

8.5.5 Power Switch

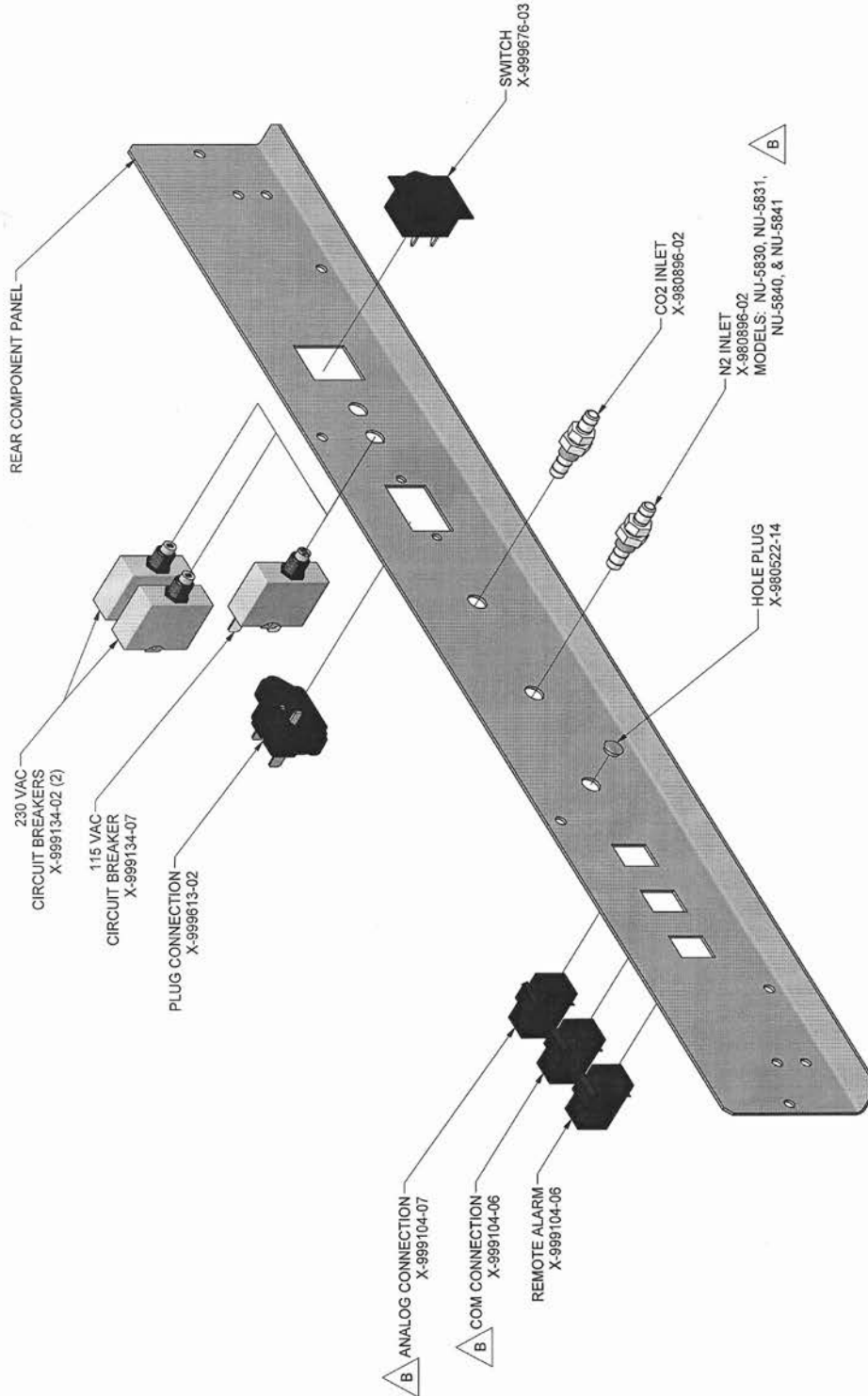
The power switch, located at the top of the rear panel, controls all power to the Incubator.

8.5.6 Standard Communication Interface's / Alarm

Three receptacle connectors are provided for direct field connection of a computer for 2 way communications and incubator monitoring/or output to a printer or other device only capable of receiving RS-485 digital information, dry contact remote alarm indicator, also 4 to 20 mA output to an analog monitoring device or system.

All come standard and ready to use. See section 10 for more detail.

REV	ECO	DESCRIPTION	DATE	DFTM	CHKD
B	11891	UPDATED FITTINGS	01/30/2013	AW	KCK



ORIGINAL		REAR PANEL ASSEMBLY	
DFTM	DATE	CHKD	SHEET
LS	3/12/2012	KCK	1 OF 1
DRAWING NUMBER		BCD-15170	
		B	

NOTES:
 1. COMPONENTS SHOWN ARE FOR ALL UNITS EQUIPPED FOR HEATED DECON CYCLE (DHD) EXCEPT AS NOTED.

8.6 Run Mode Operator Interactions

8.6.1 THE FIRST TIME THE INCUBATOR IS TURNED ON

- The NuTouch boot up screen appears then shows a screen instructing you to “Read the manual and follow all instructions to properly install the incubator”
 - Press the exit button then a thank you screen will appear.
 - Press the “Continue” button then the unit will go to the “MAIN SCREEN”.

These screens will not show again unless you “MASTER RESET” the incubator control board.

- Setting the Clock

8.6.1.1 Clock display organization:

YYYY-MM-DD Hr: Min and is displayed in green text in the lower left of the display screen.

8.6.1.2 Press the green text and the Time and date adjustment screen appears.

8.6.1.3 Use the up/down arrows to increase or decrease the highlighted value.

Use the left/right arrows to move between date and time values that require changing.

8.6.1.4 Press “Save” to save the changes you just made or

Press “Cancel” to abort the changes and return to the main screen.

The mode display, on the ‘Main’ screen, is used to identify the mode of chamber operation: either standby or run. In general, there is no need for operator interaction in “run” mode. However, operator interaction is required when the incubator is first turned on then to perform calibration functions and address abnormal conditions status. If an abnormal condition has, or does, exist for a particular parameter, an alarm becomes active and the ‘Alarm Status’ button will appear. This could be a catastrophic alarm condition, which could harm the tissue culture cells. It does indicate an operational abnormality and should be checked. To acknowledge the abnormality, simply press the “Alarm Status’ button to view the alarm, to dismiss it press the corresponding alarm’s button. The audio and visual alarms will then extinguish. If the abnormality still exists, the return after waiting the specified alarm time.

Let the Incubator run normally, and if the alarm doesn't come back on, then everything is normal. If the alarm does come back on, use the troubleshooting guide to correct the abnormality (see Section 11.0).

8.7 Standby Mode Operator Interactions

The NuAire incubator automatically enters the standby mode when necessary.

There is no action required by the user to enter this mode.

All functions that put the incubator in standby mode automatically start a 10 minute timer.

If the function is not interfaced through the screen on the NuTouch display the incubator returns to the MAIN SCREEN and switches to RUN mode.

8.8 Front Component Panel

The front component panel contains the following functions. See BCD-15180

8.5.7 RH Fill Port (Available on models NU-5820, NU-5840 and NU-5841)

The RH evaporator tank is filled through the port that has the red plug (w O-ring) screwed in it. Because of the pressure in the evaporator tank during an RH injection the O-Ring must seal against the top of the fill port.

8.5.8 N₂ Supply filter (Available on models NU-5830, NU-5831, NU-5840 and NU-5841)

The CO₂ supply filter is installed at the factory and should be changed following the instructions found in Maintenance Section 10.

8.5.9 CO₂ Supply Filter

The CO₂ supply filter is installed at the factory and should be changed following the instructions found in Maintenance Section 10.

8.6.2 Air Inlet Filter - All models

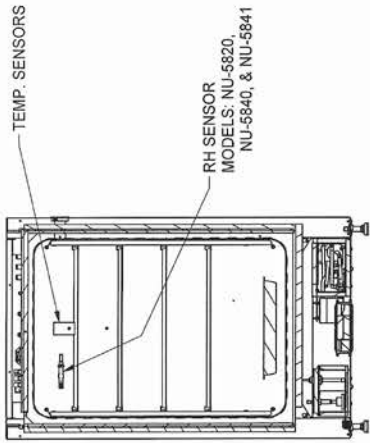
The Incubator is provided with clear vinyl tubing and a 0.3-micron HEPA filter. This is a free air supply.

Note: DO NOT CONNECT TO A PRESSURIZED SOURCE.

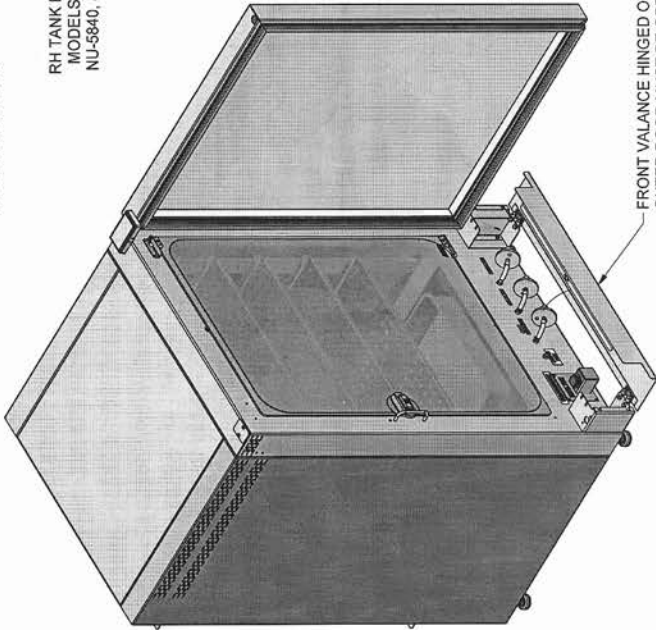
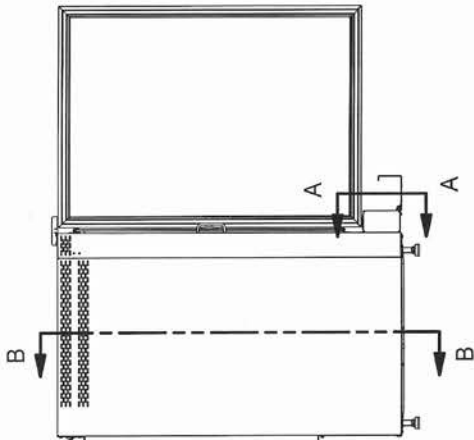
8.6.3 Chamber sample port

The Sample port is provided for checking the CO₂ level in the chamber to monitor the calibration the Sensor and determine if it need adjustment.

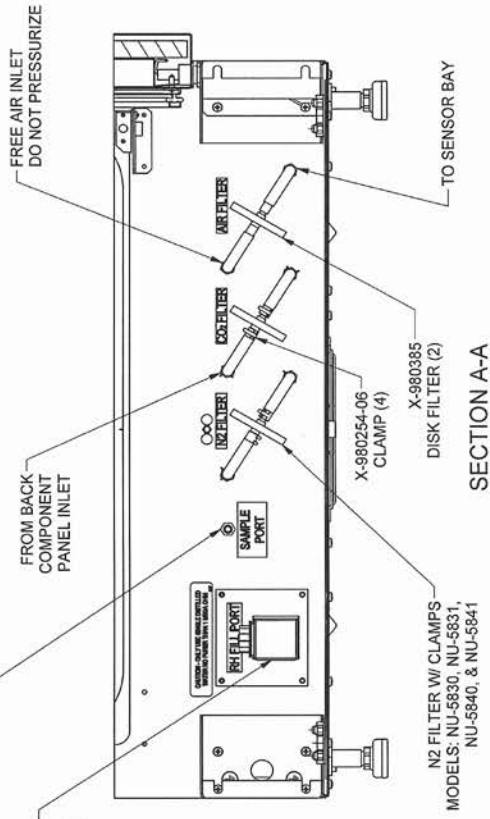
REV	ECO	DESCRIPTION	DATE	DFTM	CHKD
B	11891	ADDED RH AND O2 OPTIONS	2/27/2012	LS	KCK



SECTION B-B



SECTION A-A



SECTION A-A

ORIGINAL		FRONT COMPONENT PANEL	
TITLE	DATE	CHKD	SHEET
	2/27/2012	KCK	1 OF 1
DRAWING NUMBER	BCD-15180		B

NOTE:
1. COMPONENTS SHOWN ARE FOR ALL UNITS EQUIPPED FOR HEATED DECON CYCLE (DHD) EXCEPT AS NOTED.

8.9 Diagnostic and Checkout Procedures

The Incubator controller provides general diagnostic facilities:

- Diagnostic mode is intended for factory and field technicians.
- It allows them to turn the controller's output signals (heaters, valves, safety devices etc.) on and off.
- Diagnostics are located in the "Service Settings" menu categorized by the control systems (i.e. Temperature, CO₂, RH and O₂) plus a general category for diagnostics not directly related to the control systems. Press the "Diag" button to access them.

8.9.1 Diagnostic Mode

To initiate the diagnostic mode, perform the following from the 'Main' screen:

- Select the NuAire Logo to enter "System Settings"
- Select "Service Settings" and enter 9876, and then hit enter (ENT)
- In the Service Settings menu, select the "Diagnostics" button for the desired function

Output/Input Diagnostic Parameter Functions

Temperature

1. Safety Relay (on/off)
2. Chamber Temp. Sensor (shows current temp.)
3. Safety Temp. Sensor (shows current temp.)
4. Chamber heater Triac control (**0** - 50% - 100 % phase firing)
5. Door Heater Triac control (**0** - 50% - 100 % phase firing)
6. Perimeter Heater Triac control (**0** - 50% - 100 % phase firing)

CO₂

1. INACTIVE
2. CO₂ Sensor (Display current CO₂ percentage)
3. CO₂ Inject Valve /on/off
4. CO₂ Sensor bay Heater Triac (**0** - 50% - 100 % phase firing)
5. CO₂ Sensor bay Temp. Sensor (Displays current temp.)

Relative Humidity

1. RH Sensor
2. RH Inject Solenoid valves
3. RH Water Temperature Sensor
4. RH Water Heater
5. RH Water Level Float Switch

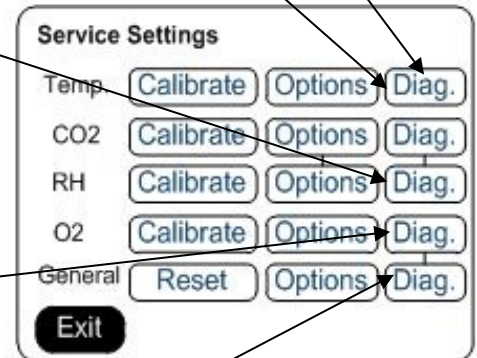
O₂

1. O₂ Sensor (shows current oxygen level)
2. N₂ Inject Valve /on/off
3. O₂ Bypass valve on/off
4. Blocking Solenoid / on/off

General diagnostics

1. Power Supply Regulated +12 VDC (current voltage)
2. Power Supply Regulated +5 VDC (current voltage)
3. Air Inject Solenoid (on/off)
4. Alarm dry contact Relay (NO/C/NC) switch states
5. Air Pump Triac (on/off)
6. Spare AC Triac

(Note: Default values are in **bold**)



The paragraphs on the following page provide a more complete description of the diagnostics listed above.

The Diagnostic screen is shown to the right of each of the control systems Temperature, CO₂, RH & O₂ and the General category for your reference. Once entered, the Diagnostics screen will display the calibrated and uncalibrated values of the given function and all related components. There will be several buttons in this screen. Interacting one of these buttons will activate that function until the twenty second timer on the bottom edge runs to zero. Activating more than one function will reset the timer but both functions will remain on.

Temperature Control Diagnostics

1. Safety Relay

This function shows the current state of the safety relay. LCD display will show “On” or “Off” corresponding to the relay condition. On for closed or set or yes.

2. Chamber Temperature Sensor

This function shows on LCD the current values, calibrated (displayed) and not calibrated of the temperature sensor controlling the chamber temperature.

3. Safety Temperature Sensor

This function shows on LCD the current values, calibrated and not calibrated of the Safety temperature sensor located in the chamber.

4. Chamber Heater Triac Control (0%, 50%, and 100%)

This function allows the jacket heater to be turned on at different percentages 0, 50,100)

5. Door Heater

This function shows on LCD the current state of the door heater. This function also allows the door heater to be turned on at different percentages (0, 50, and 100 percent). The LCD display will show phase firing percentage chosen default is 0%.

6. Perimeter Heater

This function shows the current state of the perimeter heater. This function also allows the perimeter heater to be turned on at different percentages (0, 50, and 100 percent). The LCD display will indicate percentage of phase firing chosen default is 0%.

The screenshot shows the 'Temperature Diagnostics' screen. It features two main sections: 'Chamber Sensor' and 'Safety Sensor'. Each section displays 'Calibrated' and 'Un-Calibrated' values. To the right of each sensor section are three toggle buttons for heaters: 'Safety Relay: OFF', 'Chamber Heater: OFF', and 'Door Heater: OFF' for the Chamber Sensor; and 'Perimeter Heater: OFF' for the Safety Sensor. At the bottom, there is an 'Exit' button and a 'Time to OFF' indicator showing '0 Seconds'.

CO₂ Control Diagnostics

4 CO₂ Sensor

This function shows the current CO₂ sensor reading both the “Un-Calibrated sensor signal and the Calibrated value shown in the display screen.

5 CO₂ Inject Valve / on/off

This function shows on LCD the current state of the CO₂ inject valve. LCD will show “ON” or “OFF” corresponding to the valve condition. On for open or set or yes.

6 Shroud Heater Triac Condition / on/off

This function shows on LCD the current state of the sensor bay Heater triac. LCD will show 0, 50, and 100 percent corresponding to the relay position. The triac can be toggled to each percent of phase firing manually.

7 CO₂ Sensor Bay Temperature Sensor

This function shows on LCD the sensor bay temperature in degrees C

8 Air inject Solenoid / on/off

This function shows on LCD the current state of the Air Inject Solenoid. LCD will show “ON” or “OFF” corresponding to the solenoid position. Default is off-solenoid activates when the button is touched

9 Air Pump / on/off

The screenshot shows the 'CO2 Diagnostics' screen. It features a 'CO2 Sensor' section with 'Calibrated' and 'Un-Calibrated' values, and a 'Sensor Bay' temperature reading. To the right are four toggle buttons: 'CO2 Inject: OFF', 'Air Inject 2: OFF', 'Air Pump: OFF', and 'Shroud Heater: OFF'. At the bottom, there is an 'Exit' button and a 'Time to OFF' indicator showing '0 Seconds'.

RH Control Diagnostics functioning

1 RH Sensor

This function displays the current value of the chambers RH sensor from 0 to 100%. It shows both the calibrated value shown in the display screen and un-calibrated sensor signal.

2 RH Inject Solenoid

This function indicates the on/off (default off) state of the RH Inject solenoid valve and allows the activation of it.

3 RH Water Level Float Switch

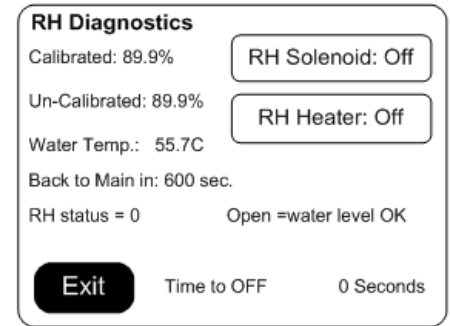
This function shows when the float switch is: Open=water level OK or Closed=water level Low.

4 RH Water Heater

This function reports back on whether the triac/heater circuit is on or off (default off) and allows the activation of it each time the RH heater button is pushed.

5 RH Water Temperature Sensor

This function shows the current temperature (in C) for the water in the water reservoir. The water temperature should be 10 deg. greater than the chamber temperature set point. It can reduce some during long RH injections after a door opening or when the system is first turned on but should recover within a few minutes.



O₂ Control Diagnostics Functioning

1. O₂ Sensor

This value displays the current value of the chambers oxygen sensor both the Calibrated value shown in the display screen and Un-Calibrated sensor signal.

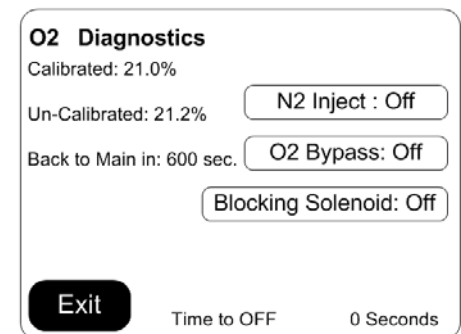
2. N₂ Inject Valve /on/off :

This function indicates the on/off (default off) state of the N₂ Inject solenoid valve and allows the activation of it.

3. O₂ Bypass valve on/off: THIS FEATURE IS NOT ACTIVE.

4. Blocking Solenoid /on/off

This function indicates the on/off (default off) state of the Blocking solenoid valve and allows the activation of it.



General Control Diagnostics

1. Power Supply Regulated +12 VDC

This function will display on the LCD screen the current value (+12.xx) of the regulated +12 VDC power supply.

2. Power Supply Regulated +5 VDC

This function will display on LCD screen the current value (+5.00) of the regulated +5 VDC power supply.

3. Chamber Air Inject Solenoid

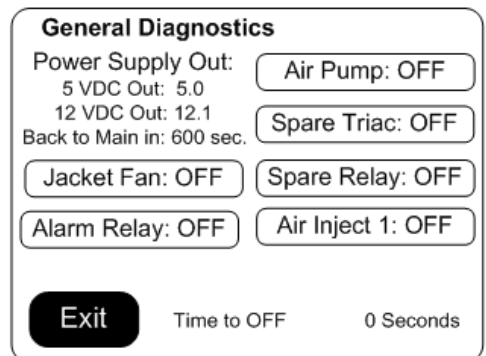
This function shows on LCD the current state of the Air Inject Solenoid. LCD will show "ON" or "OFF" corresponding to the solenoid position. Default is off-solenoid activates when the button is touched

4. Remote Alarm Relay

This function shows on LCD the current state of the remote alarm relay. The LCD display will show "ON" or "OFF" corresponding to the relay condition and its Normally Open (NO0 pair of contacts

5. Air Pump Triac

This function shows on LCD the current state of the Air Pump Triac. LCD will show "ON" or "OFF" corresponding to the relay position. The triac can be manually turned On and Off.



NOTES: The following features are integral to all Diagnostics screens.

1. Back to Main screen in 600 sec.

This is a timer that starts when entering any diagnostic or other screen that puts the incubator in standby mode. If the screen is not manually interfaced within 600 sec (10 min) the incubator automatically returns to the Main screen*

2. Time to OFF (seconds)

When a button is pushed that turns a component on like a solenoid or a heater it starts 20 second timer. When the timer reaches 0 the component(s) are automatically turned off. Each time the button is pushed the timer will restart.

8.8 Option Configuration Parameters

Format: Option (**Default**, Min/Max)

All the options for the NU-5810 Incubator use this same format. The default is set at the factory and can be restored in the field with a Master or a Factory reset command. On the following pages, there is a short description of each Option with its Default/Min/Max setting, followed by a more detailed description.

Temperature

1. Temperature Max Above Set Point (**1.0°**, 0.0/50.0)
2. Temperature Low Time Out Timer (**360min**, 0/500)
3. Temperature Min Below Set Point (**0.5°**, 0.1/25.0)
4. Temperature Sensor Differential (**4.0°**, 0.0/25.0)
5. Temperature Recovery Delay Time (**60sec**, 0/500)

CO₂

1. CO₂ System Enable (**On**, On/Off) (in Settings Screen)
2. CO₂ Max Above Set Point (**1.0%**, 0.1/25.0)
3. CO₂ Time Out Timer (**30min**, 0/500)
4. CO₂ Min Below Set Point (**0.5°**, 0.1/20.0)
5. Post Inject Delay Time (PIDT) (**40sec**, 0/500)

Relative Humidity

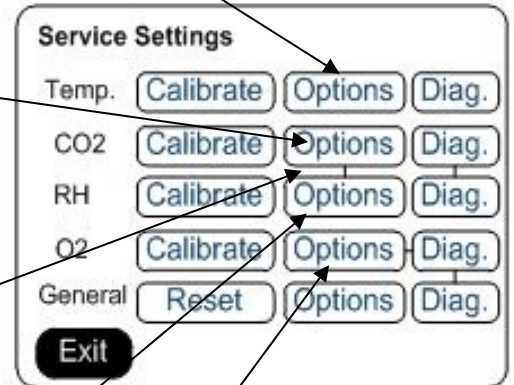
1. RH System enable (**On**, On/Off) (in Settings Screen)
2. RH Max above set-point (**5.0 %**/0.0/50.0)
3. RH Time Out timer (**30 minutes**/0/500)
4. RH min below Set-Point (**3.0%**/0.1/25.0)
5. Post Inject Delay time (PIDT) (**180 seconds**/0/500)

O₂

1. O₂ System Enable (**On**, On/Off) (in Settings Screen)
2. O₂ Max under Set point (**1.0 %**/0.0/25.0)
3. O₂ Not Achieving Set Point timer (**30 minute**/0/500)
4. O₂ Min above Set Point (**1.0 %**/0.1/20.0%)
5. Post Inject Delay time (PIDT) (**40 seconds**/0/500)

General

1. Door Close Delay Time (**60 sec**, 0/500)
2. General Air Inject Time (**5sec**, 0/500)
3. General Air Inject Cycle Time (**1min**, 0/500)
4. General Digital Output Interval (**0min**, 0/300)
5. General Door Ajar Alarm Delay (**5min**, 1/60)
6. Settings (Text in top right side of screen)



Note: Selecting any of the Option title texts will open a brief description of that option's functions.
Default values are in **bold**

The following paragraphs provide a more complete description of the Optional configuration parameters listed above.

Temperature

1. Temperature Maximum Above Set point
This value determines the maximum deviation, measured in (°C) that the chamber is permitted to rise above set point, once it is reached before an alarm condition is declared. An alarm condition will cause the chamber to enter a safe condition where no power is enabled to any of the system output controls until the situation is rectified.
2. Temperature Time Out
This value determines the time, in minutes, for the temperature to achieve set point. If the temperature doesn't get to within 0.2° of set point within this time period, an alarm condition is declared.
3. Temperature Minimum Below Set point
This value determines the maximum deviation, measured in (°C) that the chamber is permitted to fall below set point, once it is reached before an alarm condition is declared.
4. Temperature Sensor Differential
This value specifies a maximum differential, measured in temperature (°C) that the two temperature sensors may deviate from one another, or from the last read value. If this differential is exceeded, a warning LED is shown on the running chamber. If multiple sensors fail to read within the specified limits, an alarm condition is declared. An alarm condition will cause the chamber to enter a safe condition where no power is enabled to any of the system output controls until the situation is rectified.
5. Temperature Recovery Delay Time
This value determines the time, in seconds, to turn off the chamber heaters in half-degree increments during a temperature recovery cycle. The delay time is required to prevent temperature overshoot of the control set point.

CO₂

1. CO₂ System Enable (**Enabled**/disabled) (Settings Screen)
This function will enable or disable the CO₂ system. If the system is Enabled it will be displayed in the MAIN screen. If it is disabled it will not be displayed.
In the Option/Settings screen for the CO₂ system:

System Enabled (with check mark) means the System is enabled
System Enabled (without check mark) indicates that the system is disabled
2. CO₂ Max Above Set point
This value determines the maximum deviation, measured in (%) that the chamber is permitted to rise above set point, once it is reached before an alarm condition is declared.
3. CO₂ Time Out
This value determines the time, in minutes, for the CO₂ percentage to achieve set point. If the CO₂ percentage doesn't get to within its lower limit of set point within this time period an alarm condition is declared
4. CO₂ Min Below Set Point
This Function gives the ability to set the value in percent CO₂ below set point that starts the CO₂ time out timer described in item 2.
5. CO₂ Inject Delay Time
This value specifies the time, in seconds, for an injection of CO₂ to be measurable at the sensor. When CO₂ is injected into the chamber, the system delays until this time period has elapsed before making a new control decision. In this manner, diffusion induced delays will not cause the CO₂ system to overshoot the control set point.

Relative Humidity

1. RH System Enable (**Enabled**/disabled) on models NU-5820, NU-5840, & NU-5841 (Settings Screen)
(system is disabled on all other models)
This function will enable or disable the RH system. If the system is Enabled it will be displayed in the MAIN screen. If it is disabled it will not be displayed.
In the Option/Settings screen for the RH system:

System Enabled (with check mark) means the System is enabled

System Enabled (without check mark) indicates that the system is disabled
2. Rh Max above set-point (Default 5.0%)
This value determines the amount, in percent, that the measured value can be above the set-point prior to setting an alarm condition.
3. RH Not Achieving Set Point Timer (Default 30 min.)
This value determines the amount of time before declaring a RH Low alarm because RH level is not reaching set-point.
4. RH Min. below Set-Point (Default 3.0%)
This function gives the ability to set the value in percent RH below set-point that starts the "Not achieving set-point timer" described in item 2.
5. RH Post Inject Daley Time (Default 180 sec.)
This value specifies the time, in seconds, that the Rh system delays control to allow detection of the level RH that was just injected into the chamber.

O₂

1. O₂ System Enable (**Enabled**/disabled) on models NU-5830, NU-5831, NU-5840, & NU-5841 (Settings Screen)
(system is disabled on all other models)
This function will enable or disable the O₂ system. If the system is Enabled it will be displayed in the MAIN screen. If it is disabled it will not be displayed.
In the Option/Settings screen for the O₂ system:

System Enabled (with check mark) means the System is enabled

System Enabled (without check mark) indicates that the system is disabled
2. O₂ Max Above Set-Point
This value determines the maximum deviation, measured in (%) that the chamber is permitted to rise above set-point, once it is reached before an alarm condition is declared.
3. O₂ Not Achieving Set-Point Timer
This value determines the time, in minutes, for the O₂ percentage to achieve set-point. If the O₂ percentage doesn't get to within its lower limit of set-point within this time period an alarm condition is declared.
4. O₂ Min above set-point to Start Not Achieving Set-Point Timer
This value determines the limit in percent that starts the Not Achieving Set-Point Timer for declaring the alarm. This can also be referred to as a time out alarm.
5. N₂ Inject Delay Time
This value specifies the time, in seconds, for an injection of N₂ to be measurable at the sensor. When N₂ is injected into the chamber, the system delays until this time period has elapsed before making a new control decision. In this manner, diffusion induced delays do not cause the O₂ system to overshoot the control set-point.

General Options

1. Door Close Delay Time
This value determines the time, in seconds, to turn on the door heater to a 50 percent duty cycle after an inner glass door opening. Also inhibits CO₂ control for the same period.
2. Air Inject Time
This value specifies the time, in seconds, for an injection of air into the chamber
3. Air Inject Cycle Time
This value specifies the amount of time in minutes between each injection of air into the chamber
4. Digital Output Interval
This parameter specifies the frequency, in minutes that lines are to be printed on a status report. If the frequency is specified as zero, no report will be printed.
5. Door Ajar Alarm Delay
Determines how long in minutes the glass door can be open before an alarm is declared.
6. Settings (text located at the top of screen)
Pressing the Settings text gives access to Settings screen containing the following:
 - The Filter Maintenance button to access:
 - Resetting the change filter notice
 - Setting time to reminder (**24 months/1/48**) 0 disables the feature.
 - View time remaining until current notice is triggered.
 - The Clear Password button that clears the 4 digit password that was input through the Set Password screen.
 - User screens language to English. Spanish, French & German are available see section 8.11.3 for instructions to change the user screen language.

8.9 Resetting the Electronics Software

8.9.1 Factory Reset

The Factory Reset is similar to the Mast Reset. However, it only changes the Options (returned to default settings) and the environmental set-points (returned to their defaults).

To perform a Factory Reset, you will need to do the following:

NuAire Logo → Service Settings → 9876 Enter → Reset → Factory Reset → Confirm

The Incubator will perform the Factory Reset and return to the Main screen.

8.9.2 Master Reset

The master reset diagnostic function is the last effort to correct operational faults which otherwise cannot be solved. By reloading the default configuration, the entire memory will be reset and ALL CALIBRATION OFFSETS, USER PASSWORD, CONFIGURATION OPTIONS, MODEL NUMBER OF THE INCUBATOR, AND THE SERIAL NUMBER WILL BE LOST. All calibrations will need to be performed following a master reset.

To perform a Master Reset, you will need to do the following:

NuAire Logo →
Service Settings →
9876 Enter →
Reset →
Master Reset →
Confirm

The Incubator will perform the Master Reset then the “Factory Setup” Screen will appear

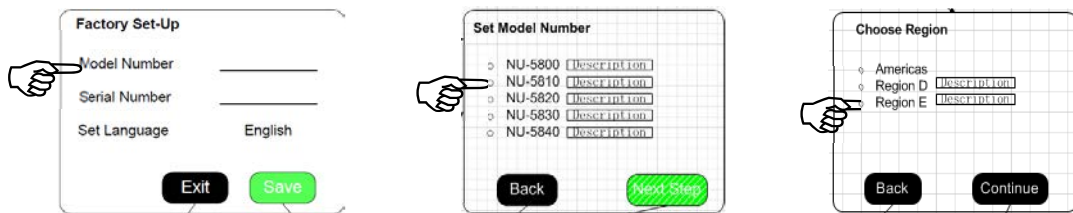
 **Note: After performing either Factory or Master Reset remember to turn the incubator off then on again to ensure that all intended parameters were reset.**

8.9.3 Inputting the Factory settings:

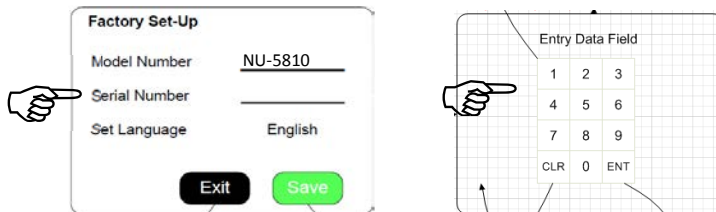
The “Factory Set-up” screen will appear after the master reset, this screen has several functions.

Setting the model number sets the following function:

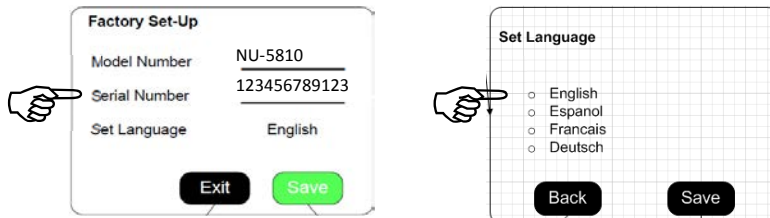
- Model no. NU-5800 and E or D models
Enables Temperature and CO₂ the only control systems available on this model
Chooses the algorithm suited for low watt heating of the chamber
Supresses the decon button in the “Systems Settings” screen
Loads the model number in the System information screen
- Model no’s NU-5810, NU-5820, NU-5830 & NU-5840 and E or D models
Enables Temperature and CO₂ plus RH and O₂ control systems as available on the various models
Chooses the algorithm suited for high watt heating of the chamber suited for heated Decon cycles.
Activates the heated decon cycle choices in the “Systems Settings” screen
- Touch the “Model Number” text then follow the screen prompts as shown below.
Pressing continue on the choose Region screen will bring you back to the Factory Set-Up screen showing the Model Number you just entered. Default is NU-5800 if no model number is entered



- Touch the Serial Number text then enter the 12 digit serial number which can be found on the serial number label located behind the hinged valence under the sample port. Press the ENT button on the key pad screen and you will return to the Factory Set-Up screen showing the serial number you just entered. Default is blank if no number is entered.



- Touch the Set Language text then touch the save button. This sets the language on all of the user screens. The language in the Service Settings menu /screen will remain in English. English is default language if none is chosen. Touch the green save button to exit the factory screen.



- The final change that is requested is the clock. It should not have been reset. As long as the date and time are correct you can press cancel or save in that screen to exit to the Main screen. See section 7.8.1 if for instructions to reset date and/or time.

9.0 Calibration

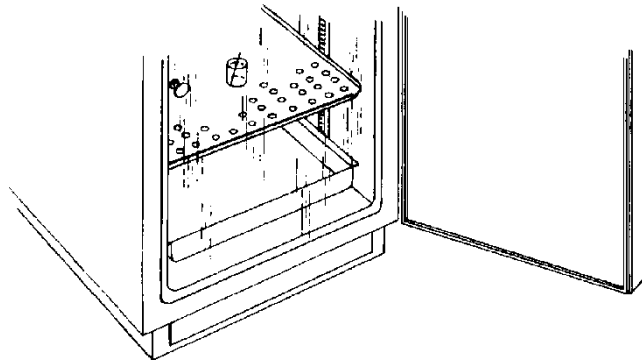
Proper calibration of the incubator involves following parameters. On all models of the Invitrocell incubator the chamber temperature, door temperature, perimeter temperature, and CO₂ sensor require calibration at installation and the calibration should be checked on a regular schedule. The first three, chamber, door, and perimeter temperature should be completed and stabilized before any CO₂ sensor calibration is performed. On Invitrocell Below, each calibration procedure is described in detail. For the best results, follow the procedure carefully, and if the desired result is not achieved, try procedure again from the start.

9.1 Chamber Temperature Calibration

The DH's TEMPERATURE CALIBRATION MUST BE PERFORMED WITHIN 1°C OF THE PLANNED OPERATING TEMPERATURE. Normally, 37.0°C is the most common set point. To initiate the procedure, turn on the incubator via the power switch on the back panel. The default set point is 37.0°C; enter "Environmental Set Points" and adjust if desired. Let the unit stabilize for 8 to 12 hours. Use an independent calibrated instrument to check and calibrate the temperature.

Below is a description of calibration with a glass thermometer as one example for temperature calibration.

At the beginning of this procedure, set a calibrated glass thermometer in a glass beaker filled with water resting on a shelf in the middle of the chamber. Do not place the glass beaker on the bottom of the chamber because it will result in a slightly higher temperature reading due to the heater located on the chamber bottom. Placing the thermometer in glass beaker on the middle shelf will give the most accurate results for calibration. The chamber should be humidified to avoid false low readings due to evaporation of water from the flask. An accurate digital thermometer with a type K thermal couple could also be used.



When the unit has stabilized at the operating temperature, perform the following calibration procedure.

- Allow Incubator to stabilize at its given temperature set point in run mode.
- Enter "Service Settings" by means of your provided password.
- Press the Temperature Calibration button.
- Determine actual temperature within chamber by reading temperature measurement instrument.
- Select the number digits below the "Current Calibrated Sensor Reading" blue text button
- Input the current value displayed on your temperature measurement instrument and exit calibration.

 **Note: THE DISPLAY DOES NOT UPDATE IMMEDIATELY; IT TAKES 2-3 SECONDS**

The chamber temperature calibration is complete. Let unit stabilize for 8 to 12 hours. If the chamber temperature (actual thermometer) still does not match the display, perform the above procedure again. In some cases it might be necessary to calibrate several times to achieve a stable condition due to ambient conditions of temperature and humidity within the laboratory.

9.2 Door and Perimeter Duty Cycle adjustments for Temperature Calibration

The Door and Perimeter heaters are run on “Base Duty Cycle” calculations that is automatically increased or decreased to run in accordance with the chamber temperature at a chosen set point. These duty cycles work in the controlled lab environment but due to the many variables involved in temperature control there is also a manual adjustment. The heater duty cycles can be adjusted to control condensation or to adjust the temperature uniformity in the chamber.

The inner glass door and outer shell perimeter temperature calibration is best accomplished by running the Incubator for a minimum of 24 hours with the water pan in place and perform the following calibration sequence, if required. Open the Incubator door and look for general condensation. Some condensation on the glass door can be desirable as an indication of adequate humidity in the chamber. Typically, one to two inches of condensation in the corners of the glass door and/or gasket indicates a properly calibrated door and perimeter heater. The perimeter heater is the heater located on the outer shell next to the glass door gasket. If calibration is required, simply perform the procedure as stated below. The door and perimeter heater operates as a base duty cycle calculated for the chamber temperature set point being used. In the door and perimeter heater (adjustment) screen “100” = the calculated base duty cycle. Adjusting the value up or down adds or removes 1 percent of the base duty cycle based on phase firing the control triac for that heater. Adjustments should be limited to 5% up or down at a time.

The following steps should be taken for setting these duty cycle percentages:

- Allow Incubator to stabilize at its given temperature and humidity level in run mode.
- Enter the “Environmental Set Points” screen either from the MAIN SCREEN or the SYSTEM SETTINGS screen.
- Select the numerical digits following the “Door” or “Perimeter” text.
- Press UP or DOWN keys to increase or decrease the numerical value to the desired level.
- Press “Done” to set current value and exit calibration.

Environmental Set-Points

Temperature Set-Point	37.0C
CO2 Set-Point	5.0%

Heaters, Door 100 Perimeter 100

Exit

9.2.1 Door and Perimeter heater duty cycle automatic control

The door and perimeter duty cycles are automatically reduced when the room temperature in the lab increases enough to allow the contribution from these heaters to overheat the chamber. For example if the door and perimeter duty cycles are set up when the room temperature is 22°C and the room temperature is allowed to increase to 27°C. Less heat is required to keep the chamber at set point. If the chamber starts to overheat, the duty cycles will be reduced at a rate of 1% per minute starting when the chamber temperature is 0.2°C above set point. The duty cycles will continue to be reduced until the chamber temperature returns to set point. These duty cycles are continuously monitored and will be increased slowly again, as long as the chamber temperature does not go over the set point. If the room ambient reduces back to 22°C the door and perimeter duty cycles will actually be returned to their original settings.

Note: If it is known that the lab room temperature where the Incubator is installed will vary significantly. (For example, the heater or air conditioning is shut off after work hours or there is no air conditioning and the room temperature has large temperature swings.) The door and perimeter duty cycles should be set in the lower temperature expected in the lab. Then the door and perimeter heaters will automatically be adjusted to avoid over temperature conditions in the chamber when the room temperature rises. In this case the chamber should be monitored for condensation regularly. If the chamber walls and ceiling start to get excessive condensation the door and perimeter heater duty cycle settings will need to be reduced.

9.3 Setting Air Injections

If there is still some undesired condensation in the chamber when the door and perimeter heaters are set for the desired result, the air injections can be adjusted. There is a control for length of the air injection labeled, Air Inject Time, and the frequency that air is injected called, Air Inject Cycle. These controls are described in more detail in the "General Options" section of the Service Settings menu. The default is 5-second injections every 1 minute. Start by increasing the length of the injection by a few seconds at a time then increase the frequency if needed. If the humidity in the chamber is less than desired, reduce the Air Inject Time.

9.4 CO₂ Calibration

The DHD infrared CO₂ sensor may be calibrated using one of four techniques: Open Door CO₂, Closed Door CO₂, Off-Set, and CO₂ injection calibrations. CO₂ calibrations can be performed in approximately ten minutes, by accessing the CO₂ calibrations menu in "Service Settings" and following the on screen instructions. To perform Off-Set, Open Door, and Closed Door calibrations attach an independent CO₂ measurement device to the Sample Port in the front of the unit before the calibration begins.

9.4.1 CO₂ Off Set Calibration

CO₂ Off Set Calibration can be performed anytime an independent measurement doesn't correlate to the front panel display. However, this calibration SHOULD NOT BE PERFORMED MORE THAN ONCE PER WEEK. Sensor calibration should be performed if an independent measurement, if it doesn't match the display within ± 0.3 percent within one week after a sensor calibration. Before doing the following calibration, check and change, if necessary, the Incubator in-line filter found within the Sensor bay.

When unit has stabilized at the operational temperature and CO₂ percentage, take an independent measurement and, if necessary, perform the following:

- In "Service Settings" enter the CO₂ Calibrations menu.
- Press the "CO₂ Offset Calibration" text button
- Use an independent instrument to determine actual CO₂ percentage (compare the display CO₂ to the independent measurement). If these two readings have a difference of less than 1.0 percent, proceed to enter the CO₂ Fyrite value. (See * **Note** below) If the difference is greater than 1.0 percent, it is recommended to perform a CO₂ Open Door Calibration.
- Enter the value measured by the independent device
- Exit and Save to retain this value.

***Note:** When the display value is more that 0.3% different from the measured value, offset display 1/2 the difference measured. Allow the Incubator to stabilize back to set point, then measure the CO₂ in the chamber again. Offset the display again if necessary.

9.4.2 CO₂ Sensor Calibration (Zero/Span/CAL. INJ.)

There are 2 sensor (zero/span) calibration routines available to the lab professional. The first option is the "open door" routine involving opening the outer and inner door to zero the sensor. This routine also automatically calibrates to the CO₂ injection rate during the injection for the span portion of the sensor calibration. It is recommended that this routine be used during the initial setup of the Incubator, if the set point of the system is changed or if other changes are made on the Incubator affecting the CO₂ system.

The second option is a "closed door" routine. This routine allows calibration of the sensor without opening the door avoiding undue exposure to the cultures that may be in process. This routine injects "fresh air" into the detector head of the sensor to calibrate zero. The chamber air is then allowed back into the detector head to calibrate the gas span that is detected.

9.4.3 Open Door CO₂ Sensor Calibration Routine

The CO₂ inject rate is automatically calculated from the CO₂ injection made during the span calibration making it unnecessary to run the separate "Injection Calibration". The injection is dependent on the proper gas pressure and factory set flow rate. Any changes in either will result in a change to the value reached during this injection.

9.4.4 Closed Door CO₂ Sensor Calibration Routine

- Attach independent CO₂ monitoring device to the sample port on the front of the unit
- Enter CO₂ calibrations by means of Service Settings
- Select the “CO₂ Closed Door Zero Span” text
- Follow on screen instructions

Enter measurement on independent device when prompted

Allow unit to run and stabilize for a minimum of 2 hours then, check calibration with an independent instrument. Compare the display CO₂ percent to your independent measurement. If these two readings have a difference greater than 0.3%, repeat above procedure. If these two readings have a difference of less than 0.3%, perform the CO₂ Offset calibration procedure in Section 9.4.1.

9.4.5 CO₂ Injection Calibration

The CO₂ injection calibration can be performed separately from zero/span calibration to optimize the gas injection time required to recover the CO₂ level to set point after a door opening. The recovery time should be as minimal as possible with virtually no overshoot. Verify the CO₂ sensor calibration prior to performing an injection calibration. The injection calibration is not required after an “Open Door” sensor calibration since it is performed automatically during this routine. The injection calibration should be performed after a “Closed Door” sensor calibration when possible, if CO₂ supply pressure of the Incubator is changed, or is the CO₂ flow control valve is disturbed.

The following steps should be taken for the CO₂ injection calibration:

- Enter CO₂ Calibrations by means of the Service Settings menu
- Select the “CO₂ Injection Time” text
- Follow the on screen instructions

9.5 Relative Humidity sensor calibration - System available on Models NU-5820, NU-5840 & NU-5841

Relative humidity calibration can be performed anytime if the relative humidity system has been installed. The relative humidity sensor can be calibrated from a known source of humidity within the Incubator chamber. Typically, the water pan is used because it has a known minimum humidity level of 96 percent after 12 hours. A hygrometer can also be used to calibrate the chamber Relative Humidity. See the following instructions for both methods of calibration.

9.5.1 Calibrating with a water pan (included with the Incubator)

As stated in the introduction the relative humidity sensor can be calibrated from a known source of humidity within the Incubator chamber. Typically, the water pan is used because it has a known minimum humidity level of 96 percent after 12 hours **when the Air injections are deactivated.**

To use the water pan

- Access the Environmental Set points screen to set the RH set point to zero if not set there already.
- Go to the Service Settings/General/Options button and change the Air Inject time from 5 (sec) to 0 (sec). This will stop air injections which is necessary to reach RH saturation of the chamber.
- After 12 hours refer to 9.5.3 Display Offset Calibration section for instructions on how to adjust the display displayed value for RH.
- Set the calibration to 96% RH
- Remember to reset the air inject time to 5(sec.) after you complete the calibration and choose your RH set point above zero.

Note: Some condensation can be expected in the chamber at this humidity level with the air injections turned off.

9.5.2 Calibrating with a Hygrometer

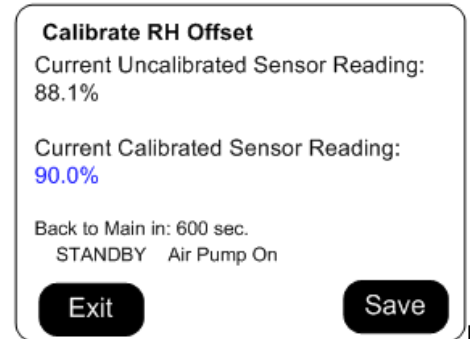
When unit chamber has stabilized at the operational temperature, CO₂%, the RH set point has been chosen and with water in the tank the heater has been powered for at least 30 minutes ensuring it is up to temperature. Allow the RH system to achieve set point and stabilize there for at least 30 minutes. Then a measurement with an independent hygrometer probe can be made. It is usually inserted into the chamber through the chamber access port located on the right side of the incubator. The Hygrometer must be up left undisturbed until it indicates that it is up to the chamber temperature or until the temperature on the hygrometer stops increasing for at least 5 min. Take a reading then move to the Display Offset Calibration described in the next section to adjust the RH value for the incubator system.

ACCURACY OF CALIBRATION W/ THE HYGROMETER:

The hygrometer used to calibrate the Incubator sensor will have a tolerance that is specified by the manufacturer of the instrument. The tolerance of accurate hygrometers can be as tight as $\pm 2\%$ others can have tolerances of $\pm 3\%$ or greater at this humidity level. This means that when 90% is read on the instrument the actual relative humidity percentage can be at the high or low limit of the hygrometer's tolerance. If condensation is encountered the value that the incubator displays can be adjusted accordingly.

9.5.3 Display Offset Calibration:

Pressing the Calibrate button on the Service settings screen produces the Calibrate the RH offset screen as show to the right. Press the Calibrated sensor reading value (blue text) to access the key pad screen then, to input the independently measured value and press the ENT button on the key pad. This returns you to the "Calibrate RH offset" screen. I might take a couple of seconds for the new value to appear in this screen. Then, press the **SAVE** button to return to the "Service settings screen". Pressing the exit button in that screen will return you to the MAIN screen.



NOTES:

1. When you use the Water pan method of calibration remember to set the "Air Inject Time" back to 5 (sec). Otherwise Condensation is likely to form in the chamber. That Option is accessed through Service settings/General/Options button.
2. Choose the desired set-point that you want to run the system at in the "Environmental Set Point screen remembering that it was set to 0 (zero) for the calibration.

9.6 O₂ Calibration – System available on Models NU-5830, NU-5831, NU-5840 & NU-5841

When unit chamber has stabilized at the operational temperature, CO₂%, and RH%, O₂ system has been powered for at least 10 minutes ensuring the sensor is up to temperature - take an O₂ measurement with an independent instrument Through the chamber sample port used for taking CO₂ readings. It is located behind the hinged cover under the incubator outer door and, if necessary, perform the following:

NOTE: If a Fyrite instrument is used,

BE SURE TO READ THE O₂ FYRITE OPERATING AND SAFETY INSTRUCTIONS FOR PROPER O₂ MEASUREMENTS AND SAFETY CONSIDERATIONS.

Display Offset Calibration:

Press the Calibrate button on the Service settings screen produces the Calibrate the O₂ offset screen. Press the Calibrated sensor reading value to access the key pad to input the independently measured value then press the ENT button on the key pad. When you return the Calibrate O₂ offset screen press the save button to return to the System settings screen. Press the exit button in this screen to go back to the main screen.

10.0 Maintaining Your DHD

DHD Chamber

The chamber maintenance is up to the discretion of the owner and the extent of cleanliness and sterility desired. The shelves and bracket supports are all removable and autoclavable. The interior should be wiped down with an appropriate disinfectant such as 70% ISOPROPYL ALCOHOL or equivalent.

 **Note: DO NOT USE ANY CHLORINATED OR HALOGEN MATERIALS IN THE CHAMBER. SUCH MATERIAL IS HARMFUL TO THE POLISHED STAINLESS STEEL.**

The humidity pan should also be sterilized and the water changed regularly to assure sterility. A small amount of copper sulfate may be added to the humidity pan to inhibit bacterial growth.

CO₂ Supply Filter

P/N X-980385 (50 mm Disk, Uni-directional In-Line, Dry)*

The CO₂ Supply Filter should be replaced every fifth empty CO₂ tank or when the filter is visibly discolored (yellow-brown).

Note: Direction of flow (IN is labeled on one side of filter) when replacing filter.

Sensor Bay Capsule Filter

P/N X-980398-02 (Capsule, Uni-Directional In-Line, Wet)

The CO₂ Sensor Filter should be replaced EVERY TWO YEARS to assure optimum performance.

A visual check should be performed during CO₂ sensor calibration to assure filter integrity.

Remove sensor housing cover to perform visual check.

Outlet port is on flat top side.

Air Supply Filter

P/N X-980385 (50 mm Disk, Uni-directional In-Line, Dry)*

The Air Supply Filter should be replaced every fifth empty CO₂ tank or when the filter is visibly discolored (yellow-brown).

Note: direction of flow (IN is labeled on one side of filter) when replacing filter.

Air Pump Filters

P/N X-980366 (50mm Disk, Uni-Directional In-Line, Wet)*

The Air Pump Filters should be replaced EVERY TWO YEARS to assure optimum performance.

A visual check should be performed during CO₂ sensor calibration to assure filter integrity.

Remove the sensor housing cover to perform visual check.

CO₂ Sensor Filter

P/N X-980366 (50mm Disk, Uni-Directional In-Line, Wet)*

The filter should be changed when discolored (yellow brown).

The filter is plumbed in the chamber sample hose and can be inspected when the cover is removed to check the air pump filter.

This filter has a green dot to distinguish it from the "dry" filter.

*** Note:** The word "In" on the outer rink of the body indicates the inlet side of the filter and should be installed toward the gas supply.

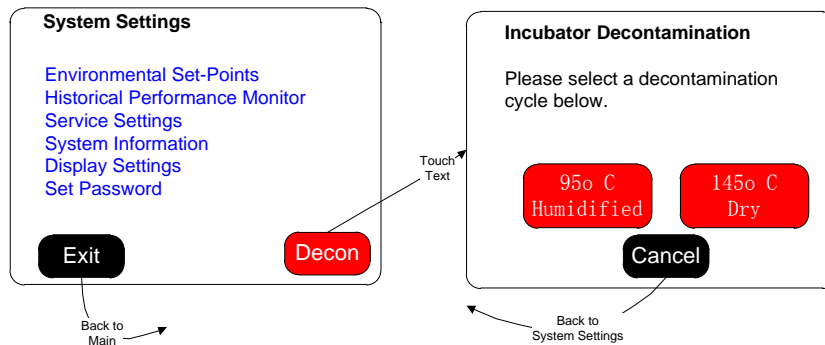
10.1 Heated Decon Cycles

Heated Decontamination Cycle Preparation and use Procedures for Incubator models:
NU-5810, NU-5820, NU-5830, NU-5831, NU-5840 and NU-5841

IMPORTANT **READ AND UNDERSTAND ALL OF THE ATTACHED INSTRUCTIONS BEFORE USING** **THE HEATED DECONTAMINATION CYCLES**

NuAire gives the lab professional the choice of the 2 most commonly accepted, heated decontamination cycles available. They are a 95°C humidified cycle and a 145°C dry cycle. To choose, the user goes to the System Settings menu and pushes the Decon button in the lower right hand of the display. From there it will ask which Decon (95 or 145), and proceed to instruct the user in preparation of the chamber.

Choosing the 145° DECON CYCLE



The 145°C decontamination cycle is high temperature dry cycle to ensure that the contaminating agents are eradicated. The complete cycle takes less than 8 hours to run. (See graph for cycle phases). There is no need to recalibrate or remove the CO₂ IR sensor since it is not located in the chamber. See the instructions above for choosing this cycle in the System Settings Menu.



OUTER DOOR MUST REMAIN CLOSED DURING THE DOCONTAMINATION CYCLE OR IF CHAMBER TEMPERATURE IS OVER 55°.



THE DECONTAMINATION CYCLE WILL HEAT THE INCUBATOR INTERIOR SURFACES TO 145° C +. CONTACT WITH ANY SURFACE INSIDE OF THE OUTER DOOR DURING THIS CYCLE CAN RESULT IN BURNS.

PREPARATION

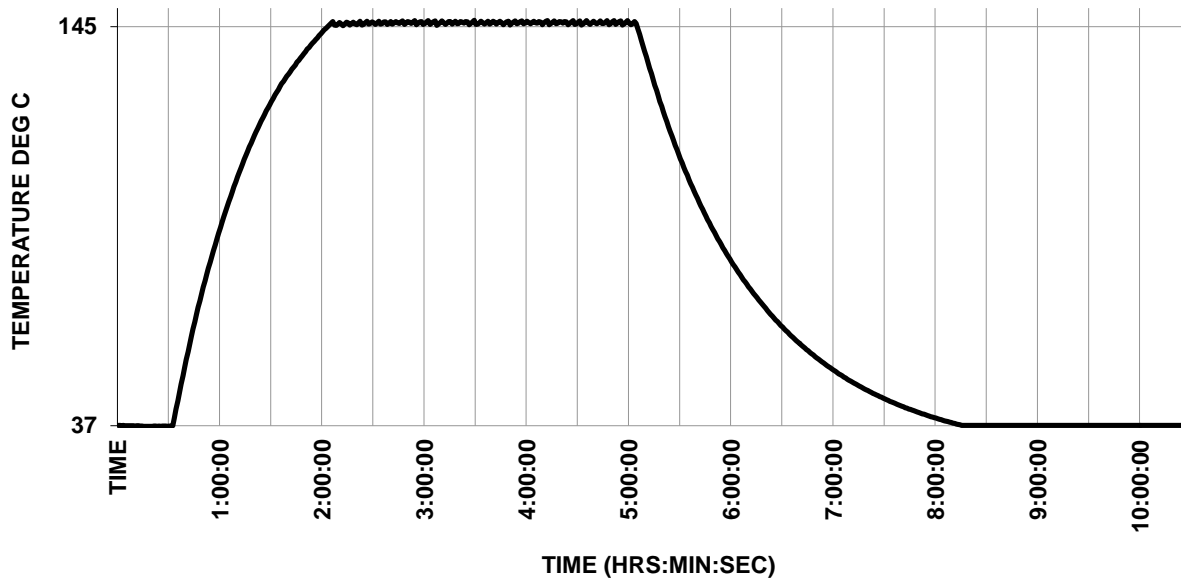
Following the prompts in the incubator display screen you will:

- Remove culture cells, samples, dishes, instruments, or other user-introduced equipment from the chamber.
- Wiping out all spills and materials from chamber walls, shelves, plenums, & inner door may be required to avoid stains, odor and material baked on these surfaces during the cycle.
- IF a cleaner is used make sure it is compatible with the construction of the chamber (stainless steel).
- Ensure the hole in the access port plug at the back of the Incubator is open.
This is a relief for the chamber during the Decon Cycle.
- Models NU-5820/NU-5840/NU-5841 remove the RH sensor from upper left side of the back wall of the chamber. The sensor will be damaged if it is not removed. The sensor cable is made to withstand the heat of a decon cycle and is left in place.



FOLLOW ALL FEDERAL, STATE AND LOCAL REGULATIONS THAT APPLY WHEN USING CLEANER. ANY RESIDUE LEFT OF THE CLEANER WILL BE EXPOSED TO THE DECON. TEMPERATURES CHECK WITH MANUFACTURER ABOUT EXPOSURE OF THE CLEANER TO THESE TEMPERATURES.

DRY 145° C DECON CYCLE

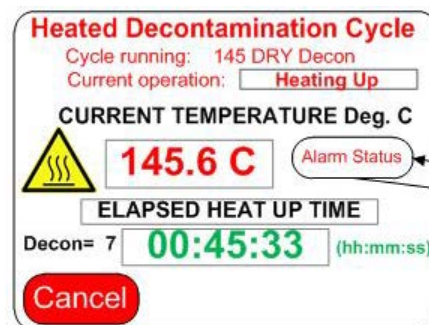


Note:

- CO₂, RH and O₂ control systems will be idle during the cycle.
- Protection of the CO₂ and O₂ sensors during the heated cycle is automatic.
- RH sensor must be removed from all models equipped with RH control the as stated in the Preparation section and in the NuTouch screen prompts that show during the startup of the cycle. The sensor will be damaged if it is not removed.
- The Decon Cycle will not advance to the heat up phase unless the door is opened .
- Follow the on screen instructions, pressing the Next button when each step is completed

Start the decon cycle by following the prompts on the NuTouch display screen. The decon cycle will automatically go through the following phases:

- HEAT UP** 1 hour on average
- Complete the chamber preparation and either schedule a start time or press the Start button to start the heat up portion of the cycle.
 - Temperature display shows chamber temperature.
 - Text displays that the unit is currently in the Heating Up cycle
 - A timer tracks how long the unit has been heating thus far



Alarm Button
Shows up only if
Alarms are present

- DECONTAMINATION** 3 hours
- The unit automatically starts a countdown timer for the correct length of cycle when the decontamination temperature is reached.
 - Temperature display shows chamber temperature.
 - Text displays that the unit is currently in the Decontamination cycle.
- COOL DOWN & STABILIZING** 4 hours
- When the decontamination period is complete the heaters are shut off and the air pump is turned on blowing HEPA filtered air to cool the chamber to the user chosen temperature set point.
 - Temperature display shows chamber temperature during cycle.
 - Text displays that the unit is currently in the Cooling Down portion of the DECON cycle
 - A count up timer (incrementing time) tracks how long the unit has been cooling down

CYCLE COMPLETE

- Indicates the user should:
 - Refill the water pan with single distilled water no purer than 1 Mega OHM in preparation to return to normal running.

Note: If Decon Cycle is run as routine maintenance, it is ok to reuse the HEPA filters for the service life indicated in Section 10.

If contamination is an issue due to the room environment, HEPA filters can be replaced as necessary.

RESUME NORMAL OPERATION

- Press the Exit button after fulfilling the on screen instructions
 - This puts the Incubator into normal run mode
 - CO₂ control resumes
 - Checking the calibration of the temperature sensor is recommended.
- Follow the instructions in section 9.1 of the manual

DECON CYCLE NOTES:

- Aborting the cycle:
To abort any phase of either the 95 or 145 decontamination cycles press the cancel button to step through the different phases of the cycle that are described above. The cool down phase cannot be bypassed until temperature reduces to the temperature set point. See cautions below.
- In case of a power interruption, the heat up, drying & cool down phases will resume when power is restored. The decon phase will reset to the beginning of the 3-hour cycle or if the temperature drops more than 10° it will go back to the heat up phase then resume the cycle when decon temperature is reached.
- It is considered normal for some odor to occur during the Decon Cycles.
This odor reduces with use of the Decon Cycle.
- Some discoloration due to heat of the chamber and its components can be expected.
- If decon temperature is not reached within the time allotted (set by the temp. Time Out option).
The Incubator will alarm and indicate an Alarm Status condition in the display.
- If the inner glass door is opened during the Decon Cycle an alarm sounds and the Decon Door Open Alarm will overtake the display telling the user to close the door.
- Place Incubators 10" apart when placed side-by-side to enable running the heated Decon Cycle while surrounding Incubators are in normal run mode.

USING THE 95° DECON CYCLE

The 95° C decontamination cycle is humidified to ensure that the contaminating agents are eradicated. The complete cycle takes about 14 hours to run. (See graph for cycle phases). There is no need to recalibrate or remove the CO₂ IR sensor since it is remote from the chamber.



OUTER DOOR MUST REMAIN CLOSED DURING THE DOCONTAMINATION CYCLE OR IF TEMPERATURE IS OVER 55°.



THE DECONTAMINATION CYCLE WILL HEAT THE INCUBATOR INTERIOR SURFACES TO 95° C +. CONTACT WITH ANY SURFACE INSIDE OF THE OUTER DOOR DURING THIS CYCLE CAN RESULT IN BURNS.

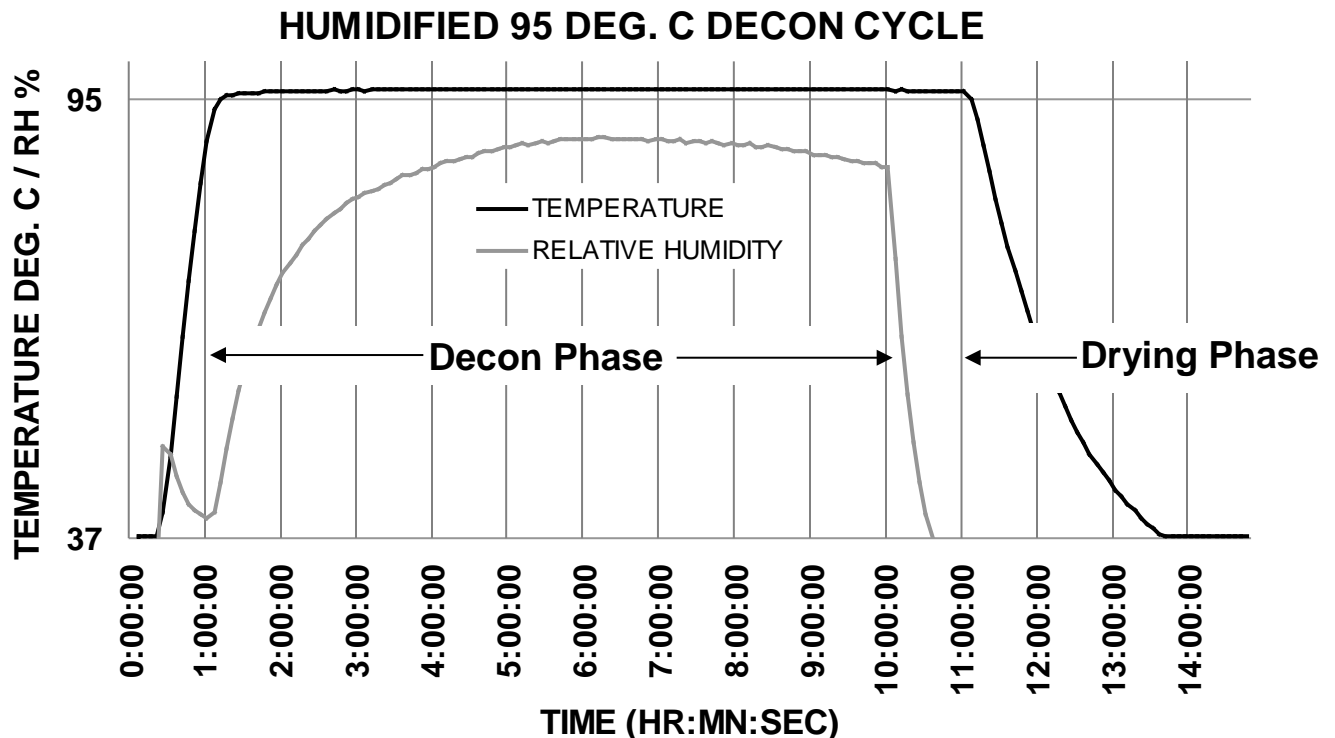
PREPARATION

Following the prompts in the incubator display screen you will:

- Remove culture cells, samples, dishes, instruments, or other user-introduced equipment from the chamber.
- Wipe out all spills and materials from chamber walls, shelves, and plenums using a disinfectant of choice that is compatible with construction of the Incubator chamber and instrumentation.
- Ensure the hole in the access port plug at the back of the Incubator is open. This is a relief for the chamber during the Decon Cycle.
- Ensure that the sample port in the front panel of the Incubator is capped. Condensation can form in tubing if it is left open.
- Models NU-5820/NU-5840/NU-5841 remove the RH sensor from upper left side of the back wall of the chamber. The sensor will be damaged if it is not removed. The sensor cable is made to withstand the heat of a decon cycle and is left in place.
- Empty water pan then clean it with a disinfectant then, fill with 300ml of water. Place it back in the chamber on the highest shelf for the decon cycle.



FOLLOW ALL FEDERAL, STATE AND LOCAL REGULATIONS THAT APPLY TO THE DISINFECTANT USED TO CLEAN THE CHAMBER.



Note:

- CO₂, RH and O₂ systems will be idle during the cycle.
- Protection of the CO₂ and O₂ sensors during the heated cycle is automatic.
- RH sensor must be removed from all models equipped with RH control as stated in the Preparation section and in the NuTouch screen prompts that show during the startup of the cycle. The sensor will be damaged if it is not removed.
- The Decon Cycle will not advance to the heat up phase unless the door is opened so that the NuTouch screen prompts to empty the water pan, clean the chamber and remove the RH sensor are followed.
- Follow the on screen instructions, pressing the Next button when each step is completed

Start the decon cycle by following the prompts on the NuTouch display screen. The decon cycle will automatically go through the following phases:

HEAT UP .75 hours

- Complete the chamber preparation and either schedule a start time or press the Start button to start the heat up portion of the cycle.
- Temperature display shows chamber temperature.
- Text displays that the unit is currently in the Heating Up cycle
- A timer tracks how long the unit has been heating thus far

DECONTAMINATION 9 hours

- The unit automatically starts a timer for the correct length of cycle when the decontamination temperature is reached.
- Temperature display shows chamber temperature.
- The Text displays that the Decontamination cycle is in progress
- A timer tracks the remaining time in Decontamination

HUMIDITY REDUCTION 1 hour

- The unit remains at the decontamination temperature and the air pump is turned on to reduce the humidity left from the decontamination phase.
- Temperature display shows chamber temperature during cycle.
- The Text displays that the Decontamination cycle is in progress
- A timer tracks the remaining time in Decontamination.

COOL DOWN 3 hours

- When the humidity reduction period is complete the heaters are shut off to cool the chamber to the user chosen temperature set point.
- Temperature display shows chamber temperature during cycle.
- The Text displays that the unit is now in the Cooling Down cycle
- A timer tracks how long the unit has been cooling

CYCLE COMPLETE

- Indicates the user should:
 - Refill the water pan with single distilled water no purer than 1 Mega OHM in preparation to return to normal running.

Note: If Decon Cycle is run as routine maintenance, it is ok to reuse the HEPA filters for the service life indicated in Section 10. If contamination is an issue due to the room environment, HEPA filters can be replaced as necessary.

RESUME NORMAL OPERATION

- Press the Exit button after fulfilling the on screen instructions.
- This puts the Incubator into normal run mode
- CO₂ control resumes
- Checking the calibration of the temperature sensor is recommended.
- Follow the instructions in section 9.1 of the manual

10.2 Chemical Decontamination of the Incubator Chamber

To chemically decontaminate NuAire Incubator inner chambers, users may use the traditional formaldehyde or Chlorine Dioxide in gas form, or Vapor Phased Hydrogen Peroxide. All three of the chemicals are compatible to all parts within NuAire Incubator chambers. The incubator should be turned off during these procedures

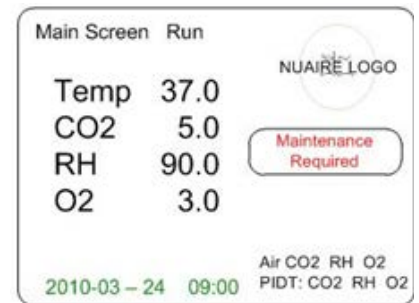
Note: As stated previously, the chamber and components can also be wiped down with a 70% solution of Isopropyl Alcohol for cleaning and decontamination.

10.3 Shutting down the Incubator

Prior to shutting down the Incubator open the inner and outer doors and remove the water pan. Leave doors open for at least 5 minutes prior to shutting it off. This will purge the chamber, circulating system and the sensors of humidity that could condense and cause faulty readings when the Incubator is turned back on. Be sure to empty the water pan prior to putting it back into the chamber if the Incubator is going to be shut off for any length of time.

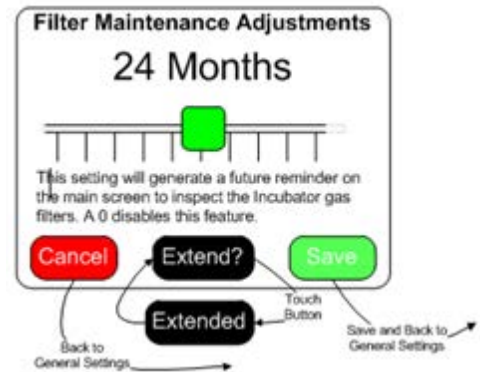
10.4 Automatic Filter Change Notification

The Capsule filter located in the Sensor bay (see BCD- 15634 for location) should be checked average every 2 years to see if it should be changed. The Filter material is normally a white material. Discoloration of the filter material is an indicator that it should be changed. Retro Fit Kit RF566 should be ordered for the replacement filter. A timed notice triggers a Maintenance Notification button in the Main Screen when this timer counts down to zero. Pressing the Maintenance Required button produces a screen indicating that the timer for filter life has expired.



Responding to the notification:

From the main screen press the NuAire Logo / Service settings / General Option / Settings / Filter Maintenance to access the Filter Maintenance Adjustments screen. In this screen you can extend the alarm by 1 month by pushing the Extend? button. Reset the notification timer from 1 month to 48 months by sliding the green button right or left on the scale. The number of months showing will change as the button is moved. Setting the timer to 0 months deactivates the notification. After extending or resetting the timer you can return to the main screen by following the screen prompts.

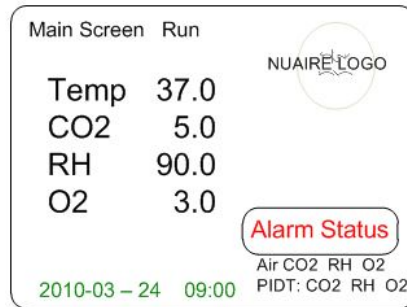


11.0 Error Indicators & Troubleshooting

Step 1 NOTE ALL ERROR INDICATORS.

When the Incubator is running, the Alarm Status button indicates an error.

Pressing the Alarm Status button, entering the correlating Alarms Menu and pressing the Silence button in the Alarms Menu will silence the audible alarm until Diagnostics is entered or another alarm becomes active.

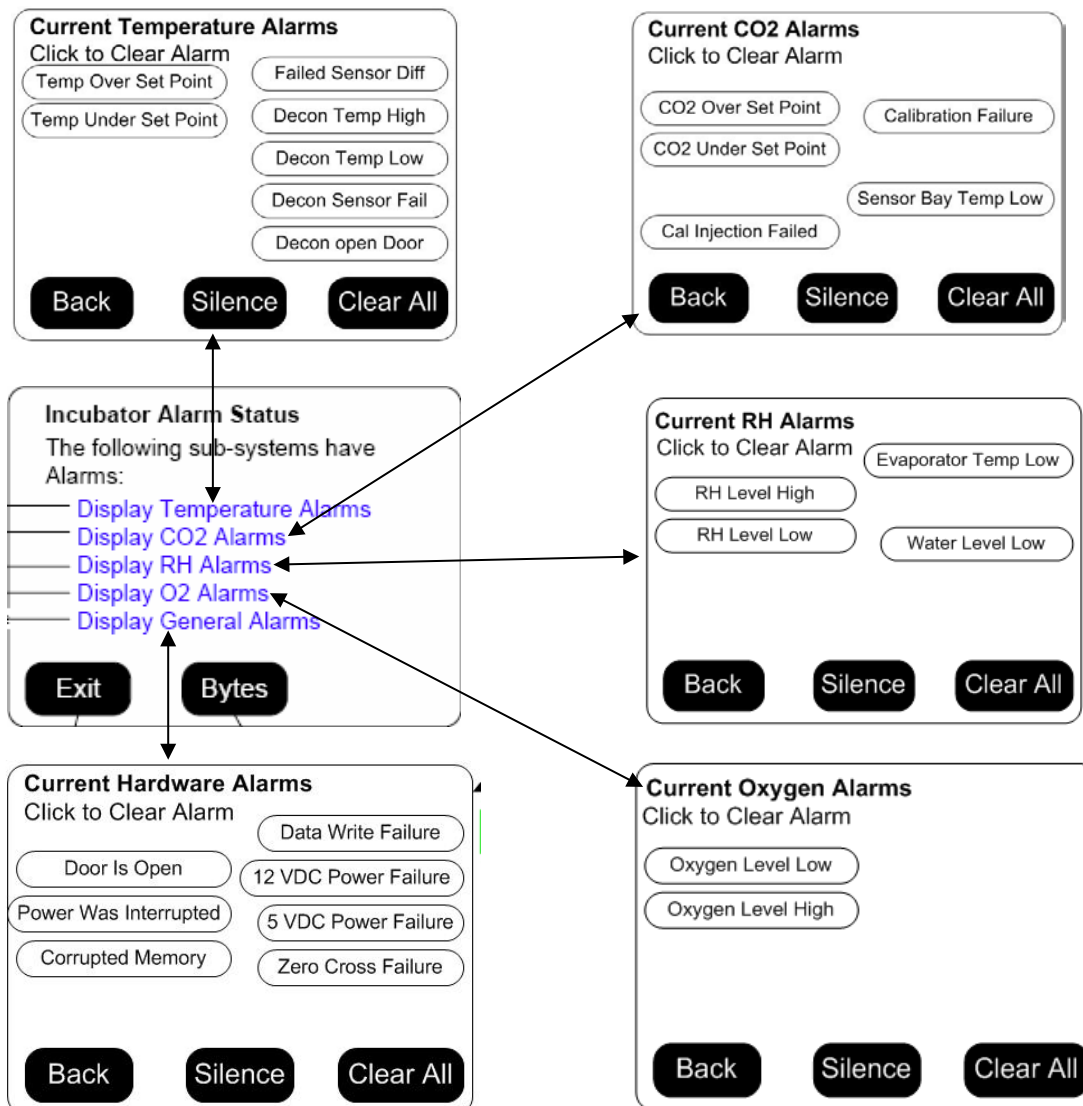


Step 2 CLEAR ERROR INDICATORS.

Error indicators can be cleared by entering the Alarms Menu and pressing the Clear All button; if the error is still present the indicator will return when the alarm time reaches 0.

Step 3 MONITOR REOCCURRENCE OF ERROR INDICATORS.

If reoccurrence of the error indicator is immediate or daily, use guide below to correct the situation.



Error Indicator Troubleshooting Guide

Displayed Error Code	Code Description	Checks and Corrections
Temperature System		
Temp Over Set Point, Decon Temp High	-Temperature over setpoint Normal mode and Decon Cycle	Check temperature sensor calibration. Faulty TRIAC, replace control board.
Temp Under Set Point, Decon Temp Low	-Temperature time out error during normal running and in Decon Cycle - Decon Time Out	Check temperature sensor calibration Replace fuse. Faulty TRIAC, replace control board Faulty chamber heater contact NuAire Technical Service. Door/Perimeter heater needs to be increased with a high temperature set-point in a low ambient temperature
Failed Sensor Differential	-Sensor temperature (differential) error normal running. -Occurs when difference between sensors exceeds 4°C.	Check temperature sensor calibration Check connection on control board One or both temp sensors faulty, replace
Decon Sensor Fail	-Sensor temperature (differential) error Decon Cycle. -Occurs when difference between sensors exceeds 10° C.	Check temperature sensor calibration Check connection on control board One or both temp sensors faulty, replace
CO₂ Sensor Shroud Heater		
Temp Sensor Failure	-Defective shroud temperature sensor	Confirm it is plugged in at board connector P6. Replace CO ₂ shroud temperature sensor
Sensor Bay Temp Low	-Low shroud temperature	Check control board output to relay, replace board if faulty. Check heater relay for function, replace if faulty Check both shroud heaters for function, replace if faulty.
CO₂ System		
CO₂ Over Set Point	- CO ₂ over setpoint	Perform CO ₂ sensor calibration Check injection solenoid for leaking valve Check sensor and disk filter for condensation
CO₂ Under Set Point	- CO ₂ time out error	Check CO ₂ gas supply - inline gas filters, CO ₂ gas tank pressure, CO ₂ sensor function Run Cal Inj. Calibration (see Section 9.3.3) Check/replace CO ₂ gas supply tanks Check for leaks in chamber - inner door gasket, chamber blower fan shaft seal Check for leaks in air pump and hosing
Cal Inject Failed	- Cal inject calibration failed. Not enough increase in the CO ₂ reading after gas was injected.	Check gas supply then run calibration again Call NuAire Technical Services if error persists.
RH System		
RH Level High	- RH over set point beyond the alarm limit	Perform RH sensor calibration Check injection solenoid for leaking valve Check sensor & moisture barrier in sensor cap for moisture
RH Level Low	- RH Level is below the set point beyond the alarm limit and the timer has counted down to zero	Perform RH sensor calibration Check RH tank for water level if low check Float switch in tank for function if Maintenance reminder does not appear in the MAIN screen Check for leaks in chamber Check for leaks in air pump and hosing Check sensor and inject solenoid for loose connections
Evaporator Temp low	-Water temperature in the water tank is below the alarm limit and the timer has counted down to zero	Check for loose connections on the tank heater Check for loose connections on the tank temperature sensor Check the tank heater for function replace if faulty.

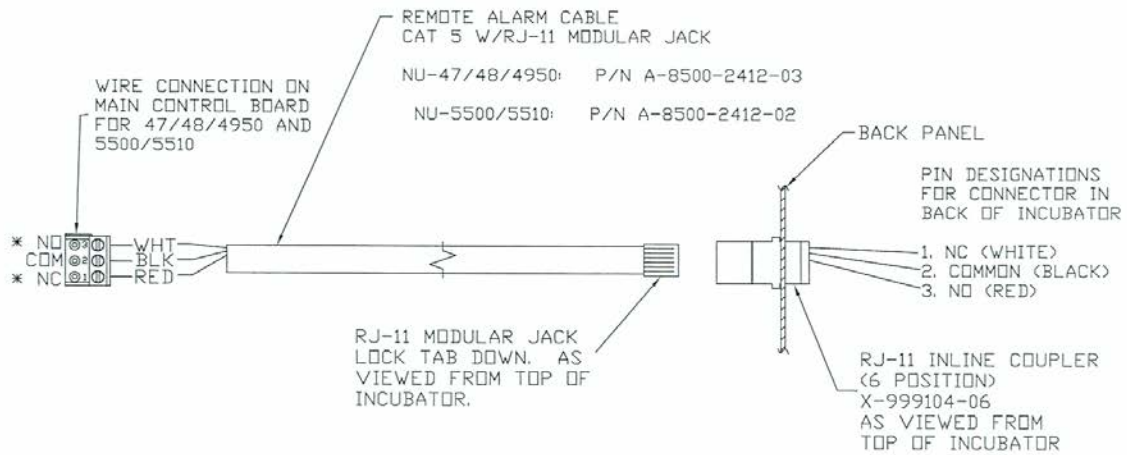
Displayed Error Code	Code Description	Checks and Corrections
O₂ System		
O₂ Under Set Point	- O ₂ under set point	Perform O ₂ sensor calibration Check injection solenoid for leaking valve Check sensor and disk filter for condensation
O₂ Over Set Point	- O ₂ time out error	Check O ₂ gas supply - inline gas filters, CO ₂ gas tank pressure, O ₂ sensor function Check/replace O ₂ gas supply tanks Check for leaks in chamber - inner door gasket, chamber blower fan shaft seal Check for leaks in air pump and hosing
General Indicators		
Door Ajar	- Inner glass door is not closed or switch not making connection with the control board.	Close and latch inner glass door. Confirm connection on the Control Board Check door switch, if faulty, replace.
“Power Interruption” Text instead of the NuAire Logo	- Interruption of power	Press the power interruption text to dismiss the notice.
Corrupted Memory	Corrupted memory was detected during boot up of the incubator	Replace Control Board
Data Write Failure	A change in parameters failed to write to memory	Replace Control board
12 VDC Power Failure	Low voltage detected on the 12 VDC power circuit	Check output @ Power Supply-If good could be Control Bd Check power supply connection to Control board DC power supply failed - replace
5 VDC Power Failure	Low voltage detected on the 5 VDC power circuit	Check output @ Power Supply-If good could be Control Bd Check power supply connection to Control board DC power supply failed - replace
Zero Cross Failure	The Power Triacs control circuit not working	Check for loose line voltage connection to control board Replace fuse with slow blow fuse of the correct amp rating as specified on the wiring diagram Replace Control Board
Condensation Excessive (Humidity pan in place)	- Glass door, gasket or front wall of chamber is wet.	Increase door and front perimeter heater duty cycles. See section 9 for detailed instructions.
	- Back wall bottom and top walls	Decrease door and front perimeter heater duty cycle. See section 9 for detailed instructions.
Note: Depending on the room ambient that the Incubator is operating, the operator may have to readjust the door and perimeter heater duty cycle are too high and likewise if the door and perimeter heater duty cycles are too low the glass door and front wall of the chamber will show excessive condensation.		
Condensation Persists After Door and Perimeter Duty Cycles are Adjusted		Increase air injections, increasing duration first, recommended initial change to 6 sec (Air Inj) & 1 min (Air Cyc)
Excess Vibration		Check for and remove the block of shipping foam from under the air pump. Check jacket fan mounted in bottom on Incubator Turn the incubator off. If the vibration persists it is from the room where the incubator is installed
Maintenance Required Button in Main Screen	Press button Message says it is time to change Filter	Check and Change filters in sensor bay and reset timer Check Filter and extend timer if filter doesn't need changing Extend Timer – See section 10.4 for more detail on all responses
	Message is RH Watertank	Fill with maximum 3 liters of distilled single water no purer Than 1 Mega Ohm – removes message on main screen

For further assistance, call NuAire Customer Service at 1-800-328-3352 or (763) 553-1270 USA.

12.0 Communication Outputs

12.1 Remote Alarm Contacts

The NuAire DHD Incubator contains a set of contact points to connect to a remote alarm system. The contacts are located on the rear panel (see page 14). The contacts are housed in a modular (RJ-11) telephone jack and rated for (30V at 1 Amp). The contacts provided are normally open (NO), normally closed (NC) and common (COM) as shown below. The alarm contacts do not distinguish between a CO₂ temperature and any other alarm. Each will open or close the contacts upon an alarm condition. Power interruption will also change the state of the contacts. To reset the alarm contents press the Run/Setup key to setup, then back to Run.



* THE STATE OF THE CONTACTS EITHER NORMALLY OPEN (NO) or NORMALLY CLOSED (NC) INDICATED IN THIS DRAWING OCCURS WHEN INCUBATOR IS TURNED ON. THE STATE INDICATED ON THE PCB BOARD OCCURS WITH THE INCUBATOR TURNED OFF.

12.2 4 to 20mA Analog System Performance Output:

Refer to PTB0235

12.3 RS-485 2-way Communications:

Refer to PTB0234

12.4 On-Board USB Port:

Uploading Service Performance/Event Data:

Refer to STB0213

Uploading Incubator Programming:

Refer to PTB0212

13.0 Electrical/Environmental Requirements

13.1 Electrical

Models: NU-5510, 5820,5830,5831,5840, & 5841

Domestic Units:	115V,	50/60Hz,	1 Phase,	10.0 Amps
"E" Units	230V,	50/60Hz,	1 Phase,	5.0 Amps

Start Up Power 345 WATTS

Running Power 175 WATTS

Decon Cycle 995 WATTS

13.2 Operational Performance (for indoor use only)

Environment Temperature Range: 60°F-85°F (15.5°C – 29.4°C)

Environment Humidity: 20% - 60% Relative Humidity

Environment Altitude: 6562 ft (2000 m) over sea level maximum

13.3 Light Exposure

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

13.4 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 2500V for a 230V supply and 1500V for a 120V supply.

13.5 Pollution Degree: 2.0

Pollution degree describes the amount of conductive pollution present in the operating environment. Pollution degree 2.0 assumes that normally only non-conductive pollution such as dust occurs with the exception of occasional conductivity caused by condensation.

13.6 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.

13.7 EMC Performance (classified for light industrial)

European Standard EN 61000-3-2 (1995) (+A14: 2000) Electromagnetic Compatibility Limits for Harmonic Current Emissions (equipment input current \leq 16 Amps per phase).

European Standard EN 61000-3-3 (1995) Electromagnetic Compatibility - limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current \leq 16 Amps.


European Standard EN 61326-1 (1997) (+Amendment A1, 1998) Electrical Equipment for Measurement, Control, and Laboratory Use - EMC Requirements.

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.

13.8 Heat Rejection: 10 BTU/Min.

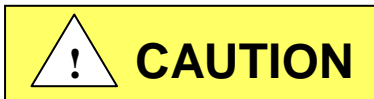
14.0 Disposal and Recycle

Incubators that are no longer in use and are ready for disposal contain reusable materials. ALL components with the exception of the HEPA filters may be disposed and/or recycled after they are known to be properly disinfected.

 **Note:** Follow all local, state and federal guidelines for disposal of HEPA filter solid waste.



BIOHAZARD



Prior to any disassembly for disposal the incubator must be decontaminated



RECYCLE

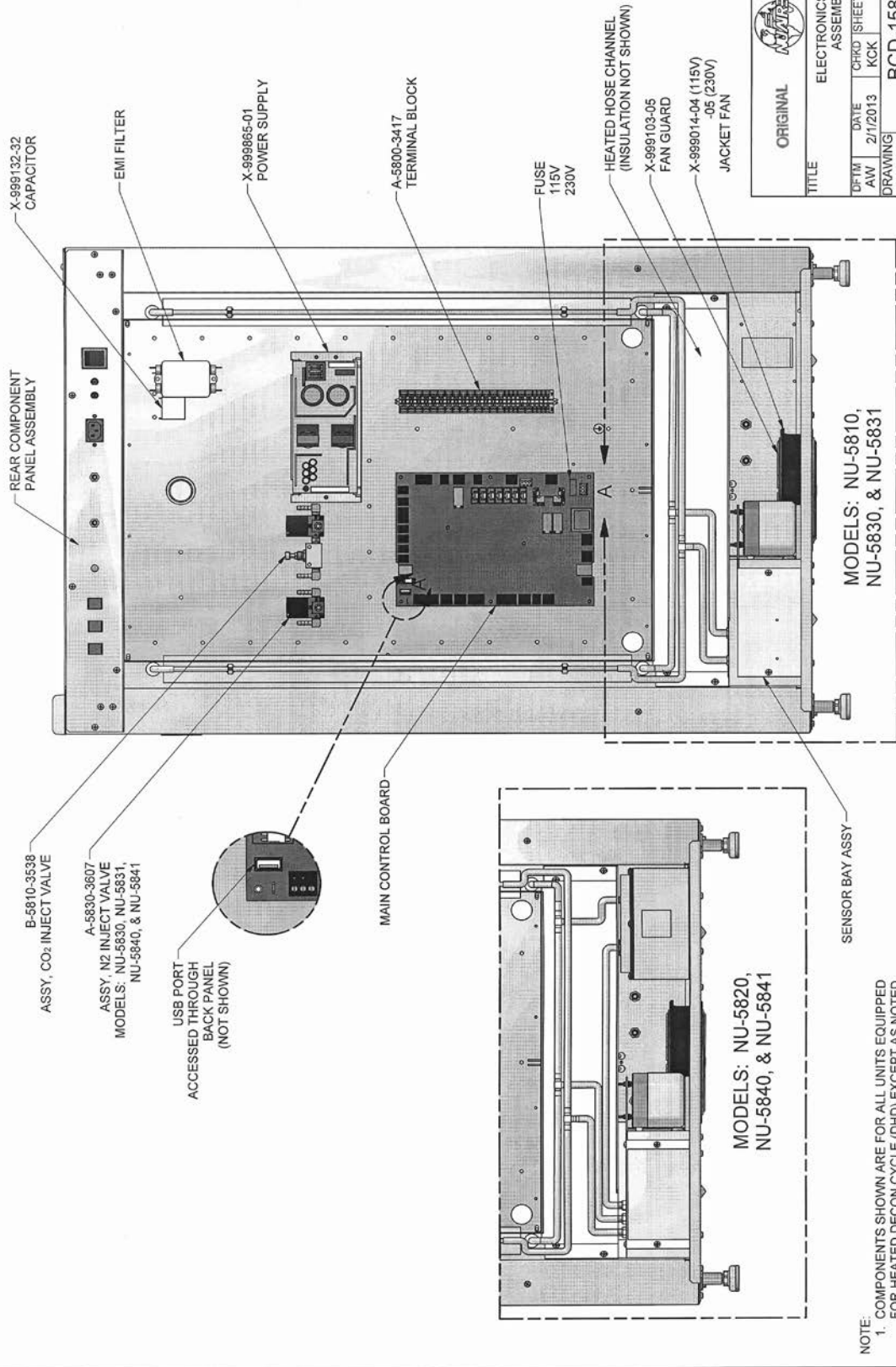
LEAD FREE

Component	Material
Incubator Cabinet	Painted Steel
Outer Door	Painted Steel
Chamber	Stainless Steel
Outer Door Gasket	Vinyl Clad Magnet
Inner Door Gasket	Silicon Rubber
Front Service Panel	Painted Steel
Electronics Panel	Painted Steel
Sensor Bay	Aluminum
Exhaust Filter	Aluminum
Hosing	Silicon Rubber
Tubing	Stainless Steel
Air Pump	Various Steel/Copper/Nylon
Motor	Various Steel/Copper/PVC
Printed Wiring Assembly	Lead Free Electronic
Wire	PVC Coated Copper
Solenoid Valves	Various Steel/Copper
Connectors	PVC
Hardware	Stainless Steel and Steel

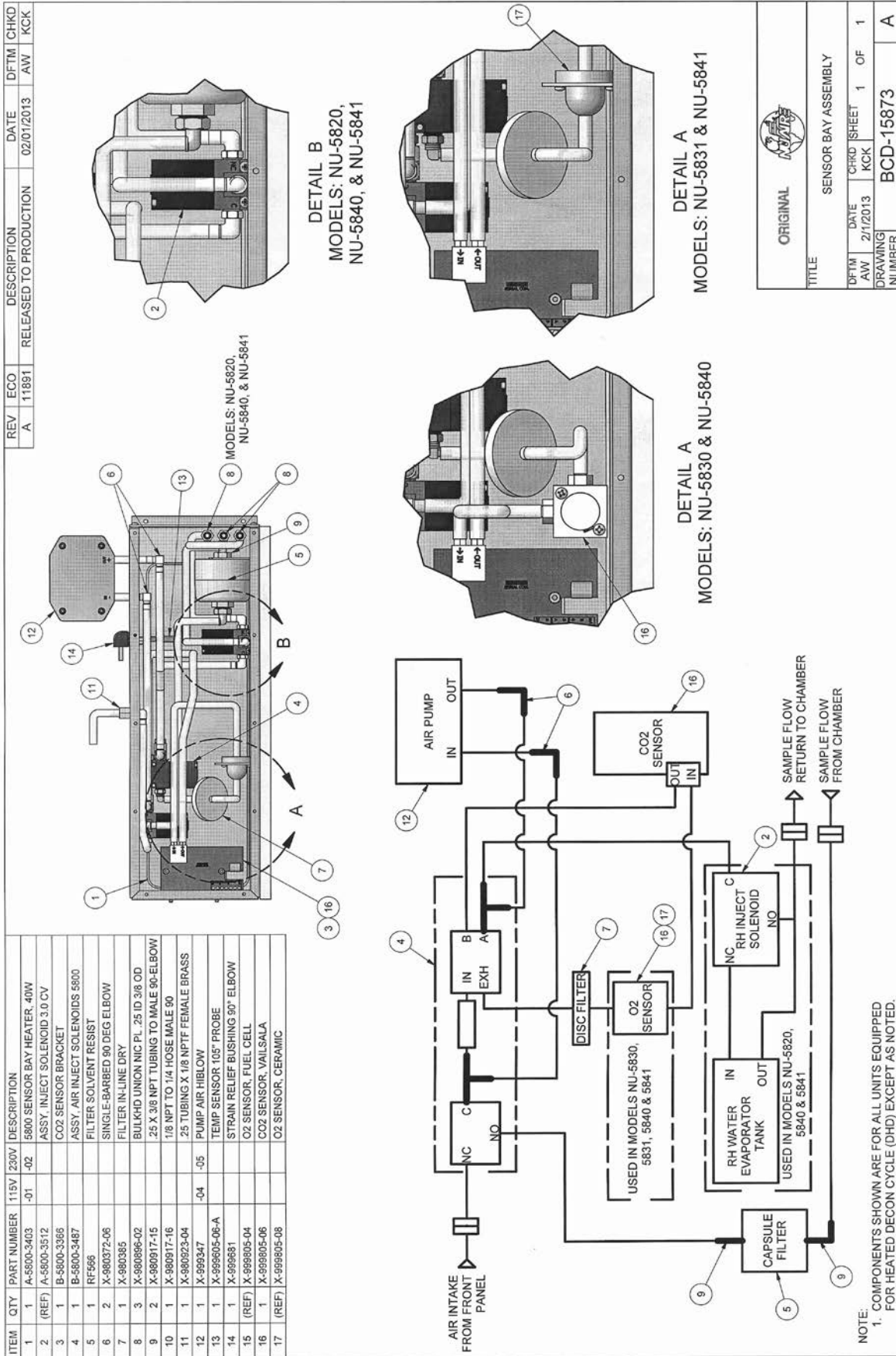
 **Note:** Material type can be verified with use of a magnet with stainless and aluminum being non-magnetic.

REV	ECO	DESCRIPTION	DATE	DFTM	CHKD
A	11891	RELEASE TO PRODUCTION	02/07/2013	AW	KCK

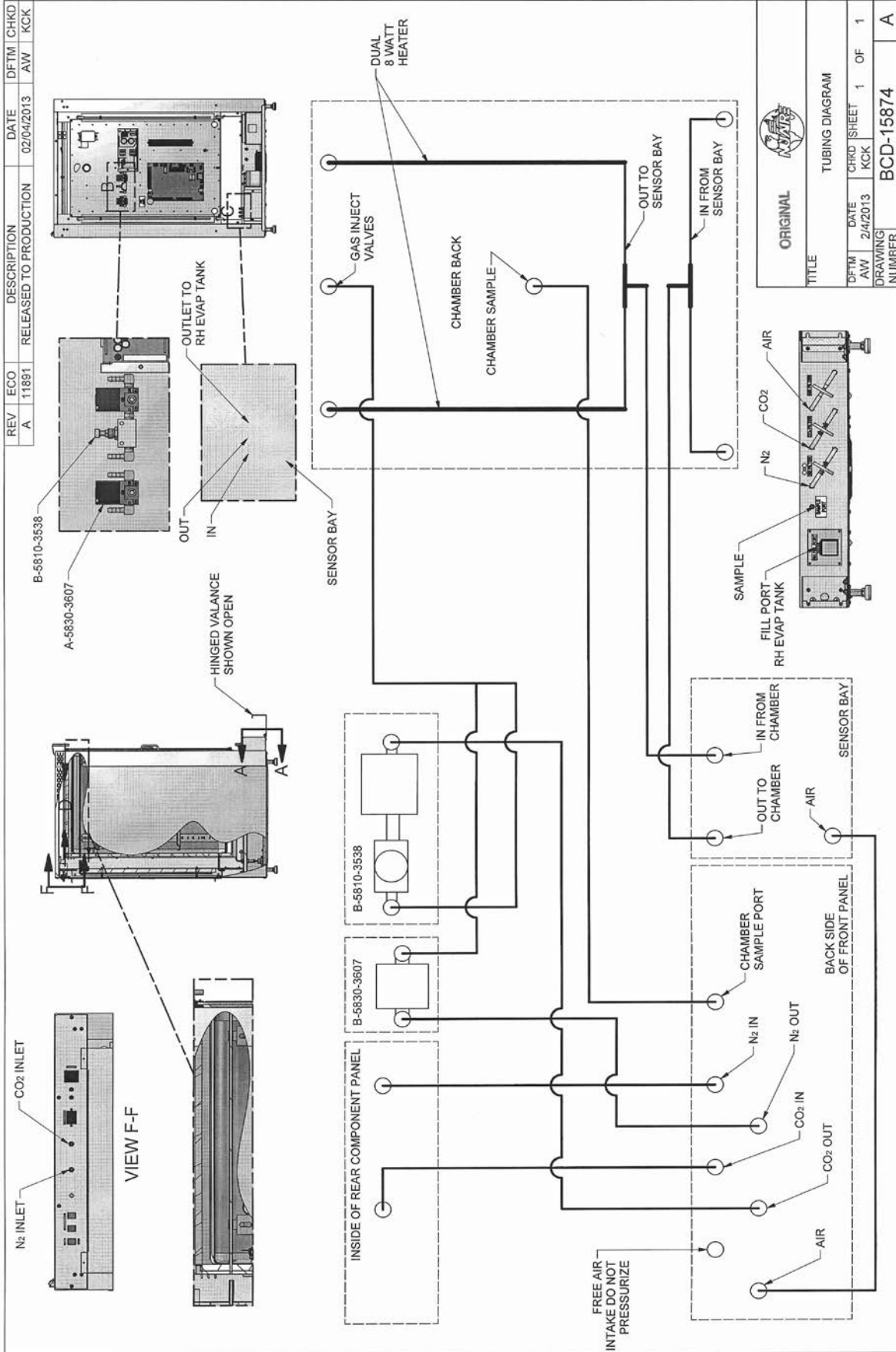
TITLE	ELECTRONICS PANEL ASSEMBLY		
DFTM	DATE	CHKD	SHEET
AW	2/1/2013	KCK	1 OF 1
DRAWING NUMBER	BCD-15872		



NOTE:
1. COMPONENTS SHOWN ARE FOR ALL UNITS EQUIPPED FOR HEATED DECON CYCLE (DHD) EXCEPT AS NOTED.

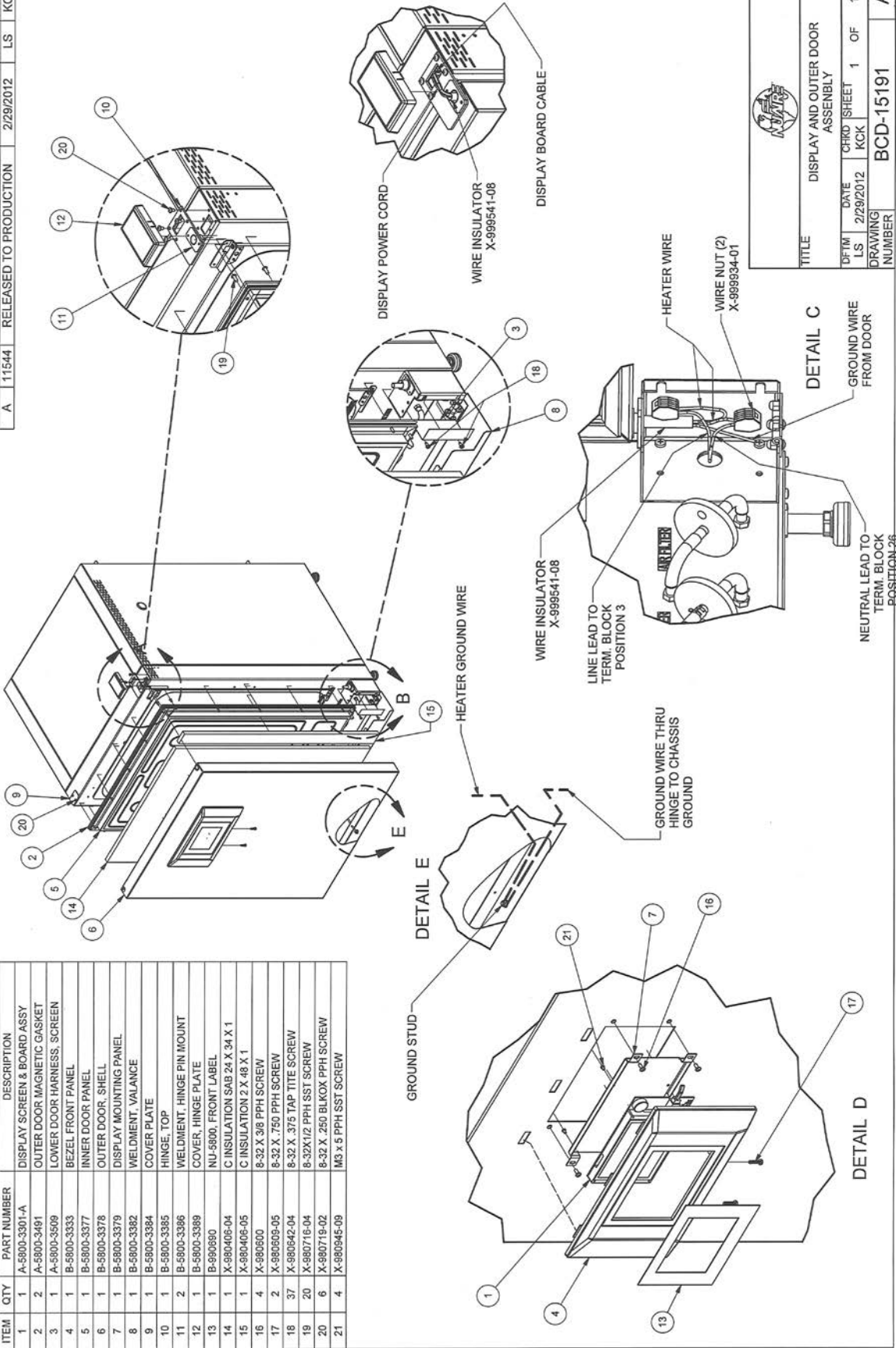


NOTE:
1. COMPONENTS SHOWN ARE FOR ALL UNITS EQUIPPED FOR HEATED DECON CYCLE (DHD) EXCEPT AS NOTED.

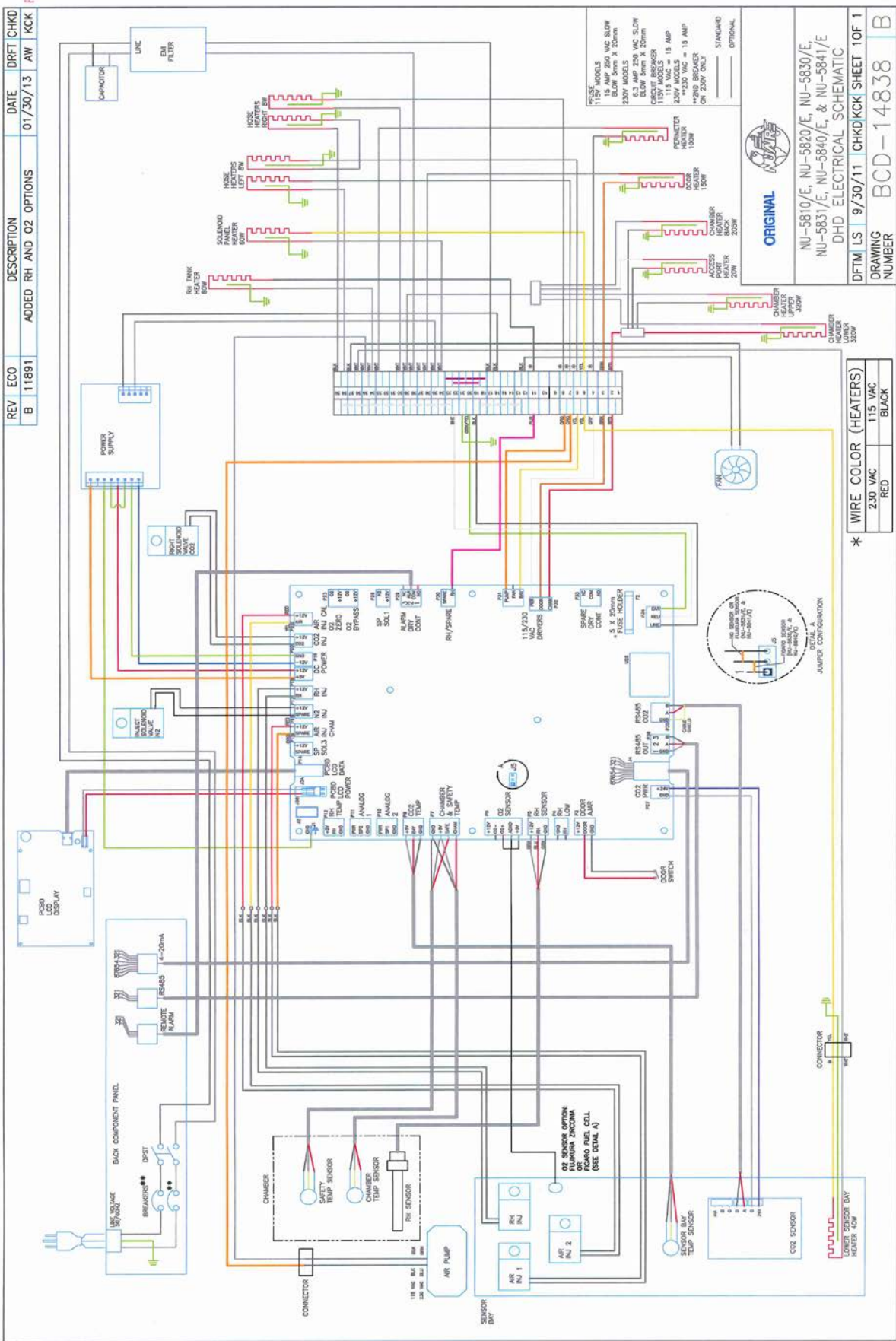


REV	ECO	DESCRIPTION	DATE	DFTM	CHKD
A	11544	RELEASED TO PRODUCTION	2/29/2012	LS	KCK

Part List		DESCRIPTION
1	A-5800-3301-A	DISPLAY SCREEN & BOARD ASSY
2	A-5800-3481	OUTER DOOR MAGNETIC GASKET
3	A-5800-3509	LOWER DOOR HARNESS, SCREEN
4	B-5800-3333	BEZEL FRONT PANEL
5	B-5800-3377	INNER DOOR PANEL
6	B-5800-3378	OUTER DOOR, SHELL
7	B-5800-3379	DISPLAY MOUNTING PANEL
8	B-5800-3382	WELDMENT, VALANCE
9	B-5800-3384	COVER PLATE
10	B-5800-3385	HINGE, TOP
11	B-5800-3386	WELDMENT, HINGE PIN MOUNT
12	B-5800-3389	COVER, HINGE PLATE
13	B-990890	NU-5800, FRONT LABEL
14	X-980406-04	C INSULATION SAG 24 X 34 X 1
15	X-980406-05	C INSULATION 2 X 48 X 1
16	X-980500	8-32 X 3/8 PPH SCREW
17	X-980609-05	8-32 X 7/50 PPH SCREW
18	X-980642-04	8-32 X 3/75 TITE SCREW
19	X-980716-04	8-32X1/2 PPH SST SCREW
20	X-980719-02	8-32 X 250 BLK OX PPH SCREW
21	X-980845-09	M3 X 5 PPH SST SCREW

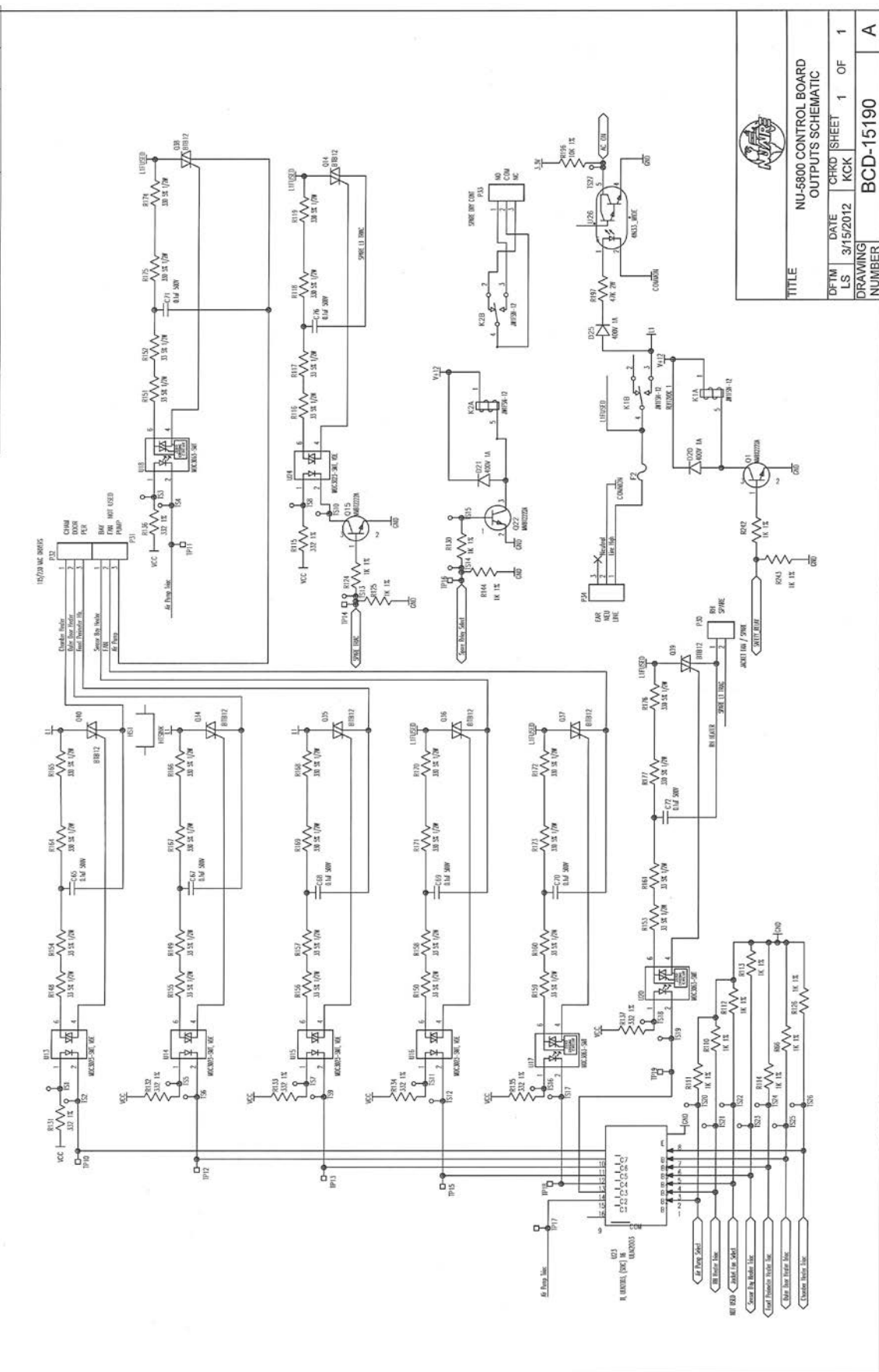


TITLE		DISPLAY AND OUTER DOOR ASSEMBLY	
DFTM	DATE	CHD SHEET	OF
LS	2/29/2012	KCK	1
DRAWING NUMBER		BCD-15191	
		A	



REV	ECO	DESCRIPTION	DATE	DFTM	CHKD
A	11544	RELEASED TO PRODUCTION	3/15/2012	LS	KCK

TITLE		NU-5800 CONTROL BOARD	
DFTM		DATE	
LS	3/15/2012	CHKD	SHEET 1 OF 1
DRAWING NUMBER		BCD-15190	



TITLE		NU-5800 CONTROL BOARD	
DFTM		DATE	
LS	3/15/2012	CHKD	SHEET 1 OF 1
DRAWING NUMBER		BCD-15190	