Water-Jacketed,
IR Autoflow Automatic CO_2 Incubator

Models
NU-8500/D/E
NU-8700/D/E

Operation & Maintenance Manual

July, 2012
Revision 9

Series 9 or Higher 8500
Series 5 or Higher 8500D
Series 9 or Higher 8500E

Series 9 or Higher 8700
Series 4 or Higher 8700D
Series 9 or Higher 8700E

115 Vac, 60 Hz Unit Only

Manufactured By:
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1.0 General Description

The NuAire IR Autoflow Automatic CO_2 water-jacketed 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 embryos, gametes and animal tissue cell cultures at on near body temperature. Six parameters contribute to optimum growth conditions. These are:

1. Humidity
2. Precise temperature control
3. Precise CO_2 control
4. Sterility
5. Reliability

Like all NuAire equiprl

1.3 CO_2 Display and Control

The NuAire IR Autoflow employs a solid-state single gas analyzer for carbon dioxide. This innovative analyzer utilizes a filter correlation technique for non-dispersive infrared analysis of CO_2. The analyzer consists of an optical bench incorporating an infrared source, sample cell, and infrared detector. The amount of power radiating on the detector is an approximate logarithmic function of the CO_2 concentration in the gas between source and detector. Detector linearization is performed with 32-bit digital accuracy. The measurement of CO_2 is independent of humidity and temperature variations within the chamber.

1.4 All Stainless Steel Construction

The IR Autoflow's exterior is constructed of 16 gauge, type 304L stainless steel with the interior being 16 gauge, type 304L polished stainless steel using coved corner construction, which provides an easily cleanable inert surface (for decontamination) that does not promote biological growth. All exposed edges are deburred to insure no sharp edges. The exterior is finished in a textured polyurethane powder-coat finish, which is resistant

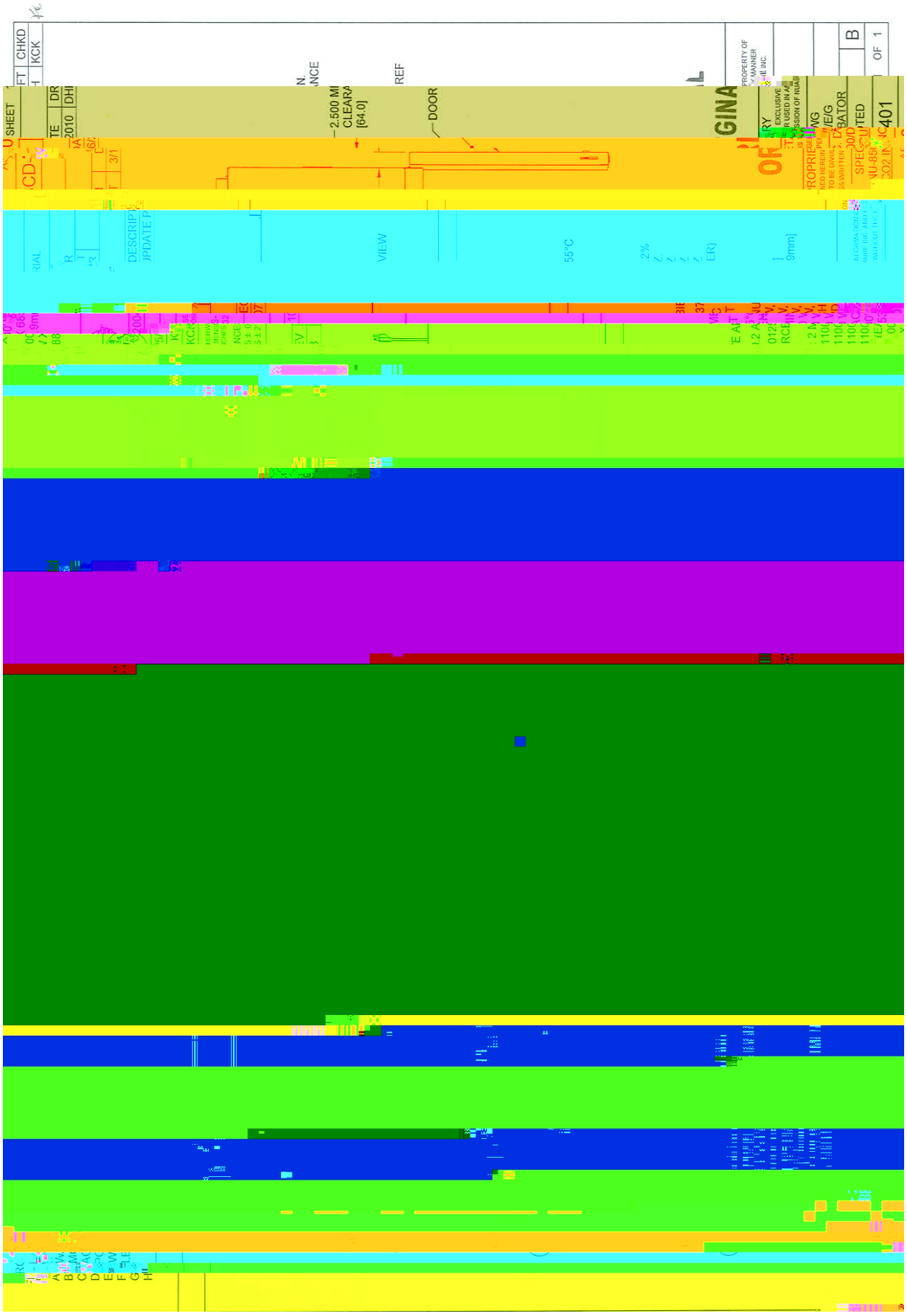
2.0 Performance Parameters

2.1 Both the interior and exterior of the IR Autoflow are constructed of 16-gauge, Type 304L stainless steel.

3.0 Models & Features

NuAire offers various Water-Jacketed IR Autoflow Automatic models:

Model	Standard	D	E
NU-			



4.0 Test Performance & Procedures

All equipment is thoroughly inspected by NuAire at the time of shipment. Quality control is maintained by constant surveillance over each product, beginning at the receipt of purchased material and concluding with a final inspection before packing. In all instances where product quality cannot be easily assessed on the end item (i.e. water-jacket leak tightness), the product is inspected during sub-assembly fabrication. The following test procedures are conducted on each cabinet and a copy of the test report is included with each unit.

4.1 Visual Inspection

4.1.1 Each IR Autoflow 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 ground and polished smooth.

4.1.2 Painted surfaces are inspected to be free of scratches, nicks, insufficient covering, and runs.

4.1.3 The doors open and close freely without binding of the hinges. The gasket seals the inner glass door tightly. The glass door is free of scratches.

4.2 Electrical Tests

4.2.1 Electrical Leakage Test

All Autoflow Incubators may not exceed 0.5 milliampere in the normal running mode and may not exceed 3.5 milliampere in a single fault condition (ex. open ground).

4.2.2 Dielectric Voltage

All Autoflow Incubators are required to withstand 1770 VDC (2150 VDC for 230 VAC units) between dead metal parts and the hot/neutral power source leads with no electrical breakdown. This is factory tested using an Associated Research Model 520L and 7564SA.

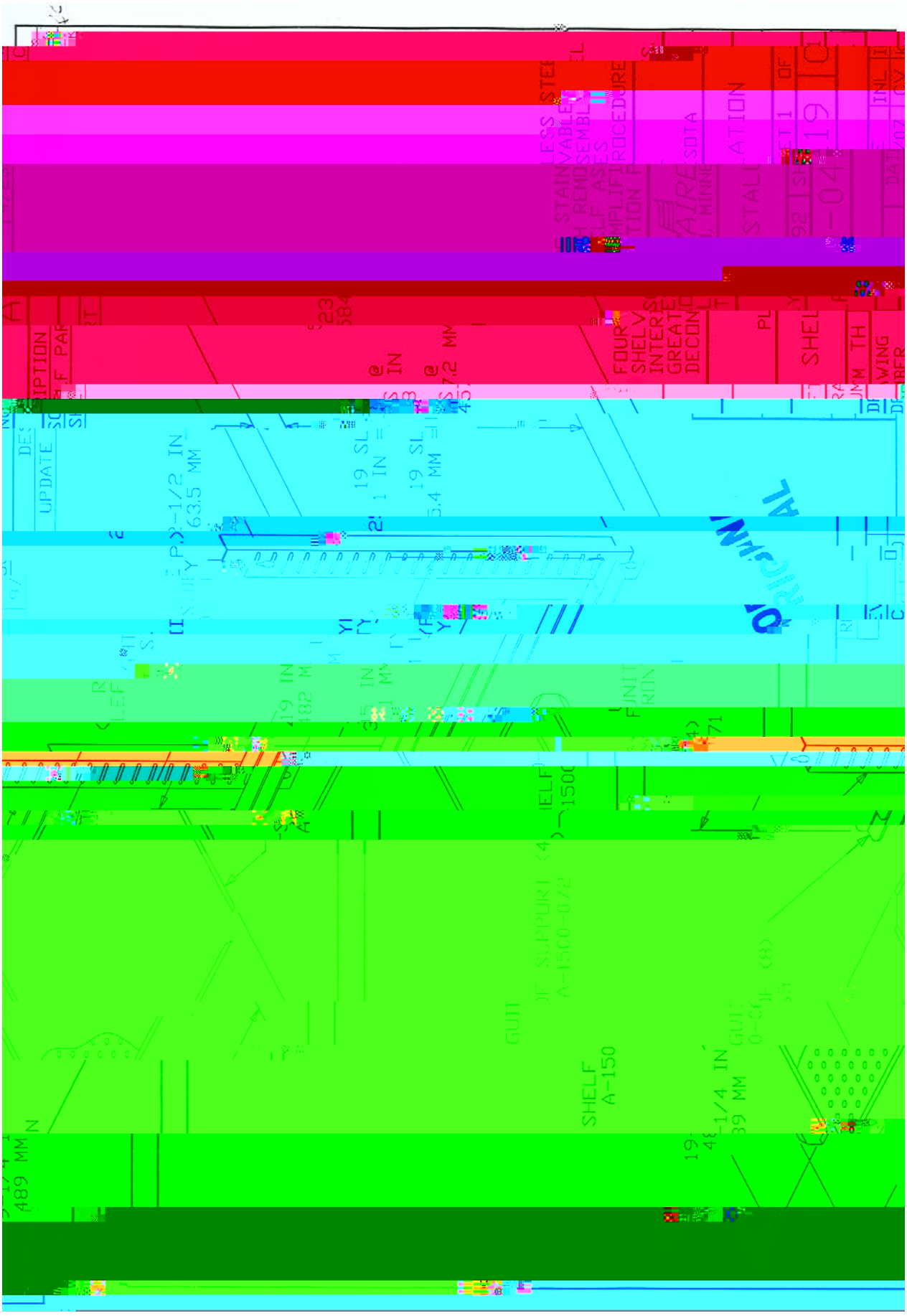
4.2.3

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 parts and labor 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 underl4(c)1(c)13a(1r0T* [(w)(e)8(n

7.0 Installation

The IR Autoflow is fastened to the base skid and it is usually the best procedure to leave the skid attached until the IR Autoflow 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. Examine the IR Autoflow carefully. INSPECT



7.5 Electrical

The electrical supply circuit to the IR Autoflow must conform to all national and local electrical codes. Consult the IR Autoflow's serial-data plate, located inside the door, 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 5% FROM SERIAL PLATE RATINGS. 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.

7.6 Precaution for IR Autoflow Filling

To prepare the IR Autoflow for filling, turn on main power switch located on back panel and set mode switch to setup. The digital indicator should light up as well as the low water light.

7.7 Filling & Draining the Water-Jacket

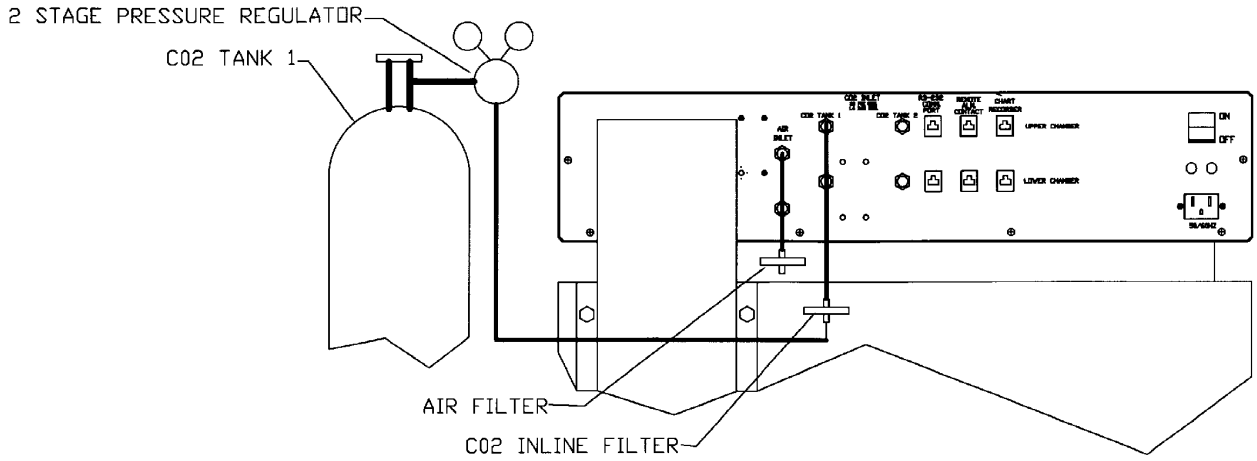
The fill port plug is located on the front top left side behind the exterior door. Remove fill port plug and install the fill port adapter. Place the tubing over the adapter and connect the other end to either a funnel or serrated tap. Use single distilled water, **NO PURER THAN 1 MEGAOHM.** Fill the water-jacket until the "LOW WATER" light turns off. Add an additional 3 to 4 liters of water and remove the tube/adapter and replace fill port plug.

CAUTION

7.8 Air Inlet Connection

An air inlet tubing kit consists of a one-foot clear vinyl tube and (1) 50mm polypropylene .3 micron HEPA filter. Locate the air inlet port on the back panel of the unit. Remove the cover cap; connect one end of tubing to the air inlet port, and the other end of tubing to the air filter.

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



7.9 CO_2 Tube Connection

High concentration of CO_2/N_2 gas can cause asphyxiation! Install Incubator in well ventilated area.

This Incubator is designed to be operated with CO_2 gas only. Connecting a flammable or toxic gas can result in a hazardous condition. Gases other than CO_2 should not be connected to this equipment. CO_2 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 CO_2 gas cylinders equipped with siphon tubes. A siphon tube is used to extract liquid CO_2 from the cylinder which can damage the pressure regulator. Consult with your gas supplier to ensure that the CO_2 cylinder does not contain a siphon tube.

Included with every IR Autoflow is a tubing kit consisting of (1) six foot (2 m) vinyl tube, and (1) 50 mm polypropylene 0.3 micron HEPA filter.

7.9.1 CO_2 Supply

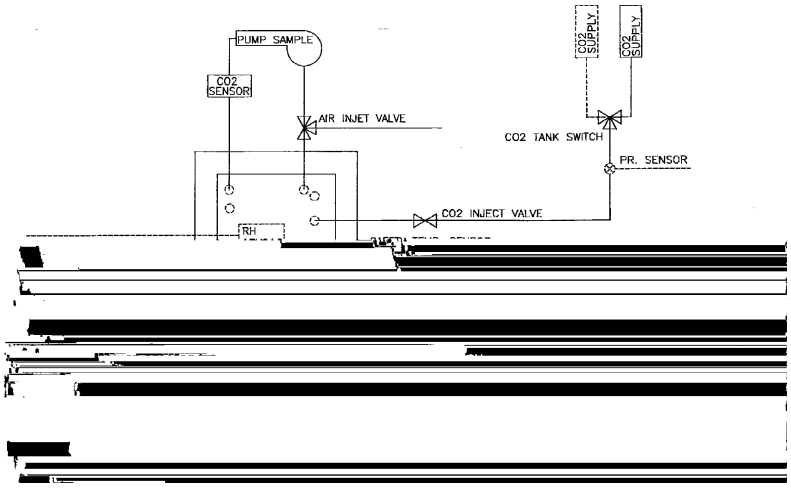
1. Before the CO_2 supply is turned on to the IR Autoflow, fill the water-jacket and set the temperature (See Section 8.7.1.).

CAUTION:
CO_2 Pressure to the IR Autoflow is rated at 20 PSIG or 1.4 BAR.
Do not exceed 25 PSIG or 1.8 BAR

2. CO_2 of medical grade is recommended.
3. A two-

8.3 System Introduction

The NuAire Incubator Control Electronics (NICE) system is designed to service the control requirements of the IR Autoflow incubator chamber. Temperature and CO_2 level are controlled by preset values to provide optimum conditions for culture growth within a chamber. Operator input is coordinated through the control panel keypad and status displays. The figure below shows the various inputs and outputs of the system.



The NuAire Incubator Control Electronics is a state-of-the-art microcomputer based system that provides:

8.3.1 Single chamber control in a single electronic package.

8.3.2 Enhanced information presentation of the following:

- Chamber temperature (setpoint and actual)
- CO_2 level (setpoint and actual)
- Humidity level (setpoint and actual) (Optional)
- Output and alarm status:

  Water Jacket Heater Status
  CO_2 Control Status
  Water-Jacket Low Water Status
  Door Ajar Status
  System Alarm Condition Status
  Optional, CO_2 Tank Selection
  RH Display Status

8.3.3 Simplified operator controls. The control panel is operated using five keypads, mode key, Up/Down arrow keys, Select key, and Hidden key (NuAire logo). The mode key controls the incubator's two modes, Run or Setup. To change modes, press and hold the mode key for three seconds. If in Run mode, the green LED above the mode key should be on solid. If in Setup mode, the green LED above the mode key should be blinking, as well as the temperature and CO_2 displays indicating "SETUP". In the Run mode, the unit is fully functional with all control/alarms activated. In the Setup mode, the unit is inactive, no control/alarms exists. The Select key controls the current active parameter. As the Select key is repeatedly depressed, the corresponding green LED next to the parameter will indicate the parameter which is active. Each depression advances to the next parameter. The Up or Down arrow keys are used for setpoint parameter changes by depressing the Up or Down arrow key when the selected parameter is activated. As the Hidden key is pressed, it allows access to diagnosis, option, and reset modes.

Password Protection - The IR Autoflow has the ability to offer password protection of the setup parameters. By activating the password function in the option configuration parameters (Section 8.8.4), the use of the Up, Down, and Select keys are required in the correct order to access the set up mode.

8.3.4 Automatic notification of abnormal situations. The red alarm LED on the control panel indicators will light to indicate a fault within the system. Such faults include:

- System intermittent
- Temperature Control Fault (temperature exceeds setpoint by more than 1.0°C, or does not reach to setpoint within 4 hours)
- CO_2 Control Fault (CO_2 exceeds setpoint by more than 1.0% or doesn't reach setpoint within 30 minutes).

8.3.5 Provision for add-on expansion capability. Options include:

- Remote communication capability (RS-232)
- Chart recorder output (0-10VDC) of individual monitored parameters
- Automatic tank switch

8.3.6 Diagnostic and calibration assists. By pressing hidden key, diagnostic mode is entered. In this mode:

- 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
- Front panel lamps may be tested
- Memory and internal processor diagnostics may be selected
- All options may be individually tested

8.4 Front Control Panel

The system front control panel contains the following functions described in detail.
(See Drawing BCD-08317 & 08226)

8.4.1 Heat Jacket Status LED

The jacket heat green LED indicates when the chamber heater is turned on.
A blinking LED indicates chamber heater is being cycled to maintain chamber setpoint temperature.

8.4.2 Door Ajar Status LED

The door ajar yellow LED indicates when the inner glass door is not closed.
The LED acts upon a magnetic switch located along the lower right corner of the inner glass door.

8.4.3 Low Water Status LED

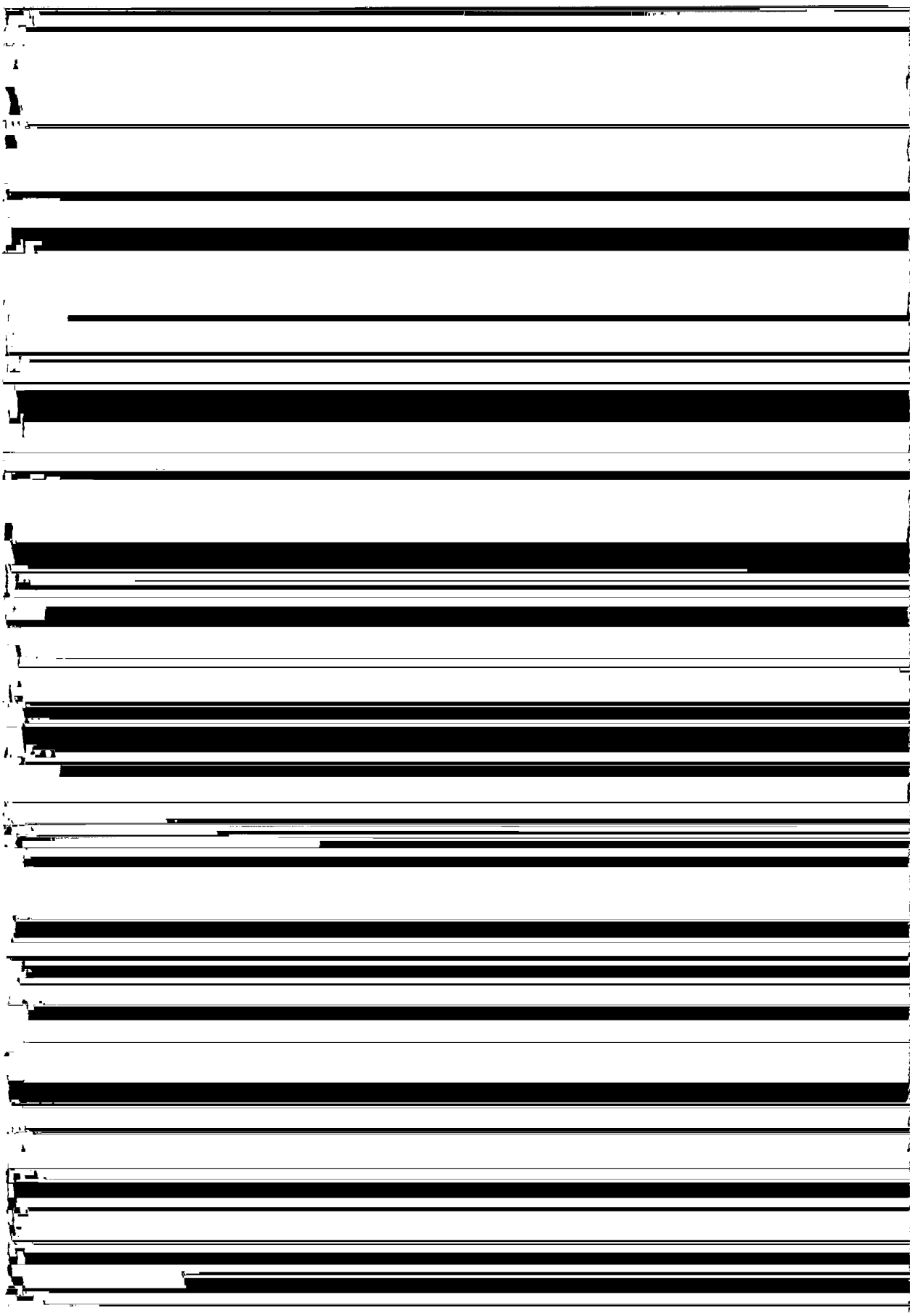
The low water yellow LED indicates when the water-jacket requires additional water. If the low water light is lit, the water-jacket should be filled as soon as possible to avoid uneven heating of the chamber.

8.4.4 Inject CO_2 Status LED

The control CO_2 green LED indicates when the CO_2 control valve is open and CO_2 is flowing into the chamber.

8.4.5 CO_2 Tank 1 Status LED

The CO_2 tank 1 green LED indicates when the IR Autoflow is consuming CO_2 from tank 1.



8.4.6 CO_2 Tank 2 Status LED (Option)

The CO_2 tank 2 yellow LED indicates when the IR Autoflow is consuming CO_2 from tank 2.

8.4.7 Alarm Status LED

The alarm red LED indicates an abnormal status condition. The alarm LED is always accompanied by an additional LED or display that specifies the abnormality. If the Alarm Status LED is on continuously, a catastrophic condition exists. A catastrophic temperature control condition will de-energize the safety relay and cause the chamber to cool below the setpoint. The audible alarm ringback function may be silenced for twenty minutes by pressing any key.

8.4.8 Chamber Sample

The chamber sample port is provided to measure CO_2 percentage manually with a CO_2 Fyrite instrument, or other suitable instrument (see BCD-10401, BCD-10402 for port locations).

8.5.5 RS-232 Communication Interface (Option)

The incubator is provided with RJ-45 telephone type connection for one to one communication interface with a serial printer.

8.5.6 Chart Recorder Outputs (Option)

The Chart Recorder Output board is provided as an option, which allows output signals of temperature, CO_2%, RH%, O_2%. The output signals are conditioned and linearized. There are 3 analog signals to choose from: 0 to 5 VDC, 0-10 VDC, and 4-20 MA. Connection to chart recorder or other monitoring device is via RJ-45 telephone type jack.

8.5.7 Remote Alarm Contacts

The incubator is provided with an RJ-11 telephone type connection to remote alarm device.
See Section 12.0 for details on configuration and connection.

8.5.8 Power Switch

The power switch, located at the top right-hand side of the rear panel, controls all power to the incubator.

8.5.9 CO_2 Internal Tank Switch (Option)

The internal tank switch is an option which is factory installed at the time of manufacture.
The tank switch performs the critical back-up function of switching tank 1 and tank 2 and back again when each depleted tank is replaced.

8.6 Run Mode Operator Interactions

In general, there is no need for operator interaction in "RUN" mode.
Operator interaction is required to perform calibration functions (see Section 9) or respond to abnormal condition alarms (see Section 11).

8.7 Setup Mode Operator Interactions

8.7.1 Chamber Temperature, CO_2%, Humidity Percent

Setpoint values are entered by pressing the "SEL" key until the LED is lit next to the desired parameter indicator. The value of the selected parameter will be shown in the display in the form of "XX.X". To enter a setpoint, perform the following:

Chamber Temperature

- Press and hold mode key for three seconds to Setup.
- Press [SEL] to indicate green LED next to chamber temperature display.
- Press or to indicate desired temperature.
- Press mode key back to Run.

CO_2 Percent*

- Press and hold mode key for three seconds to Setup.
- Press [SEL] to indicate green LED next to CO_2 percent display.
- Press or to indicate desired CO_2 percent.
- Press mode key back to Run.

Humidity Percent (Optional)

- Press and hold mode key for three seconds to Setup.
- Press [SEL] to indicate green LED next to humidity percent display.
- Press or to indicate desired humidity percent.
- Press mode key back to Run.

*Please note: when the CO_2 setpoint is set for 0.0%,
the CO_2 control system is turned off and all alarms are inhibited.

8.8 Diagnostic Interactions

The IR Autoflow has two types of general diagnostic methods, Power-up self-test and Diagnostic Mode tests.

8.8.1 Power-Up Self Test

The power-up self-

To initiate the diagnostic mode, perform the following:

a) Press and hold Hidden key (flag on NuAire logo) for four seconds (in either Run or Setup mode), the temperature display will indicate the first menu "tst"
b) To advance to second menu, press key, temp. display will indicate "opt"
c) To advance to the third menu, press key, temp. display will indicate "rst".
d) To repeat the menus, continue to press the which will advance the menus in a round robin fashion.
e) To enter to desired menu, press the SEL key while desired menu is indicated on temp. display.

The "tst" and "opt" menus each have several function parameters as described below. The "rst" menu performs a master reset function which clears the microprocessor's memory and resets all parameters to their default conditions.

To enter the function parameters, press the SEL key while the temp. display indicates the desired menu. Then, while in the menu, press SEL key to advance through the function parameters, again, in a round robin fashion. Once in the desired function parameter, press the or key to alter or toggle on/off. To exit the diagnostic mode at any time, press the Hidden key several times.

8.8.3 Test Output Parameters

1. All Lights Display/LED Test
2. SAF -Safety Relay (**yes**/no)
3. CHt -Chamber Temp. Sensor (**0**,25,50,75,100)
4. SFt -Safety Temp. Sensor (**0**,25,50,75,100)
5. CO_2 -CO_2 Inject Valve (on/**off**)
6. P 12 -Power Supply Regulated +12 VDC
7. - 12 -Power Supply Regulated -12 VDC
8. rH -RH Display Status (optional)
9. Ct2 -CO_2 Tank 2 Valve (on/**off**)
10. dor -Door Heater (**0**, 25, 50, 75, 100)
11. Air -Air Inject Valve (on/**off**)
12. ALr -Alarm Relay (on/**off**)

(Note: Default values are in bold)

Once you have made your menu selection, you will remain within that menu selection until you exit the diagnostic mode. If another menu selection is desired, you must re-enter the diagnostic mode via the hidden key.

To exit the function parameters, press the hidden key (flag on NuAire logo). The following is a description of each function parameter.

FUNCTION DESCRIPTION **READOUT DISPLAYED**

Note: - Indicates alternating displays
or *- Indicates displays you can choose*

1. *Display/LED Test*
   This function will turn all individual LED's and value segments on, sequentially turn them all off and repeat the sequence until another function is selected.

2. *Safety Relay*
   This function shows the current state of the safety relay. The CO_2 percent display will show "yes" or "no" corresponding to the relay condition.

3. *Chamber Temperature Sensor*
   This function shows the current value of the chamber temperature sensor on the CO_2 display. This function also allows the jacket heater to be turned on at different percentages (0, 25, 50, 75,100) shown in the temperature display alternating with the function symbol characters (function 2 – Safety Relay should be "NO" to force heater output).

4. *Safety Temperature Sensor*
   This function shows the current value of the safety temperature sensor on the CO_2 display. (c)-5(h)9(af 0.0004 Tc 0.006 Tw -12.598291.217 Td [(T)-6(e)-6(r)-9(

6. *Power Supply Regulated +12 VDC*
   This function shows the current state of the regulated +12 VDC power supply.

7. *Power Supply Regulated -12 VDC*
   This function shows the current state of the regulated -12 VDC power supply.

Shs cer R106-6(s396.6 300.96 18DC 0.001 C 0506 Tw 0j -0Tc 0.009)-4nkt 0 Td Fj /a4 Tc v(a)8(y -7.076 -1.2175.152(s)7( )11(w)-6(i)-3(t)

8. *RH Display Status*
   Shows chamber RH percent in CO_2% display.
   Not applicable for models without RH display option.

TeguD.006 ffe-3(nre6(n) /)-6(h)10(e)-6(-1(15-0Tc 0.0t()]TJ/)-6(h)-32

Alarm Relay
This function shows the current state of the alarm relay.
The CO_2 percent display will show “on” or “off” corresponding to the relay condition.

8.8.4 **Option Configuration Parameters** (Note: Default values are in bold)

			Min	Max	Current
1.		-CO_2 System Enable (**on**/off)	N/A	N/A	
2.		-CO_2 Tank 2 Enable (on/**off**)	N/A	N/A	
3.		-CO_2 Auto Switch Back (on/**off**)	N/A	N/A	
4.		-Closed Door CO_2 Zero/Span Calibration (on/**off**)	N/A	N/A	
5.		-RH System Enable (on/**off**)	N/A	N/A	
6.		-Password (on/**off**)	N/A	N/A	
7.		-CO_2 Display Delay (**on**/off)	N/A	N/A	
8.		-Alarm Audible Enable (**on**/off)	N/A	N/A	
9.	AU.O	-Auto Zero (**on**/off)	N/A	N/A	
10.		-Door Heater Delay Time (seconds/**45**)	2	240	
11.		-CO_2 Inject Delay Time (seconds/**45**)	2	240	
12.		-Air Inject Time (seconds/**30**)	0	999	
13.		-Air Inject Cycle (minutes/**10**)	1	999	
14.		-Print Frequency Time (minutes/**0**)	0	999	
15.		-Temperature Time Out (min/**360**)	1	999	
16.		-CO_2 Time Out (min/**30**)	1	999	
17.		-RH Time Out (optional) (min/**240**)	1	999	
18.		-Temp. Sensor Differential (°C/**6.0**)	0.5	20.0	
19.		-Temp. Max. Above Setpoint (°C/**1.0**)	0.5	10.0	
20.					

FUNCTION DESCRIPTION **READOUT DISPLAYED**

Note: - Indicates alternating displays
or *- Indicates displays you can choose*

1. *CO_2 System Enable*
   This function will enable or disable the CO_2 system. The value display will show "on" or "off" corresponding to the current condition. In Run mode, the CO_2 percent display will indicate either the CO_2 percent when the system is on, or blank when the system is off.

2. *CO_2 Tank 2 Enable (option)*
   This function will enable or disable the optional CO_2 tank 2 system. The value displayed will show "on" or "off" corresponding to the current condition.

3. *CO_2 Tank Auto Switch Back (Option)*
   Note function can only be enabled with CO_2 tank 2 option in use. Unit will automatically check tank 1 for gas pressure every 12 hours, and switch back if present.

4. *Closed Door CO_2 Zero/Span Calibration*
   This option enables user to run zero & span calibration on the CO_2 sensor with out opening the incubator door. (See section 9.4.2).

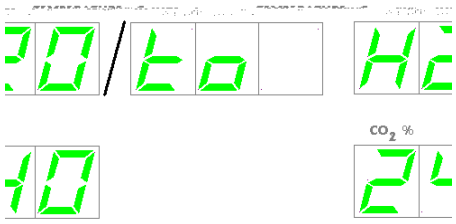
5. *RH System Enable*
   This function will enable or disable the optional RH display system.

6. Password

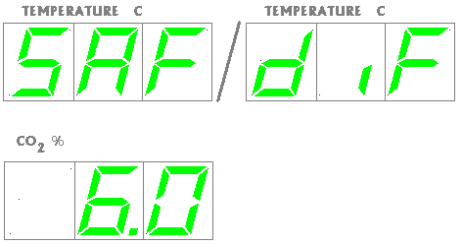
11. *CO_2 Inject Delay Time*

    This value specifies the time, in seconds, for an injection of CO_2 to be measurable at the sensor. When CO_2 is injected into the chamber, the system delays until this period has elapsed before making a new control decision. In this manner tubing induced delays do not cause the CO_2 system to overshoot the control setpoint. The CO_2 inject delay tiu04 0 07tpoinynnynv6eca2v99999216 Tm 6n ae CO

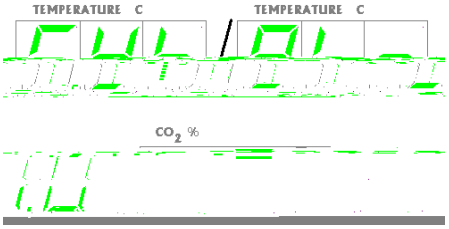
17. *RH Time Out (Optional)*
This value determines the time, in minutes, for the RH percentage to achieve setpoint. If the RH percentage doesn't increase to within 3% of setpoint within this time period, an alarm condition is declared.



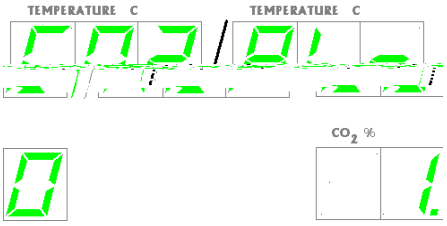
18. *Temperature Sensor Differential*
This value specifies a maximum differential, measured in temperature (°C) that the two temperature sensors may deviate from one another or from the last read value. If this differential is exceeded, a warning LED is shown, and an alarm condition is declared. An alarm 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.



19. *Temperature Maximum above Setpoint*
This value determines the maximum deviation, measured in temperature (°C) that the chamber is permitted above once the incubator reaches the specified setpoint 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.



20. *CO_2 Maximum above Setpoint*
This value determines the maximum deviation, measured in CO_2 percent (%) that the chamber is permitted above once the incubator reaches the specified setpoint before an alarm condition is declared.



8.8.5 Reset, Master

The master reset diagnosis 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 AND CONFIGURATION OPTIONS WILL BE LOST. ALL CURRENT RUN PARAMETERS WILL BE RESET TO DEFAULT VALUES.**

To perform a master reset, follow the steps below:

- Press and hold Hidden key for four seconds (in either Run or Setup mode), the temperature display will indicate the first menu "tst".
- Press key, temp. display will indicate "opt".
- Press key, temp. display will indicate "rst".
- Press [SEL] key two times to initiate the reset process. Once the master reset process is complete, the unit will reset into the Setup mode.

All calibration will need to be performed following a master reset. Default control parameters after master reset are 37 ^{o}C (temperature), and 5% (CO_2).

- Press Hidden key to enter option menu.
- Press to advance to “opt”.
- Press [SEL] several times to advance to “H2O”
- Press to enable system, “ON”.
- Press Hidden key twice to exit option menu.
- Change default setpoint (95%) if necessary.

9.0 Calibration

Proper calibration of the IR Autoflow involves four parameters: chamber temperature, door temperature, CO_2 sensor & humidity. The first two, chamber and door temperature, should be completed and stabilized before any CO_2/humidity sensor calibration is performed. 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 procedures again from the start.

9.1 Chamber Temperature Calibration

The IR Autoflow's TEMPERATURE CALIBRATION MUST BE PERFORMED WITHIN 1°C OF THE PLANNED OPERATING TEMPERATURE. Normally, 37.0°C is the most common setpoint. To initiate the procedure, turn on the IR Autoflow via the power switch on the back panel. Press the mode key until the unit goes into setup mode to check the temperature value parameter for your planned operating temperature and change if necessary. Press the mode key again until the unit switches back to Run and let stabilize for 8 to 12 hours.

At the beginning of this procedure, set a mercury glass thermometer in a glass beaker filled with water resting on a shelf in the middle of the IR Autoflow chamber. Do not place the glass beaker on the bottom of the chamber because it will result in a slightly higher temperature due to the heater pan being located just below the chamber bottom. Placing the thermometer in a glass beaker on the middle shelf will give the most accurate results for calibration. 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 thermo couple could also be used.

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

- Make sure unit is in Run mode, green LED above the mode key should be on solid.
- Press [SEL] to indicate green LED next to temperature display.
- Press and hold key for four seconds,
  temperature display alternates between "Adj" and the current temperature.
- Press or key to indicate same temperature as thermometer.
- Press [SEL] key to complete calibration.

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. temp cl2(le)-32

9.2 Door Temperature Calibration

This calibration is provided to control condensation on the inner glass door and help maintain chamber temperature uniformity over the range of ambient temperatures and chamber temperature set-points that the Incubator is designed to handle. The door heater operates on a duty cycle that is a percentage of the time that the heater is turned on. The duty cycle ranges from 0% which is "off" to 100% which is "on" continuously. The default setting for the door heater duty cycle is 45%. This setting should prevent excessive condensation from forming on the glass door in most cases when the Incubator is at default temperature (37.0°C) in a lab ambient of approximately 22.0°C. Typically, 40 to 60 percent is the most effective duty cycle range for this set of condit

9.2.1 Door heater duty cycle automatic control

The door duty cycle is automatically reduced when the room temperature in the lab increases enough to allow the contribution from this heater to overheat the chamber. For example, if the door duty cycle is set up when the room temperature is 22ºC and the room temperature is allowed to increase to 27ºC. Less heat is required to keep the chamber at set point. If the chamber starts to overheat, the door duty cycle will be reduced at a rate of 1% per minute starting when the chamber temperature is 0.2ºC above set point. The duty cycle will continue to be reduced u cnenooooo11(os-3(as)i)3(l)3(l)5(u)5(tp)-1( )11(s)2(et)11( )]TJ -8

*__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 CO_2 in the chamber again. Offset the display again if necessary.

9.4.2 CO_2 Sensor Calibration (Zero/Span)

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 CO_2 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 CO_2 system. The second option is a "closed door" routine. This routine allows calibration of the sensor with out 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

Zero Calibration

- Make sure unit is in Run mode, the green LED above the mode key should be on and not blinking.
-

10.0 Maintaining Your IR Autoflow

IR Autoflow 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. **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.*

IR Autoflow Water-Jacket

The water-jacket requires no anti-bacterial agents. The IR Autoflow already incorporates a copper tube producing copper sulfate which eliminates bacterial growth within the water-jacket. **DO NOT USE ANY CHLORINATED OR HALOGEN MATERIALS IN THE WATER-JACKET.**

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

- **CO_2 Supply***
  The CO_2 supply filter should be replaced every fifth empty CO_2 tank or when the filter is visibly discolored (yellow brown).
- **Air Inlet***
  The air inlet filter is located on the back panel. The purpose of the filter is to cleanse the room air, which is drawn into the chamber via the pump during the air inject cycles, assuring the proper amount of oxygen is available to the cultures. The air inlet filter should be replaced every three to six months or when visibly discolored.

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

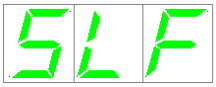
- **Air Pump Filter**
  The CO_2

RH Sensor (Optional) Care and Cleaning

CAUTION: Do not spray cleaner / disinfectant directly on the filter cap or the sensor (inside the filter housing under the filter cap). Some cleaners may damage this sensor.

NOTE:

RH System



LOW WATER	- Low water level in water jacket - Faulty level indicator switch	1. Fill jacket until light goes out 2. Replace level indicator switch
BLINKING DISPLAY	- Interruption of power	1. Press any key to stop blinking displays.
CONDENSATION EXCESSIVE (Humidity pan in place)	- Glass door, gasket or front wall of chamber wet.	1. Increase door heater duty cycles. See section 9.2 for detailed instructions.
	- Back wall bottom and top walls	1. Decrease door heater duty cycle. See section 9.2 for detailed instructions.
CONDENSATION PERSISTS AFTER DOOR DUTY CYCLE IS ADJUSTED		1. Increase air injections, increasing duration first, recommended in 20 second intervals

EXCESS VIBRATION

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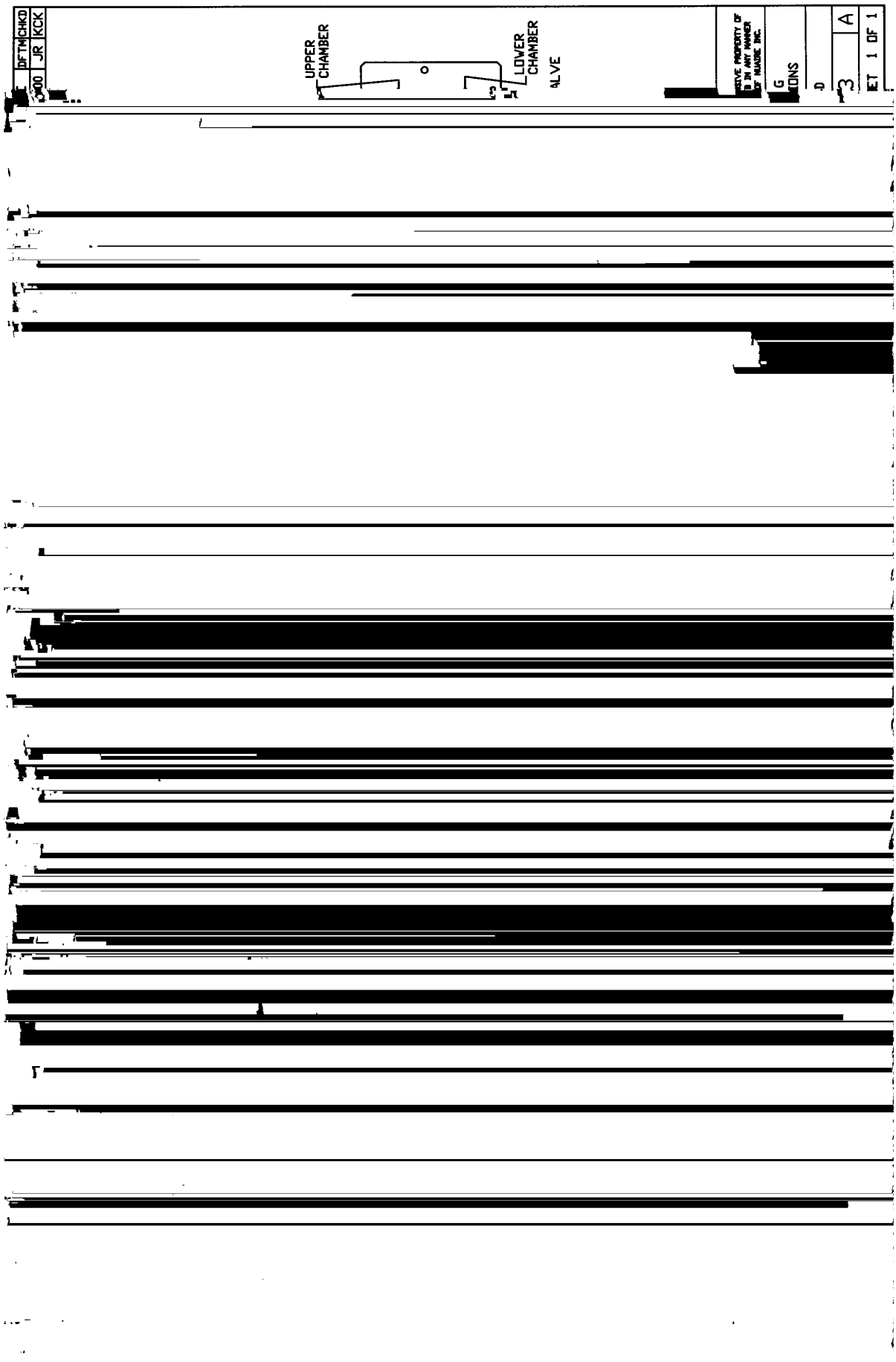
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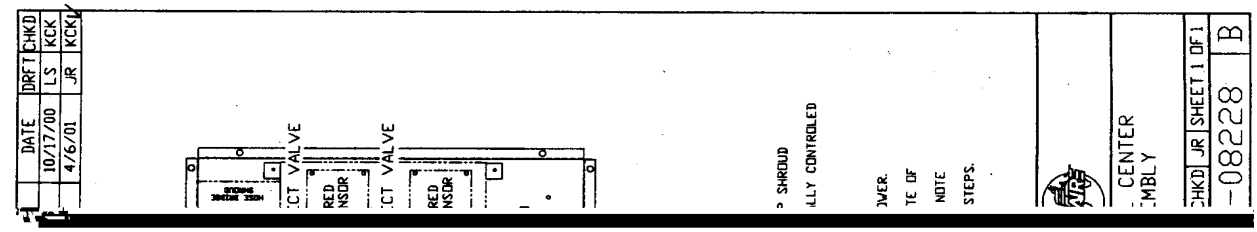
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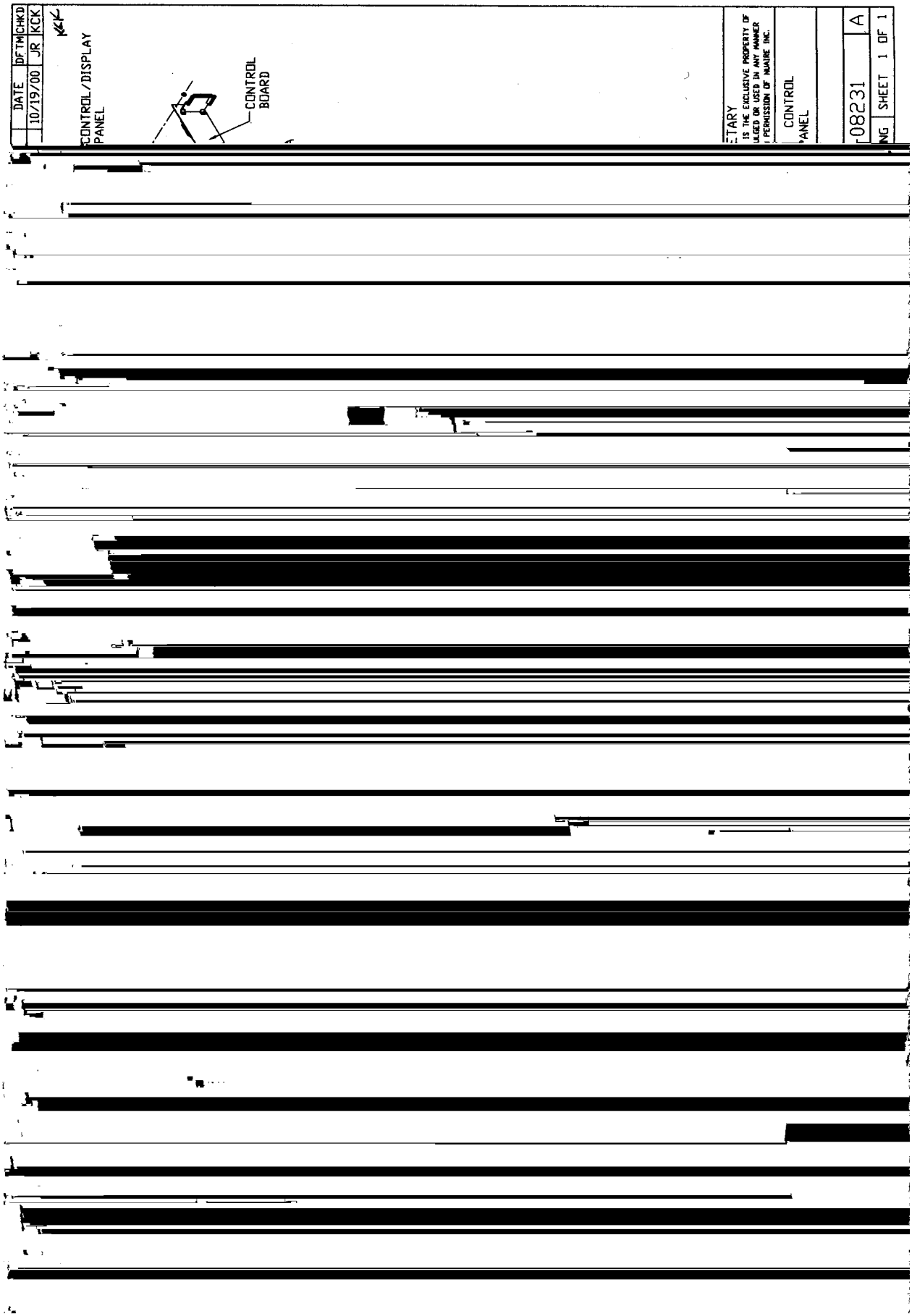
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