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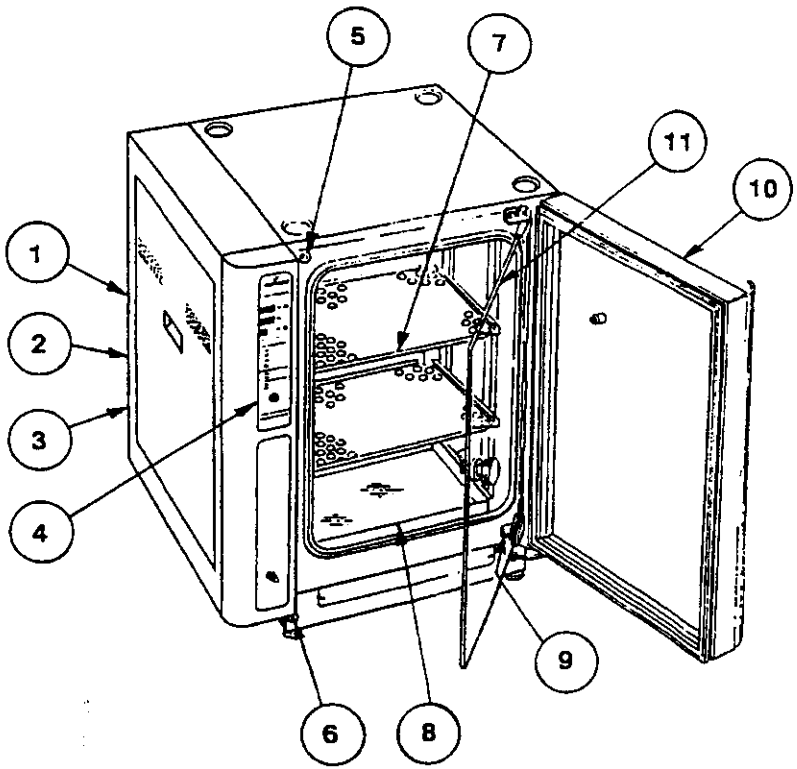
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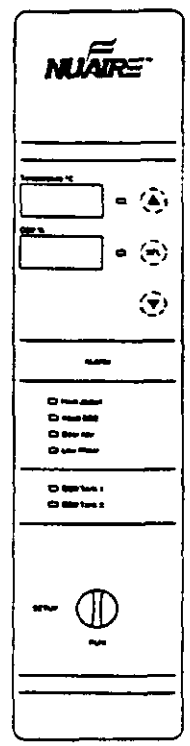
1.0 Guide To Components

1. Air Inlet Filter
2. Circuit Breaker
3. On/Off Switch
4. Front Panel
5. Fill Port
6. Drain Valve
7. Shelf Assembly
8. Water Pan
9. Magnetic Door Switch
10. Outer Door
11. Inner Glass Door



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2.0 Control Panel and Indicators



- HEAT JACKET — Indicates Main Heater ON
- DOOR AJAR — Inner Glass Door Open
- LOW WATER — Add Water to Jacket
- INJECT CO_2 — Indicates Injection of CO_2
- CO_2 TANK 1 — Indicates CO_2 Tank in Use
- CO_2 Tank 2 (Option) — Indicates CO_2 Tank in Use

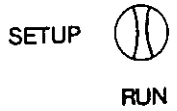
ALARM — Fault Occurrence

[SEL] Select key allows selection of parameters on display

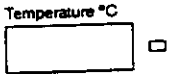
↑ UP arrow key allows increase of parameter values

↓ DOWN arrow key allows decrease of parameter values

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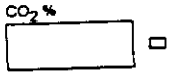


Mode Switch - Indicates Incubator is Running or In Setup.

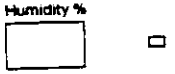


RUN Mode Indicators

Indicates Present Chamber Temperature

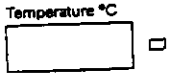


Indicates Present Chamber CO_2 Percent

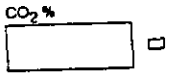


(Option) Indicates Present Chamber Humidity Percent

RUN Mode Fault Indicators



Blinking Green LED Next to Display Indicates Chamber Temperature Fault.



Blinking Green LED Next to Display Indicates CO_2 Percent Fault.



Blinking Green LED Next to Display Indicates Humidity Percent Fault.

All Displays Blinking Indicate Power Interruption.

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3.0 US Autoflow Start-Up

After your US Autoflow Incubator has been unpacked, positioned and leveled, proceed with the following check list.

1. Check for standard items packed with unit.
   - (4) Stainless steel shelves
   - (8) Stainless steel shelf brackets
   - (4) Stainless steel shelf bracket supports
   - (1) Full size water pan with supports
   - (1) Fill port adapter
   - (1) Fill port plug
   - (1) Gas tube with filter
   - (1) 6 feet (2M), fill tube
   - (1) Electrical Cord 8 foot (2.5m)
   - (1) Operation and Maintenance Manual
   - (1) Operating Instructions

2. Install shelf brackets, shelves and water pan. Connect incubator to an appropriate grounded power source via the backpanel power cord. Use a dedicated laboratory circuit for the power supply. A SURGE PROTECTOR IS STRONGLY RECOMMENDED to avoid power-related faults.

   Turn mode switch on front panel to setup, turn on incubator via the on/off switch on the backpanel.

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3. Fill incubator water-jacket with SINGLE distilled or de-ionized water. No purer than 5 MEGOHM water should be used. Use enclosed tubing and fill port adapter to fill water-jacket until the low water light on the front panel turns off. Add an additional 1 to 2 liters of water and install fill port plug. **ABSOLUTELY NO CHLORINATED OR HALOGEN MATERIALS ARE TO BE USED IN THE WATER-JACKET.**

4. Attach CO_2 gas supply to the CO_2 inlet on the incubator backpanel. Use a TWO-STAGE REGULATOR and set the output pressure to approximately 20 PSI.

5. Attach air inlet tubing/filter to the air inlet fitting port on the incubator back panel.

6. Enter temperature and CO_2 percent setpoints (see section 4.0).

7. Once parameter setpoints are entered, turn mode switch to run and let incubator stabilize for 24 hours. The CO_2 percent will indicate "dely" until the incubator reaches within 2° of setpoint temperature.

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4.0 Setpoint Parameter Entry

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

Chamber Temperature

- Turn Mode Switch to Set Up
- Press [SEL] to Indicate Green LED Next to Chamber Temperature Display
- Press ↑ or ↓ to Indicate Desired Temperature
- Turn Mode Switch Back to Run

CO_2 Percent

- Turn Mode Switch to Set Up
- Press [SEL] to Indicate Green LED Next to CO_2 Percent Display
- Press ↑ or ↓ to Indicate Desired CO_2 Percent
- Turn Mode Switch Back to Run

Humidity RH (Optional)

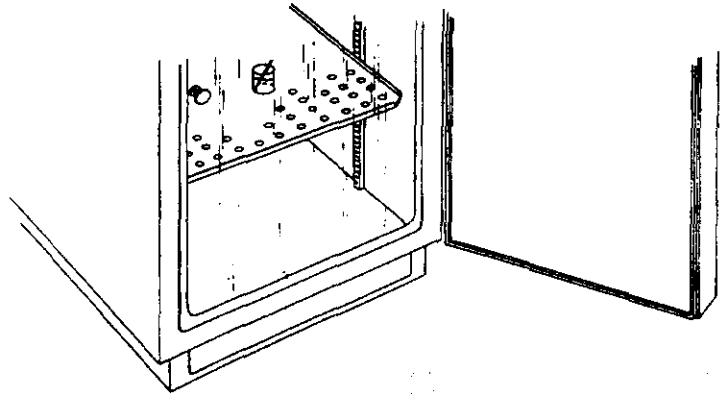
- Turn Mode Switch to Set Up
- Press [SEL] to Indicate Green LED Next to Humidity Percent Display
- Press ↑ or ↓ to Indicate Desired Humidity Percent
- Turn Mode Switch Back to Run

NOTE: If an entry error is made, re-enter data.

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5.0 Chamber Temperature Calibration

The US Autoflow's TEMPERATURE CALIBRATION MUST BE PERFORMED WITHIN 1°C OF THE PLANNED OPERATING TEMPERATURE. Normally, 37.0°C is the most common setpoint. With the incubator operating at its setpoint, place a mercury glass thermometer in a glass beaker filled with water or through an inverted Styrofoam cup resting on a shelf in the middle of the chamber. *Do not place the glass beaker on the bottom of the* incubator chamber. Placing the thermometer in the middle of the chamber will give the most accurate results for calibration. Allow the thermometer 2 hours to stabilize.



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

- Turn Mode Switch to Run
- Press [SEL] to indicate green LED next to temperature display
- Press and hold one ↑ key for four seconds, display blinks
- 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. 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.

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6.0 Door Temperature Calibration

The US Autoflow's inner glass door temperature calibration is best accomplished by running the incubator 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 is desirable as an indication of adequate humidity in the chamber. Typically one to two inches of condensation in the corners of the glass door indicates a properly calibrated door heater. However, if calibration is required, simply perform the procedure as stated below. The door heater operates as a percentage ON/OFF (0 is off, 100 is full ON). Typically, 40 to 60 percent is the most effective setpoint range.

- Turn Mode Switch to Set Up.
- Press [SEL] to indicate green LED next to temperature display.
- Press both ↑ or ↓ keys simultaneously, display "dor"/door heat % on (XX).
- Press ↑ or ↓ key to desired door heat % on.
- Press [SEL] to complete the calibration.
- Turn Mode Switch back to Run.

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7.0 CO_2 Control Calibration

CO_2 Control Calibration can be performed any time the CO_2 fyrite 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 the CO_2 fyrite measurement doesn't match the display within $\pm$0.3 percent after one week. Before doing the following calibration, check and change, if necessary, the incubator in-line filter found within the control center.

When unit has stabilized at the operational temperature and CO_2 percentage, take a CO_2 fyrite measurement and, if necessary, perform the following:

- Turn mode switch to RUN.
- Press [SEL] to indicate green LED next to CO_2% display.
- Press and hold one ↑ key for four seconds, CO_2 display blinks (clears all previous offsets) (compare the display CO_2 to the CO_2 fyrite measurement. If these two readings have a difference less than 2.0 percent, proceed to enter the fyrite value. If the difference is greater than 2.0%, proceed to CO_2 sensor calibration, Section 8.0)
- Press ↑ or ↓ key to indicate same CO_2% as fyrite measurement.
- Press [SEL] to set current value and exit calibration.

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8.0 CO_2 Sensor Internal Calibration

CO_2 sensor front panel calibration should only be performed when required due to reoccurring error indicators. The CO_2 sensor has two calibration points, a zero point (ambient CO_2 percentage) and a span point (high CO_2 percentage). The following calibration procedure should be performed ONLY after the chamber temperature is stabilized and the CO_2 sensor has been operating at the stabilized temperature for 2 hours. If the incubator has been in operation for a year or more, in line filter replacement may be necessary. After the above conditions are satisfied, proceed with the following:

Step 1: Remove control center side panel.

Step 2: Remove sensor housing via (2) thumbscrews.

Step 3: Check and replace, if necessary, in-line filters.

Step 4: Replace sensor housing and secure it.

Step 5: Turn mode switch to setup
- Press [SEL] to indicate green LED next to CO_2% display.
- Press both ↑ and ↓ keys simultaneously, display blinks "dor".

Step 6: Open inner glass door and evacuate chamber for 1 minute. Close door and allow chamber environment to stabilize for 1 minute.

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Step 7: Zero CO_2 Sensor

- Press ↑ key, display blinks "ZEr" and a positive or negative number.
- Locate the access panel on the sensor housing and open it.
- Open the front panel by opening outer door and quickly tap on left side of front panel.
- Locate the ZERO POT on the CO_2 sensor and adjust with blue trim pot tool provided until the CO2 displayed window reads 0 $\pm$.005V (Allow 30 seconds between adjustments for sensor to stabilize).

Step 8: Span CO2 Sensor

- Press ↑ key, display blinks "SPn" and the CO_2 percent.

Allow the unit to self inject CO_2 for 90 seconds. Wait an additional minute or until the display CO_2 percent reading is stable. The CO_2 inject green LED will indicate CO_2 flow into the chamber during the 90 second automatic CO_2 injection.

Step 9: Fyrite the incubator to determine correct CO_2 percentage.
Locate the SPAN POT on the CO_2 sensor control board (see Figure 2) and adjust with trim pot tool until the display CO_2 percent is the same as the fyrite CO_2 percentage (Allow 30 seconds between adjustments for sensor to stabilize.)

Step 10:Open inner glass door and evacuate chamber for 1 minute. Then, close the door.

- Press ↑ key to complete the calibration.
- Replace sensor access and control center side panel.
- Turn mode switch back to run.

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Allow unit to run and stabilize for 2 hours. Check calibration with the fyrite. Compare the display CO_2 percent to your fyrite measurement. If these two readings have a difference greater than 0.5%, repeat above procedure beginning with Step 5. If these two readings have a difference of less than 0.5%, perform the CO_2 control calibration procedure in Section 7.0.

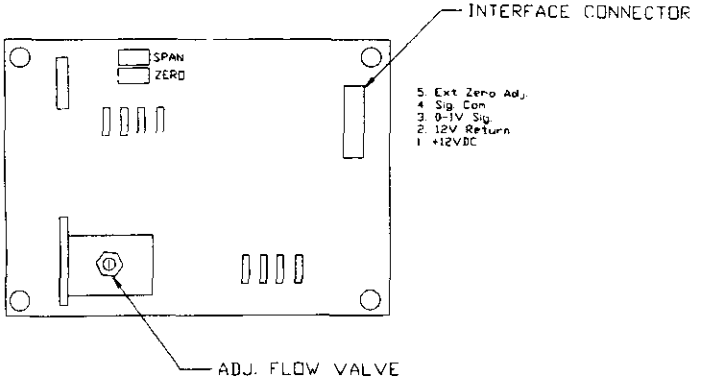


Figure 2

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9.0 Relative Humidity Calibration (Option)

Relative humidity calibration can be performed anytime if the relative humidity option 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 humidity level of 96 percent after one hour in the chamber. A calibration sensor may also be used if it's available.

The calibration procedure is a two step process. The first step is to perform an RH control calibration. The second step, RH sensor calibration, is only required if the RH control calibration cannot be performed.

When unit is stabilized at the operational temperature, CO_2 percentage and water pan in place, perform the following calibration procedure:

RH CONTROL CALIBRATION

- Turn Mode Switch to RUN.
- Press [SEL] to indicate green LED next to RH % display.
- Press and hold ↑ arrow key for four seconds, RH % display blinks (clears all previous offsets) (If the RH % display is between 93 to 99 percent, proceed to next step. If the RH % display is not between 93 to 99 percent, proceed to RH sensor calibration below).
- Press ↑ or ↓ arrow key to indicate 96 percent or known humidity percent.
- Press [SEL] to set current value and exit calibration.

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RH SENSOR CALIBRATION

Since the location of the humidity sensor board is difficult to reach. The calibration method described below, removes the humidity sensor board from the rear wall and mounts it to a calibration fixture next to the side access port of the chamber to allow the calibration to be preformed outside the chamber.

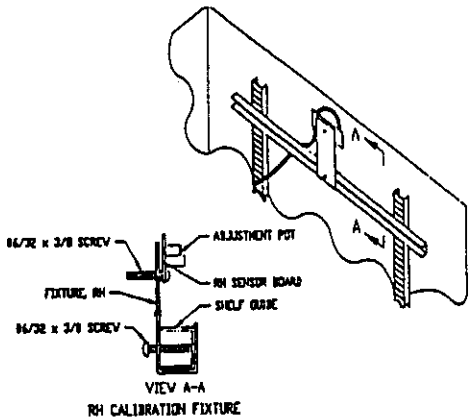
Step 1: Remove RH sensor from upper wall of chamber.

Step 2: Attach RH sensor cable extension and calibration fixture. Be sure the RH sensor adjustment pot is accessible through the side access port.

Step 3: Close incubator doors, and, with the water pan in place, let incubator stabilize for a minimum of one hour.

Step 4: When operational temperature and CO_2 percentage have stabilized with the water pan in place, perform the following calibration procedure:

- Turn mode switch to RUN
- Press [SEL] to indicate green LED next to RH% display. Press and hold ↑ arrow key for four seconds until display starts blinking (clears all previous offsets) adjust RH sensor pot through side access port. Adjust pot counter-clockwise to increase display or clockwise to decrease display. The goal is to achieve 96% or a known measurement.
- Press [SEL] to set current value and exit calibration.



Allow incubator to stabilize for 2 hours and repeat above steps if necessary. When calibration is complete, return RH sensor to original position.

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10.0 Maintaining Your US Autoflow

US 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. 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.

US Autoflow Water-Jacket
The water-jacket requires no anti-bacterial agents. The US 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.

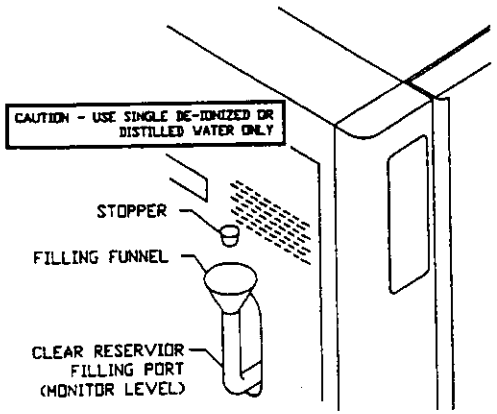
CO_2 Supply Filter (50mm In-Line, Dry)
The CO_2 Supply Filter should be replaced every fifth empty CO_2 tank or when the filter is visibly discolored (yellow-brown). Note direction of flow (IN is labeled on one side of filter) when replacing filter.

Air Inlet Filter (50mm In-Line, Dry)
The Air Inlet Filter is located on the backpanel. The purpose of the filter is to cleanse the room air which is drawn into the chamber, via the pump, for three seconds every minute, assuring the proper amount of oxygen is available to the cultures. The air inlet filter should be replaced every six months.

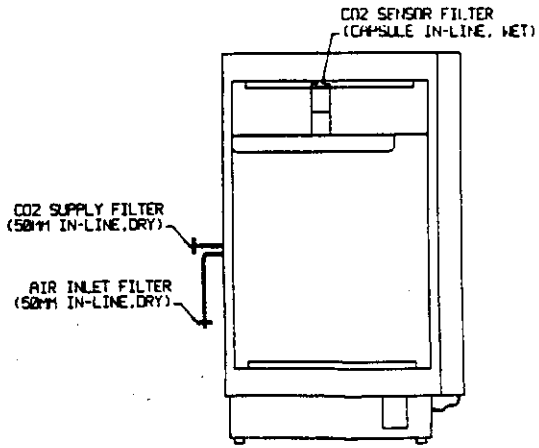
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CO_2 Sensor Filter (Capsule In-Line, Wet)
The CO_2 Sensor Filter should be replaced EVERY TWO YEARS to assure optimum performance. A visual check should be performed during the CO_2 sensor calibration to assure filter integrity. Remove sensor housing cover to perform visual check. A similar procedure should be followed with the RH filter as well (option).

RH Reservoir
THE RH RESERVOIR REQUIRES NO ANTI-BACTERIAL AGENTS. The RH Reservoir is filled using single distilled or de-ionized water. NO PURER THAN 5 MEG OHM WATER. Do not use any chlorinated or halogen materials in the RH Reservoir.



RH OPTION RESERVIOR FILL PORT



CONTROL CENTER FILTERS

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11.0 Error Indicators and Troubleshooting Guide

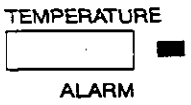
Step 1: NOTE ALL ERROR INDICATORS. When the incubator is running, any and all red or yellow LEDs indicate an error.

Step 2: CLEAR ERROR INDICATORS. Error indicators can be cleared by turning mode switch to setup and back to run.

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

Error Indicator Troubleshooting Guide

CHAMBER TEMPERATURE

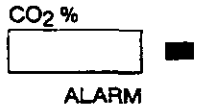


Indicates:
- Chamber temperature has exceeded allowable range or incubator not heating.
- Temp. sensor (chamber or jacket) are faulty or out of calibration.

Correction:
- Perform temperature sensor calibration.
- Check or replace fuse on main control board.
- Check or replace main control board.

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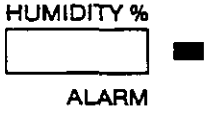
CO_2 PERCENT



Indicates:
- Backup CO_2 control system is in effect. Turning the mode switch to setup and back to run will clear it and allow the CO_2 control system to resume as normal.
- Reoccurring indicator is due to the CO_2 percentage value exceeding its allowable range.

Correction: Check CO_2 gas supply to unit.
-If display over setpoint, reduce gas cylinder regulator pressure.
-If display under setpoint, increase gas cylinder regulator pressure.
- Replace in-line filters.
- Perform CO_2 sensor and control calibration using fyrite instrument.

RH PERCENT



Indicates: RH value has exceeded allowable range. Usually due to a low water pan.

Correction:
- Fill water pan.

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GENERAL INDICATORS

■ DOOR AJAR	Indicates:	• Inner glass door is not closed. • Magnetic switch needs a position adjustment.
	Correction:	Close door or adjust switch position by loosening acorn nut.
■ LOW WATER	Indicates:	• Low water level in water jacket. • Faulty level indicator switch.
	Correction:	• Fill jacket until light goes out. • Replace level indicator switch.
■ RH RESERVOIR (option)	Indicates:	• Low water in RH reservoir • Faulty level indicator switch.
	Correction:	• Fill RH reservoir. • Replace level indicator switch.

LED DISPLAY INDICATORS

Sto (with intermittent high/low audible alarm)	Indicates:	Main control board failed to read correct setup information.

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Correction: Turn incubator on and off. If error indicator is continuous, replace main control board. If error indicator appears once, recalibrate incubator temperature and CO_2 control.

dely

Indicates: CO_2 control is in delay for one of the following reasons:

1) Power interruption just occurred. Will resume CO_2 control within 30 minutes.

To bypass, perform following:

- Turn mode switch to setup.
- Press [SEL] to indicate green LED next to CO_2% display.
- Press both ↑ or ↓ keys simultaneously, display flashes "dor".
- Press ↓ key four times quickly to exit bypass.
- Turn mode switch back to run.

2) Chamber temperature is not within 2.0°C of setpoint. Cannot bypass.

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AUDIBLE ALARM W/NO INDICATORS LIT

Indicates: Tank switch occurrence.
Correction: Press [SEL] key to silence indicator.

BLINKING DISPLAYS

Indicates: Interruption of power.
Correction: Turn mode switch to setup and back to run.

For further assistance, call NuAire customer service at 1-800-328-3352 or (612) 553-1270 USA.

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