Forma Scientific 3033

# Steri-Cult CO2 Incubator



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**Models:**

# 3033 and 3035
# 3860 and 3862

Steri-Cult Incubators

# Operating and Maintenance Manual

**Manual No: 7073033 Rev. 6**

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**Read This Instruction Manual.**

Failure to read, understand and follow the instructions in this manual may result in damage to the unit, injury to operating personnel, and poor equipment performance.




***CAUTION! All internal adjustments and maintenance must be performed by qualified service personnel.***

**Refer to the serial tag on the back of this manual.**

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**MANUAL NUMBER 7073033**

| REV | ECR/ECN | DATE | DESCRIPTION | By |
|---|---|---|---|---|
| 6 | 20122/IN-2948 | 6/18/01 | Updated electrical schematics to meet EMC standards | ccs |
| 5 | Updates from 2 | 4/16/01 | Updated Accessories list (caster dollies) | ccs |
| 4 | 19588/SI-8132 | 12/21/00 | Changed power switch P/N 360146 to 363033 (elec. schematics) | aks |
| 3 | -- | 5/19/00 | Quark format | ccs |
| 2 | 18501/SI-7634 | 8/17/99 | Added securing bracket in Section 2 | ccs |



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***Important operating and/or maintenance instructions. Read the accompanying text carefully.***

***Ce symbole attire l'attention de l'utilisateur sur des instructions importantes de fonctionnement et/ou d'entretien. Il peut être utilisé seul ou avec d'autres symboles de sécurité. Lire attentivement le texte d'accompagnement.***

***Wichtige Betriebs- und/oder Wartungshinweise. Lesen Sie den nachfolgenden Text sorgfältig.***

***Importante instruccions de operacion y/o mantenimiento. Lea el texto acompanante cuidadosamente.***



***Potential electrical hazards. Only qualified persons should perform procedures associated with this symbol.***

***Ce symbole attire l'attention de l'utilisateur sur des risques électriques potentiels. Seules des personnes qualifiées doivent appliquer les instructions et les procédures associées à ce symbole.***

***Gefahr von Stromschlägen. Nur qualifizierte Personen sollten die Tätigkeiten ausführen, die mit diesem Symbol bezeichnet sind.***

***Potencial de riesgos electricos. Solo personas das capacitadadas deben ejecutar los procedimientos asociadas con este simbulo.***



***Equipment being maintained or serviced must be turned off and locked off to prevent possible injury.***

***Risques potentiels liés à l'énergie. L'équipement en entretien ou en maintenance doit être éteint et mis sous clé pour éviter des blessures possibles.***

***Geräte, an denen Wartungs- oder Servicearbeiten durchgeführt werden, müssen abgeschaltet und abgeschlossen werden, um Verletzungen zu vermeiden.***

***El equipo recibiendo servicio o mantenimiento debe ser apagado y segurado para prevenir danos.***

√ Always use the proper protective equipment (clothing, gloves, goggles, etc.)
√ Always dissipate extreme cold or heat and wear protective clothing.
√ Always follow good hygiene practices.
√ Each individual is responsible for his or her own safety.



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When more extensive service is necessary, we will assist you with direct factory trained technicians or a qualified service organization for on-the-spot repair. If your service need is covered by the warranty, we will arrange for the unit to be repaired at our expense and to your satisfaction.

Regardless of your needs, our professional telephone technicians are available to assist you Monday through Friday from 8:00 a.m. to 7:00 p.m. Eastern Time. Please contact us by telephone or fax. If you wish to write, our mailing address is:

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# Section 1 - Receiving

## 1.1 Preliminary Inspection

This unit was thoroughly inspected and carefully packed prior to shipment and all necessary precautions were taken to ensure safe arrival. Immediately upon receipt, before the unit is moved from the receiving area, carefully examine the shipment for loss or damage. Unpack the shipment and inspect both interior and exterior for any in-transit damage.

## 1.2 Visible Loss or Damage

If any loss or damage is discovered, note any discrepancies on the delivery receipt and call the delivering carrier and request that their representative perform an inspection. Do not discard any of the packing material and do not move the shipment from the receiving area.

## 1.3 Responsibility for Shipping Damage

For products shipped F.O.B. Marietta, Ohio, the responsibility of Thermo Forma ends when the merchandise is loaded onto the carrier's vehicle.

On F.O.B. Destination shipments, Thermo Forma and the carrier's responsibility ends when your Receiving Department personnel sign a free and clear delivery receipt.

Whenever possible, Thermo Forma will assist in settling claims for loss or in-transit damage.

# Section 2 - Installation and Start-up

## 2.1 Location

Locate the incubator in a draft-free area away from doors, windows, and air conditioning or heating ductwork. To help prevent microbial contamination, the incubator should also be removed from areas of high personnel traffic.

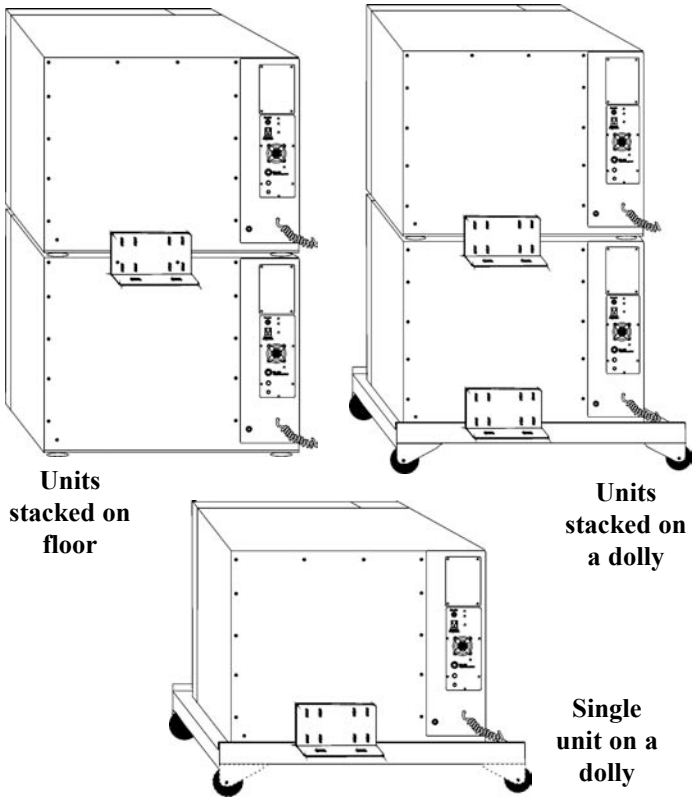
Place the unit on a firm, level surface capable of supporting the unit with humidity reservoir water (Approximate weight with water = 278 lbs or 125 kg).

Allow enough clearance on the left side of the unit for easy access to view the reservoir water level, the filters and electrical components. Adequate space is also required behind the incubator for electrical and gas connections.

## 2.2 Securing the Unit

Shipped with the shelf channels is a securing bracket and mounting hardware. Retain these for future use, if not required at this time.

All 3033/3860 Series units require a securing bracket, with the exception of a single unit standing on the floor. All incubators must be secured to each other if stacked, and/or to the caster dolly when used. The securing brackets mount to the back of the unit, using holes already drilled. See the illustrations below. The screws in these locations can be discarded and the screws and flatwashers included with the bracket installed in their place.



**Units stacked on floor**

**Units stacked on a dolly**

**Single unit on a dolly**



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## 2.3 Leveling

Before filling the humidity system, check the level of the unit by placing a bubble-type level on one of the shelves. Turning the leveling feet counterclockwise lengthens them, clockwise shortens them. Level the unit front-to-back and left-to-right.

***To prevent injury to personnel and/or damage to equipment, lock the inner glass door and secure outer door before tipping unit to adjust leveling feet.***
***Do not attempt to tilt the incubator without assistance.***

## 2.4 Connecting to Power

See the serial tag on the left side panel of the unit for electrical specifications.

***Connect the incubator to a grounded dedicated circuit only.***
***The power switch is the mains disconnect device for the incubator.***

Plug the power cord provided into the power connector and into a grounded dedicated circuit. See Figure 2-1.

## 2.5 Connecting the Water Drain Line

A barb-type fitting on the back of the incubator (beneath and to the left of the power cord) is the drain connection for the humidity reservoir. (Refer to Figure 2-1.)

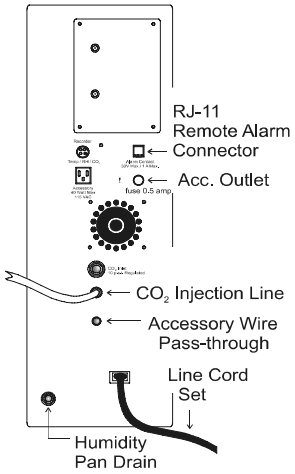



**Figure 2-1**

Connect one end of the 1/4" tubing supplied with the incubator to the barb fitting. Place the other end of the tubing into a container capable of holding at least 1.5 gallons of water or route the tubing to a suitable drain.

## 2.6 Preliminary Disinfecting

Disinfect all interior surfaces, including both door gaskets, by washing with an appropriate laboratory disinfectant. Rinse the surfaces with sterile distilled water. Repeat rinsing until all of the disinfectant-detergent has been removed.

Remove the protective plastic film from the shelf brackets. Wash the shelf brackets, diffuser pans, pilasters and shelves with the laboratory disinfectant and rinse with sterile distilled water.

It is recommended that the incubator run for 24 hours to assure removal of all trace vapors.

## 2.7 Installing the Diffuser Pans and Pilasters

1. Install the boots onto the top and bottom diffuser pans. The diffuser pans are the flat, metal shelf-type assemblies that form the top and bottom of the incubator chamber. (Refer to Figure 2-2).
2. The diffuser pans must be installed with the feather gasket contacting the chamber top or bottom and the boots matching the holes in the chamber wall.
3. Place the bottom diffuser pan into the incubator chamber by positioning the left side first to align the boot with the hole in the chamber wall.
4. Place the left and right pilasters into the chamber with the vertical keyholes at the front (Figure 2-3). Allow the top of the right pilaster to lay diagonally across the chamber, resting upon the left pilaster. Pilasters are the assemblies that hold the shelves inside the incubator chamber.
5. Place top diffuser pan into the incubator chamber. While supporting the top diffuser pan, raise the right pilaster up until it is vertical.
6. Lock the retainers on the pilasters into place.
7. Remove the protective cap from the gas inlet tube located on the bottom of the top diffuser pan. (Figure 2-2).
8. Connect the incoming $CO_2$ tubing to the gas inlet tube. The $CO_2$ tubing is routed through the stopper in the back wall of the incubator chamber.

## 2.8 Installing the Shelves

The shelves are easily installed and removed for cleaning.

1. Slide the rivets on the shelf channel into the keyholes on the pilasters.
2. Slide the shelf into the channel.



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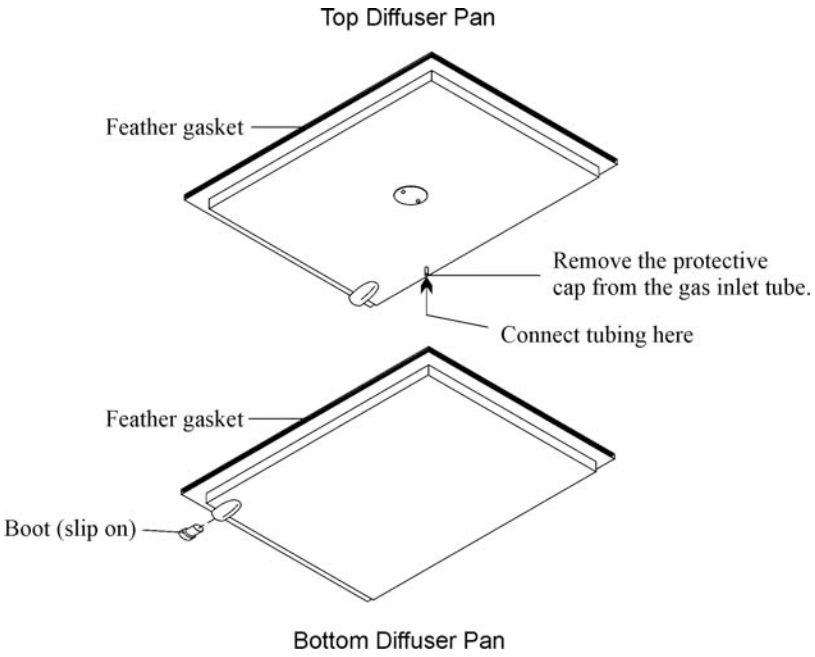



**Figure 2-2**

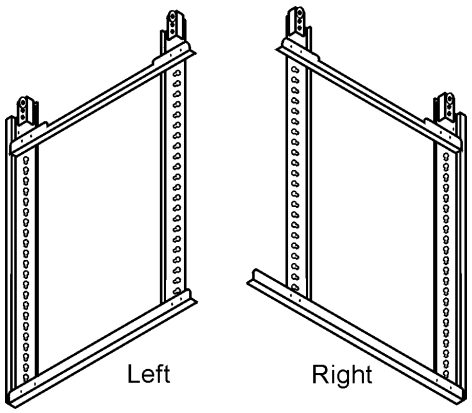



**Figure 2-3**

## 2.9 Connecting the $CO_2$ Supply

A main supply of liquid $CO_2$ is recommended. The liquid $CO_2$ should be supplied from tanks without siphon tubes to ensure that only $CO_2$ gas enters the incubator injection system. It is also recommended that a two-stage pressure regulator with indicating gauges be installed at the supply cylinder outlet.

The high pressure gauge should have an indicating range of 0 to 2000 PSIG to monitor tank pressure and the low pressure gauge should have an indicating range of 0 to 30 PSIG to monitor the input pressure to the incubator injection system. A suitable two-stage pressure regulator is available from Forma, Stock #965010.

The $CO_2$ source must be regulated at a pressure level of 5 to 10 PSIG. Higher pressure levels may damage the $CO_2$ system. Pressure levels lower than 5 PSI will not affect the operation of the incubator, but will increase the $CO_2$ recovery time.

### a. To connect the CO2 supply:

The $CO_2$ supply fitting (labeled CO2 inlet) is located on the back of the incubator. Securely attach the vinyl $CO_2$ line to the barbed fitting and check the connection for leaks.

## 2.10 Connecting the Temp/Alarm Back-Up Battery

The temperature alarm back-up battery has been disconnected to prevent it from discharging during shipment. To connect the battery:

1. Turn the incubator off. Remove the Temperature Alarm module.

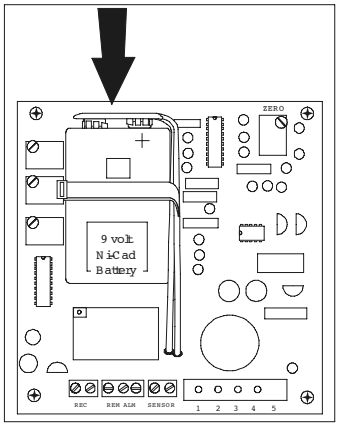
2. Locate the 9-volt battery and its connector on the back of the module (Figure 2-4).

3. Snap the battery connector onto the battery terminals and reinstall the module.

**Note:** If the alarm sounds, turn the alarm switch to the Standby position until the incubator is turned on.

***Replace batteries with a rechargeable type only. Dispose of the old battery in an environmentally safe manner.***

**Figure 2-4**






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## 2.11 Filling the Humidity Reservoir

For best operation of the incubator, sterilized distilled, demineralized or de-ionized water should be used in the humidity reservoir. Water purity should be in the resistance range of 50K to 1M Ohm/cm, or a conductivity range of 20.0 to 1.0 uS/cm. Refer to ASTM Standard D5391-93 or D4195-88 for measuring water purity.

Distillation systems, as well as some types of reverse osmosis water purity systems, can produce water in the quality range specified. Tap water is not recommended as it may contain chlorine, which can deteriorate the stainless steel. Tap water may also have a high mineral content, which would produce a build-up of scale in the reservoir. High purity, ultra pure or milli-q water is not recommended as it is an extremely aggressive solvent and will deteriorate the stainless steel. High purity water has a resistance of above 1M Ohm to 18M Ohm/cm. Even high purity water can contain bacteria and organic contaminants. Water should always be sterilized or treated with a decontaminant, safe for use with stainless steel as well as safe for the product, prior to being introduced into the humidity reservoir.

***Distilled or de-ionized water used in the humidity reservoir must be within a water quality resistance range of 50K to 1M Ohm/cm to protect and prolong the life of the stainless steel. Use of water outside the specified range will decrease the operating life of the unit and may void the warranty.***

The humidity reservoir fill port fitting is located on the upper left side of the incubator. A viewing window built into the side panel allows the reservoir bottle water level to be seen.

1. Remove the brass plug from the fill port using a 1/4" Allen wrench.
2. Attach the threaded fitting, tubing and funnel to the fill port.
3. Add 3 liters of sterile distilled water to the reservoir. If the humidity reservoir is overfilled, water will escape through the overflow drain.

**Note:** With the power switch ON, the Add Water alarm may activate if the reservoir is not filled within 10 minutes. Silence the alarm by pressing any "sensi-touch" key.

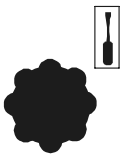
***No modification to the Add Water system should be made, such as attaching to a pressurized supply, without first consulting the Forma Service department. The water valve is rated to 5 PSIG. Pressure in excess of this may damage or override the valve and cause flooding of the incubator chamber.***

## 2.12 Setting the Over/Under Temperature Safety (Refer to Figure 2-5)

The over/under temperature safety settings are made on the Temperature Alarm/Monitor control panel. Power to the incubator must be turned on.

To make these adjustments, a screwdriver is provided. Pull on the black knob located to the right of the sample port on the power control panel. The knob is the handle of the screwdriver.

Refer to the control panel illustration in Figure 2-5 and look for this screwdriver symbol:



**To set the overtemperature safety limit:**

1. Slide the Set Hi/Actual/Set Low switch on the Temperature Alarm Monitor to the Set Hi position.
2. Using the screwdriver turn the adjustment screw labeled Set Hi until the desired high limit temperature is displayed.

**Note:** The incubator will likely overshoot 2 or 3°C on initial start-up. The Set Hi should be set to allow for this. It may later be set closer to the setpoint.

**To set the under temperature safety limit:**

1. Slide the switch to the Set Lo position and turn the Set Lo adjustment screw until the desired low limit temperature is displayed on the LCD display.

**Note:** On initial start-up, the Set Lo should be set below ambient to avoid an alarm condition. When the incubator has stabilized, the Set Lo may be adjusted closer to setpoint temperature. the high and low setpoint temperature limits should not be set within 0.2°C of the desired temperature to avoid nuisance alarms.

2. Return the slide switch to the center Actual position to display the chamber temperature.

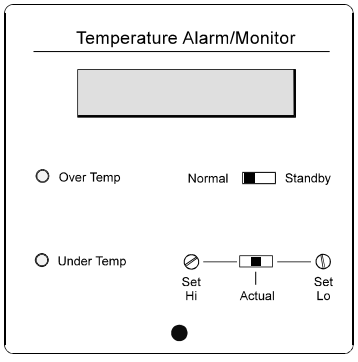



**Figure 2-5**



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## 2.13 Setting the $CO_2$

When setting the $CO_2$, the incubator power must be on and the key switch set to Program. Refer to the power control module illustration in Figure 2-6 and the $CO_2$ control module illustration, Figure 2-7.

1. With the Program/Run key switch turned to Program, press the inverted Y touch button on the $CO_2$ control panel until the word SET appears on the left side of the $CO_2$ display.
2. Using the up arrow or down arrow touch buttons, set the $CO_2$ concentration percentage. The $CO_2$ may be set in 0.1% increments within a range of 0% to 20%.
3. When the $CO_2$ concentration has been selected, press the inverted Y button again to return to the display mode. (SET will disappear from the window).
4. When programming is complete, turn the Program/Run key switch to Run and remove the key to secure the setpoints.

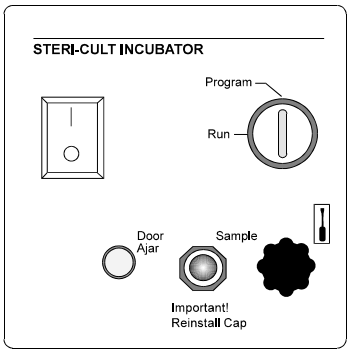



Figure 2-6

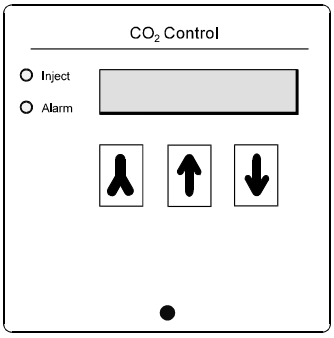



Figure 2-7

## 2.14 Setting the Relative Humidity

1. With the Program/Run key switch turned to Program, press the inverted Y touch button on the RH Control panel until the word SET appears on the left side of the display.
2. Using the arrow keys, increase or decrease the setpoint until the desired humidity percentage appears. The RH may be set in 1% increments from 5% above ambient to 98%.
3. When the RH level has been selected, press the inverted Y button. (SET will disappear from the window).
4. When programming is complete, return the Program/Run key switch to Run and remove the key to protect the setpoints from unauthorized tampering.

**Note:** The incubator will not attempt to control the RH until the chamber temperature is within 1°C of setpoint. During this time the value displayed in the RH control panel will be "—". The RH recorder output will be the RH setpoint value.

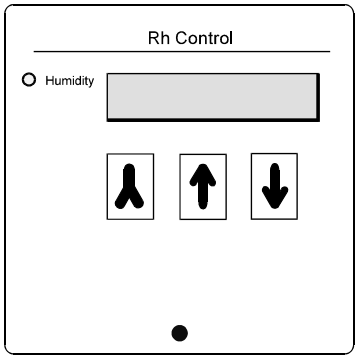



Figure 2-8

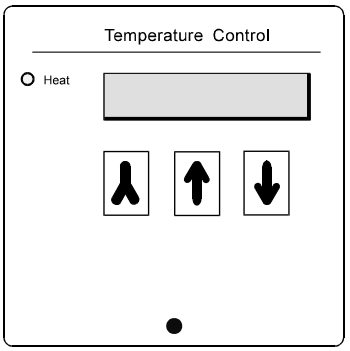



Figure 2-9

## 2.15 Setting the Chamber Temperature (Refer to Figure 2-9)

**Note:** The Temperature Control panel displays the temperature setpoint. The Temperature Alarm/Monitor displays the actual chamber temperature.

1. Turn the Program/Run key switch to Program and press the arrow keys to increase or decrease the temperature setpoint.

**Note:** The temperature may be set in 0.1°C increments within a range of 4°C above ambient to +45°C.

2. When the temperature setpoint has been selected, return the key switch to Run and remove the key to secure the setpoints.

## 2.16 Connecting to the Recorder Jack

A recorder jack, capable of an input signal from 0 to 999mV, is provided for connecting electronic recorders. The TEMP/RH/$CO_2$ jack is located on the back panel of the incubator. Refer to Figure 2-1 for the jack location and Figure 2-10 for the pin descriptions.

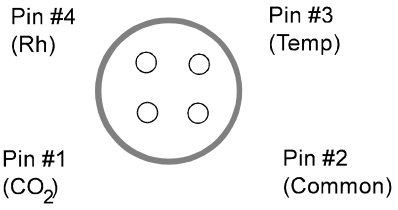



Figure 2-10



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## 2.17 Connecting to the Remote Alarm Contacts

An internal DPDT relay is provided on the Temperature Alarm/Monitor to monitor alarms and is connected to an RJ-11 (telephone style) jack on the back of the cabinet. Figure 2-10 identifies the pin contacts, Figure 2-1 shows the location of the Remote Alarm Connector.

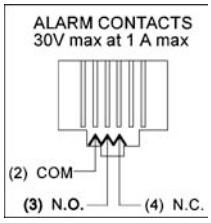



**Figure 2-11**

**IMPORTANT USER INFORMATION**

**Caution! Stored product should be protected by an activated alarm system capable of initiating a timely response 24 hours/day. Forma Alarms provide interconnect for centralized monitoring.**

The remote contacts are “dry” contacts, rated at 30V, 1A maximum.

A modular to modular cable (Forma Stock No. 190388) and an RJ-11 telephone style terminal converter (Stock No. 190392) or equivalent may be used to convert the remote alarm output to a screw terminal connection. Refer to Figure 2-12.

## 2.18 Convenience/Accessory Outlet

An electrical outlet is located on the back of the incubator, providing 115VAC 0.35A max for lights and accessories. The maximum allowable leakage current for the product plugged into the outlet is 3 mA. The outlet is protected by an adjacent fuse 0.5 amp, 250V, T (time-lag), Forma P/N 230120. Refer to the electrical schematic in Section 9 of this manual.

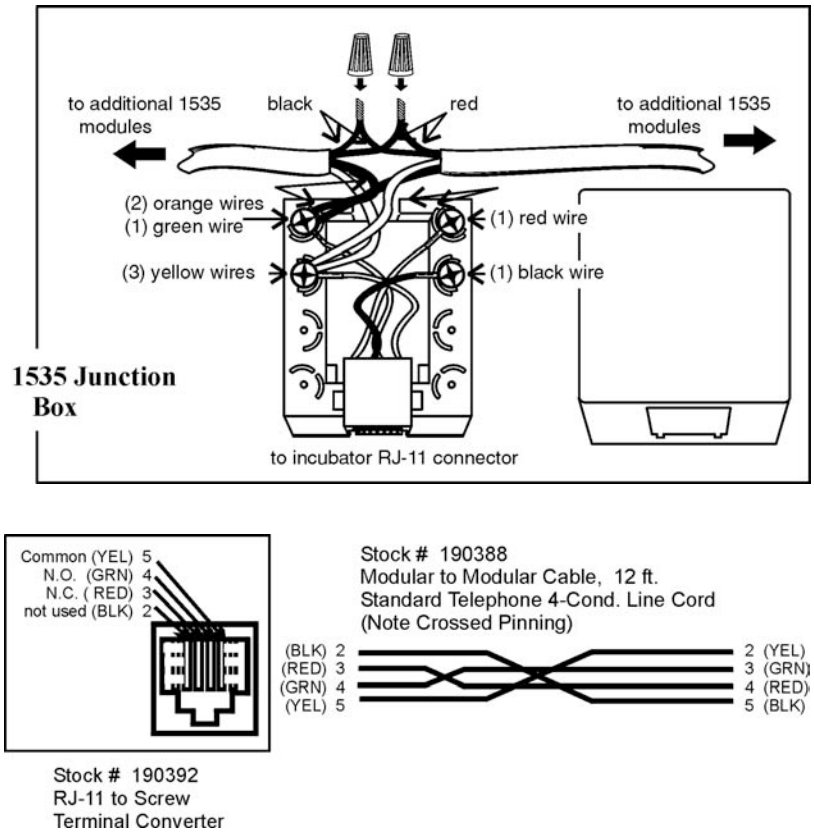



**Figure 2-12**



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# Section 3 - Operation

## 3.1 Description

The Steri-Cult Series $CO_2$ incubator provides perfect culture conditions in a state-of-the-art, microprocessor controlled incubator. During operation, the chamber air is drawn through the top diffuser pan and into the chamber outlet duct where it passes over a temperature probe. The temperature controller then cycles the heaters which surround the incubator chamber.

Next, the air passes through the blower and onto a microbiological filter. The filter scrubs the circulating air, trapping spores and other airborne contaminants. The "scrubbed" air exits the filter and continues along the sensing/conditioning path. A sample of this air is routed through the infrared $CO_2$ sensing unit where precise $CO_2$ levels are monitored.

Periodically, the Air Inject solenoid opens, allowing filtered outside air to pass across the IR sensor. This serves as an Auto-Zero to eliminate possible sensor or electrical component drift. During this time, the $CO_2$ inject solenoid will not cycle. Signals from the IR sensor are sent to the CPU Board where they are compared to the $CO_2$ setpoint. If a difference exists between the actual value and the setpoint, the microprocessor computes the appropriate solenoid on/off times. This creates a proportional $CO_2$ controller when the actual value is within 1% of setpoint.

The recirculated chamber air continues into the humidity reservoir. The air passes below the water level and is humidified as it bubbles through the water. The microprocessor looks at the air temperature and selected humidity level and calculates the necessary water temperature required to obtain the desired RH. Water in the reservoir is heated by an external heater and the temperature is monitored by an immersed temperature probe.

**Note:** The Steri-Cult incubators are designed to minimize the amount of condensation on the glass door. However, the units are not condensate-free, specifically if the chamber interior is operated above an absolute RH average of 85%. It is normal to have a small amount of condensate form across the bottom and in the corners of the glass door if the RH setpoint is equal to or greater than 90% RH.

No attempt to control RH will occur until the chamber temperature is within 1°C of setpoint. During this time the value displayed in the RH Control module will be "—". The RH recorder output will be the RH setpoint value.

The humidified and $CO_2$ enhanced air then passes across another heater which is controlled by a third temperature probe. The purpose of this heater is to restore lost heat to the air before entering the chamber.

Air enters the chamber beneath the bottom diffuser pan and is forced up through the holes into the chamber.

When the outer door is opened, power to the heaters, $CO_2$ inject solenoid and humidity reservoir is interrupted. When the outer door is closed, power is restored.

## 3.2 Power Control Panel (Figure 3-1)

The Power Control Panel houses the Main Power switch, Program/Run key switch, Door Ajar light (red), Sample Port and Adjustment Screwdriver.

### a. Main Power Switch

The Main Power switch controls all electrical power to the incubator. The switch must be on for any of the incubator systems to be functional.

### b. Program/Run Key Switch

The Program/Run key switch determines the operating mode of the incubator.

When the switch is set to Program, the operator may set the chamber temperature, relative humidity and $CO_2$.

When the switch is set to Run, the programmed setpoints are locked. The setpoints may be viewed but not changed.

### c. Door Ajar Light

The red Door Ajar light warns that the outer door is open or has not been securely closed.

When the Door Ajar light is on, power to the heaters and the $CO_2$ injection solenoid is interrupted.

### d. Sample Port

The Sample Port is used to draw a sample of chamber atmosphere so $CO_2$ content may be measured by an independent source.



***For proper operation and to prevent $CO_2$ loss, the sample port must be capped when not in use.***



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## 3.3 Temperature Alarm/Monitor

The Temperature Alarm/Monitor contains a liquid crystal display (LCD), red Overtemp and red UnderTemp lights, a Normal/Standby alarm switch, Set Hi and Set Lo adjustment screws and a three-position selector switch.

### a. LED Temp Display

The LCD display will show actual chamber temperature, high alarm limit or low alarm limit, depending upon the position of the three position switch.

### b. High and Low Temp Limit Switch

The High and Low temperature limits are set by placing the three position switch to Set Hi or Set Lo and turning the proper adjustment screw until the desired temperature appears in the LCD window. When the switch is returned to Actual the LCD displays the actual chamber temperature.

### c. Temp Alarm Lights, Audible Alarm and Normal/Standby Switch

If the chamber temperature exceeds the programmed high or low limits, the appropriate red LED lights and an audible alarm will sound.

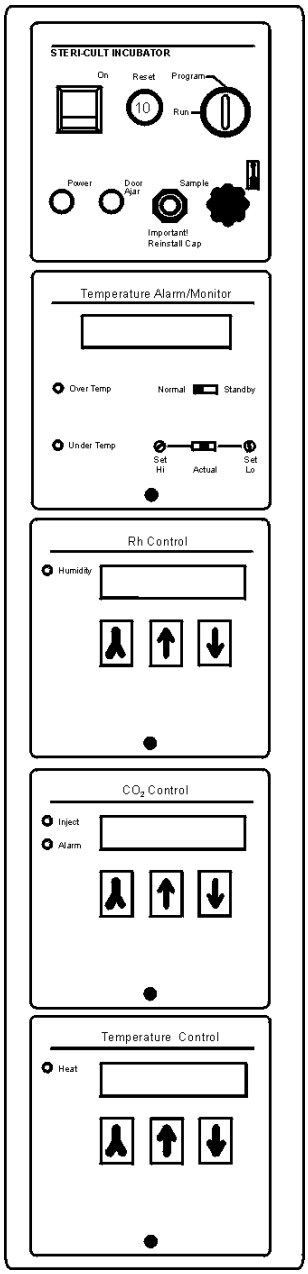



**Figure 3-1**

The audible alarm is silenced by turning the Normal/Standby switch to the Standby position. The red LED will remain lit until the alarm condition has been corrected.

**Note:** The alarm will ring back when the alarm condition has been corrected as a reminder to turn the Normal/Standby switch to the Normal position.

## 3.4 $CO_2$ Control Panel

The $CO_2$ Control Panel contains an amber LED inject light, a red alarm light, an LCD readout and three "Sensi-Touch" touch pad buttons.

### a. $CO_2$ LCD Display

The LCD readout displays either the actual chamber $CO_2$ content or the $CO_2$ setpoint. Touching the inverted Y button selects the mode of the display.

When the unit is in the Set mode the word SET appears on the left side of the display. With the key switch turned to Program, the $CO_2$ setpoint is set by pressing the up arrow or down arrow buttons. Touching the inverted Y button again will change the display to read the actual chamber $CO_2$.

### b. $CO_2$ Inject Light

When $CO_2$ is being injected, the amber Inject light will be lit.

### c. $CO_2$ Alarm Light and Audible Alarm

If the incubator $CO_2$ concentration deviates from the setpoint by +/- 1% (nominal) for more than 30 minutes, the red LED alarm light will be activated and a pulsing audible alarm will sound.

Pressing any of the nine Sensi-Touch buttons on the control panel will silence the alarm and turn off the red alarm light.

If the alarm is not silenced, and the actual $CO_2$ concentration returns to within +/- 1% of the setpoint, the audible alarm will turn off, but the alarm light will stay lit until a touch pad button is pressed.

A $CO_2$ setpoint of 00.0 will disable the deviation alarm.

## 3.5 Auto Zero Function

The $CO_2$ Auto Zero Function compensates for any drift in the $CO_2$ sensing system.

The Auto Zero solenoid activates approximately every four hours to allow room air supplied by the air pump to enter the $CO_2$ sensor cell. (The reading from the room air is considered to be 0% $CO_2$.) The calibration value is automatically adjusted to make the actual reading 0%.

**Note:** The "%" indicator in the %CO2 display is turned off during the Auto Zero cycle, which takes 3-4 minutes.



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### 3.6 Auto Zero Alarm

If the calibration correction value is larger than that of a typical instrument drift, it is considered an error and the calibration value will not be changed.



***This indicates a problem such as elevated ambient, $CO_2$ component failure, plugged lines, electrical noise, etc. Therefore, the incubator will continue to use the last correct zero value.***

Four consecutive errors are considered an alarm condition. The %CO2 in the $CO_2$ display will then flash and the audible alarm will sound.

**Note:** If a subsequent auto zero calibration value is within the range, the alarms will be turned off.

A $CO_2$ setpoint of 00.0 will disable the Auto Zero alarm.

### 3.7 RH Control Panel

The Relative Humidity (RH) Control Panel contains an amber LED, an LCD readout and three Sensi-Touch buttons.

#### a. Relative Humidity Liquid Crystal (LCD) Display

The LCD readout displays either the actual chamber RH or the RH setpoint. Touching the inverted Y button selects the display mode.

When the inverted Y button is pressed, the word SET appears on the left side of the LCD window. With the key switch turned to Program, the RH level can be set by touching the up arrow or the down arrow. Pressing the inverted Y button again changes the display to read the chamber humidity.

If the humidity reservoir runs low on water a steady audible alarm will sound and the symbol $H_2O$ will flash in the LCD window. Pressing any of the nine Sensi-Touch buttons on the control panel will silence the alarm for 10 minutes.

When a low water alarm occurs, add 3 liters of sterile distilled water to the humidity reservoir. Follow the instructions in Section 2.10.

**Note:** No humidification will take place until the chamber temperature is within 1° of the temperature setpoint. During this time, the LCD reading will default to two dashes ("—"), and the RH recorder output will be the RH setpoint value.

If no humidity control is desired, a 00.0 setpoint should be selected. This will cause the display to show "—" and will also defeat the $H_20$ alarm.

#### b. Humidity Indicator Light

The amber LED will light as the unit calls for more moisture to maintain the humidity setpoint.

### 3.8 Temperature Control Panel

The Temperature Control Panel contains an amber LED, an LCD and three Sensi-Touch buttons.

#### a. Temperature LCD Display

The LCD readout displays the selected temperature setpoint.

**Note:** On this module the inverted y button performs no function.

With the key switch turned to Program, the temperature is set by pressing the up arrow or down arrow buttons.

**Note:** This module displays setpoint - not actual temperature.

#### b. Heat Indicator Light

The amber Heat LED lights when the temperature controller calls for more heat in the chamber.



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Thermo Forma

# PREVENTIVE MAINTENANCE

## Incubators

Your Thermo Forma equipment has been thoroughly tested and calibrated before shipment. Regular preventive maintenance is important to keep your unit functioning properly. The operator should perform routine cleaning and maintenance on a regular basis. For maximum performance and efficiency, it is recommended the unit be checked and calibrated periodically by a qualified service technician.

The following is a condensed list of preventive maintenance requirements. See the specified section of the instruction manual for further details.

Thermo Forma has qualified service technicians, using NIST traceable instruments, available in many areas. For more information on Preventive Maintenance or Extended Warranties, please contact us at the number listed below.

Cleaning and calibration adjustment intervals are dependent upon use, environmental conditions and accuracy required.

**Tips for all incubators:**

- Do NOT use bleach or any disinfectant that has high chloros
- Use sterile, distilled or demineralized water.
- Avoid spraying cleaner on the $CO_2$ sensor.
- Do not use powdered gloves for tissue cultures.

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USA and Canada 888-213-1790 Telefax: 740-373-4189 http://www.fservice@forma.com

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# Preventive Maintenance for 3033 and 3860 Series Incubators

| Refer to Manual Section | Action | Daily | Weekly | Yearly | Every 2 Years |
|---|---|---|---|---|---|
| -- | Check $CO_2$ tank levels. | ✓ | | | |
| -- | Inspect door latch, hinges and door gasket seal. | | | ✓ | |
| 5.2 | * Verify and document $CO_2$, temperature and humidity calibration | | | ✓ | |
| 5.16 | * Verify and document Auto Zero, at the minimum. | | | ✓ | |
| 4.1, 4.4 | Perform a complete decontamination procedure. Wipe down interior, shelves and side panels with disinfectant. Drain the water reservoir bottle and rinse with disinfectant. Rinse all well with sterile distilled water. | Between experiments<br>*More frequent decontamination may be required, depending on use and environmental conditions* | | | |
| 5.5 | * Change HEPA, gas, water and air filters, as applicable | | ✓<br>*More frequent changes may be required, depending on use and environmental conditions* | | |

* Qualified service technicians only

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# Section 4 - Routine Maintenance

## 4.1 Disinfecting the Incubator Interior

The incubator can be disinfected in about 30 minutes using an appropriate disinfectant diluted with sterile distilled water (50K to 1M Ohm/cm) per manufacturer's instructions.

***Do not use strong alkaline or caustic agents. Stainless steel is corrosion resistant, not corrosion proof. do not use solutions of sodium hypochlorite (bleach), as they may cause pitting and rust.***

1. Turn the power switch off.
2. Remove the shelves, pilasters and diffuser pans and clean all interior surfaces with disinfectant solution.
3. Rinse surfaces at least twice with sterile distilled water, or until all of the disinfectant-detergent has been removed.
4. Thoroughly clean the inner door gasket.
5. Clean the inside of the glass door with disinfectant solution and rinse with sterile distilled water.
6. Wash the shelves and rinse with sterile distilled water.
7. Reinstall the diffuser pans, pilasters and shelves. (See Sections 2.6 and 2.7 if necessary.)
8. Turn the power switch on.

After decontamination, operate the unit for 24 hours to remove trace vapors from the incubator chamber.

## 4.2 Cleaning the Cabinet Exterior

The incubator exterior may be cleaned with a general-use laboratory disinfectant.

## 4.3 Cleaning Stainless Steel

Use the mildest cleaning procedure that will do the job effectively. To insure maximum effectiveness and to avoid marring the surface, always rub in the direction of the finish polish lines. Rinse the surface thoroughly and wipe the surface dry.

The use of aromatic solvents is not recommended for cleaning cabinet interiors as residues could cause contamination of the cabinet environment.

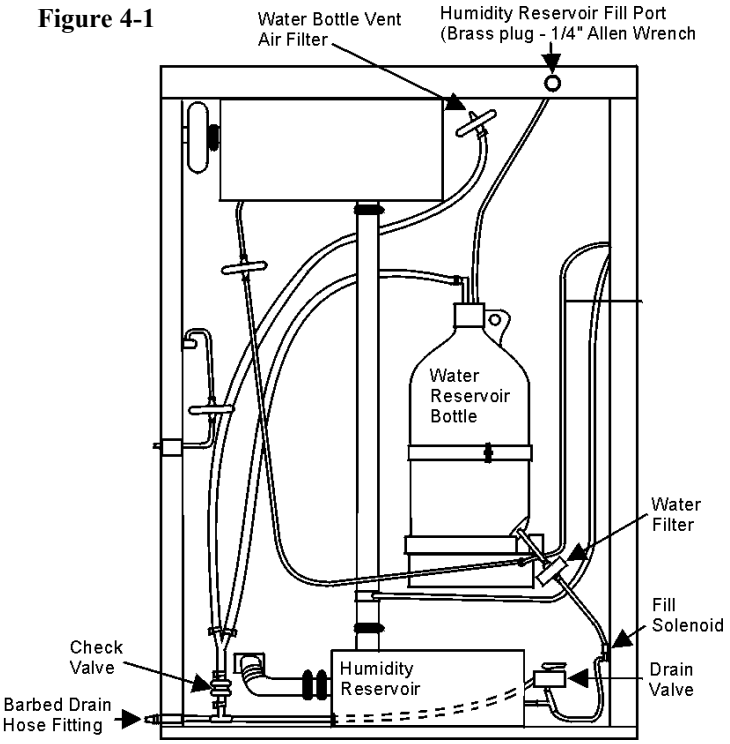
Do not use strong alkaline or caustic agents. Stainless steel is corrosion-resistant, not corrosion-proof. Do not use solutions of sodium hypochlorite (bleach) as they may cause pitting and rust.

## 4.4 Draining the Humidity Reservoir

A drain valve has been provided for draining of the humidity system.

1. Verify that there is a hose connected to the drain fitting on the back of the incubator. Route the line to a large container or suitable drain.
2. Turn the incubator on.
3. Remove the humidity reservoir fill port plug located on the upper left side of the incubator using a 1/4" Allen wrench. (Refer to Figure 4-1)

**Figure 4-1**




4. Remove the cover plate located directly beneath the Temperature Control Module. The cover is released by pulling the two black plastic locking pins. (Refer to Figure 4-2)

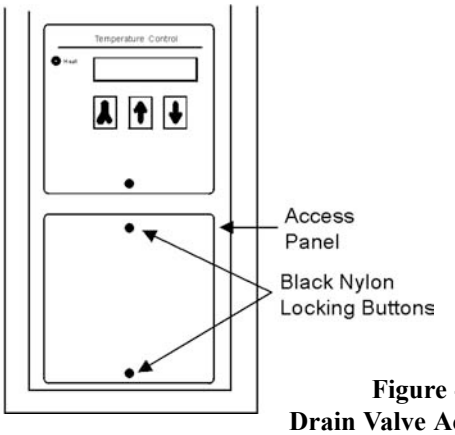



**Figure 4-2**
**Drain Valve Access Panel**



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5. Reach through the opening and open the drain valve by rotating it 90° counterclockwise so the handle is parallel with the drain line. (Figure 4-3) This will drain the entire humidity system.
6. Close the drain and replace the access panel.

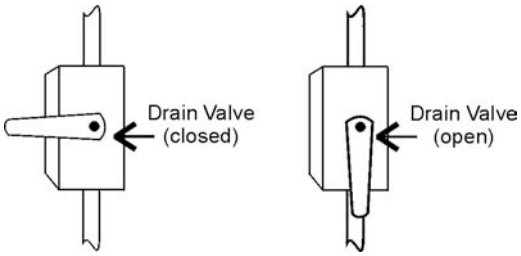



**Figure 4-3**



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# Section 5 - Service

**CAUTION**
Contains Parts and Assemblies Susceptible to Damage by Electrostatic Discharge (ESD)

***Servicing must be performed by qualified service personnel only!***

## 5.1 Fuses

Two North American UL and/or CSA 250VAC time-lag fuses are located behind the side access panel on the component mount. (See Figure 8-1) To gain access to the fuses, remove the cabinet side panel. Replace the fuses with fuses of the same type and rating.

The following chart identifies the fuses in the unit and their characteristics.

| Incubator Model | Fuse Stock # | Amp/Size/Rating | Rupture Speed | IEC Letter Code |
|---|---|---|---|---|
| 3033, 3860 | (main) 230066 | 250V, 10 Amp | Time-Lag | T |
| 3035, 3862 | (main) 230093 | 250V, 5 Amp | Time-Lag | T |
| All Models | (power supply) 230103 | 250V, 0.75 Amp | Time-Lag | T |
| All Models | (accessory) 230120 | 250V, 0.5 Amp | Time-Lag | T |

## 5.2 Calibration

Frequency of calibration is dependent upon use, environmental conditions and accuracy required. Thermo Forma recommends calibration every three to four months.

All incubators are factory calibrated. However, the incubator should be run and checked for proper operation prior to being put into use. Before making any calibrations or adjustments to the unit, it is imperative that all reference instruments be in good repair and properly calibrated.

### a. $CO_2$ Calibration

Equipment required: Fyrite or another independent method of $CO_2$ measurement.

1. With the $CO_2$ supply connected, adjust the $CO_2$ to the desired level.
2. If the unit is already operating, allow 30 minutes to stabilize. If the unit is being started up and is cold, allow two hours for stabilization.
3. When the incubator has stabilized, turn the Program/Run key switch to Program.
4. Turn the incubator power switch off.
5. Press and hold the inverted Y button on the $CO_2$ module while turning the Power switch on. Continue to press the inverted Y button until the "beeping" stops.

**Note:** When entering the calibration mode, the temperature display will read 00.0 and the RH display will show the $CO_2$ sensor output voltage in millivolts. (This value can be used for diagnostic purposes by service personnel.)

6. Press the inverted Y touch button on the $CO_2$ module so that the word SET appears in the LCD window. This puts the module into the Span Adjust mode.
7. Remove the cap from the Sample Port on the front of the control panel and read the $CO_2$ concentration with the Fyrite. Two readings should be taken.
8. Using the up or down arrow buttons, change the $CO_2$ display to match the Fyrite reading.
9. Disconnect the reference instrument and replace the Sample Port cap.

***For proper operation and to prevent $CO_2$ loss, the sample port must be capped when not in use.***

10. Turn the incubator power switch off, then back on without pressing any buttons.
11. Return the Program/Run key switch to Run.



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### b. RH Calibration

Equipment required: Humidity sensing instrument of known accuracy.

1. Place the reference humidity instrument in the center of the chamber.
2. Allow the incubator to run at the desired humidity level for at least an hour after it has stabilized.
3. Record the humidity level shown by the reference instrument and the humidity level displayed on the RH Control module.
4. Turn the Program/Run key switch to Program.
5. Turn the incubator off.
6. Press and hold the inverted Y button on the RH module and turn the power switch on. Press the inverted Y key until the beeping stops.

The incubator RH is ready for calibration when the temperature display and $CO_2$ displays read 00.0. If the word SET appears in the LCD window, press the inverted y button to remove it.

When in the RH Calibration mode, the display shows the temperature (°C) of the water in the humidity reservoir, not the RH concentration.

7a. Using the arrow touch buttons, adjust the display upward or downward. If the RH reading was lower than the reference instrument, increase the display by 0.2°C for each percent that the (RH) incubator reading was low.

**Example:** If the RH display reads 85% and the reference instrument reads 87%, increase the display reading by 0.4°C.

7b. If the RH Control reading was higher than the reference instrument, decrease the display by 0.2°C for each percent that the (RH) incubator reading was high.

**Example:** If the RH display reads 87% and the reference instrument reads 85%, decrease display by 0.4°C.

8. Turn the incubator off, then back on without pressing any buttons.
9. Return the Program/Run key switch to Run.

### c. Temperature Calibration

***Any change in temperature calibration will require adjustments to the temperature alarm/monitor, RH control and temperature control. Failure to make these adjustments will result in incorrect humidity control, poor temperature uniformity, or both.***

Equipment Required: a thermometer of known accuracy.

1. Place the reference thermometer in the center of the chamber.
2. Close both incubator doors and allow the incubator temperature to stabilize for about one hour.
3. Record the temperature indicated on the thermometer and the temperature readout on the Temperature Alarm/Monitor Module.
4. Carefully swing open the control panel and identify the Temperature Alarm module.
5. Locate the adjustment potentiometer labeled Zero. Refer to the illustration at the right.
6. Using the adjustment screwdriver, turn the Zero pot until the displayed temperature agrees with the reference thermometer.
7. Close the control panel, taking care not to pinch the ribbon wires inside the compartment.

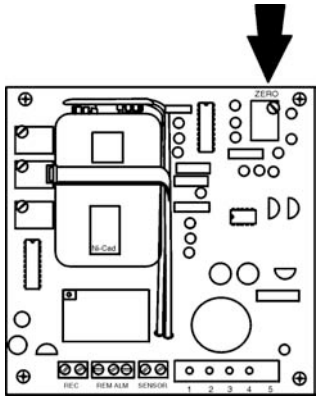


**Figure 5-1**

8. Turn the Program/Run key switch to Program.
9. Turn the incubator off.
10. Press and hold the inverted Y touch button on the RH module while turning the power switch on. Press the inverted Y button until the beeping stops. When the unit is ready for calibration, the temperature display and the $CO_2$ display will read 00.0.

**Note:** If the word SET appears in the lcd window, momentarily press the inverted Y button to remove it.

11. Using the up or down arrow buttons, change the display by an amount equal to the amount the Temperature Alarm/Monitor display was changed.

**Example:** If the reference instrument reads 37.5 and the Temperature Alarm/Monitor reads 37.0, the display would have been increased 0.5. Therefore, the RH Control display must also be increased 0.5.

12. Turn the incubator off.
13. Press and hold the inverted Y touch button on the Temperature Module while turning the incubator on.

**Note:** Continue to press the inverted Y button until the beeping stops. when the unit is ready for calibration, the RH display and the $CO_2$ display will read 00.0. If the word Set appears in the display window, press the inverted Y button to remove it.



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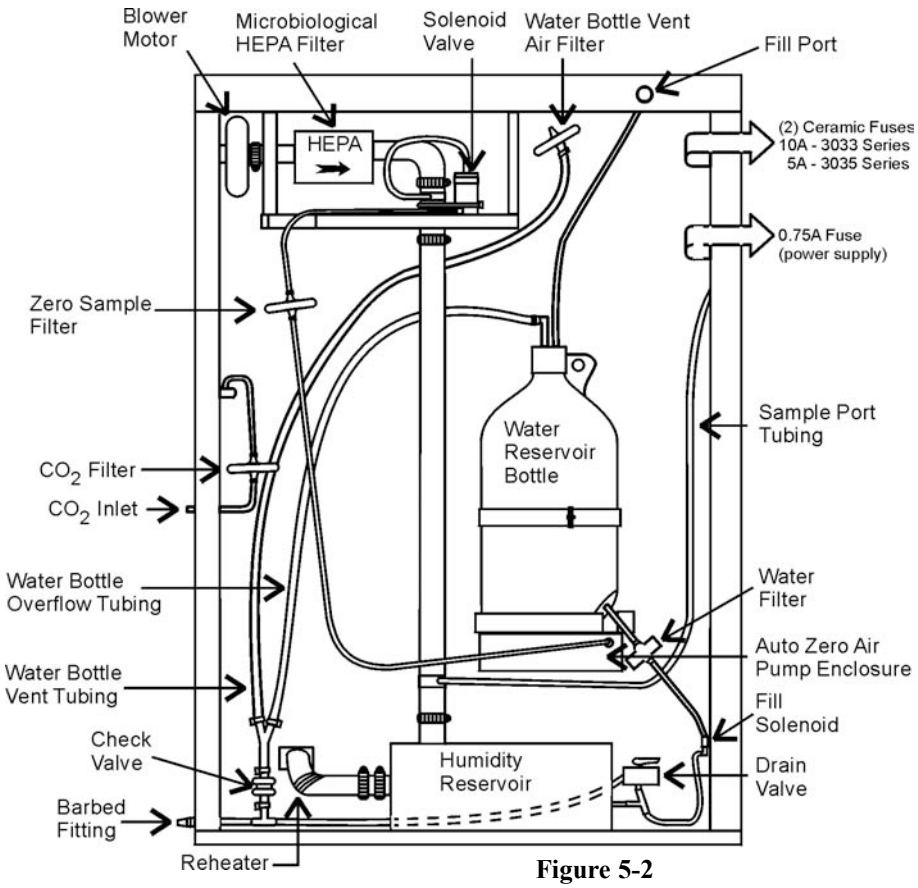



**Figure 5-2**

14. Using the arrow buttons, change the displayed value by an amount equal to the amount the Temperature Alarm/Monitor display was changed.

**Example:** If the reference instrument reads 37.5 and the Temperature Alarm/Monitor reads 37.0, the display should be increased 0.5. Therefore, the Temperature Control display must also be increased 0.5.

15. Turn incubator off, then back on without pressing any keys.
16. Return the Program/Run key switch to Run.

### 5.3 Changing the $CO_2$ Filter P/N 770001

**Note:** Under normal use, the $CO_2$ filter should be serviceable for about two years. If the $CO_2$ filter becomes clogged, replace it with Thermo Forma stock #770001.

1. Turn the incubator off and unplug it.
2. Remove the screws securing the left side access panel.
3. Remove the panel by lifting it up and out. Set it aside.
4. Locate the $CO_2$ filter about halfway up the left side. (It will be connected to the hose leading to the $CO_2$ gas fitting on the back of the incubator. (See Figure 5-2.)
5. Remove and replace the filter by forcing the plastic hose clamps open or cutting them.
6. Install the new filter and refasten the plastic hose clamps or install new clamps.
7. Dispose of the old filter following approved biological safety procedures.

### 5.4 Changing the Zero Sample Filter P/N 770001

**Note:** Under normal use, the service life of the Zero Sample filter is about two years. If the filter becomes clogged, replace it with Thermo Forma stock #770001.

1. Turn the incubator off and unplug it.
2. Remove the screws securing the side access panel.
3. Remove the panel by lifting it up and out. Set it aside.
4. Locate the Zero Sampler Filter installed in the clear vinyl tubing connected between the upper solenoid valve and the air pump located beneath the reservoir bottle. See Figure 5-2.
5. Remove and replace the filter by forcing the plastic hose clamps open, or cutting them.
6. Install the new filter and refasten the plastic hose clamps, or install new clamps.
7. Dispose of the old filter following approved biological safety procedures.

### 5.5 Changing the Microbiological Filter P/N 760043

**Note:** Under normal usage, the service life of the microbiological filter is about two years. Replace the filter with Thermo Forma stock #760043.

1. Turn the incubator off and unplug it.
2. Remove the screws securing the side access panel.
3. Remove the panel by lifting it up and out and set it aside.
4. Locate the cover plate in the upper left corner and remove it.
5. Remove the fiber insulation to expose the filter. Refer to Figure 5-2.
6. Cut the small plastic tie wrap which secures the solenoid valve to the one inch plastic tubing.



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7. Loosen the metal hose clamp below the filter's 90° elbow.
8. Loosen the metal hose clamp on the end of the filter connected to the blower motor.
9. Slide the filter out and replace it, reversing Steps 1 through 9. Make sure the airflow direction is from the blower through the filter and downward through the one-inch tubing. Look for the flow direction arrow on the body of the filter.
10. Dispose of the old filter following approved biological safety procedures.

### 5.6 Changing the Air Pump

1. Turn the incubator off and unplug it.
2. Remove the screws securing the side access panel.
3. Remove the panel by lifting it up and out and set it aside.
4. The air pump is located in a foam-lined metal enclosure attached to the bottom of the reservoir bottle platform.
5. Cut and remove the two outermost tie wraps which secure the enclosure to the base of the platform. The tie wraps are fed through rubber grommets. (Figure 5-3)
6. Tip the enclosure downward, pivoting on the two rear grommet/tie wraps.
7. Cut the two tie wraps which hold the air pump to the bottom of the enclosure. The tie wraps may be cut from inside the enclosure or at where they exit from the bottom of the enclosure.
8. Lift the air pump out and remove the vinyl hose by pulling it off of the pump fitting.
9. Trace the two black air pump wires to the two yellow wire nuts. Remove the wire nuts and disconnect the pump wires from the wiring harness.
10. Install the new air pump by reversing Steps 1 through 9.

**Note:** If there is a vibration with the air pump, creating an undesirable noise or shelf vibration, remove all four of the tie wraps on the outer corners of the enclosure (Refer to Figure 5-3).

### 5.7 Changing the Inline Water Filter P/N 780266

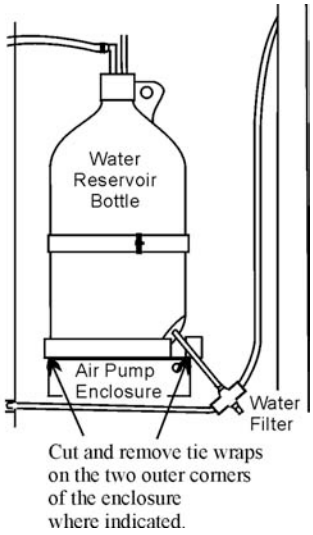



**Figure 5-3**

1. Turn the incubator off and pull the plug.
2. Remove the screws securing the left side access panel.
3. Remove the side access panel by lifting it straight up and set it aside.
4. Locate the inline water filter. (Refer to Figures 5-3 and 5-4)
5. Remove and replace the filter by pushing the tubing onto the ends of the filter.

### 5.8 Changing the Blower Motor P/N 900078

1. Turn the incubator off and pull the plug.
2. Remove the screws securing the left side access panel.
3. Remove the side access panel by lifting it straight up and set it aside.
4. Remove the cover panel from the enclosed section in the upper left corner.
5. Remove the loose fiber insulation.
6. Loosen or remove the metal hose clamp securing the blower motor to the microbiological filter. (Refer to Figure 5-4).
7. Remove or cut the white snapper hose clamp which secures the rubber boot from the blower motor to the stainless steel elbow (air intake line).
8. Locate the two black blower motor connecting wires, unscrew the wire nuts and remove the wires from the harness.
9. Remove the screws from the four corners of the blower mounting plate. This plate is the top panel on the back of the incubator cabinet. Do not remove the two screws in the center of the mounting plate. These screws secure the blower motor to the blower bracket.
10. Remove the blower and mounting plate from the incubator.

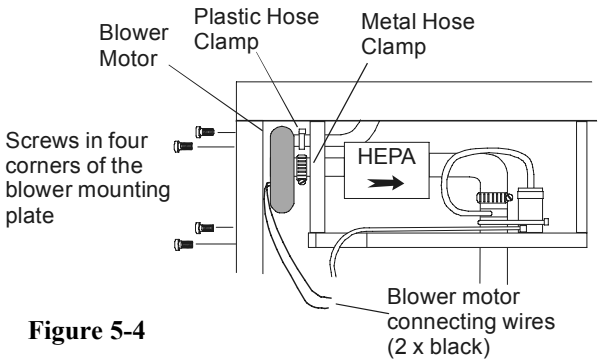



**Figure 5-4**

11. Replace the blower motor on its mounting bracket and install the assembly by reversing Steps 1-10.



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## 5.9 Replacing the IR Sensor

1. Turn the incubator off and pull the plug.
2. Remove the screws securing the left side access panel.
3. Remove the side access panel by lifting it straight up and set it aside.
4. Remove the cover panel from the enclosed section in the upper left corner.
5. Remove the loose fiber insulation.
6. Locate sensor board and unplug the electrical connector.
7. Remove the tubing from the IR sensor.
8. Remove the sensor board from the (4) nylon support mounts. (Push in on each small tab, and pull board forward)
9. Install the new board over the (4) nylon support mounts.
10. Remove the top piece (plug-in part with screws) of the electrical connector on new board.
11. Reconnect the original electrical connector.
12. Reconnect the tubing to the IR sensor.
13. Replace the insulation and cover panels.

## 5.10 Silencing the Audible Alarm

To turn OFF the audible alarm on the Microprocessor Board:

1. Swing open the control panel.
2. Locate the red, surface-mounted switch in the upper right corner of the microprocessor board. (Refer to Illustration 5-5.)
3. Using a small screwdriver or your fingernail, move the switch from on to off. The audible alarm will silence.

**Note:** Turning this switch off will eliminate $CO_2$ and RH alarms. It will also silence the key tones.

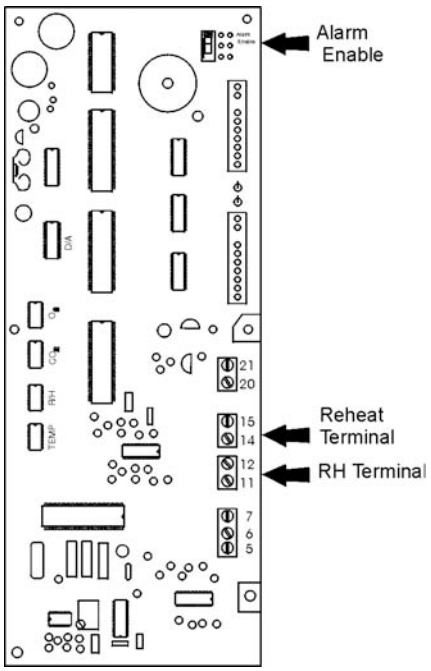



**Figure 5-5**

## 5.11 Service Calibration Guide

***This service guide supplement is designed to be used in direct conjunction with Sections 4 and 6. All calibration functions are to be performed with the word "Set" removed from the LCD displays except when calibrating $CO_2$ span.***

### a. Set-up

1. Check that the battery in the Temperature Alarm/Monitor is connected.
2. Check that High and Low alarm points are set properly.
3. Check that the alarm enable microboard DIP switches are all On (down).

### b. Functional checks

1. With the power switch off, plug the unit in.
2. Turn the key switch to Program.
3. Turn the unit on. The green LED and LCD displays will light. Verify that the chamber blower is operating.
4. Check the water bottle level. The bottle should be full.
5. Verify that water is flowing through the Fill solenoid and into the humidity reservoir.
6. Place unit in the Run mode and confirm that the setpoints of RH, $CO_2$ and temperature cannot be changed.
7. Return key switch to Program.
8. Check the operation of the overtemp and undertemp including the alarm contacts on the Temperature Alarm/Monitor board. (Refer to Figure 5-6.)
9. Open and close the outer door to verify the Door Ajar switch operation.
10. Check for default of cabinet.

### c. Has the cabinet defaulted?

This is indicated if setpoints have changed and are:

(20°C) = Temp, (0%) = RH, (0%) = $CO_2$.

If there is no evidence of default, proceed to Section: Reheat Calibration.

If default is evident, then zero and span both Reheat and RH. (See "Procedure for Returning the Cabinet from Total Default").

0°C= (1000) Ohm resistor

60°C= (1232) Ohm resistor.



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The Reheat terminals on the microboard for resistor hook-up are 14 and 15.

The RH terminals on the microboard for resistor hook-up are 11 and 12.

**Note:** Do not leave any inputs to the microboard disconnected during zero and span phase, or errors will occur. Proceed to the Reheat Calibration procedure.

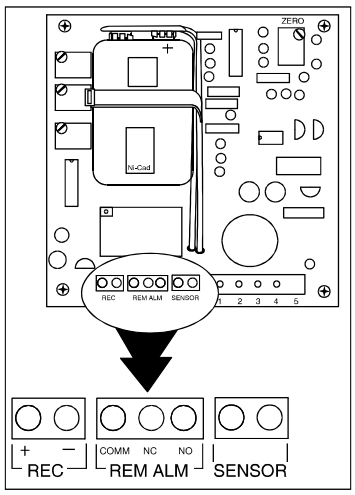



**Figure 5-6**

## 5.12 Temperature Alarm/Monitor Calibration

**Note:** Allow a minimum of 6 hours for stabilization from a cold start up to 37°C.

Place a thermometer in the center of the chamber and adjust the zero trim pot on the Temperature Alarm/Monitor board to match. (Refer to Section 6.1.c.)

## 5.13 Reheat Calibration

Place the Temperature Control module in the calibration mode using the inverted Y key.

Check the LCD display to ensure that the word Set does not appear. If it does, depress the inverted Y key to remove it. The module is now in the Zero mode.

Place the Reheat probe, located in the outlet tube of the humidity reservoir (not in the reservoir itself) in a beaker with the same thermocouple or thermometer used to calibrate the monitor module.

Using the up arrow and down arrow, adjust the display to match.

Put thermal compound on the tip of the probe and insert it fully into the sheath. Seal it with silastic.

## 5.14 RH Calibration

1. Read the RH in the cabinet with a reliable humidity indicating device. Note the difference between the indicating device and the LCD readout.
2. Put incubator in calibrate mode using inverted Y key. Next press the inverted Y key until the word Set disappears from the window. You are now in the RH Zero mode. Using the up and down arrow keys, adjust the display (0.2°C) for each percent difference in the LCD readout compared to the indicating device.

**Example:** If the indicating device is 95% and the LCD readout is 90%, with the RH module in the Calibration mode, raise the displayed temperature (0.2°C) for each percent of difference, or (0.2) x 5% = 1.0. Raise the displayed temperature 1.0°C.

3. Return the incubator to the Run mode by turning the power off, then on.

## 5.15 Temperature Offset Adjustment

1. Make sure unit is stable before proceeding.
2. Place the Temperature Control module in the Calibration mode, EXCEPT depress the up arrow instead of the inverted Y key. Use the inverted Y to remove the word Set.
3. Use the up arrow and down arrow keys to adjust the Temperature Control to match the Temperature Alarm/Monitor module.
4. Return incubator to Operation mode.

## 5.16 $CO_2$ Calibration Procedure

Equipment required: Fyrite, or another independent method of $CO_2$ measurement.

1. Put the Run/Program key switch on control panel in Program mode.
2. Change the $CO_2$ setpoint to 1.0%.
3. Default $CO_2$ values by depressing the up arrow key on the $CO_2$ module and turning the main power switch off, and then back on.
4. Check $CO_2$ setpoint. If it now reads 0.0%, the default was successful. If not, then repeat Step 3.
5. Locate “hidden” key to the right of the down arrow key on the CO2 module. (This is a touch-tone key like the other keys).
6. While depressing the “hidden” key on the $CO_2$ module, turn the incubator power switch “OFF” and back “ON”. Continue holding the “hidden” key until the high audible tone stops.



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7. The incubator is now in Calibration mode with "Auto-Zero" activated.

**Note:** RH display will show the $CO_2$ sensor output voltage in millivolts and the temp control will be "00.0" if Calibration mode has been successfully entered. If the attempt was unsuccessful, repeat Steps 5 and 6.

8. Remove the cover plate directly beneath the Temperature Control module and locate the labeled "CO2 Zero Adjustment" pot. Adjust this pot so that the RH display reads 000 (+/- 20). Turning this pot counterclockwise will decrease the display reading and clockwise will increase it.

**Note:** There will be several seconds of delay between each pot adjustment and the voltmeter reaction to that adjustment. In addition, the voltage will tend to "wander" by 10 millivolts or so. This is normal.

9. Using the up and down arrows on the $CO_2$ module, adjust the $CO_2$ display so that it reads "00.0".

**Note:** Make sure the word "Set" is not in the $CO_2$ window before making adjustment.

10. Turn the incubator power switch Off , then On, to take the unit out of Calibration mode.
11. Connect $CO_2$ to the incubator and adjust the $CO_2$ setpoint to the desired level.
12. Wait at least 10 minutes after the incubator has reached proper control level.
13. Turn the incubator OFF.
14. While holding down the inverted Y key on the $CO_2$ module, turn the incubator on. Continue holding the inverted Y key until the the high audible tone stops.
15. Check to see that the Temp Set display reads "00.0". (This indicates that you are in the Calibration mode).
16. Momentarily depress the inverted Y key so that the word Set appears in the LCD window. (This puts the unit in span adjust mode).
17. Read the $CO_2$ concentration on the independent test instrument.
18. Using the up and down arrow keys on the $CO_2$ module, adjust the $CO_2$ display to agree with actual $CO_2$ content in cabinet.
19. Turn the incubator off.
20. Close the control panel door and secure it.
21. Open and close (or fan) the chamber door to release the $CO_2$.
22. Turn the incubator on and adjust the setpoints as desired. Return the incubator to normal operation.
23. Allow the unit to stabilize about 1 hour.
24. Initiate an Auto-Zero cycle by placing the Program/Run switch in Program and the $CO_2$ module in Set mode (press the inverted "Y" key) and press the "hidden" key.
25. Wait about 30 minutes after the Auto-Zero cycle completes and read the $CO_2$ concentration on the independent test instrument.
26. If the $CO_2$ display does not match the independent instrument reading, repeat Steps 13 through 22.

## 5.17 Returning the Cabinet from Total Default

1. Turn the key switch to Program.

**Note:** All adjustments will be made on the RH module.

2. Place the RH module in the calibrate mode by pressing the inverted Y key while turning the power on.
3. Remove the sensor leads from terminals 11 and 12 on the micro-board.
4. Install a 1000 Ohm resistor across terminals 11 and 12.
5. Remove the word "Set" by momentarily depressing the inverted Y key.
6. Adjust the display to read "00.0" by using the up and down arrow keys.
7. Remove the 1000 Ohm resistor and replace it with a 1232 Ohm resistor.
8. Momentarily depress the inverted Y key to bring the word "Set" into the LCD window.
9. Adjust the display to read "60.0" by using the up and down arrow keys.
10. Repeat steps 4 through 9 until no changes are necessary.
11. Turn the incubator off.
12. Remove the resistor from terminals 11 and 12 and reinstall the sensor wires.

**Note:** The adjustments which follow will be made on the Temperature module.

13. Remove the reheat sensor wires from terminals 14 and 15.
14. Place the Temperature module in Calibrate mode by pressing the inverted Y key while turning the incubator on.
15. Install a 1000 Ohm resistor across terminals 14 and 15.
16. Remove the word "Set" by momentarily depressing the inverted Y key.
17. Adjust the display to read "00.0" by using the up and down arrow keys.
18. Remove the 1000 Ohm resistor and replace it with a 1232 Ohm resistor.



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19. Momentarily press the inverted Y key so that the word "Set" appears in the LCD window.
20. Adjust the display to read "60.0" by using the up and down arrow keys.
21. Repeat steps 15 to 20, as necessary.
22. Turn the incubator off.
23. Remove the resistor from terminals 14 and 15 and reinstall the sensor wires.
24. Hold down the fourth unmarked key on the $CO_2$ module and turn the main power on. Hold the key depressed until the high audible tone stops.
25. Remove the word "Set" from the LCD window by momentarily pressing the inverted Y key. Wait two minutes.
26. Adjust display to read "00.0" by using the up and down arrow keys.
27. Turn the incubator off.
28. Place an accurate thermometer and RH indicating device in the middle of the chamber.
29. Turn the incubator on and set the $CO_2$ setpoint for 05.0%. Set the temperature for 37.0°. Set the RH for 80%. Set the overtemp safety for 45.0°. Allow the incubator to stabilize for 6 hours.
30. Proceed with calibration of temperature, RH and $CO_2$ as outlined in the beginning of this section.

## 5.18 Drying out the Humidity Reservoir



***Servicing must be performed by qualified service personnel only!***

1. Drain the humidity reservoir (refer to Section 4.4).
2. Turn off and remove the cap from the barbed drain fitting on the back of the cabinet.
3. Open the incubator's outer and inner doors.
4. Swing open the control panel and remove the vinyl fill tubing from the side of the humidity reservoir. (The white plastic hose clamp is easily broken by twisting it).
5. Remove the access panel on the left side of the incubator (four screws) and jumper pin #4 of the humidity control relay to ground. (See Figure 5-7).

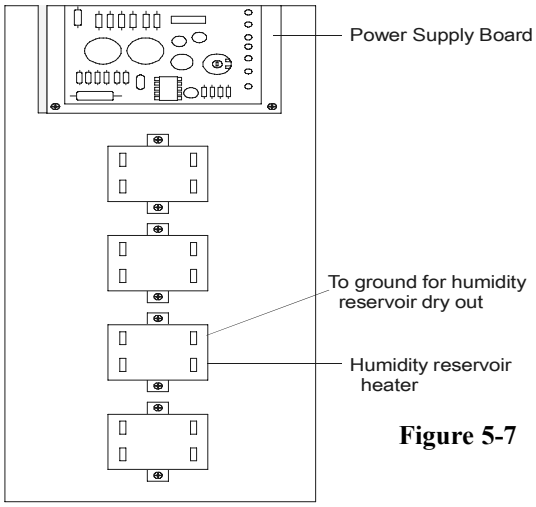



**Figure 5-7**

6. Turn the power to the unit on and leave it on for 45 minutes.
7. Turn the unit off and remove the jumper wire.
8. Replace the fill tubing onto the humidity reservoir and clamp it.
9. Close the control panel and replace the side access cover.
10. The unit is ready to be returned to service.



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# Section 6 - Specifications

## a. Electrical Requirements

**Model 3033:**
90-130VAC, 60 Hz, 1 Phase, 7 FLA Nominal

**Model 3035:**
180-260VAC, 50/60 Hz, 1 Phase, 4 FLA Nominal

**Model 3860:**
90-130VAC, 60 Hz, 1 Phase, 6.5 FLA Nominal

**Model 3862:**
180-260VAC, 50/60 Hz, 1 Phase, 3.7 FLA Nominal

Power Switch: 2 Pole
Main Control: Microprocessor
Data Output: 10 M/V Temperature, Humidity & $CO_2$
Installation Category: Overvoltage Category II
Pollution Degree 2

## b. Dimensions

**Model 3033/3035**
Exterior: 40.25”W x 39.50”H x 26.75”F-B
102.2cm x 100.33cm x 67.95cm
Interior: 27.20”W x 32.95”H x 20.25”F-B
69.09cm x 83.69cm x 51.44cm

**Model 3860/3862**
Exterior: 32.50”W x 39.50”H x 26.75”F-B
82.55cm x 100.33cm x 67.95cm
Interior: 19.20”W x 32.95”H x 20.25”F-B
48.77cm x 83.69cm x 51.44cm

## c. Temperature Control (+/- 0.05°C at 37°C)

Range: +4°C Above Ambient to +45°C
Sensor: Platinum Probe
Controller: Microprocessor
Display: Digital LCD
Readability: 0.1°C
Setability: 0.1°C

## d. Temperature Alarm

Sensor: Platinum Probe
Display: Audio/Visual
Readability: 0.1°C
Setability: 0.1°C

## e. $CO_2$

Inlet Pressure: 10 PSIG
Sensor: Infrared
Controller: Microprocessor
Display: Digital LCD
Readability: 0.1%
Setability: 0.1%
Alarm Differential and Delay: +/- 1% (nominal)

## f. Fittings

Drain Port: 1/4” FPT Barbed Fitting
Access Port: 1.18” Removable Plug
CO2 Inlet: 1/4” Barbed Fitting
Fill Port: 1/4” FPT

## g. Capacity

Humidity Reservoir: 1.0 gal., 50K to 1M Ohm/cm (3.75 L)

## h. Shelves

**Model 3033/3035**
Standard: 6 Provided
Maximum: 26
Dimensions: 25.57” x 19.69” (64.95 cm x 50.01 cm)
Construction: Stainless Steel, Perforated

Surface Area:
Per Shelf: 3.5 sq. ft. (0.32 sq. m.)
Maximum Per Chamber: 91 sq. ft. (8.4 sq. m.)
Clearance: Adjustable on 1.0” centers (2.54cm)

**Model 3860/3862**
Standard: 5 Provided
Maximum: 26
Dimensions: 17.75” x 17.75” (45.1 cm x 45.1cm)
Construction: Stainless Steel, Perforated, Electropolished

Surface Area:
Per Shelf: 2.2 sq. ft. (0.2 sq. m.)
Maximum Per Chamber: 57 sq. ft. (5.3 sq. m.)
Clearance: Adjustable on 1.0” centers (2.54cm)



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### i. Certification

CSA: Standard 151
UL: Standard 1262 (Model 3033, 3860 Only)
EN61010-1, IEC 1010-1, IEC 1010-2-010
EN55011, Group 1 Class B
EN50082-1

### j. Weight

**Model 3033/3035**
Approximate Net Weight: 380 lbs. (172 Kg)

Shipping:
Motor: 430 lbs. (195 Kg)
Air: 460 lbs. (209 Kg)
Ocean: 500 lbs. (227 Kg)

**Model 3860/3862**
Approximate Net Weight, 270 lbs. (122 Kg)

Shipping:
Motor: 350 lbs. (159 Kg)
Air: 380 lbs. (172 Kg)
Ocean: 430 lbs. (195 Kg)

### k. Environmental Conditions (Indoor Use only)

Ambient Conditions: 5°C to 40°C
Relative Humidity: 80% up to 31°C, then decreasing linearly to 50% at 40°C
Altitude: Up to 2000 meters above sea level



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# Section 7 - Accessories

## 7.1 Incubator Accessories

| | | Model Numbers | | | |
|---|---|---|---|---|---|
| **Stock No.** | **Description** | **3033** | **3035** | **3860** | **3862** |
| 1900024 | Caster Dolly | X | X | | |
| 1900026 | Caster Dolly | | | X | X |
| 224136 | Stainless Steel Shelf Kit | X | X | | |
| 224144 | Copper Shelf | | | X | X |
| 224145 | Electropolished Stainless Steel Shelf Kit | | | X | X |
| 224159 | Electropolished Stainless Steel Shelf Kit | X | X | | |
| 190035 | Duplex Outlet Kit 115V (factory installed) | X | | X | |
| 190036 | Duplex Outlet Kit 220V (factory installed) | | X | | X |
| 523028 | Floor Stand (for stacked units) | X | X | X | X |
| 760045 | Disposable HEPA Filter (99.97%) Assembly | X | X | X | X |
| 770001 | Disposable Microbiological Gas Filter (99.97%) | X | X | X | X |
| 6003033 | Installation/Operation Qualification Protocol | X | X | X | X |

## 7.2 General Accessories

| **Stock No.** | **Description** |
|---|---|
| 155021 | $CO_2$ Fyrite Analyzer Kit 0-20% |
| 220051 | Replacement Fluid for $CO_2$ Analyzer (three bottles per carton) |
| 965010 | Two-Stage Regulator, $CO_2$ |
| 285722 | Glass Thermometer, 0°C to 100°C |



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# Section 8 - Parts List

## Model 3033/3035/3860/3862 Parts

| Qty | Stock | # Description |
|---|---|---|
| 1 | 900078 | Blower motor kit |
| 1 | 130625 | Tubeaxial fan, 115V |
| 1 | 760045 | Disposable HEPA filter 99.97 |
| 1 | 770001 | Disposable gas filter 99.97 |
| 1 | 780266 | Inline water filter |
| 1 | 290042 | Platinum probe (1000 Ohm sensor) |
| 1 | 190253 | $CO_2$ sensor with p.c. board |
| 1 | 400051 | Power supply board |
| 1 | 190867 | Temp alarm/monitor board |
| 1 | 250049 | S.S. solenoid valve (humidity) |
| 1 | 250052 | 3-way solenoid valve (auto-zero) |
| 1 | 250085 | Solenoid valve ($CO_2$) |
| 1 | 184058 | Mini vac/pressure pump-1/4 l/m (for auto-zero solenoid) |
| 1 | 190211 | Frequency control board (3035/3862) |
| 1 | 230103 | Glass fuse, .75A, time delay |
| 2 | 230066 | Ceramic fuse, 10A, time delay (3033/3860) |
| 2 | 230093 | Ceramic fuse, 5A, time delay (3035/3862) |
| 1 | 230120 | Fuse, (for convenience outlet) .5A, time delay |
| 1 | 430108 | Line cord set (3033/3860) |
| 1 | | * Line cord set (3035/3862) |

* Country dependent, consult factory



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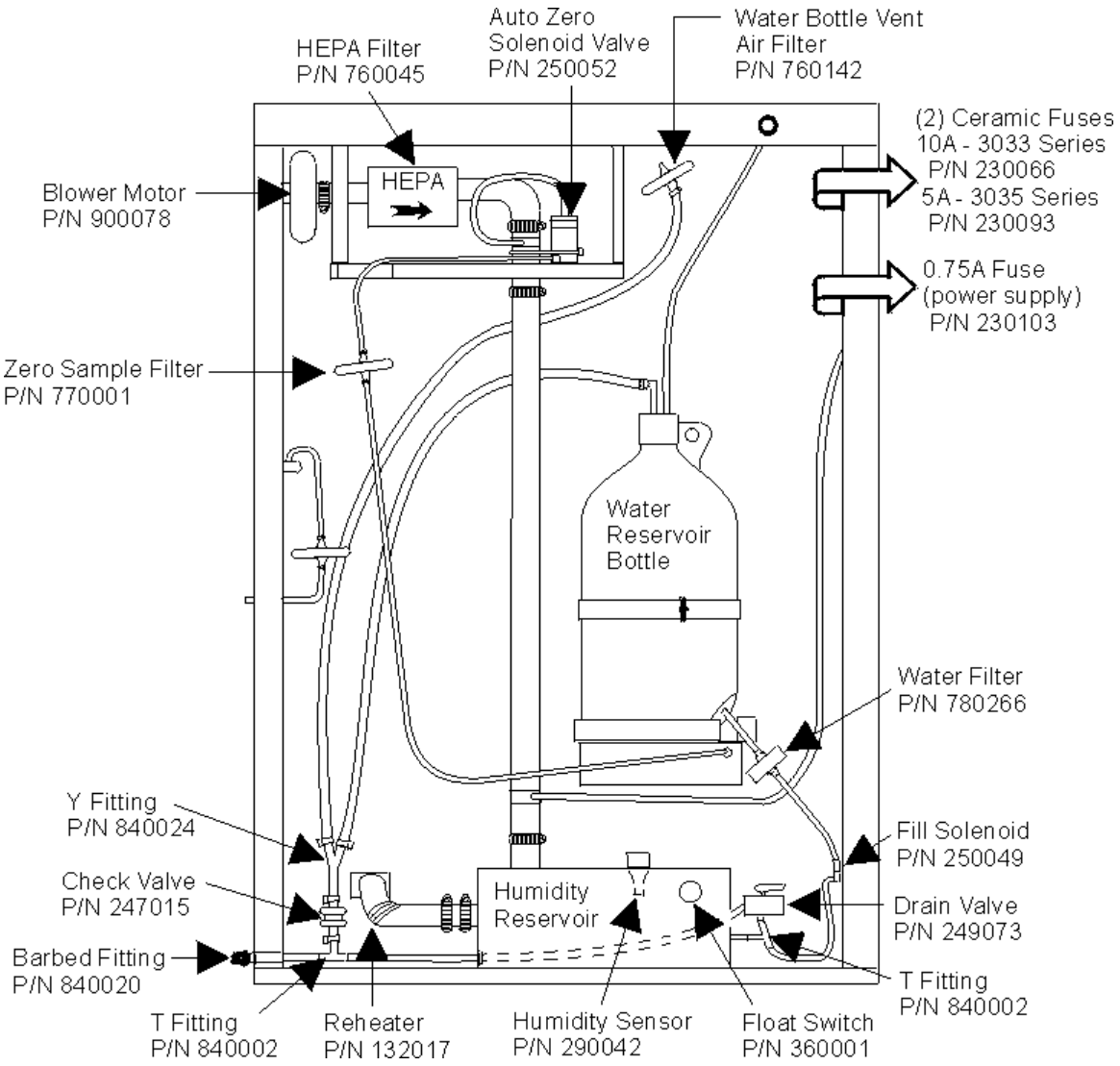



**Figure 8-1**



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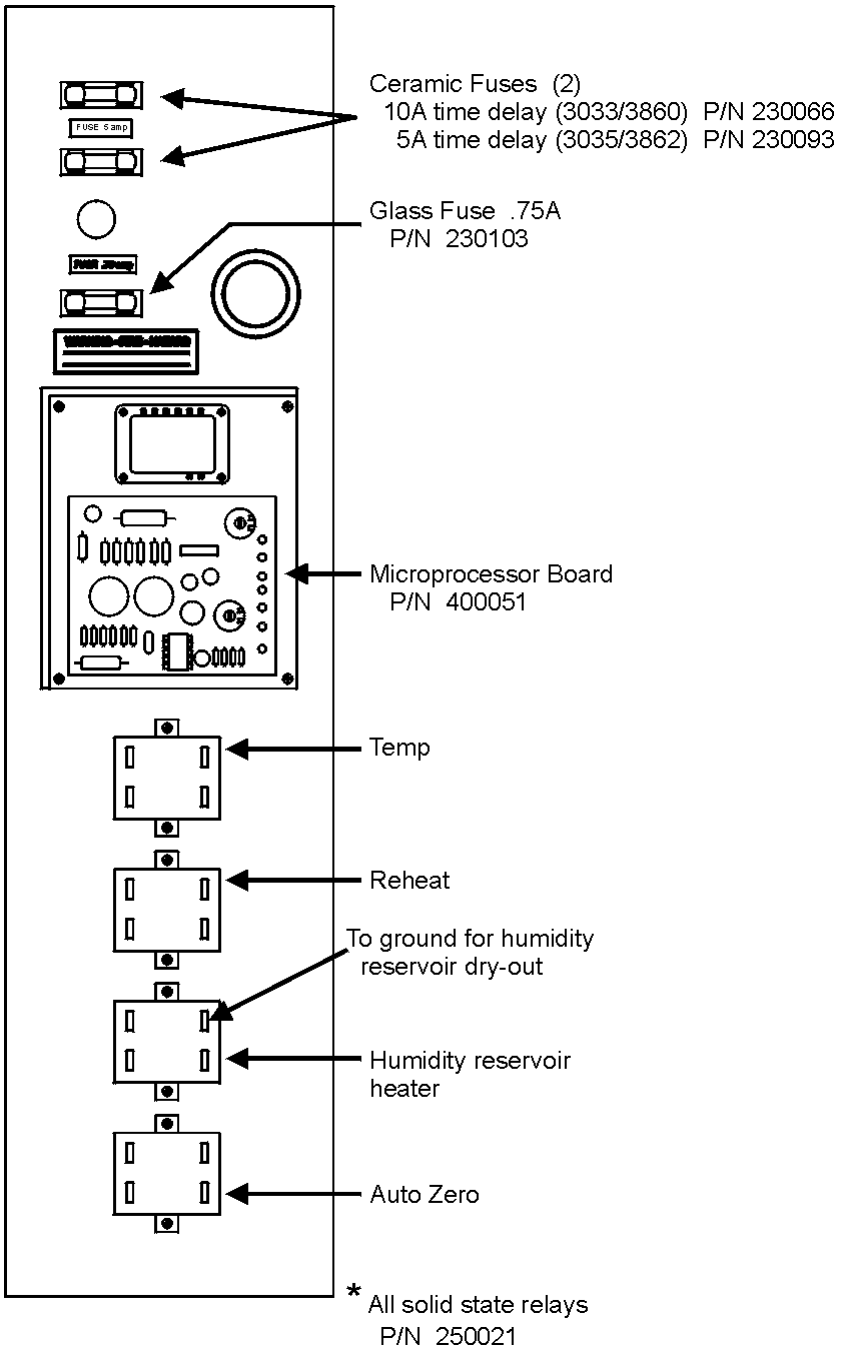
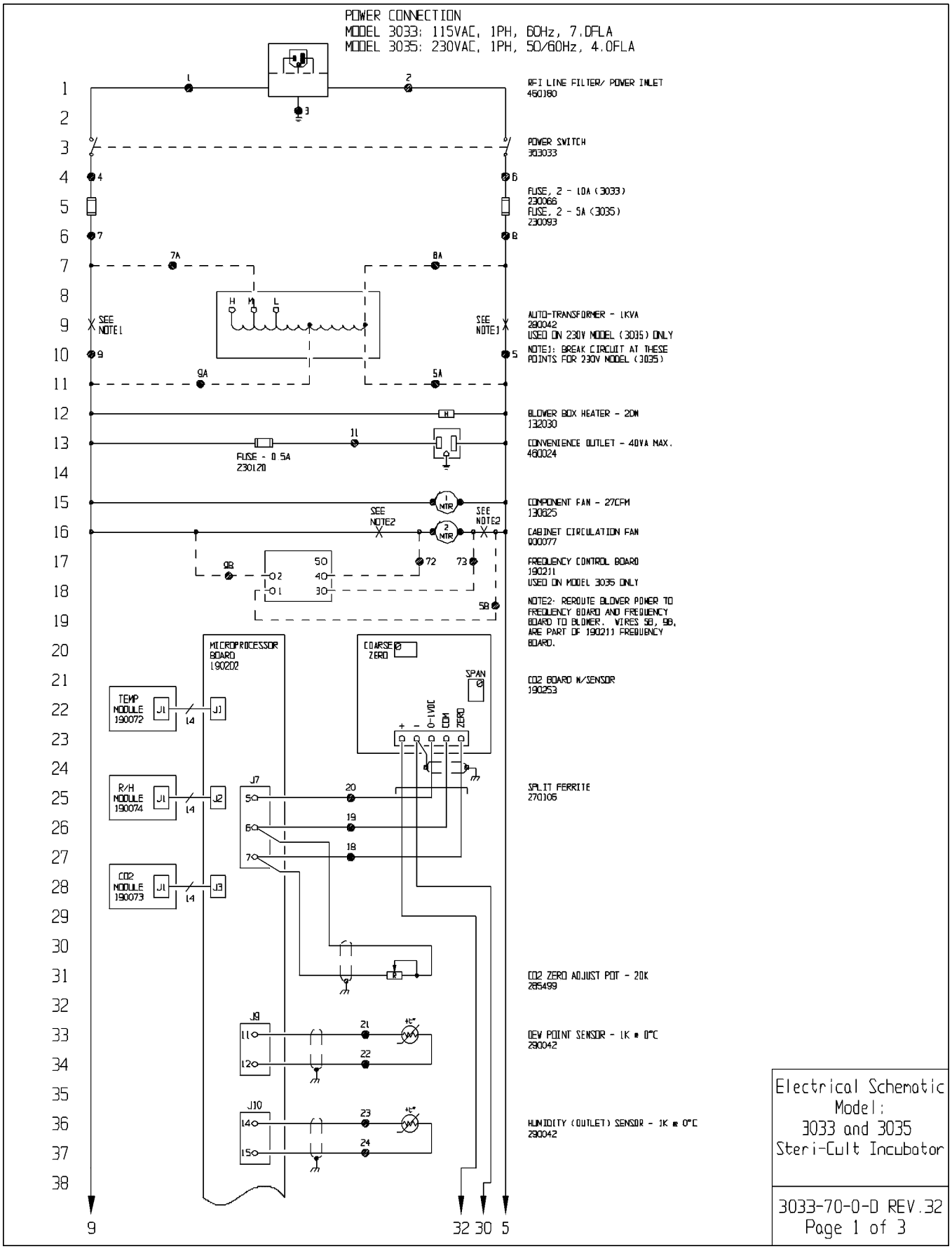



**Figure 8-2**

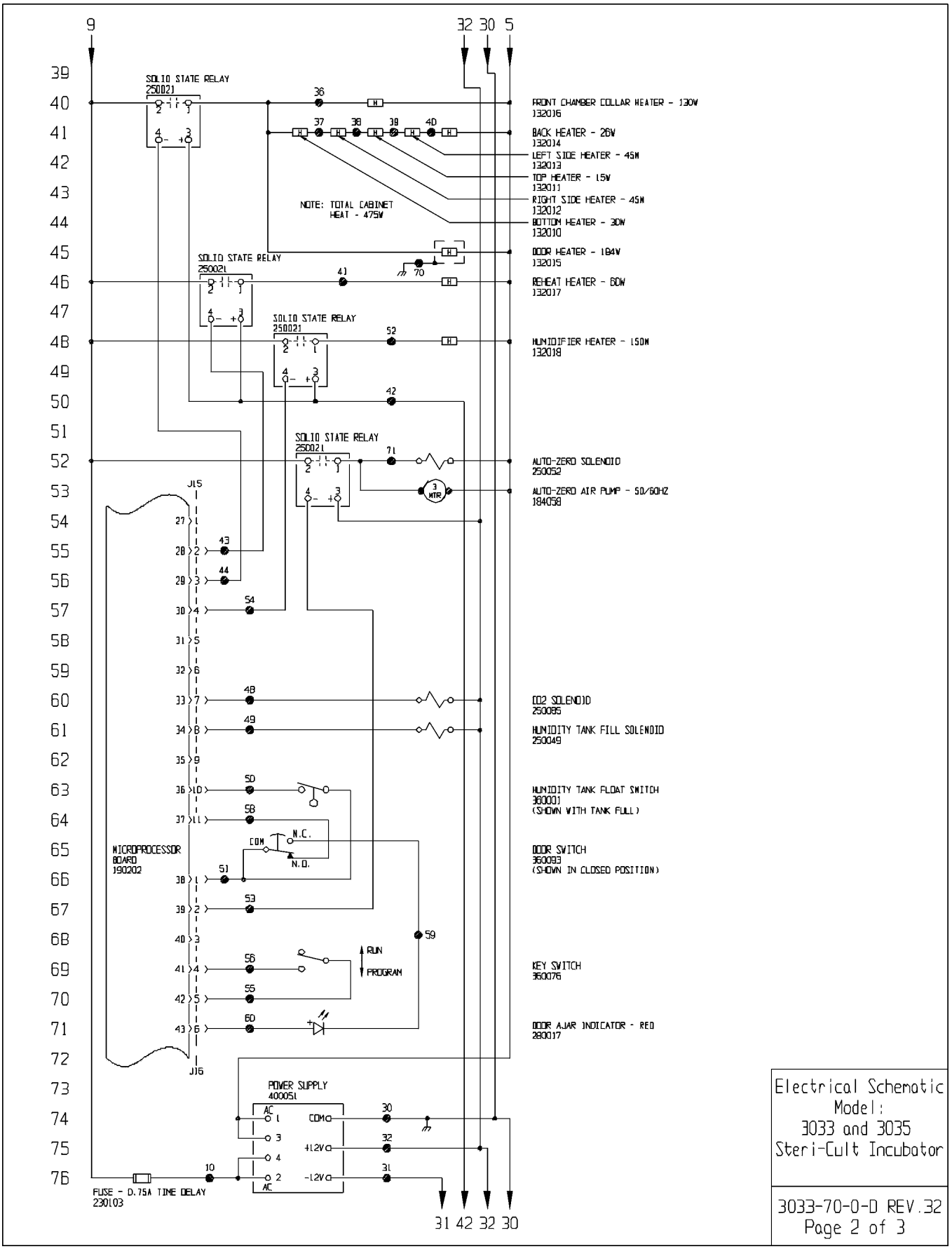


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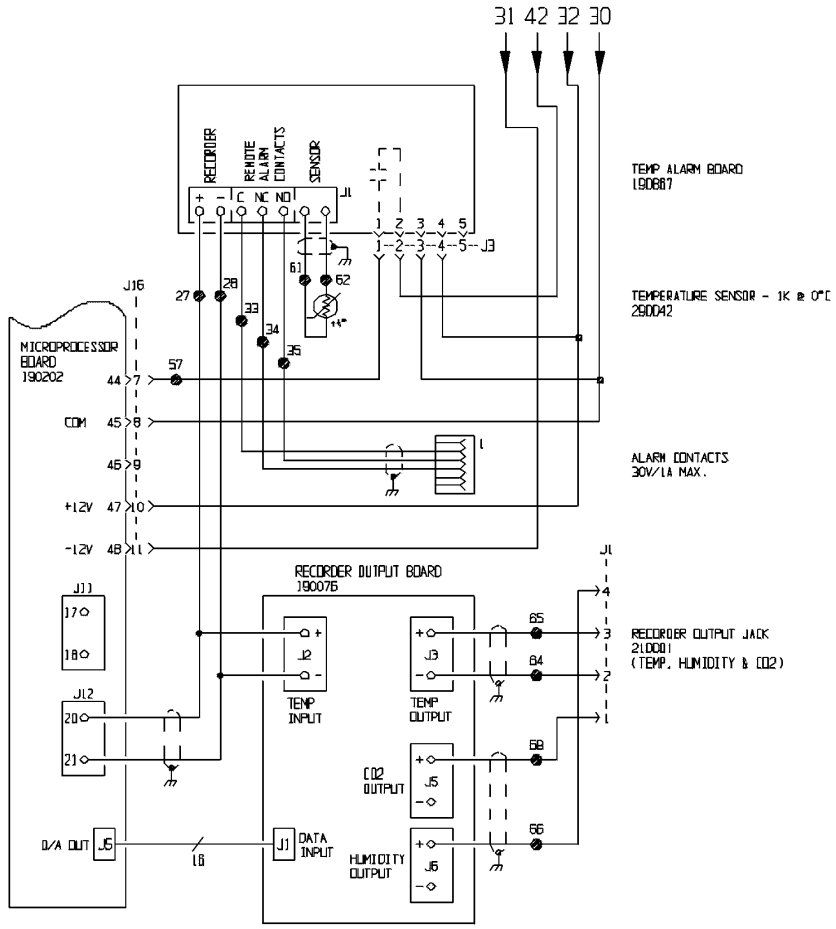



Electrical Schematic
Model:
3033 and 3035
Steri-Cult Incubator

3033-70-0-D REV.32
Page 2 of 3



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## WIRE REFERENCE CHART

| WIRE NO | GA | COLOR | WIRE NO | GA | COLOR | WIRE NO | GA | COLOR |
|---|---|---|---|---|---|---|---|---|
| 1 | 16 | BRN | 21 | 24/2 | BLK | 48 | 20 | ORG |
| 2 | 16 | BLU | 22 | 24/2 | WHT or CLR | 49 | 20 | BRN |
| 3 | 16 | GRN/YEL | 23 | 24/2 | BLK | 50 | 20 | PUR |
| 4 | 16 | BLK | 24 | 24/2 | WHT or CLR | 51 | 20 | PUR |
| 5 | 20 | WHT | 25 | NOT USED | | 52 | 20 | ORG |
| 5A | 10 | WHT | 26 | NOT USED | | 53 | 20 | BRN |
| 5B | 24 | WHT | 27 | 24/2 | WHT or CLR | 54 | 20 | BLK |
| 6 | 10 | GRY | 28 | 24/2 | BLK | 55 | 20 | BLU |
| 6A | 16 | BLU | 29 | 20 | YEL | 56 | 20 | BLU |
| 7 | 16 | BRN | 30 | 20 | GRN | 57 | 20 | PUR |
| 7A | 16 | BRN | 31 | 20 | BLK | 58 | 20 | YEL |
| 8 | 16 | BLU | 32 | 20 | RED | 59 | 20 | RED |
| 8A | 16 | BLU | 33 | 22/3 | BLK | 60 | 20 | ORG |
| 9 | 20 | BLK | 34 | 22/3 | WHT | 61 | 24/2 | BLK |
| 9A | 16 | BLK | 35 | 22/3 | RED | 62 | 24/2 | WHT or CLR |
| 9B | 24 | BLK | 36 | 20 | BLU | 63 | NOT USED | |
| 10 | 20 | PUR | 37 | HEATER LEAD | | 64 | 22/3 | BLK |
| 11 | 20 | BRN | 38 | HEATER LEAD | | 65 | 22/3 | RED |
| 12 | NOT USED | | 39 | HEATER LEAD | | 66 | 22/3 | WHT or CLR |
| 13 | NOT USED | | 40 | HEATER LEAD | | 67 | NOT USED | |
| 14 | NOT USED | | 41 | 20 | YEL | 68 | 22/3 | RED |
| 15 | NOT USED | | 42 | 20 | RED | 69 | NOT USED | |
| 16 | NOT USED | | 43 | 20 | ORG | 70 | 16 | GRN |
| 17 | NOT USED | | 44 | 20 | BRN | 71 | 20 | RED |
| 18 | 22/3 | RED | 45 | NOT USED | | 72 | 20 | BLK |
| 19 | 22/3 | BLK | 46 | NOT USED | | 73 | 20 | BLK |
| 20 | 22/3 | WHT or CLR | 47 | NOT USED | | | | |

NOTES:

| | | | |
|---|---|---|---|
| ⊛ | Denotes Terminal Strip Connection | Parts List Reference Number | |
| N/A | Last Relay Number | ○ | Assembly |
| N/A | Last Terminal Number | ⬠ | Panel |
| 73 | Last Wire Number | ⬡ | Refrigeration |
| | | □ | Wiring |

CUSTOMER APPROVAL/REFERENCE
APPROVED BY _____
APPROVING FIRM _____
DATE OF APPROVAL _____

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| REV | ECR NO. | DATE | BY | CAD | APPD | DESCRIPTION OF REVISION |
|---|---|---|---|---|---|---|
| 32 | IN-2948 | 06-05-01 | GLM | KDG | LDN | INLET 460123 TO 480160 & ADD FERRITE |
| 31 | SI-8132 | 12-18-00 | JAS | KDG | LDN | CHG. 360146 POWER SWITCH TO 363033 |
| 30 | SI-6940 | 03-26-98 | CBG | KDG | LDN | CHG. WIRES 5B & 9B 22 GA. TO 24 GA. |
| 29 | SI-6743 | 10-20-97 | CBG | KDG | LDN | CLARIFY WIRING ON XFORMER INPUT |
| 28 | IN-2308 | 07-29-97 | GJG | GJG | LDN | CHANGED AIR PUMP STOCK NUMBER |

DATE 8-10-94 | DWN RET | CAD N/A | APPD LDN | SCALE NTS

CUSTOMER

JOB TITLE 3033/3035 STERI-CULT 200 INCUBATOR

DWG TITLE ELECTRICAL SCHEMATIC

LOCATION INCUBATR01 | JOB NUMBER | DRAWING NUMBER 3033-70-0-D

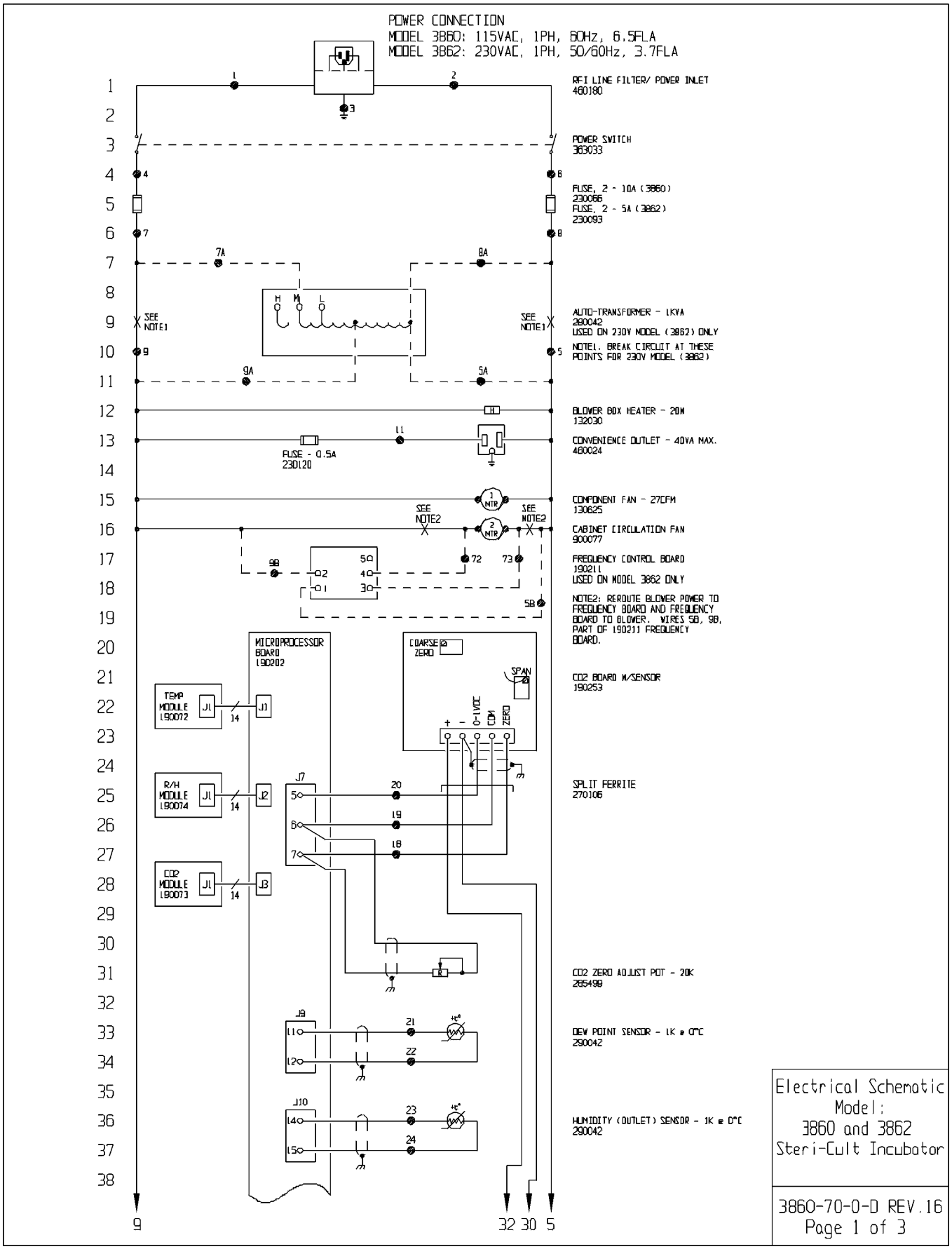
ThermoForma
ROI 649, MARIETTA, OHIO 45750

Electrical Schematic
Model:
3033 and 3035
Steri-Cult Incubator

3033-70-0-D REV.32
Page 3 of 3

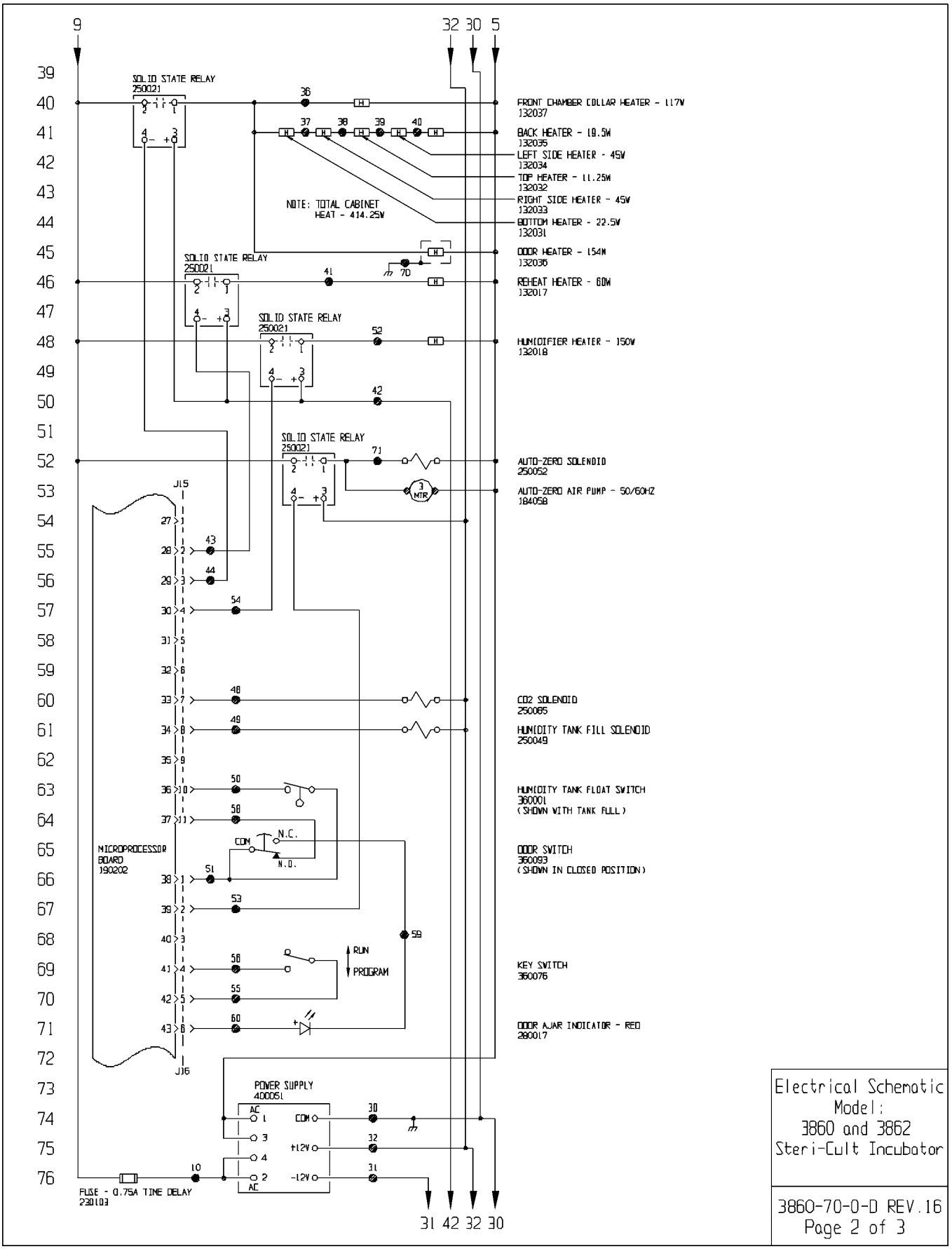


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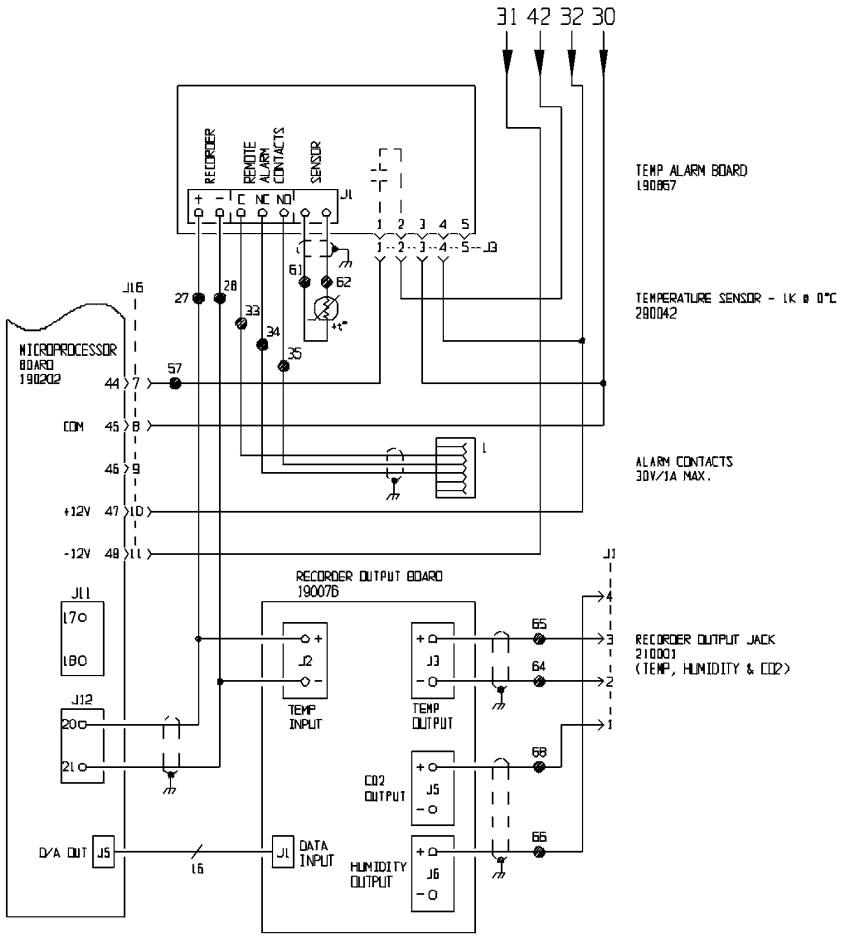



Electrical Schematic
Model:
3860 and 3862
Steri-Cult Incubator

3860-70-0-D REV.16
Page 2 of 3



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## WIRE REFERENCE CHART

| WIRE NO | GA | COLOR | WIRE NO | GA | COLOR | WIRE NO | GA | COLOR |
|---|---|---|---|---|---|---|---|---|
| 1 | 16 | BRN | 21 | 24/2 | BLK | 48 | 20 | ORG |
| 2 | 16 | BLU | 22 | 24/2 | WHT or CLR | 49 | 20 | BRN |
| 3 | 16 | GRN/YEL | 23 | 24/2 | BLK | 50 | 20 | PUR |
| 4 | 16 | BLK | 24 | 24/2 | WHT or CLR | 51 | 20 | PUR |
| 5 | 20 | WHT | 25 | NOT USED | | 52 | 20 | ORG |
| 5A | 16 | WHT | 26 | NOT USED | | 53 | 20 | BRN |
| 5B | 22 | WHT | 27 | 24/2 | WHT or CLR | 54 | 20 | BLK |
| 6 | 16 | GRY | 28 | 24/2 | BLK | 55 | 20 | BLU |
| 6A | 16 | BLU | 29 | 20 | YEL | 56 | 20 | BLU |
| 7 | 16 | BRN | 30 | 20 | GRN | 57 | 20 | PUR |
| 7A | 16 | BRN | 31 | 20 | BLK | 58 | 20 | YEL |
| 8 | 16 | BLU | 32 | 20 | RED | 59 | 20 | RED |
| 8A | 16 | BLU | 33 | 22/3 | BLK | 60 | 20 | ORG |
| 9 | 20 | BLK | 34 | 22/3 | WHT | 61 | 24/2 | BLK |
| 9A | 16 | BLK | 35 | 22/3 | RED | 62 | 24/2 | WHT or CLR |
| 9B | 22 | BLK | 36 | 20 | BLU | 63 | NOT USED | |
| 10 | 20 | PUR | 37 | HEATER LEAD | | 64 | 22/3 | BLK |
| 11 | 20 | BRN | 38 | HEATER LEAD | | 65 | 22/3 | RED |
| 12 | NOT USED | | 39 | HEATER LEAD | | 66 | 22/3 | WHT or CLR |
| 13 | NOT USED | | 40 | HEATER LEAD | | 67 | NOT USED | |
| 14 | NOT USED | | 41 | 20 | YEL | 68 | 22/3 | RED |
| 15 | NOT USED | | 42 | 20 | RED | 69 | NOT USED | |
| 16 | NOT USED | | 43 | 20 | ORG | 70 | 16 | GRN |
| 17 | NOT USED | | 44 | 20 | BRN | 71 | 20 | RED |
| 18 | 22/3 | RED | 45 | NOT USED | | 72 | 20 | BLK |
| 19 | 22/3 | BLK | 46 | NOT USED | | 73 | 20 | BLK |
| 20 | 22/3 | WHT or CLR | 47 | NOT USED | | | | |

NOTES.

| | | | |
|---|---|---|---|
| ⊛ | Denotes Terminal Strip Connection | Parts List Reference Number | |
| N/A | Last Relay Number | ⬠ | Assembly |
| N/A | Last Terminal Number | ⬠ | Panel |
| 73 | Last Wire Number | ⬡ | Refrigeration |
| | | □ | Wiring |

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APPROVED BY _____
APPROVING FIRM _____
DATE OF APPROVAL _____

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| REV | ECR NO. | DATE | BY | CAD | APPD | DESCRIPTION OF REVISION |
|---|---|---|---|---|---|---|
| J6 | IN-2948 | 06-05-01 | GLM | KDG | LDN | INLET 460129 TO 460180 & ADD FERRITE |
| J5 | SI-8132 | 12-18-00 | JAS | KDG | LDN | CHG. 360146 POWER SWITCH TO 363033 |
| J4 | SI-6743 | 10-20-97 | CBG | KDG | LDN | CLARIFY WIRING ON XFORMER INPUT |
| J3 | IN-2308 | 07-29-97 | GJG | GJG | LDN | CHANGE AIR PUMP STOCK NUMBER |
| J2 | IN-2294 | 08-30-97 | JAS | KDG | LDN | DELETED FREQUENCY BOARD OUTPUT CABLE |

| | | | |
|---|---|---|---|
| DATE 8-14-89 | DWN RTT | CAD N/A | APPD LDN | SCALE NTS |
| CUSTOMER | | | |
| JOB TITLE 3860/3862 HEPA FILTERED IR INCUBATOR | | | |
| DWG TITLE ELECTRICAL SCHEMATIC | | | |
| LOCATION INCUBATR01 | JOB NUMBER | DRAWING NUMBER 3860-70-0-D | |

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Electrical Schematic
Model:
3860 and 3862
Steri-Cult Incubator

3860-70-0-D REV.16
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