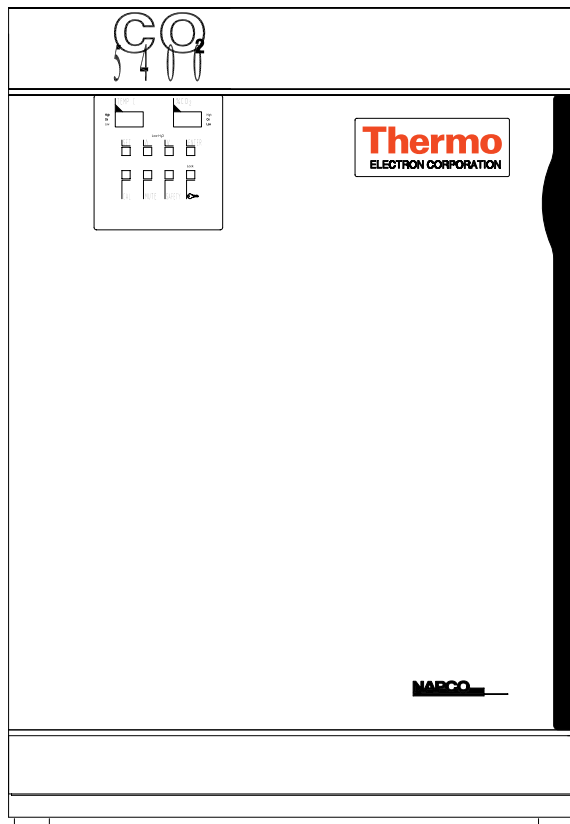




Instruction / Service Manual

NAPCO® Automatic CO₂ Incubators

Series 5400 115V Models



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Manual P/N 36100104(34000120)
Rev. E Dated 12 December, 2004



THIS SYMBOL MARKS CHAPTERS AND SECTIONS OF THIS INSTRUCTION MANUAL WHICH ARE PARTICULARLY RELEVANT TO SAFETY. WHEN ATTACHED TO THE UNIT, THIS SYMBOL DRAWS ATTENTION TO THE RELEVANT SECTION OF THE INSTRUCTION MANUAL.



THIS SYMBOL INDICATES HAZARDOUS VOLTAGES MAY BE PRESENT.

NOTICE

THE MATERIAL IN THIS MANUAL IS FOR INFORMATION PURPOSES ONLY. THE CONTENTS AND THE PRODUCT IT DESCRIBES ARE SUBJECT TO CHANGE WITHOUT NOTICE. NAPCO MAKES NO REPRESENTATIONS OR WARRANTIES WITH RESPECT TO THIS MANUAL. IN NO EVENT SHALL NAPCO BE LIABLE FOR ANY DAMAGES, DIRECT OR INCIDENTAL, ARISING OUT OF OR RELATED TO THE USE OF THIS MANUAL.

For repair information or replacement parts assistance from the manufacturer, call Customer Service using our toll free telephone number.

800-621-8820
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REVISION STATUS

INDEX	DATE	AMENDED PAGES	NOTES
A	6/99		Initial release
B	11/99		Update parts list for new kit no's.
C	5/02	29-31	Update for covered corners
D	8/04	30	Update parts list
E	12/04	5, 37	Add stacking instructions

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1.0 Introduction

- 1.01** Your satisfaction and safety are important to NAPCO and a complete understanding of this unit is necessary to attain these objectives.
- 1.02** As the ultimate user of this apparatus, you have the responsibility to understand its proper function and operational characteristics. This instruction manual should be thoroughly read and all operators given adequate training before attempting to place this unit in service. Awareness of the stated cautions and warnings, and compliance with recommended operating parameters — together with maintenance requirements — are important for safe and satisfactory operation. The unit should be used for its intended application; **alterations or modifications will void the warranty.**



WARNING

AS A ROUTINE LABORATORY PRECAUTION, ALWAYS WEAR SAFETY GLASSES WHEN WORKING WITH THIS APPARATUS.

- 1.03** This product is not intended, nor can it be used, as a sterile or patient connected device. In addition, this apparatus is not designed for use in Class I, II, or III locations as defined by the National Electrical Code.

2.0 Unpacking and Damage

- 2.01** This product was carefully packed and thoroughly inspected before leaving our factory. Save all packing material if apparatus is received damaged.
- 2.02** Responsibility for safe delivery was assumed by the carrier upon acceptance of the shipment; therefore, claims for loss or damage sustained in transit must be made upon the carrier by the recipient as follows:

Visible Loss or Damage: Note any external evidence of loss or damage on the freight bill or express receipt, and have it signed by the carrier's agent. Failure to adequately describe such external evidence of loss or damage may result in the carrier's refusing to honor your claim. The form required to file such claim will be supplied by the carrier.

Concealed Loss or Damage: Concealed loss or damage is any loss or damage which does not become apparent until the merchandise has been unpacked and inspected. Should either occur, make a written request for inspection by carrier's agent within 15 days of the delivery date; then file a claim with the carrier.

- 2.03** If you follow the above instructions carefully, Precision Scientific will guarantee our full support of your claim to be compensated for loss or damage in transit.

DO NOT — for any reason — return this unit to NAPCO without first obtaining return authorization. In any correspondence with NAPCO please supply the nameplate data, including catalog number and serial number.

3.0 General and Maintenance Information

- 3.01** Napco water jacketed, microprocessor controlled CO₂ incubators are ideal for applications requiring precise and uniform control of temperature and CO₂. They provide a controlled environment for the growth of culture common in virology, physiology and microbiology.
- 3.02** The solid state digital control panel houses all functions necessary to operate the incubator. The push button switches and individual LED displays allow the operator to adjust temperature, CO₂, and calibration via a single set of controls. No adjusting of trim pots is required for operation.
- 3.03** The proportional integral derivative (PID) temperature control allows precise temperature control from 5°C above ambient to 50°C. The patented internal air heater located within the chamber provides rapid temperature recovery unparalleled in the industry.
- 3.04** A digital hi-limit safety switch is provided which can be easily set through the control panel to prevent thermal runaway in the event of temperature control failure.
- 3.05** Visible and audible Hi and Lo alarms are provided for temperature and CO₂. Contacts are also provided on the rear of the unit for connection to a central monitoring system.
- 3.06** Your incubator is supplied with five shelves per chamber and can hold a maximum of ten shelves per chamber. The entire stainless steel shelf system can be assembled and disassembled without the use of tools for ease of cleaning.
- 3.07** A stainless steel humidity pan is also supplied with the unit to promote high RH levels within the chamber. The humidity pan rests on the chamber floor to promote quick recovery of RH. For even quicker RH recovery levels, the bottom of the chamber may be flooded with distilled water.
- 3.08** The incubators are available in both single chamber and double chamber configurations. The double units contain two independent sets of controls enabling operation of a single chamber even when the other is turned off.
- 3.09** Maintenance: Add water to the water jacket when the red low water light is illuminated. Refer to Section 8.06. Bimonthly calibration of the unit is recommended. See section 10.0. For cleaning, see Section 12.0. Normal operation requires periodic filling of the humidity pan. See section 10.01. No other maintenance is required.
- 3.10** As always, the NAPCO support team is ready to help.

Please call 540-869-9892 if you have any questions or require further assistance.

4.0 Specifications

4.01 The following table lists the performance specifications for these CO₂ incubators:

"R" suffix added to model number denotes right-hinged door

		TABLE 4.1 Specifications	
		Single Chamber	
Catalog Number	115 VAC	TC Sensor 51200063	IR Sensor 51200064
Chamber Volume:	5.4 cu. ft. 153.5 liters		
Chamber Dimensions: (usable)	(L x W x H) 17.3 x 17.5x 25 in. 439 x 445 x 635 mm		
Exterior Dimensions:	(L x W x H) 27.8 x 24.5 x 33.8 in. 706 x 622 x 859 mm		
Temperature Range: Control: Stability: Uniformity:	Ambient +5.0°C to 50.0°C 0.1°C ±0.1°C ±0.25°C Ambient + 5.0°C to 50.0°C		
CO ₂ Range: Control: Stability: Uniformity:	0 to 20.0% 0.1% ±0.1% ±0.25% 0 - 20.0%		
Humidity Range:	Above ambient to 98%		
Humidity Source:	1 Pan (supplied)		
Shelves:	5 (supplied) 10 (maximum)		
Shelf Capacity: (maximum)	20 sq. ft. 1.84 sq. meter		
Electrical Service Overvoltage Category II +/-10% 50/60Hz	115V~ 550 Watts 4.7 Amps		
Maximum BTU Output:	1876		
Net Weight:	188 lbs., 85 kg		
Shipping Information Dimensions: Weight: Volume:	L x W x H 36 x 33 x 40 in. 915 x 838 x 1016 mm 265 lbs., 120 kg 29.5 cu. ft., 0.83 cu. meter		

Environmental Conditions

- Indoor Use Only
- Maximum Altitude 2000 meters
- Operating Ambient: 5° to 40°
- Relative Humidity: 80% for temperatures to 31°
50% for temperatures to 40°
- Pollution Degree: 2

5.0 Installation

NOTE

DO NOT SUPPLY POWER OR TURN ON INCUBATOR UNTIL AFTER READING EXPLANATION OF CONTROLS (SECTION 6.0) AND START UP (SECTION 8.0).

5.01 Materials Supplied — The incubator was checked carefully before it was shipped from the factory. However, should any items be missing, contact your dealer representative.

5.02 The most uniform operating conditions and results will be obtained by placing the incubator on a level surface in an area remote from drafts, ventilating outputs, radiators, and other areas where rapidly changing ambient conditions may be present. If at all possible, leave at least two (2) feet of space around the incubator to allow access to power, gas inlets, and remote alarms located on the back of the unit. Position the incubator in proper place prior to filling with water. There are four (4) adjustable leveling legs on the bottom of the incubator to accommodate any unevenness of the floor or table top. The leveling feet should be adjustable by hand. If not use a "1-3/8" wrench.

5.03 Electrical Connections — Important, please read the following information carefully. Failure to follow instructions may result in personal injury.



WARNING

FOR PERSONAL SAFETY, AND FOR BEST PERFORMANCE, THIS APPARATUS MUST BE PROPERLY GROUNDED.

5.04 Determine the total amount of current being used by other apparatus connected to the circuit that will be used for this apparatus. It is critical that the added current demand (see nameplate) of this and other equipment used on the same circuit does not exceed the rating of the fuse or circuit breaker.

CAUTION

BE SURE THAT THE POWER SUPPLY IS OF THE SAME VOLTAGE AS SPECIFIED ON THE NAMEPLATE.

5.05 Stacking two units -

CAUTION

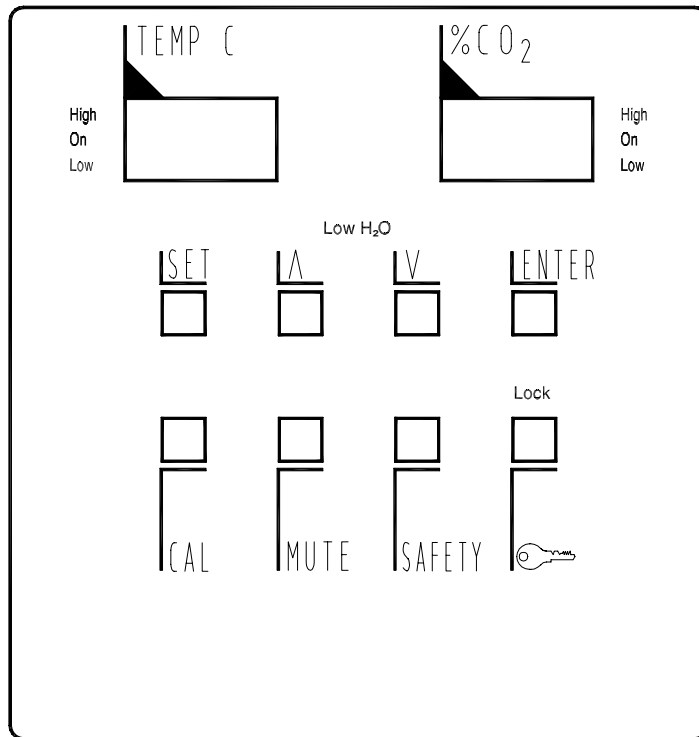
DISCONNECT POWER CORD FROM THE UNIT BEFORE PROCEEDING WITH THIS INSTALLATION.

Drain the water from the water jacket and remove any items from the chamber before attempting to place the incubator on top of the bottom unit.

1. Remove the four (4) adjustable feet from the bottom of the incubator to be placed as the top unit.
2. From the incubator that will be used as the bottom unit, remove the screws that hold the top front panel. There is one screw on each side of the panel and 2 or 3 screws on the top of the panel. Pull the panel forward at which time the 2 white hole plugs become loose. Discard these plugs. Using the pliers, disconnect the sample tube from the sample fitting.
3. Place the other incubator on top of the bottom unit.
4. Refer to the drawing on page 37 for locations. Insert the rubber inserts into the bottom front of the top unit. Remove the nuts on the center two thread studs on top of the bottom chamber and attach straps 34002308. Replace the two nuts. Attach the hex bolt through the strap and into the threaded insert and tighten. Replace the sample tube to the sample fitting and replace the top panel to the lower unit. Use only the 2 side screws to attach the panel.
5. Remove the 2 black hole plugs on the rear of the incubators. Place the threaded inserts in place of the hole plugs. Attach the strap number 34002307 using the hex bolt and tighten.

6.0 Explanation of Controls

6.01 Front Panel



Changes temperature or CO₂ control setpoint.



Increments displayed value. As button is pressed, displayed value scrolls up through values in the range. As button is held pressed, scroll rate accelerates.



Decrements displayed value. As button is pressed, displayed value scrolls down through values in the range. As button is held pressed, scroll rate accelerates.



Stores the new setpoint, calibration or Hi Limit value. Stores newly entered values.



Matches displayed value of temperature or CO₂ to actual measured chamber conditions.



Sets chamber high temperature limit.



Temporarily silences audible alarm.



Locks SETPOINT and CALIBRATION values to protect against unauthorized or inadvertent changes, and to unlock controls once locked.



6.01.2 Front Panel Displays

"Temp. °C": Displays actual chamber temperature during operation. May be used for other display purposes during setup and calibration.

"% CO₂": Displays actual chamber CO₂ during operation. May be used for other display purposes during setup and calibration.

6.01.3 Front Panel Fittings and Connectors

"Fill Port:" Used to fill or to siphon drain the chamber water jacket.

"CO₂ Sample:" Provides a direct connection for sampling the chamber atmosphere for calibration of the CO₂ displayed value.

6.01.4 Front Panel Indicator Lamps

"H₂O" Indicates that water in the water jacket is below normal operating level.

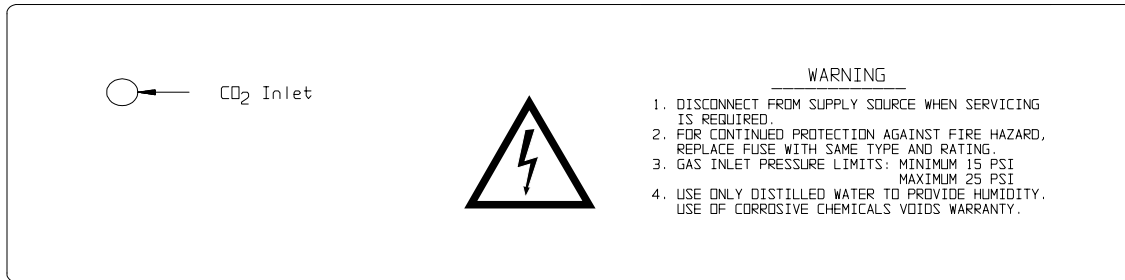
"Lock" Illuminates when control panel settings have been locked.

"High" Indicates that the current displayed value is above SETPOINT.

"Low" Indicates that the current displayed value is below SETPOINT.

"On" Indicates that controller is regulating this parameter.

6.02 Rear Panel



"CO₂
Inlet:" Provides 1/4" I.D. tubing connectors for connection to one CO₂ cylinder (tank). There is one set of CO₂ input connectors per incubator.

6.03 Left Side Panel

Fuses: The (2) fuses provides protection for the primary incubator power line. Fuse current rating varies, depending on supply voltage.

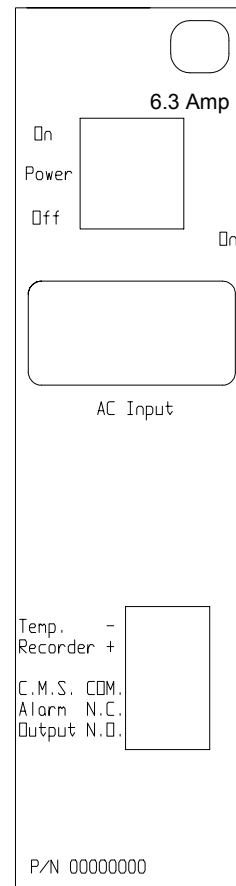
"Power:" Primary electrical power switch. There is one power switch for each chamber.

"AC
Input:" IEC standard connector for connection to electrical service line. There is one "AC input" per incubator.

"Temp
Recorder:" Used to connect a recording device (10mv DC/°C) to monitor chamber temperature if desired. "+" and "-" connectors indicate signal polarity. There is one recorder output per chamber.

"Central
Monitoring
System (C.M.S)
Alarm

Output:" Used to connect to a central monitoring system if desired. Connection is Form "C" contacts. May be wired NC (Normally Closed) or "NO" (Normally Open) with isolated ground ("COM" connection).



7.0 Cleaning and Decontamination

WARNING

DISCONNECT POWER BEFORE PROCEEDING. SOME PARTS MAY BE HOT.

NOTE

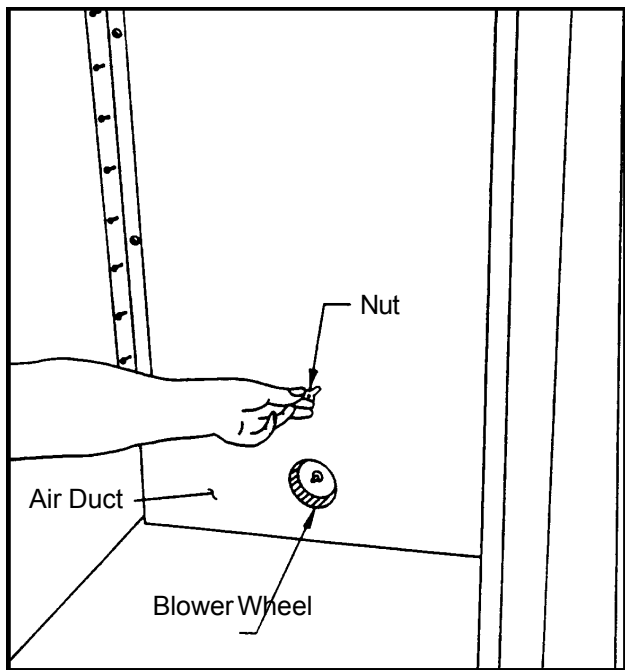
THIS INCUBATOR IS MANUFACTURED IN AN INDUSTRIAL ENVIRONMENT. WHILE EVERY EFFORT IS MADE TO KEEP THIS INCUBATOR AS CLEAN AS POSSIBLE DURING MANUFACTURE AND TRANSIT, IT IS NOT STERILE.

7.01 To ensure optimal growth conditions, we strongly recommend you thoroughly clean and disinfect the incubator prior to use.

7.02 Open the incubator doors and remove any packaging or accessory items.

7.03 Remove the air duct from each chamber

1. Loosen nut.
2. Carefully tilt top of air duct forward and toward either side.



3. Remove air duct from chamber.
7.04 Thoroughly clean and disinfect chamber(s), air duct(s), shelves, supports, shelf slide brackets, shelf slides, humidity pan(s), glass door, gasket, latch, and any other objects which will be placed inside the chamber. All stainless steel parts may be autoclaved for thorough sterilization.

7.05 Blower wheel may be removed and cleaned. The blower wheel is fastened to the motor axle by a firm press fit. Some force may be required for removal.

NOTE

HANDLE ALL STERILIZED PARTS CAREFULLY TO REDUCE POSSIBILITY OF INTRODUCING CONTAMINANTS INTO THE INCUBATOR.

7.06 Re-install blower wheel and air duct.

Press the blower wheel firmly onto the axle until the blower wheel rests against the axle stop. Place the plastic spacer on the long stud located on the fan motor plate. Re-install the air duct and fasten the plastic nut. Check for free rotation of the blower wheel by turning the wheel clockwise using a finger. If the blower wheel rubs against the air duct: a) verify that wheel is pushed back against the axle stop, and b) loosen the nut slightly.

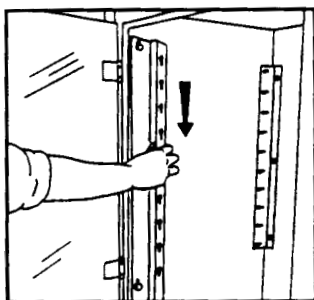
8.0 Set-up

8.01 Ensure that the incubator is level. Adjust the 4 corner leveling feet as needed.

8.02 Ensure that the incubator is plugged into a properly grounded outlet of the correct supply voltage, and that the power switch is in the *off* position (0).

8.03 Ensure that the blower wheel and air duct are properly installed (See Section 7.06).

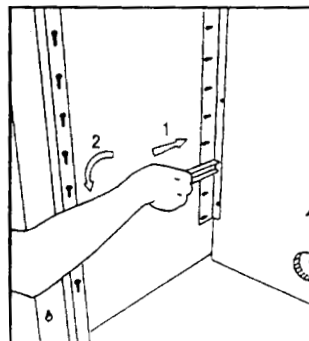
8.04 Install front shelf slide supports by sliding the keyed slots of each support into place over the buttons located near the top and bottom of each side wall of the chamber. Note that the keyed mounting slots should be at the edge of the shelf slide support which faces the front of the chamber.



8.05 Install shelves. The incubator is provided with five (5) shelves per chamber, and will accommodate up to ten (10) shelves per chamber. Each shelf rides on a pair of shelf slides for ease of access to samples. Shelf height may be adjusted by installing the slides into the proper keyways in the shelf slide supports. Additional shelf kits (which include one (1) shelf and one (1) pair of shelf slides) are available through your laboratory equipment dealer or from NAPCO.

Note that the shelf slides are keyed differently at each end — the end which installs into the rear slide support bracket has a key which is parallel to the length of the slide, while the end which installs into the front slide support bracket has a key which is perpendicular to the length of the slide.

1. Refer to the following illustration and insert the shelf slide into a rear keyway of your choice in the rear shelf slide bracket on either side of the chamber. Next insert the shelf slide into the matching front keyway. Attach another slide on the opposite side of the chamber at the same elevation. Repeat for the remaining shelf slides.



2. Slide a shelf into each pair of shelf slides. The shelves are designed so that they may be used with the lip facing either up or down.

8.06 Fill each chamber's water jacket with distilled water (approximately 11 gallons [40 Liters]).

WARNING

WHEN SETTING UP VERTICALLY STACKED INCUBATORS, THE LOWER CHAMBER WATER JACKET MUST BE FILLED FIRST.











CAUTION

TO AVOID BUILD-UP OF MINERAL DEPOSITS AND TO PREVENT CORROSION, USE ONLY DISTILLED WATER (50-K OHMS TO 1-M OHMS) IN THE WATER JACKET.

DONOT USE ULTRA-PURE OR DEIONIZED WATER.

1. Turn the power switch on. The digital displays will light, and the "H₂O" low water jacket water level indicator will be illuminated. Verify that all setpoints are set to "OFF" or "0".

Setpoints can be adjusted to "OFF" or "0" as follows:

- Press   
 - Press  until   or  
 - Press  .
 - Repeat for other parameters by pressing  until the appropriate display is active.
2. Unscrew the cap from the water jacket fill port and replace the cap with the threaded hose barb connector provided in the accessories kit.
 3. Connect one end of the clear vinyl tubing provided in the accessory kit to the hose barb connector.
 4. Pour one ounce of Quaternary Ammonium germicide (provided in accessory kit) into the water jacket through the tubing to reduce possible fungus growth in the water jacket.
 5. Connect the other end of the vinyl tubing to a source of distilled water. A faucet adapter is provided in the accessories kit for your convenience in connecting to an in-house central distilled water system.

9.0 Connecting External Supplies 9.02 Gas Connection

9.01 Type of gasses required

1. Only medical grade 100% CO₂ should be used as gas supply for this incubator. The gas source may be either a cylinder or an in-house central gas supply equipped with shut-off valves and a pressure regulator.



WARNING

DO NOT USE CO₂ THAT HAS BEEN MIXED WITH OTHER GASSES OR AIR AS THIS WILL CAUSE POOR GAS CONTROL PERFORMANCE OR POSSIBLE HAZARDS.

9.02 Gas Pressure Regulation

9.02.1 When using cylinders as the gas supply, a 2-stage pressure regulator is required to reduce the tank pressure to the 15-25 PSI (1.0 - 1.7 BAR) recommended operating pressure. A 2-stage regulator must be used for each cylinder connected.

9.02.2 When using an in-house central gas supply, either a 1-stage or 2-stage pressure regulator will be required depending on the pressure level of the in-house source. Check with your facilities personnel and with your regulator vendor to ensure that the regulator will provide adequate pressure control at the 15 - 25 PSI (1.0 - 1.7 BAR) recommended operating pressure. The regulator should be installed near the incubator.

The accessory kit supplied with your incubator contains gas filters, hose clamps, and an ample length of tubing for connecting the incubator with gas.

Connect the gas supply to the incubator as follows:

1. Cut the supply hose to the length required.
2. Slide two hose clamps over the hose and connect one end of the hose to the pressure regulator and the other end to the incubator. Tighten the hose clamps at each connection.

CAUTION

DO NOT OVERTIGHTEN THE ADJUSTABLE HOSE CLAMPS. OVERTIGHTENING MAY DAMAGE THE HOSE.

3. Cut through the gas supply hose approximately 1-2 feet from the incubator gas inlet. Place one hose clamp over both open ends of the gas tubing.

NOTE

OBSERVE GAS FLOW DIRECTION ON THE CO₂ FILTER.

4. Connect a gas filter to the gas supply hose. Tighten the hose clamps to the gas filter.
5. Repeat the above for each gas supply used.

10.0 Initial Operation & Calibration

Successful operation of the incubator requires careful attention to the calibration procedures listed in this section. Failure to follow the calibration procedures will result in poor operation of the incubator. This section should be repeated anytime the incubator has been out of service for more than 24 hours or when poor performance is suspected. The calibration procedure requires a minimum stabilization period of 24 hours.









10.01 Fill the humidity pan (provided in the accessories kit) with distilled water one inch deep, and place pan on the floor of the chamber, at least two inches from the air duct.

10.02 Place a reference thermometer on the center shelf of each chamber (Note: thermometers are not provided with the incubator). This thermometer will be used to verify temperature calibration. The thermometer should be positioned such that it can be easily read through the incubator's inner glass door.

WARNING

WHEN USING MERCURY THERMOMETERS, HANDLE WITH THE UTMOST CARE. VERY SMALL AMOUNTS OF MERCURY FROM A BROKEN THERMOMETER MAY CAUSE DAMAGE TO THE CHAMBER BY ELECTROLYSIS. MERCURY ALSO CREATES A TOXIC ENVIRONMENT IN THE CHAMBER, RENDERING THE INCUBATOR USELESS.

10.04 Enter Temperature Setpoint.

1. Press    
2. Use  and  until display shows desired setpoint.
3. Press  .
4. The incubator will begin heating as indicated by the green "ON" LED indicator to the left of the temperature display.

CAUTION

NEVER OPERATE UNIT WITHOUT WATER IN THE WATER JACKET(S). OPERATION WITHOUT WATER IN THE WATER JACKET MAY RESULT IN POOR PERFORMANCE FROM THE INCUBATOR, OR MAY DAMAGE INCUBATOR COMPONENTS AND WILL VOID THE WARRANTY.

10.05 Calibrate Temperature. Allow the incubator to operate for a minimum of 24 hours before attempting to calibrate temperature. Do not open the glass door during this period.





After the incubator has stabilized at the desired operating temperature (at least 24 hours), open the **exterior door only**. **Do not open the glass door**. Compare the temperature of the digital display with the reference thermometer inside the chamber. If these readings match, no temperature calibration is required; therefore, skip to Section 10.06.

If the readings do not match, continue reading this section.

NOTE

DO NOT OPEN GLASS DOOR DURING THIS PROCEDURE.

To calibrate temperature display:

1. Press  display will show
2. Using  and  keys, match displayed temperature with reference thermometer reading.
3. Press .





Allow at least one hour for temperature to stabilize after calibration.

After allowing incubator temperature to stabilize, verify that displayed temperature matches the reference thermometer within the chamber. If not, repeat the above steps.

10.06 Calibrate CO₂ to 0.





Perform CO₂ calibration only after calibrating temperature. Failure to calibrate Temp. prior to CO₂ will result in poor CO₂ performance.

Relative humidity must be stable prior to calibration of CO₂. Failure to do so will result in poor CO₂ performance.

1. Press  twice. Display will show
2. Using  and  set CO₂ display to 0.0%.
3. Press .

Do not be alarmed if the CO₂ display is negative or far from zero. This is normal upon initial calibration.




10.07 Set CO₂.

1. Press .
2. Use  or  to set desired CO₂ level.
3. Press .

After the incubator has stabilized at operating CO₂ level for at least 30 minutes, measure actual chamber CO₂ using a CO₂ gas sampling device such as a FYRITE® tester.

10.08 Calibrate CO₂ to Measured Value.

If the displayed CO₂ level does not match the measured actual chamber CO₂ level, repeat the CO₂ calibration by matching the displayed value to the actual measured value.

1. Press  twice. Display will show
2. Using  set CO₂ display to match reading on the sampling device.
3. Press .

10.09 Check each calibration in the following sequence and recalibrate as needed.

1. Temperature
2. CO₂

Calibration is now completed.

11.0 Operation


The Temperature and CO₂ functions have 3 modes of operation; "OFF", "0" and "Setpoint".

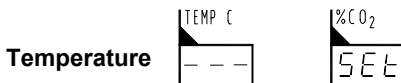
OFF - When "OFF" is displayed in the window, the controlled function is inactive.



0 - When "0" is displayed in the window, the controlled function only monitors and displays concentrations in the chamber.

Setpoint - When a setpoint is entered, the unit will control to the entered value.

11.01 Changing Setpoints.

1. Press  until the desired setpoint window is active. The word *SET* will appear in one of the two windows. Dashed lines will appear in the non-active window. The selective parameter will be active.



2. Press  or  to set desired setpoint.

3. Press 

11.02 Calibration






NOTE

TO ENSURE PROPER OPERATION OF THE INCUBATOR, CALIBRATION MUST BE COMPLETED PER SECTION 10 IN THE FOLLOWING SEQUENCE:

1. Temperature
2. CO₂

FAILURE TO DO SO MAY RESULT IN POOR INCUBATOR CONTROL.

11.03 Temperature Hi-Limit Safety

1. Press  : 
2. Use  or  until desired Hi-Limit safety is displayed.
3. Press 

The temperature Hi-Limit safety has a range from 26°C to 57°C. The temperature Hi-Limit safety can not be set nearer than 0.5°C above temperature setpoint.

When the temperature setpoint is changed upward or downward, the Hi-limit safety will automatically change a like amount to prevent the hi-limit safety from being set below the temperature setpoint.

11.04 Alarms

This incubator provides both visible and audible alarms to alert the operator to a variance in chamber conditions from SETPOINT operating conditions.

11.04.1 "High" and "Low" Alarms

Each controlled incubator function features "High" and "Low" alarms to indicate when the parameter's actual value rises above or falls below a fixed band around setpoint. See Table 11.1 for a listing of the alarm bands for each parameter.




If an alarm condition exists, the appropriate red "High" or Low" indicator lamp will light to the left of the display and an audible alarm will sound continuously. The alarms will remain active until the actual value returns to within the normal operating setpoint band.

Parameter	Alarm Band	Alarm Delay Default	Alarm Delay Limits
TEMP	HIGH	+0.5°C	5m
	LOW	-0.5°C	10m
CO ₂	HIGH	+0.5%	5m
	LOW	-0.5%	10m


11.04.2 Alarm Delays


Each alarm has an associated delay to prevent nuisance alarms. The alarm delays have been optimized and factory preset to prevent nuisance alarms under normal operating conditions. If these alarm delay settings are not appropriate for your application, they may be adjusted from the keyboard.

11.04.3 Changing Alarm Delays

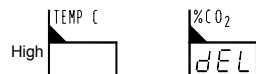
- Press    simultaneously, 2 times. The incubator is now in communication parameter set-up mode.



0 will be displayed in the Temp. window and "CFG" will be displayed


in the CO₂ window. Using the  button, press and hold until "6" is displayed in the Temp. window.

- Press  several times to cross through the communication parameter set-up until the alarm delays are reached.

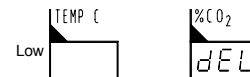
- The display will show High Temperature Delay



- Press  or  to change the temperature high alarm delay.

- Press  to store the new value and cross to the next parameter.

- The display will show Low Temperature Delay. Repeat step (4) to change delay value.



- Repeat for CO₂ high and low alarm delays.


CO₂ High Alarm Display



CO₂ Low Alarm Display



11.04.4 Muting audible alarm

To silence any audible alarm press .

Muting will silence the audible alarms for 15 minutes. The visual red "High" or "Low" indicator will continue to be displayed until the alarm condition is corrected. If the condition is not corrected within 15 minutes, the audible alarm will sound again.


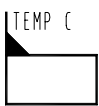
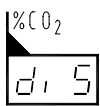



If an alarm is currently muted, the presence of an additional alarm condition will override the MUTE and the audible alarm will sound.

If an alarm has been muted and the alarm condition is removed and returns the audible alarm will sound again regardless of when MUTE was pressed.


11.04.5 Alarm Disable

All alarms may be disabled for a period of up to 99 hours.

To disable or change the alarm disable time:

1. Press  twice. Display shows  
2. Using  or  keys, enter the alarm disable time in hours.
3. Press  .


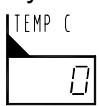




The display will flash and a beep tone will confirm that the value has been stored.

4. To check alarm disable time remaining, press  twice at any time.

11.05 Using the Keyboard Lock

The keyboard may be locked to prevent inadvertent changes to previously stored values.

11.05.1 To lock the keyboard:

1. Press  display shows  
2. Using  or  keys, enter a numerical password of your choice.
3. Press  .

Your password is stored, the control panel is now locked, and the red "Lock" indicator illuminates to indicate the locked condition.

NOTE

RECORD YOUR PASSWORD IN A SAFE LOCATION.

While the keyboard is locked, setpoints, calibration and Hi-Limit safety values may be observed but not changed.


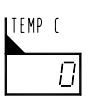
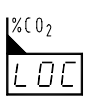



If an attempt is made to change previously stored values while the keyboard is locked, the display will show



11.05.2 Temporarily unlocking the keyboard

The control panel can be temporarily unlocked to change a setpoint, calibration, or Hi-Limit safety. The control panel will automatically re-lock after a new value has been entered.


To temporarily unlock the keyboard:

1. Press  display will show  
2. Using  or  keys, enter your numerical password.
3. Press  .

The red "LOCK" light will now blink on and off. Previously stored values may now be changed. The keyboard will relock after the new value is entered.

The keyboard will automatically re-lock after any of the following actions:

- Ten seconds elapse with no buttons pressed.















- After  is pressed whether a value was changed or not.

11.05.3 Permanently unlocking the keyboard.

The control panel can be permanently unlocked to allow operation without restricting keyboard entry.

When the control panel is unlocked, the incubator will accept changes to previously stored values.

To permanently unlock the incubator:

1. Press  display will show 
2. Using  or  keys, enter your numerical password.  
3. Press  to temporarily unlock the keyboard. The red "LOCK" light will now blink on and off.
4. Press  a second time, display will show   
5. Using  or  keys, re-enter your numerical password.
6. Press .

The red "LOCK" light will extinguish and the incubator will be permanently unlocked.










IF YOU HAVE FORGOTTEN OR LOST YOUR PASSWORD, ENTER 257


11.05.4 Factory Reset

NOTE

FOLLOWING A FACTORY RESET THE INCUBATOR MUST BE RECALIBRATED PRIOR TO USE. FOLLOW THE INITIAL OPERATING & CALIBRATION PROCEDURE, SECTION 10.0.

The incubator can be re-set to initial factory conditions at any time. To reset the incubator:

1. Press    simultaneously, display will show  
2. Press  until display reads  
3. Press .

The incubator will beep, display  and return to initial factory settings.

The following table lists all parameters that are reset and their reset values.

Parameter	Reset Value
Temp. Setpoint	0
Temp. Calibration Offset	0°C
Temp. Hi-Limit Safety	50°C
CO2 Setpoint	0
CO2 Calibration Offset	0%
Temp. Lo Alarm Delay	10 Minutes
Temp. Hi Alarm Delay	5 Minutes
CO2 Lo Alarm Delay	10 Minutes
CO2 Hi Alarm Delay	5 Minutes




11.06 Door Heater Duty Cycle




The control circuitry has the capability of controlling the incubators door heater semi-separately for the purpose of eliminating any condensation build up along the outer perimeter of the inner glass door. There is a parameter "Uar" which is accessible through a configuration display where the user can change its value.

The value of "Uar" has a range of 1.0 to 3.0. When "Uar" is 1.0, the door heater is controlled in the same manner as the other heaters in the incubator. When "Uar" is increased above 1.0, the door heater remains on proportionally longer than the other heaters when the chambers temperature is within the proportioning band. For example, when "Uar" is set to 2.0, the door heater will be on twice as long as the other heaters.


The factory setting for "Uar" is 1.0. This value allows condensation to form on the glass door. Certain applications require that the glass door be free from condensation. Set "Uar" to an initial value of 1.8. Allow the incubator to stabilize for 24 hrs. Check the condition on the glass door. Increase the "Uar" value by 0.1 if the condensation is more than required. Decrease the "Uar" value by 0.1 if the condensation is less than required. The determination of the value for "Uar" is one of trial and error. Allow 24 hours for the incubator to stabilize before adjusting "Uar" to a new value.

To change the value of "Uar":

1. Press and hold  and  and then press . Display will show a sequential test pattern.

2. Press and hold  and  and then press  again. The displays will show:






3. Press  until "7" is displayed in the temperature window and then press

.

The displays will show:



4. Use  or  keys to select the desired value of "Uar" and then press . The displays will flash and then return to their normal operating states.

12.0 CARE AND CLEANING OF STAINLESS STEEL

NOTE

THE FOLLOWING IS A GENERAL WRITE UP INTENDED AS INFORMATION. IT CAN BE USED ON INCUBATORS OR WATER BATHS.

BEFORE USING ANY CLEANING OR DECONTAMINATION METHOD EXCEPT THOSE LISTED IN THE FOLLOWING, USERS SHOULD CHECK WITH PRECISION SCIENTIFIC THAT THE PROPOSED METHOD WILL NOT DAMAGE THE EQUIPMENT.

Stainless steel is an alloy of steel with chromium and nickel which increase the metal's resistance to rust and corrosion. However, if not properly cared for it can rust and corrode. Exposure to air provides the passivations for clean stainless steel. This exposure produces a thin, durable chromium-oxide film that forms rapidly on the alloy surface and gives stainless steel its characteristic "stainless" quality. Exposure of the surface to water and other oxidizing environments also produces this passivating film. However, if free oxygen is not available due to scale or contamination buildup the metal surface may become vulnerable to attack.

Maintaining a neutral pH and frequent cleaning with detergent and water will give you years of trouble free service for your incubator or water bath. The following are some guidelines to consider.

Water

Distilled water is recommended. Maintain pH between 7 and 9 to minimize corrosion of the stainless steel.

De-ionized or reverse-osmosis water may be used. However, if this water is very pure it may be

corrosive to stainless steel; **and in such cases always add 20-40 ppm (20 to 40 mg/liter) disodium phosphate or sodium bi-carbonate. Adjust dosage to give a pH of 7 to 9. See "pH Control" below.**

If the above water is not available you may use clean, aerated soft tap water provided the total solids concentration is <500 ppm.

pH Control

Be sure to check pH regularly. If pH is <6.0, add disodium phosphate to increase pH to a 7 to 9 value. Sodium carbonate or sodium bicarbonate may be used but tend to form scale which must be rinsed out regularly. If pH is >10.0 add sodium bi-sulfate to decrease pH to a 7 to 9 value. Avoid adding harsh alkalines or acids since they may cause localized corrosion and result in unstable pH.

Anti-Fungal/Anti-Bacterial Additives

These additives are permissible to use as long as the pH of the aqueous solution is kept within the range of 7 to 9. Some of these are available through your supply dealer. Be sure they are not harmful to stainless steel.

Prevention of Scale Buildup

Additives commonly available for use in swimming pools and spas may be acceptable in circulating baths only. In static baths these are generally not effective. This is why it is best to clean the bath (especially around immersion heaters) and replace water as soon as practical.

Other Water Additives

Proper maintenance of the stainless steel bath chamber will help assure many years of service.

It should be cleaned regularly with mild soapy water and rinsed with distilled water. Always thoroughly dry the chamber after cleaning.

IMPORTANT: *If it is necessary to use the following chemicals, limit the exposure time to a maximum of four hours. Clean surfaces immediately after use.*

Aluminum Chloride	Barium Chloride
Chlorinated Lime	Calcium Chloride
Dakin's Solution	Ferrous Chloride
Citric Acid (Boiling)	Mercury Salts
Phenol	Dichloride of Mercury
Potassium Permanganate	Tartaric Acid
Potassium Thiocyanate	Carbonic Acid
Sodium Hypochlorite	Stannous Chloride
Mercuric Chloride	

NEVER USE THE FOLLOWING:

Aqua Regia	Ferric Chloride	Bromine
Fluorine	Sodium Azide	Iodine
Sulfuric Acid		

Cleaning

Spills of any chemical, especially those listed above should be removed as soon as possible and the stainless steel surface cleaned with mild soapy water followed by copious rinse with clean water. Do not use soap filled or any metallic pads. Even stainless steel pads are to be avoided as they may destroy the passive film on the surface of the metal and create crevices that may harbor contamination. If stubborn stains persist use a plastic light duty cleansing pad and rub gently in the direction of the metal grain. If stains continue to persist use one of the following methods.

WARNING

THE FOLLOWING CHEMICAL METHODS HAVE PROVEN SUCCESSFUL BUT EXTREME CARE MUST BE TAKEN WHEN HANDLING THESE MATERIALS. ALWAYS WORK IN AN AREA WITH ADEQUATE VENTILATION. USE THE PRECAUTIONS OUTLINED IN THE MATERIAL SAFETY DATA SHEET (MSDS) AND MANUFACTURER'S INSTRUCTIONS FOR THE PRODUCT YOU ARE WORKING WITH. FOLLOW THE PERSONAL PROTECTION INDEX FOUND IN THE HAZARDOUS MATERIALS IDENTIFICATION SYSTEM (HMIS) SECTION OF THE MSDS.

The use and disposal of these chemicals may be regulated by your local municipality. Consult the regulations before disposing of these materials.

1. Bathroom tub and tile cleaners. Available at supermarkets.
2. Any of a variety of "scale removers" available at your local supermarket or hardware store. Generally sold for cleaning coffee makers, humidifiers and vaporizers.
3. Citric acid based cleaners. Contact your lab supply dealer.
4. A 15 to 35% phosphoric acid solution. Available from chemical supply dealers for scale and rust removal. Allow solution to soak the surface affected until rust and scale is loosened. Immediately rinse with copious amounts of clean water.
5. Oxalic Acid 2% to 5% in warm water. Swab solution on surface allowing it to remain until rust is loosened. Immediately flush with copious amounts of clean water.
6. A mixture of 20% nitric acid and 1.5% hydrofluoric acid (or hydrochloric acid). Swab solution on surface allowing it to remain until rust is loosened. Immediately flush with copious amounts of clean water.

The above are ranked in order of mild to strong cleaning agents. Items 5 and 6 should only be used if severe rust and scale stains have developed and cannot be removed by any other method. In any case the chemical should be allowed to do the cleaning with minimal scrubbing. **Always follow the manufacturer's instructions.**

Chamber Disinfecting

Materials known to be effective in disinfecting are:

- *Household Bleach
- *Glutaraldehyde
- *Alcohol

Consult with your staff chemist for advice on using these chemicals.

CAUTION

ALWAYS RINSE WITH COPIOUS AMOUNTS OF CLEAN WATER. AIR DRY AND/OR FILL WITH FRESH WATER AND FOLLOW THE GUIDELINES IN "WATER" ABOVE.

DISCLAIMER

THE ABOVE INFORMATION IS THE RESULT OF LIMITED INVESTIGATION AND NAPCO MAKES NO CLAIMS AS TO THE SUITABILITY TO YOUR PARTICULAR APPLICATION. THESE ARE INTENDED TO BE GUIDELINES ONLY. CONSULT YOUR STAFF CHEMIST TO DETERMINE WHAT WORKS BEST IN YOUR LAB.

13.0 Troubleshooting Procedures



WARNING

REFER SERVICING TO QUALIFIED SERVICE PERSONNEL. WHEN POWER IS APPLIED DANGEROUS VOLTAGES EXIST WITHIN THE CHASSIS COMPONENTS. USE EXTREME CARE WHEN MEASURING VOLTAGES ON A LIVE CIRCUIT.

Problem	Procedure																					
<p>13.01 No Heat</p>	<p>1. Verify that setpoint temperature is greater than actual temperature.</p>																					
	<p>2. Check heaters.</p> <p>A. Disconnect power cord. Remove rear cover.</p> <p>B. Disconnect connectors J6 (bottom left) and J7 (bottom) from power supply board.</p> <p>C. Check heater resistances with an ohmmeter. Approximate heater resistances (at ambient temperature) are shown below:</p> <table border="1" data-bbox="805 831 1442 1083"> <thead> <tr> <th data-bbox="805 831 938 919">Heater</th> <th data-bbox="938 831 1127 919">Connections</th> <th data-bbox="1127 831 1442 919">Resistance (in ohms) 115V ~</th> </tr> </thead> <tbody> <tr> <td data-bbox="805 919 938 947">Air</td> <td data-bbox="938 919 1127 947">J6 Pins 1 & 3</td> <td data-bbox="1127 919 1442 947">132</td> </tr> <tr> <td data-bbox="805 947 938 974">Water #1</td> <td data-bbox="938 947 1127 974">J7 Pins 4 & 5</td> <td data-bbox="1127 947 1442 974">144</td> </tr> <tr> <td data-bbox="805 974 938 1001">Water #2</td> <td data-bbox="938 974 1127 1001">J7 Pins 5 & 6</td> <td data-bbox="1127 974 1442 1001">144</td> </tr> <tr> <td data-bbox="805 1001 938 1029">Aux</td> <td data-bbox="938 1001 1127 1029">J7 Pins 7 & 8</td> <td data-bbox="1127 1001 1442 1029">576</td> </tr> <tr> <td data-bbox="805 1029 938 1056"></td> <td data-bbox="938 1029 1127 1056">J7 Pins 8 & 9</td> <td data-bbox="1127 1029 1442 1056">576</td> </tr> <tr> <td data-bbox="805 1056 938 1083">Door</td> <td data-bbox="938 1056 1127 1083">J7 Pins 1 & 2</td> <td data-bbox="1127 1056 1442 1083">120</td> </tr> </tbody> </table> <p>D. Replace any heater that does not match the approximate resistances above.</p>	Heater	Connections	Resistance (in ohms) 115V ~	Air	J6 Pins 1 & 3	132	Water #1	J7 Pins 4 & 5	144	Water #2	J7 Pins 5 & 6	144	Aux	J7 Pins 7 & 8	576		J7 Pins 8 & 9	576	Door	J7 Pins 1 & 2	120
	Heater	Connections	Resistance (in ohms) 115V ~																			
	Air	J6 Pins 1 & 3	132																			
Water #1	J7 Pins 4 & 5	144																				
Water #2	J7 Pins 5 & 6	144																				
Aux	J7 Pins 7 & 8	576																				
	J7 Pins 8 & 9	576																				
Door	J7 Pins 1 & 2	120																				
<p>3. Check TRIAC</p> <p>A. Turn power on.</p> <p>B. Place an AC voltmeter between pins 1 & 3 on wire side of connector J6 on power supply board.</p> <p>C. Set temperature setpoint below actual chamber temperature. Voltmeter should read 0 VAC.</p> <p>D. Set temperature setpoint to at least 5°C above actual chamber temperature. Voltmeter should read line voltage.</p> <p>E. If voltmeter does not show correct values in either C or D, replace power supply board.</p>																						
<p>4. Check Safety Relay</p> <p>A. Turn power on.</p> <p>B. Place an AC voltmeter between chassis ground and right hand side of R38 on power supply board.</p> <p>C. Set temperature setpoint to at least 5°C above actual chamber temperature.</p> <p>D. Voltmeter should read line voltage. If voltmeter does not read line voltage, replace power supply board.</p>																						

Problem	Procedure
	<p>5. Check temperature sensor. The temperature sensor used in this unit is a solid state style which does not lend itself to simple ohmic testing. Problems with the temperature sensor are identified by characteristic codes on the temperature display. An open sensor creates "n n n" on the display and short circuit conditions create "U U U" on the display. The audible alarm for Hi temperature and Lo temperature visible alarm prompt or the Lo temperature visible alarm prompt in the absence of these actual conditions in the chamber may also indicate the need for temperature sensor replacement.</p> <p>A. Turn power on.</p> <p>B. Place a DC voltmeter between pins 1 and 3 on temperature sensor connector (J5) on power supply board.</p> <p>C. Voltage should read 5VDC. If not, replace power supply board.</p> <p>D. Place a DC voltmeter between pins 2 and 3 on temperature probe connector. Verify that the output of the temperature probe is 10 MV/°C.</p>
<p>13.02 Poor CO₂ Control (TC-CO₂ Sensor)</p>	<p>1. Verify that incubator is stable at setpoint temperature and R.H. levels. Calibrate the TC - CO₂ Sensor when the incubator is stable at setpoint temperature and R.H. levels. See section 10.</p>
	<p>2. Check power supply board.</p> <p>A. Turn power on.</p> <p>B. Check voltage between TP1 and TP2 on power supply board using a DC voltmeter. Voltage should read 7.00±.05V.</p> <p>C. Adjust R5 (pot at upper-right corner) until potential between TP1 and TP2 reads 7.00 ± 0.05V.</p>
	<p>3. Check power supply board</p> <p>A. Check resistance between TC - CO₂ connector (J3) Pin #1 and TP1 with TC - CO₂ sensor removed.</p> <p>B. Check resistance between TC - CO₂ connector (J3) Pin #3 and TP1 with TC - CO₂ sensor removed.</p> <p>C. Both resistances should be 150 ohms. If not, replace power supply board.</p>
	<p>4. Check gas flow lines. Assure that gas is getting to solenoid valve inlet.</p>
	<p>5. Check Solenoid</p> <p>A. Turn CO₂ setpoint up until CO₂ setpoint is 3 to 5% above the displayed actual CO₂ value. The green "on" light should be on.</p> <p>B. Place a DC voltmeter between Pin 2 on the solenoid connector J13 and TP2 on power supply board. Voltmeter should read 5 VDC. If not, replace power supply board.</p>

Problem	Procedure
<p>13.02 Poor CO₂ Control (TC Sensor) <i>continued</i></p>	<p>D. There should be an audible "click" from the solenoid each time the valve is actuated. If not, replace solenoid.</p> <p>6. Check CO₂ Sensor The CO₂ sensor used in this unit is a thermal conductivity thermistor type. Two thermistors are connected in series and have a common connection. The approximate in-circuit voltage across each junction at 37°C is 2.1 VDC and at 25°C is about 2.5 VDC. The resistance of the sensor thermistors will vary with temperature but a general range of resistance, as measured between Pins 1 & 2 or between Pins 2 & 3 should be between 2K ohms to 4K ohms. Each junction will have about 1.5K ohms of resistance at 37°C.</p>
<p>13.03 Poor CO₂ Control (IR - CO₂ Sensor)</p>	<p>1. Actual CO₂ percent does not agree with displayed CO₂ percent, displayed CO₂ percent drifts or will not inject CO₂, unit will not hold a calibration. May signal possible problems with the IRCO₂ sensor.</p> <p>2. After following the CO₂ calibration procedure Section 10.08, if a problem continues the sensor or Power PCB may be defective. Test the 5 VDC supply at the Power PCB (between TP2 and TP3). After eliminating the power supply as a potential problem check the signal output at the IRCO₂ sensor. Connect a digital voltmeter "NEG" lead to jack J1 lead labeled "COM" (ground). There are 2 "COM" leads, either lead can be used. Connect the digital voltmeter "POS" lead to jack J1 lead labeled "LINEAR" (signal output). This linear function gives 0.0 VDC to 1.0 VDC output which equates to 0.0% CO₂ to 20.0% CO₂.</p> <p>3. With the temperature and humidity stable for at least two (2) hours and with a CO₂ setpoint of 0.0% CO₂ and no CO₂ in the chamber, adjust the "FINE ZERO" potentiometer until the digital voltmeter reads 0.0 VDC+ 0.01 VDC. Enter a CO₂ setpoint between 5.0% CO₂ to 10.0% CO₂ and allow it to stabilize for about ten (10) minutes. Measure the CO₂ with a Fyrite. Multiply the measured CO₂ percentage by a factor of 0.05 and the value obtained will be the IRPCB output voltage, e.g.</p> <p style="padding-left: 40px;">5.5% - CO₂ measured X 0.05 0.275 VDC IRPCB volts out</p> <p>Slowly adjust the "SPAN" potentiometer until the proper output voltage is obtained. After completing the above procedure, follow the CO₂ calibration procedure Section 10.06.</p>

Problem	Procedure
<p>13.04 Excessive Condensation</p>	<ol style="list-style-type: none"> 1. Check magnetic door gasket. <ol style="list-style-type: none"> A. Does the gasket fit evenly along the incubator body? There should be no distortions in the gasket that could cause air to flow between the gasket and the incubator. B. If distortions exist, remove door liner and reposition or replace gasket.
	<ol style="list-style-type: none"> 2. Check glass door gasket. <ol style="list-style-type: none"> A. Check for gasket tears or imperfections. Replace gasket, if imperfections found. B. Verify that the gasket is completely adhered to the incubator chamber. If not, apply RTV Silicone sealant (Dow Corning #732) to gasket and chamber. Allow to cure for 24 hours. C. Shut and latch the glass door firmly in place. The gasket/ glass door interface should be completely sealed around the entire perimeter of the glass door. Try to place a business card between the glass door and gasket in any suspect areas. If a business card can be placed between the gasket and glass door, replace the gasket or check glass door alignment.
	<ol style="list-style-type: none"> 3. Check glass door alignment. <ol style="list-style-type: none"> A. Check that the two plastic nuts are secured tightly to the two stainless steel hinges. B. If the door does not appear to be properly aligned, loosen the four capnuts holding the hinges onto the incubator and re-align the glass door. C. Repeat step 2C to verify the glass door alignment. <p>Humidity within the chamber can vary with changing temperature, ambient conditions, and the nature of the sample. The condensation, or lack thereof, on the glass door is by no means a proper way to measure the relative humidity within the chamber, but as a general rule there will be a very slight amount of condensation near the edges of the glass door during normal operation or sometimes no condensation whatsoever. If all of the glass or greater than half the surface area of the glass is covered with moisture, this may indicate a door heater problem.</p>
	<ol style="list-style-type: none"> 4. Check door heater. <ol style="list-style-type: none"> A. Turn power off. B. Disconnect connector J7 from the power supply board. C. Check the heater resistance by placing an ohmmeter between Pins 1 and 2. See section 13.01 for resistance values. <p>If all results by following 13.04 are o.k., see section 11.06 for door heater control.</p>

Problem	Procedure
13.05 Noisy Fan	<p>Noise inside the incubator chamber, above what would normally be expected, is usually an indication of fan blade or fan motor trouble. Problems with excessive humidity and poor temperature uniformity can also signal fan motor or fan blade trouble. The fan blade mounts to the fan motor shaft by friction. The proper rotation of the fan blade, observing the blade from within the chamber, is clockwise. Air is drawn into the fan and is blown out tangent to the fan blade. Buzzing noises can be isolated by checking the fan blade position on the shaft; it may be too close to the plenum, or pushed too far back against the fan motor plate.</p>

14.0 Part Replacement Procedures



WARNING

DISCONNECT POWER CORD BEFORE PERFORMING ANY OF THE FOLLOWING PROCEDURES.

14.01 Temperature Sensor

1. Disconnect incubator from power source.
2. Remove the six (6) screws which secure rear cover plate.
3. Locate jack J5 on the main PCB and disconnect.
4. Pull out sensor from fan motor plate.
5. Reinstall new sensor, reversing above procedure.

NOTE

WHEN INSTALLING NEW PROBE MAKE CERTAIN THE FLARE AT THE CABLE END OF THE PROBE STOPS AT THE BLACK GROMMET ON THE FAN MOTOR PLATE.

6. Recalibrate temperature control, if necessary. Follow procedure in Section 10.05.

14.02 TC CO₂ Sensor

1. Disconnect incubator from power source.
2. Remove the six (6) screws which secure rear cover plate.
3. Locate jack J3 on the main PCB and disconnect.
4. Remove the four (4) screws which fasten the CO₂ sensor to the fan motor plate.
5. Reinstall new sensor, by reversing the above procedure.
6. Allow the temperature and humidity to stabilize for at least two (2) hours. Recalibrate the CO₂ control following the procedure in Section 10.08.

14.03 Fan Motor

1. Disconnect incubator from power source.
2. Remove the six (6) screws which secure rear cover plate.
3. Locate jack J6 on the main PCB and remove the leads, remove the ground lead from the motor as well.
4. Remove the shelves and plenum from the chamber. Pull fan blade off shaft, remove retaining ring and two (2) screws which secure motor to fan motor plate.

5. Reinstall the new motor, carefully noting the rotation of the shaft. Reverse the above procedure.

NOTE

THE MOTOR IS MULTIPLE VOLTAGE. THERE ARE FOUR (4) LEADS FROM THE FIELD WINDINGS. ATTACH LEADS AS FOLLOWS:

WHITE AND RED TOGETHER TO NEUTRAL. BROWN AND RED TOGETHER. BLACK IS HOT.

14.04 Air Heater

1. Disconnect incubator from power source.
2. Remove the shelves, supports, and plenum from within the incubator chamber.
3. Remove the six (6) screws which secure rear cover plate. *Note: It is not necessary to remove the fan motor plate to change the air heater.*
4. Disconnect the spade terminals leading from the main PCB at heaters ends.
5. Remove the two (2) nuts which secure the heater to the fan motor plate and pull heater out through the front of the fan motor plate.
6. Reinstall new heater, reversing the above procedure.

14.05 Water Jacket Heaters

1. Disconnect incubator from power source.
2. Remove the six (6) screws which secure rear cover plate.
3. Locate the water jacket heaters, one left, one right at rear, near the bottom of the jacket. Remove the nut and retaining washer which secure the heater in the thermowell.
4. Locate jack J7 on the main PCB and disconnect the heater leads.
5. Remove the heaters from the thermowells. *Note: Grasp the heater sheath with pliers if heater will not easily slide out. Do not pull them out by the leads, as they may rip out and leave the heater sheath stuck on the thermowell tube.*
6. Reinstall new heaters, reversing the above procedure.

14.06 Door Heaters

1. Disconnect incubator from power source.
2. Remove the screws which secure the front top panel.

3. Disconnect leads connected with wire nuts which pass through door hinge.
4. Remove screws which secure inner liner of outer door. These screws are under the outer door gasket.
5. Peel off defective heater from door liner.
6. Install a new door heater, reversing the above procedure.

14.07 Auxiliary Heater

1. Disconnect incubator from power source.
2. Remove the screws which secure control panel.
3. Remove insulation.
4. Disconnect leads connected with wire nuts.
5. Peel off defective heater from top of chamber.
6. Install a new heater, reversing the above procedure.

14.08 Power Supply/CPU PCB



WARNING

DISCONNECT POWER CORD BEFORE PERFORMING THIS SERVICE PROCEDURE.


1. Disconnect incubator from power source.
2. Remove the screws which secure the rear cover plate.
3. There are black removable jumpers on the power supply/CPU board which must be set correctly to match the power supply to the line voltage. The following table describes the jumper locations for different voltages.




	100/115 VAC
JP1	Pins 1 & 2 Pins 3 & 4
JP2	Not Used
JP3	Installed
JP4	Not Used
JP5	Installed



Note the location of each connector going to the board. Carefully remove each connector from the board.



4. Remove the screws which secure the Power Supply CPU/PCB.
5. Install new Power Supply CPU/PCB reversing steps 3, 4.

The unit now needs to have the new Power Supply/CPU configured for the model in which its placed. Find the model number of the incubator on the id tag on the outer door liner, then match it to the model in table 14.8 on the following page. Note the unit id code for your model.

1. Press and hold  while applying power to the incubator. Release the key after power is on.



2. Press    simultaneously, two times.

3. Display will show:  

4. Use  or  to enter configuration password "2"

5. Press .

If the value is not entered within 1 (one) minute, the unit automatically times out. If this occurs, repeat the setup starting at item 2.

6. Using the  or  keys, enter the I.D. number for your model.

7. Press .

To check unit, press    again

and unit will scroll through a series of verifications:

- Software revision level.
 - Unit id - this should match the value selected from table 14.8.
 - CO₂ sensor type (T/C or IR)
 - LED segment check
- Calibration of the unit must be performed. See Section 10.0.

Catalog No.	Unit ID
5420-0 5420-0R 5440-0 5440-0R	54T
5425-0 5425-0R 5445-0 5445-0R	54F

14.09 CO₂ Solenoid Valve

1. Disconnect incubator from power source.
2. Remove the four (4) screws which secure the rear cover plate.
3. Locate jack J13 and unplug connector.
4. Disconnect hoses from defective valve assembly.
5. Remove valve assembly.
6. Install new valve assembly, reversing the above procedure.

14.10 Display/Keyboard PCB

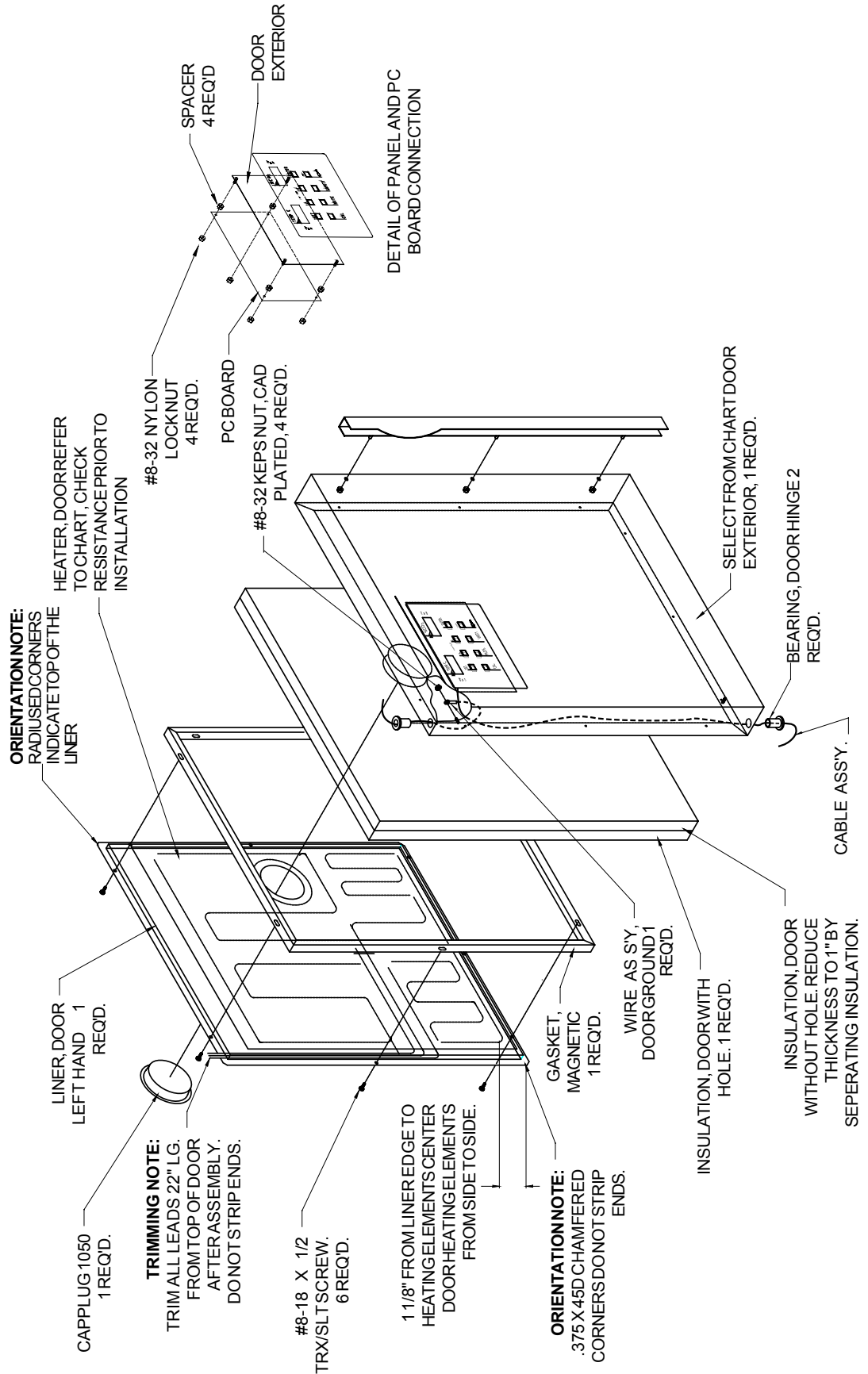
1. Disconnect incubator from power source.
2. Remove the screws which secure the inner liner of outer door. These screws are under the outer door gasket. Rest inner liner to prevent damage to heater.
3. Peel back insulation to expose control board. Disconnect cable to connector of board. Remove four (4) nuts securing the board to the door and remove board. Install new board, reversing the above procedure.

14.11 IR CO₂ Sensor

1. Disconnect power from incubator.
2. Remove the screws which secure the rear cover plate.
3. Locate jack J2 on PCB and disconnect.
4. Remove two screws from outside of shield then remove the four screws which secure the sensor and rear shield.
5. Install new sensor, carefully replace the metal shield near the sensor, reversing the above procedure.
6. Allow temperature and humidity to recover for at least four (4) hours and follow the CO₂ Calibration Procedure in Section 10.08.

Replacement and Accessory Parts		
Catalog Number	51201063 51201093	
	51201065 51201095	
	51201064 51201094	
	51201066 51201096	
Voltage	120~	
	Part Number (units built pre 6/1/2002)	Part Number (units built post 6/1/2002)
Cable Kit, CPU to Display	51245300	
Caster Kit	51200816	
Clean Start Kit	51200904	
CO2 Tank Regulator	51200901	
Door Assembly, Glass	51245040	51245479
Duct, Blower Kit	51245401	
Filter, EMI/RFI	26365012	
Filter Kit, HEPA Gas	51200834	
Fuse Kit, 5x20mm, 6.3A	51245394	
Fuseholder Kit	51245395	
Gasket, Glass Door	34232338	
Gasket, Magnetic Outer Door	34167333	
Heater, Air	34247431	
Heater, 50W Auxillary (Above Chamber)	34247450	
Heater, 100W Cartridge (Water Jacket)	34000027	
Heater, Door	34247448	
Receptacle, Main Power	34000039	
Thermal Cut-out	34239190	
Overlay	34540061	

Replacement and Accessory Parts		
Catalog Number	51201063 51201093	
	51201065 51201095	
	51201064 51201094	
	51201066 51201096	
Voltage	120~	
	Part Number (units built pre 6/1/2002)	Part Number (units built post 6/1/2002)
Hose Assembly, Water Fill (8 ft w/Fitting)	51200905	
Hose, CO2 Supply (8 ft)	51200822	
Leveler Foot Kit	51245376	
Motor Replacement Kit, Fan	51245056	
Pan Kit, Humidity	51200900	
PCB, Power Supply/CPU Board	51245022	
PCB, Keypad/Disp.	34396102	
Power Cord	34353025	
Sensor Assembly, Temperature	34542382	
Sensor Assembly, TC CO2	34542353	
Sensor Kit, Infrared CO2 (Sensor & PCB)	51245036	
Shelf Kit (One Shelf & Two Slides)	51200826	
Shelf Standard ,Left Front	34000071	36500047
Shelf Standard, Rear	34000070	
Shelf Standard, Right Front	34000072	3650042
Stopper, #6 Solid Green (For Rear Port)	34221172	
Switch Assembly, Float	51245181	
Switch, Power	34240618	
Valve Assembly, Solenoid	51245095	
Kit,Germicide	51200912	
Latch Kit, Glass Door	51245032	51245482
Solenoid Kit	51245085	
Fan Motor Plate Kit	51245393	
Door Kit, right Hinge	51245396	
Door Kit , Left Hinge	51245524	



ORIENTATION NOTE:
RADIUSED CORNERS
INDICATE TOP OF THE
LINER

HEATER, DOOR REFER
TO CHART, CHECK
RESISTANCE PRIOR TO
INSTALLATION

TRIMMING NOTE:
TRIM ALL LEADS 22" LG.
FROM TOP OF DOOR
AFTER ASSEMBLY.
DO NOT STRIP ENDS.

#8-18 X 1/2
TRX/SLT SCREW,
6 REQ'D.

1 1/8" FROM LINER EDGE TO
HEATING ELEMENTS CENTER
DOOR HEATING ELEMENTS
FROM SIDE TO SIDE.

ORIENTATION NOTE:
.375 X .45 D CHAMFERED
CORNERS DO NOT STRIP
ENDS.

GASKET,
MAGNETIC
1 REQ'D.

WIRE AS S'Y,
DOOR GROUND 1
REQ'D.

INSULATION, DOOR WITH
HOLE, 1 REQ'D.

INSULATION, DOOR
WITHOUT HOLE. REDUCE
THICKNESS TO 1" BY
SEPARATING INSULATION.

#8-32 NYLON
LOCKNUT
4 REQ'D.

PC BOARD
#8-32 KEPS NUT, CAD
PLATED, 4 REQ'D.

SPACER
4 REQ'D

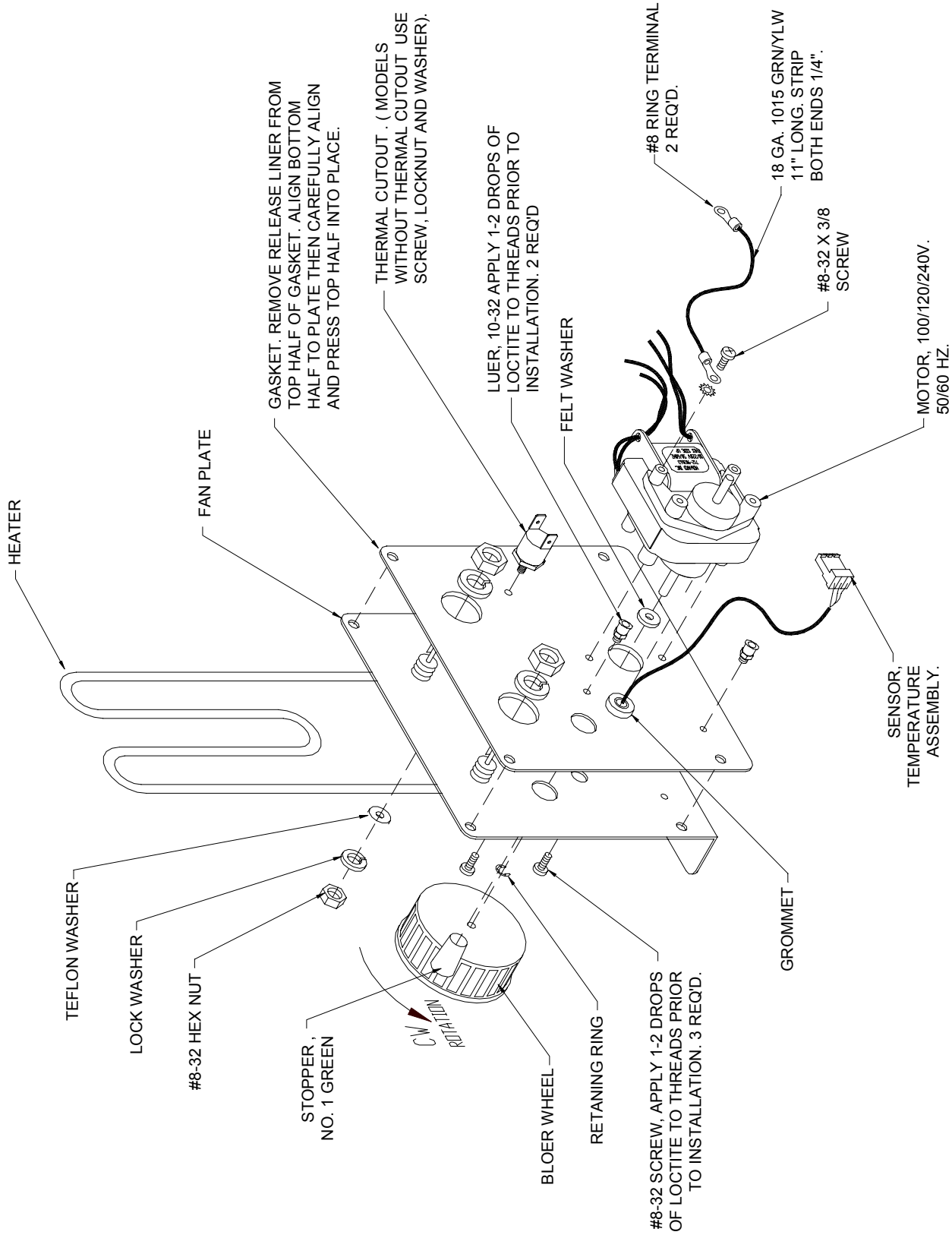
DOOR
EXTERIOR

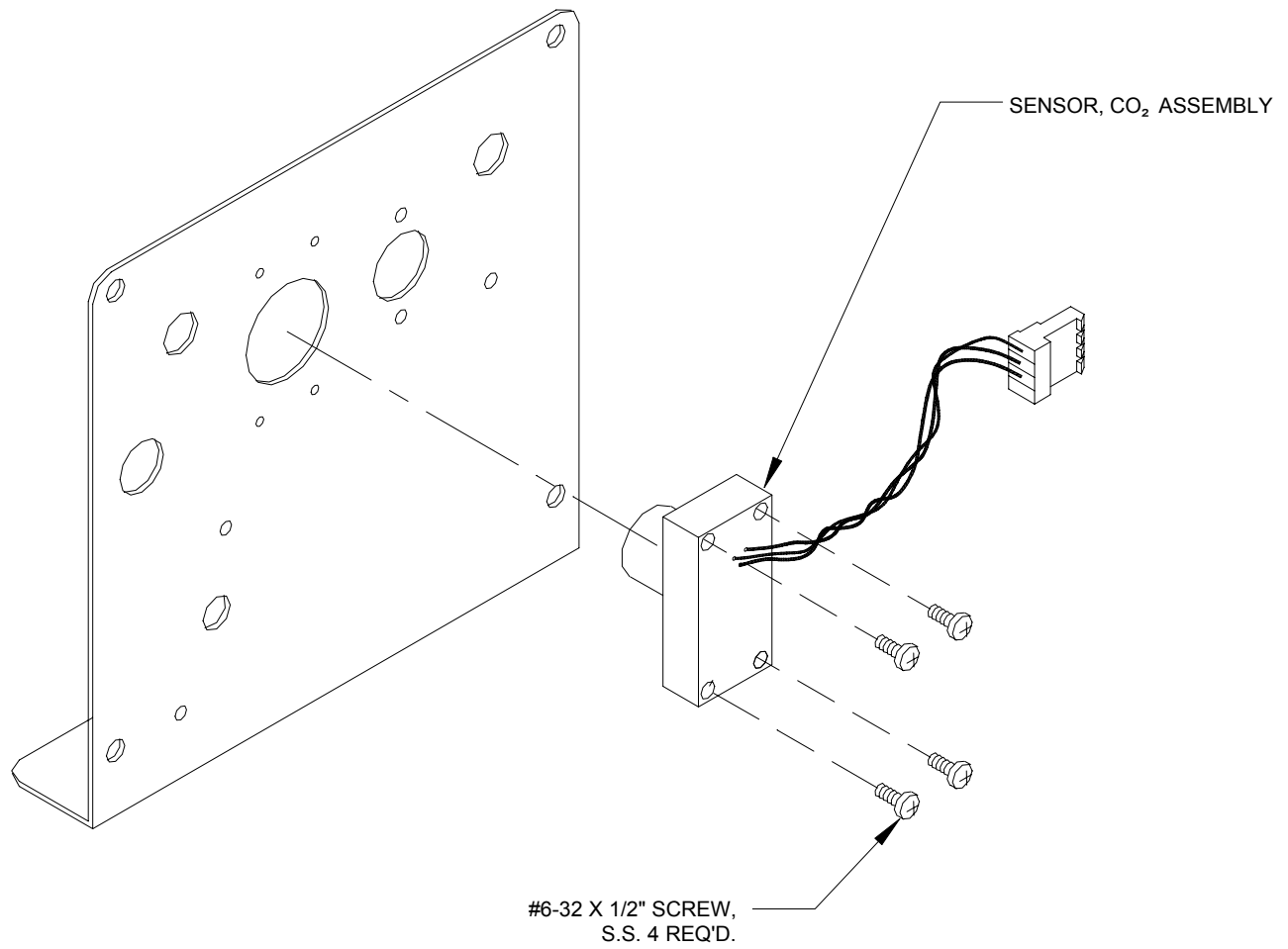
DETAIL OF PANEL AND PC
BOARD CONNECTION

SELECT FROM CHART DOOR
EXTERIOR, 1 REQ'D.

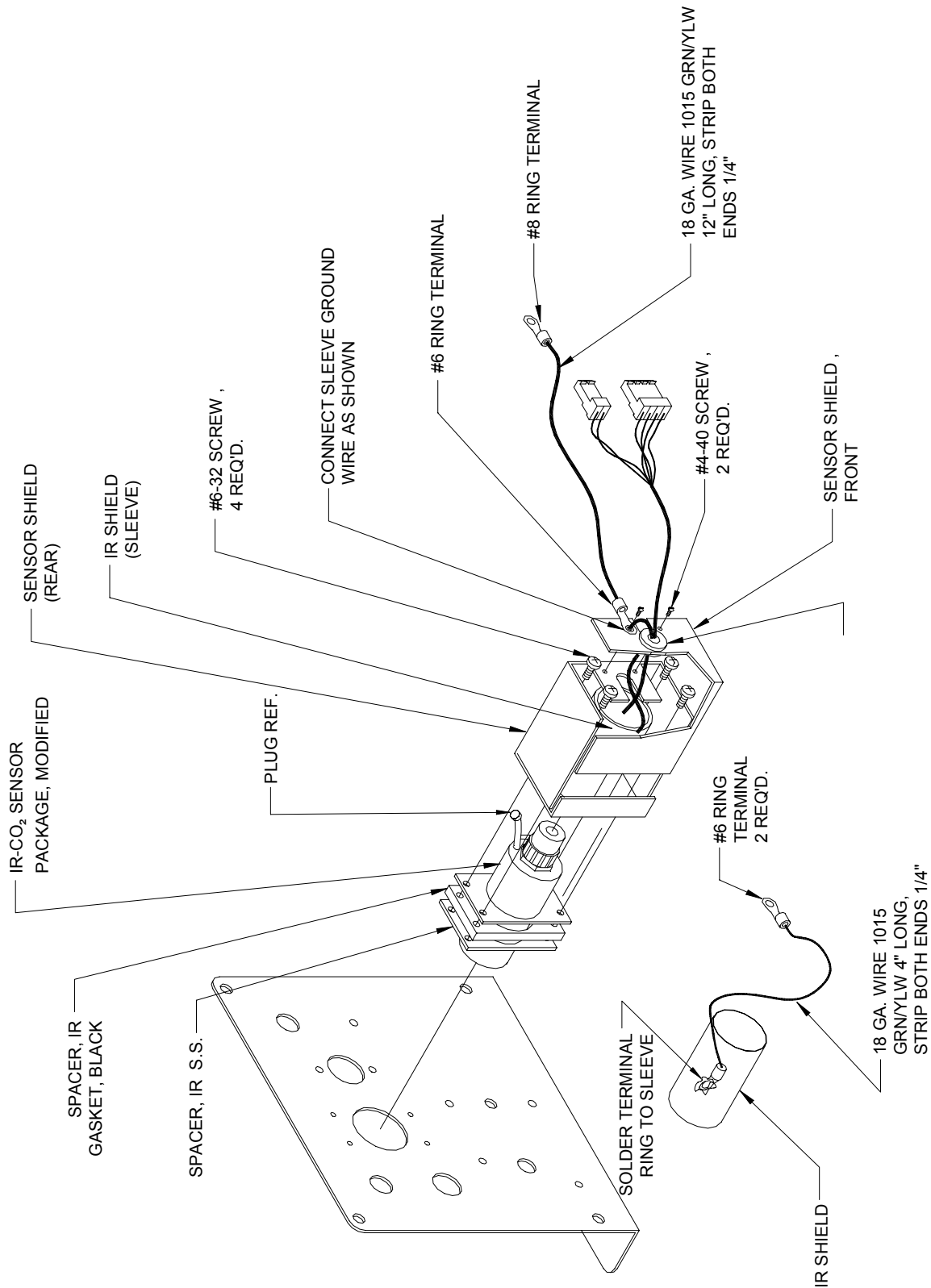
BEARING, DOOR HINGE 2
REQ'D.

CABLE ASSY.





TC CO2 SENSOR ASSEMBLY



IR CO₂ SENSOR ASSEMBLY

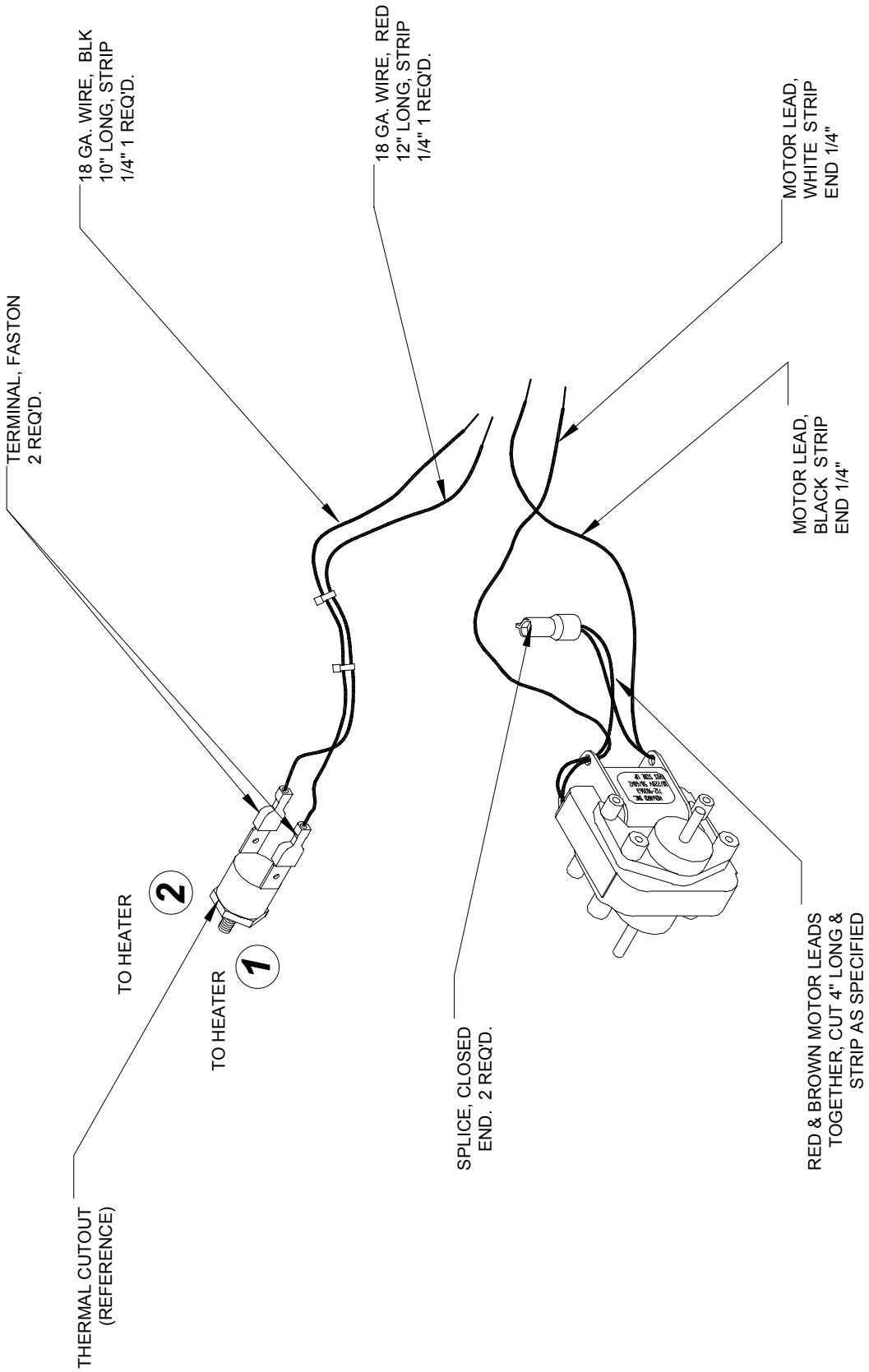
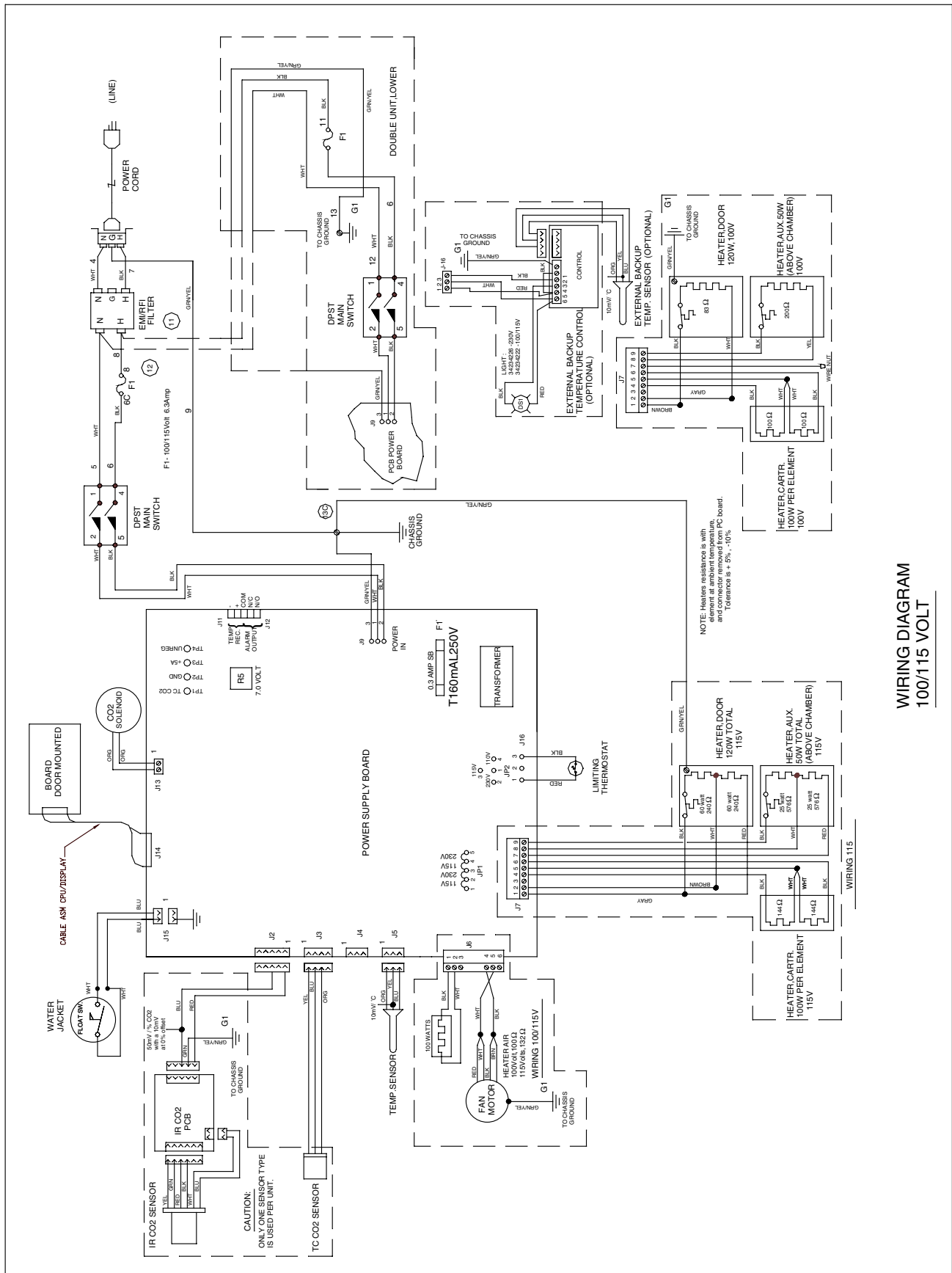
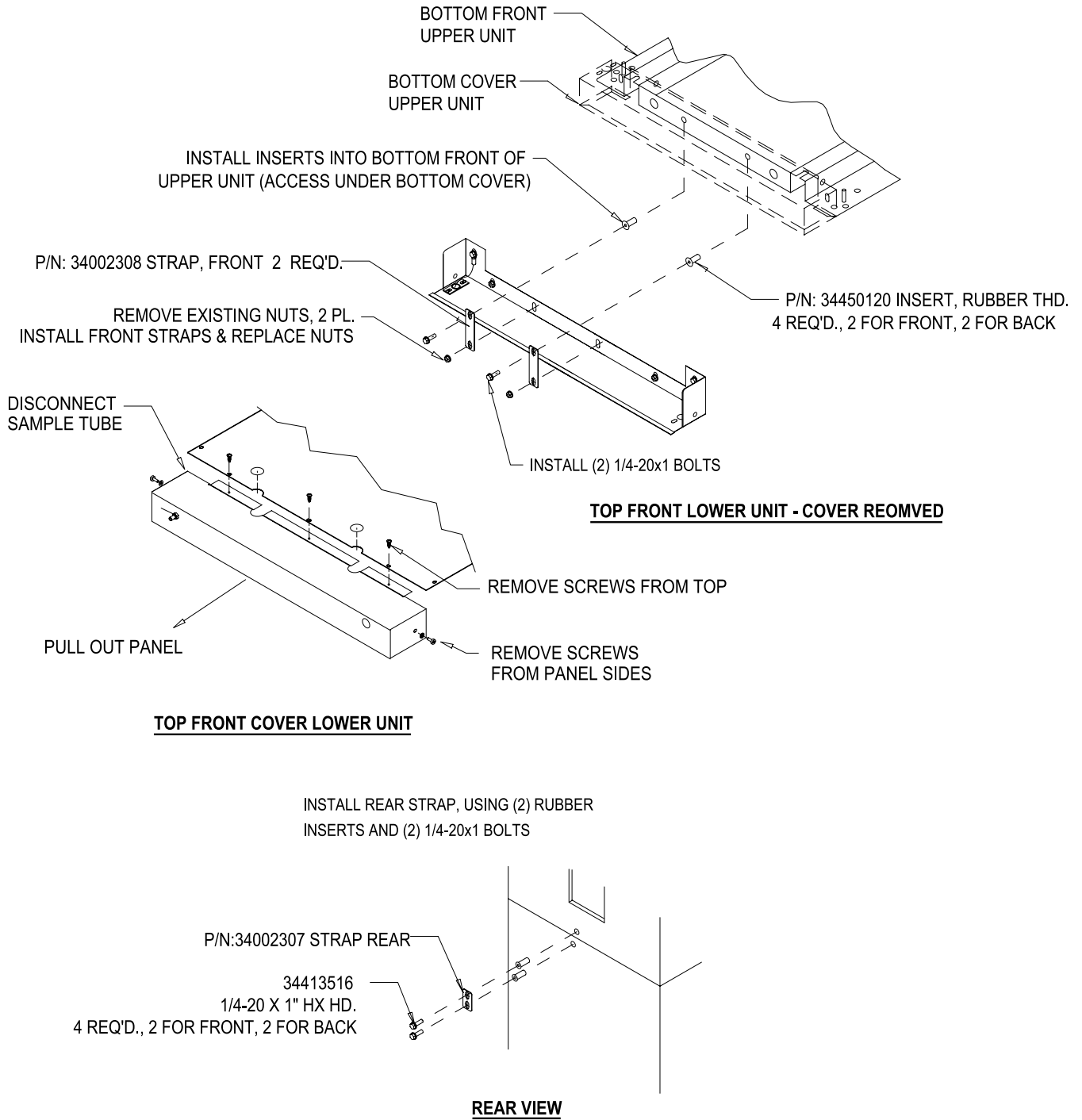


DIAGRAM "B"



**WIRING DIAGRAM
100/115 VOLT**

STACKING TWO 5400 INCUBATORS



Warranty

NAPCO warrants its products against defects in material or in workmanship when used under appropriate conditions and in accordance with appropriate operating instructions for a period of no less than one (1) year from the date of delivery of the products.

The sole obligation of **NAPCO** shall be to repair or replace at our option, FOB factory or locally, without charge, any part(s) that prove defective within the warranty period, provided that the customer notifies **NAPCO** promptly and in writing of any such defect. Compensation for labor by other than **NAPCO** employees will not be our obligation. Part(s) replacement does not constitute an extension of the original warranty period.

NAPCO makes no warranty of merchantability, fitness for a particular purpose, or any other warranty, express or implied, as to the design, sale, installation, or use of its products, and shall not be liable for consequential damages resulting from the use of its products.

NAPCO will not assume responsibility for unauthorized repairs or failure as a result of unauthorized repairs, replacement, or modifications made negligently or otherwise improperly made or performed by persons other than **NAPCO** employees or authorized representatives.

While our personnel are available to advise customers concerning general application of all manufactured products, oral representations are not warranties with respect to particular application and should not be relied upon if inconsistent with product specification or the terms stated herein.

In any event, the terms and conditions continued in **NAPCO**, formal sales contracts shall be controlling; and any changes must be in writing and signed by an authorized executive of **NAPCO**.

All defective components will be replaced without charge for one (1) year from the date of delivery. There will be no charge for labor if the apparatus is returned to the factory prepaid.

Conditions and qualifications of the warranty statement shall prevail at all times.