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Installation/Service Manual

Fisher Scientific®

Automatic CO_2 Incubators

Models

116885, 116885H, 1168851, 1168851H

1168810, 1168810H, 11688101, 11688101H

Fisher Scientific
Corporate Headquarters
711 Forbes Avenue
Pittsburgh, PA 15219

Manual P/N: 1168-9604
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NOTICE

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

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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.

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1. 0 Introduction

1.01 Your satisfaction and safety are important to FISHER SCIENTIFIC 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, Fisher 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 FISHER SCIENTIFIC without first obtaining return authorization. In any correspondence with FISHER SCIENTIFIC please supply the nameplate data, including catalog number and serial number.

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3.0 General Information

3.01 Fisher Scientific water jacketed, microprocessor controlled CO_2 incubators are ideal for applications requiring precise and uniform control of temperature and CO_2. 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, CO_2, 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 CO_2. 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.

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4.0 Specifications

	TABLE 4.1 Specifications			
	Single Chamber		Dual Chamber	
Catalog No: With R.H. Display (H)	TC CO2 116885 116885H	IR CO2 1168851 1168851H	TC CO2 1168810 1168810H	IR CO2 11688101 11688101H
Chamber Volume Cu. Ft: Liters:	5.4 153.5		10.8 307.0	
Number of Chambers	1		2 (vertical)	
Chamber Dimensions (usable) Inches: Millimeters:	(L x W x H) 17.3 x 17.5 x 25 439 x 445 x 635			
Exterior Dimensions Inches: Millimeters:	(L xW x H) 27.8 x 24.5 x 33.8 706 x 622 x 859		(L x W x H) 27.8 x 24.5 x 67.2 706 x 622 x 1707	
Temperature Range	Ambient +5.0°C to 50.0°C			
Temperature Control	0.1°C			
Temperature Stability	±0.1°C			
Temperature Uniformity	±0.25°C			
CO2 Range	0 - 20.0%			
CO2 Control	0.1%			
CO2 Stability	±0.1%			
CO2 Uniformity	±0.25%			
Humidity Range	Above ambient to 98% R.H.			
Humidity Pan	1 Included		2 Included	
Shelf Capacity (as supplied) 5 shelves per chamber: Sq. Ft: Sq. M:	10 0.92		20 1.84	
Maximum Shelf Capacity: 10 shelves per chamber: Sq. Ft: Sq. M:	20 1.83		40 3.66	
Electrical Service	115 VAC 50/60 Hz 550 Watts 4.7 Amps		115 VAC 50/60 Hz 1100 Watts 9.4 Amps	
BTU Output	1,876		3,753	
Net Weight Lb: Kg:	193 88		381 173	
Shipping Weight Lb: Kg:	271 123		462 210	
Shipping Dimensions Inches: Millimeters:	L x W x H 36 x 33 x 40 915 x 838 x 1016		L x W x H 36 x 33 x 72 915 x 838 x 1829	

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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 following materials are supplied with the incubator. Please verify that all materials listed have been supplied with the incubator.

The incubator was checked carefully before it was shipped from the factory. However, should any of these 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.

1. The power cord provided on this unit is equipped with a three connector (grounding) plug, which mates with a standard grounding wall receptacle to minimize the possibility of electric shock hazard from this apparatus. The user should have the wall receptacle and circuit checked by a qualified electrician to make sure the receptacle is properly grounded.

2. Where a non-grounding wall receptacle is encountered, it is the personal responsibility and obligation of the user to have it replaced with a properly grounded wall receptacle. ***Do not, under any circumstance, cut or remove the third (ground) prong from the power cord. Do not use a two-prong adapter plug.***

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.

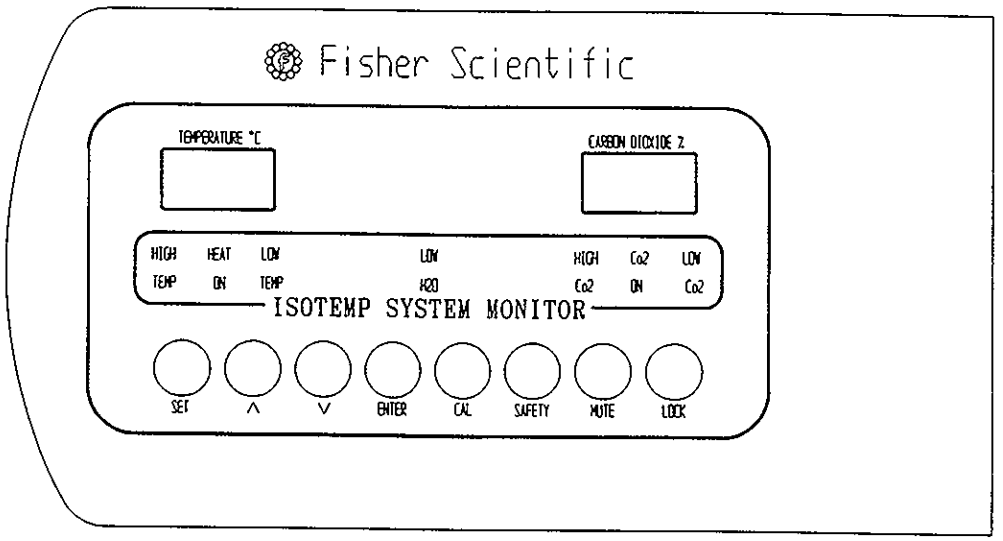
CAUTION

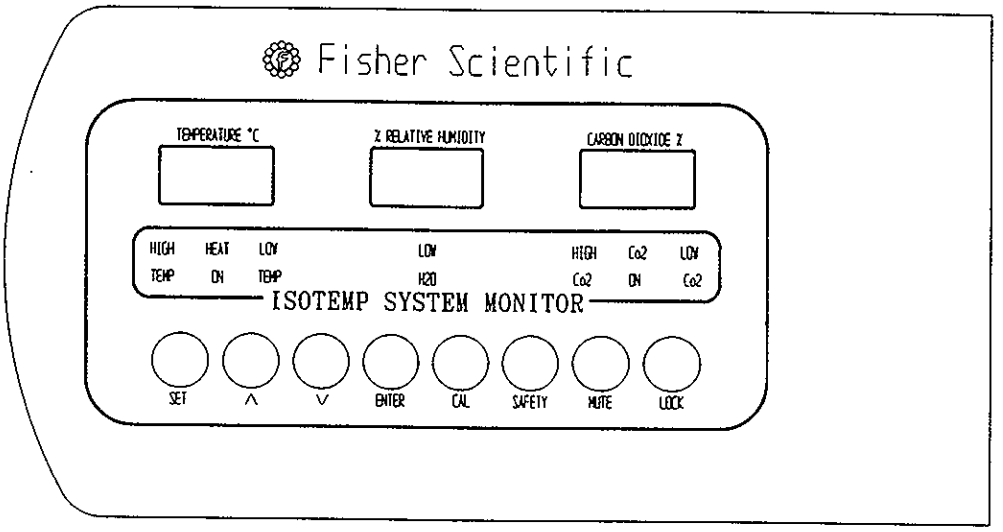
BE SURE THAT THE POWER SUPPLY IS OF THE SAME VOLTAGE AS SPECIFIED ON THE NAMEPLATE.

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6.0 Explanation of Controls

6.01 Front Panel: Top figure **without** Relative Humidity display. Bottom figure **with** Relative Humidity.





SET — Changes temperature or CO_2 control setpoint. Also changes R.H. display to show "ON" or "OFF."

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

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

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

CAL — Matches displayed value of temperature or CO_2 to actual measured chamber conditions.

SAFETY — Sets chamber high temperature limit.

MUTE — Temporarily silences audible alarm.

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

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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.

"%CO_2": Displays actual chamber CO_2 during operation. May be used for other display purposes during setup and calibration.

"%RH": Displays actual chamber relative humidity during operation.

6.01.3 Front Panel Fittings and Connectors

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

"CO_2 Sample:" Provides a direct connection for sampling the chamber atmosphere for calibration of the CO_2 displayed value.

6.01.4 Front Panel Indicator Lamps

"H_2O" Indicates that water in the water jacket is below normal operating level.

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

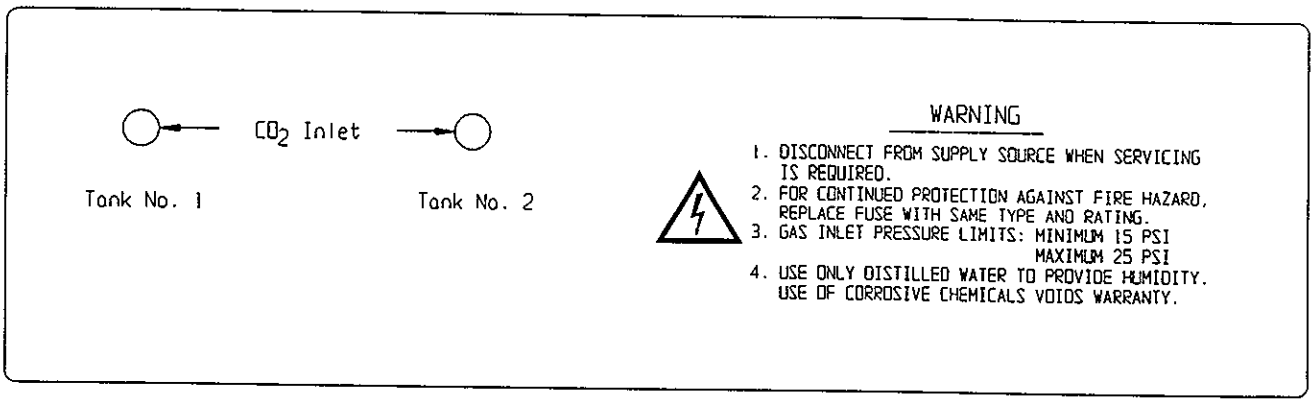
"High" Indicates that the current displayed value is above SETPOINT.

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

"On" Indicates that controller is regulating this parameter.

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6.02 Rear Panel



"CO_2 Inlet:" Provides 1/4" I.D. tubing connectors for connection to one or two CO_2 cylinders (tanks). There is one set of CO_2 input connectors per incubator.

"Tank No. 1:" The tubing connector for the CO_2 supply cylinder (or the primary cylinder if two are connected).

"Tank No. 2:" The tubing connector for the secondary CO_2 supply cylinder when two cylinders are connected.

6.03 Left Side Panel

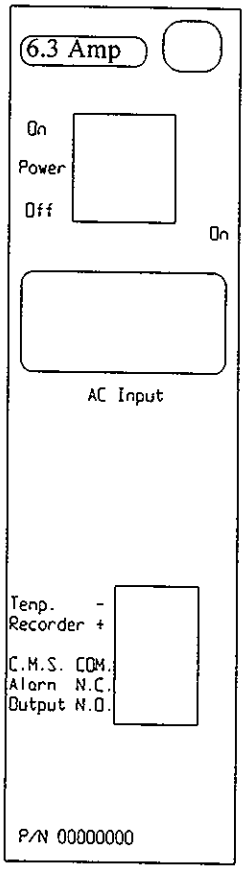
Fuses: This fuse provides protection for the primary incubator power line. Fuse current rating varies, depending on supply voltage.

"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).



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7.0 Cleaning and Decontamination

NOTE

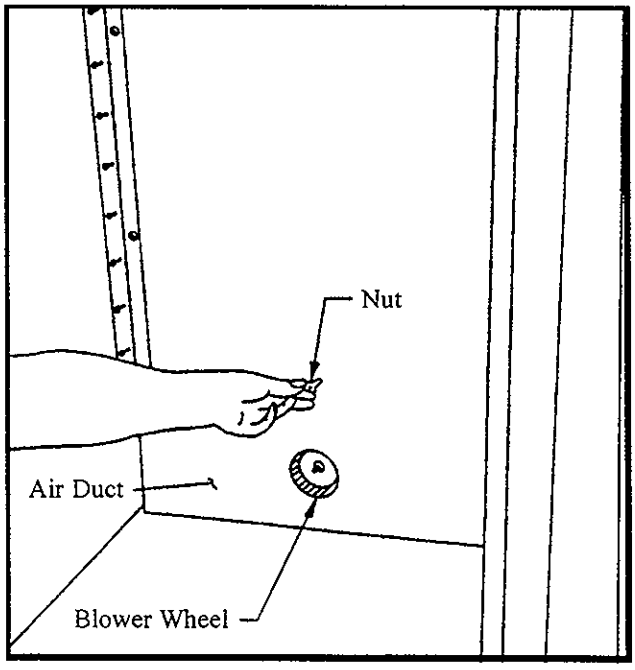
THIS INCUBATOR IS MANUFACTURED IN AN INDUSTRIAL ENVIRONMENT. WHILE EVERY EFFORT IS MADE TO KEEP THIS INCUBATOR AS CLEAN AS POSSIBLE DURING MANUFACTURE AND TRANSIT, IT IS NOT STERILE.

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 wing 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 wing nut slightly.

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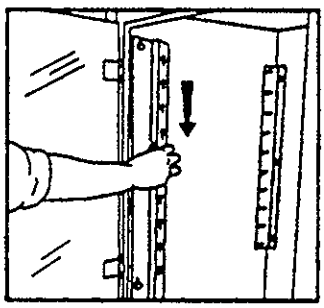
8.0 Set-up

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).

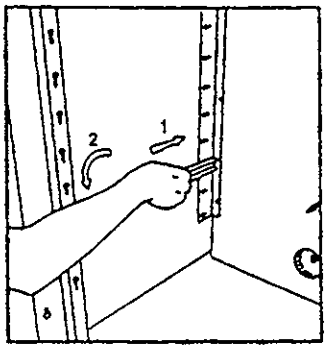
8.04 **Install front shelf slide supports** by sliding the keyed slots of each support into place over the buttons located near the top and bottom of each side wall of the chamber. Note that the keyed mounting slots should be at the edge of the shelf slide support which faces the front of the chamber.



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 Fisher Scientific.

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.

⚠ 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.

DO NOT USE ULTRA-PURE OR DEIONIZED WATER.

1. Turn the power switch on. The digital displays will light, and the "H_2O" 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:

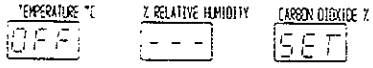
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Please note: If your unit is not equipped with RH display, the center window will not exist. The Temperature and CO2 windows will be next to each other.

- Press SET 

- Press ∨ until 

or



- Press ENTER

- Repeat for other parameters by pressing SET 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.

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9.0 Connecting External Supplies

9.01 Type of gasses required

1. Only medical grade 100% CO_2 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 CO_2 THAT HAS BEEN MIXED WITH OTHER GASSES OR AIR AS THIS WILL CAUSE POOR GAS CONTROL PERFORMANCE OR POSSIBLE HAZARDS.

9.02 Gas shuttle valves

1. This incubator is equipped with an internal CO_2 shuttle valve for connection of two CO_2 cylinders. The shuttle valves will automatically switch from a primary gas cylinder to a secondary cylinder when the primary cylinder empties. The secondary cylinders are optional and do not have to be connected. If the secondary cylinders are not connected, the gas ports will not leak.

9.03 Gas Pressure Regulation

9.03.1 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.

9.03.2 When using two cylinders for CO_2, the primary (Tank 1) cylinder should be set 3-5 PSI (.2 - .4) BAR) higher than the secondary (Tank 2) cylinder. This will allow proper operation of the gas shuttle valve.

9.03.3 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. When using an in-house supply, there is no benefit to connecting to both CO_2 inlets. Use only the "Tank 1" connector.

9.04 Gas Connection

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 CO_2 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.

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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

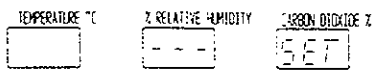
WHEN USING MERCURY THERMOMETERS, HANDLE WITH THE UTMOST CARE. VERY SMALL AMOUNTS OF MERCURY FROM A BROKEN THERMOMETER MAY CAUSE DAMAGE TO THE CHAMBER BY ELECTROLYSIS. MERCURY ALSO CREATES A TOXIC ENVIRONMENT IN THE CHAMBER, RENDERING THE INCUBATOR USELESS.

NOTE

THE INSTRUCTIONS SHOW THE CONTROL PANEL WITH THE RH DISPLAY OPTION. IF YOUR UNIT IS NOT EQUIPPED WITH RH, THE CENTER WINDOW WILL NOT EXIST. THE TEMPERATURE AND CO_2 WINDOWS WILL BE NEXT TO EACH OTHER.

10.04 Enter Temperature Setpoint.

1. Press SET



2. Use ^ v until display shows desired setpoint.

3. Press ENTER

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.

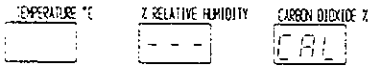
NOTE

DO NOT OPEN GLASS DOOR DURING THIS PROCEDURE.

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To calibrate temperature display:

1. Press CAL display will show



2. Using ^ v keys, match displayed temperature with reference thermometer reading.

3. Press ENTER

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

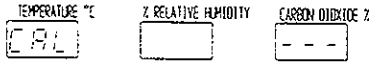
After allowing incubator temperature to stabilize, verify that displayed temperature matches the reference thermometer within the chamber. If not, repeat the above steps.

10.06 Calibrate Humidity.

The following applies to units equipped with R.H. Display.

Perform humidity calibration only after temperature calibration has been completed and a humidity pan with distilled water has been in the chamber with the glass door shut for at least 24 hours.

1. Press CAL three times, display will show



2. Use ^ v to set R.H. display to 98%.

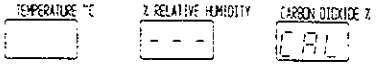
3. Press ENTER

10.07 Calibrate CO_2 .

Perform CO_2 calibration only after calibrating temperature and humidity. Failure to calibrate Temp. and R.H. prior to CO_2 will result in poor CO_2 performance.

The temperature and relative humidity must be stable at their desired setpoints prior to calibration of CO_2. Failure to do so will result in poor CO_2 performance.

1. Press CAL twice. Display will show



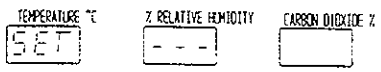
2. Using ^ v set CO_2 display to 0.0%.

3. Press ENTER

Do not be alarmed if the CO_2 display is negative or far from zero. This is normal upon initial calibration.

10.09 Set CO_2.

1. Press SET. Display will show:



2. Use ^ or v to set desired CO_2 level.

3. Press ENTER

After the incubator has stabilized at operating CO_2 level for at least 30 minutes, measure actual chamber CO_2 using a CO_2 gas sampling device such as a FYRITE® tester.

If the displayed CO_2 level does not match the measured actual chamber CO_2 level, repeat the CO_2 calibration by matching the displayed value to the actual measured value.

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

1. Temperature
2. Relative Humidity (if option is installed)
3. CO_2

Calibration is now completed.

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11.0 Operation

The Temperature and CO_2 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.

Relative Humidity is a display function only and does not control. It has 2 functions:

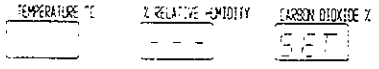
OFF- "OFF" is displayed in RH Window. No measurement of %RH is displayed.

ON- Will display current %RH in the chamber.

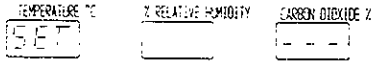
11.01 Changing Setpoints.

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

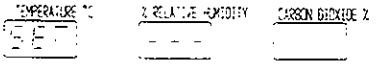
Temperature



R.H.



CO_2



2. Press ^ v to set desired setpoint.

3. Press ENTER

11.02 Calibration

NOTE

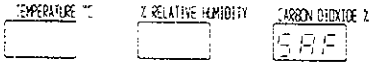
TO ENSURE PROPER OPERATION OF THE INCUBATOR, CALIBRATION MUST BE COMPLETED PER SECTION 10 IN THE FOLLOWING SEQUENCE:

1. Temperature
2. Relative Humidity (if option is installed)
3. CO_2

FAILURE TO DO SO MAY RESULT IN POOR INCUBATOR CONTROL.

11.03 Temperature Hi-Limit Safety

1. Press SAFETY



2. Use ^ v until desired Hi-Limit safety is displayed.

3. Press ENTER

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.

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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.

Table 11.1 Alarm Bands and Delay Times

Parameter	Alarm Band	Alarm Delay Default	Alarm Delay Limits
HIGH TEMP	+0.5°C	5m	0m-5m
LOW	-0.5°C	10m	0m-20mm
HIGH CO2	+0.5%	5m	0m-5m
LOW	-0.5%	10m	0m-20m

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.

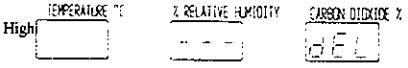
11.04.3 Changing Alarm Delays

1. Press ^ v ENTER 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.

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

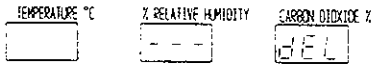
3. The display will show High Temperature Delay



4. Press ^ v to change the temperature high alarm delay.

5. Press ENTER to store the new value and cross to the next parameter.

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



7. Repeat for CO_2 high and low alarm delays.

   CO_2 High Alarm



   CO_2 Low Alarm



11.04.4 Muting audible alarm

To silence any audible alarm press MUTE (mute).

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.

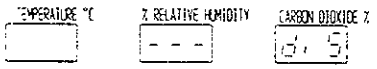
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11.04.5 Alarm Disable

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

To disable or change the alarm disable time:

1. Press MUTE twice. Display shows



2. Using ^ v keys, enter the alarm disable time in hours.

3. Press ENTER

   The display will flash confirming that the value has been stored.

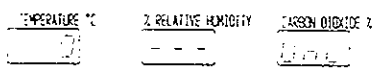
4. To check alarm disable time remaining, press MUTE twice at any time.

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 LOCK display shows



2. Using ^ v keys, enter a numerical password of your choice.

3. Press ENTER

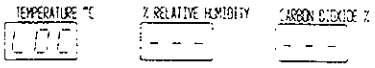
   Your password is stored, the control panel is now locked, and the red "Lock" indicator illuminates to indicate the locked condition.

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

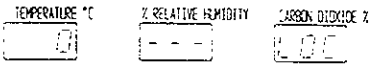


11.05.2 Temporarily unlocking the keyboard

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 LOCK display will show



2. Using ^ v keys, enter your numerical password.

3. Press ENTER

   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 ENTER is pressed whether a value was changed or not.

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11.05.3 Permanently unlocking the keyboard.

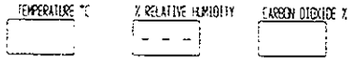
The control panel can be permanently unlocked to allow operation without restricting keyboard entry.

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

To permanently unlock the incubator:

1. Press LOCK display will show

2. Using ^ v keys, enter your numerical password.
3. Press ENTER to temporarily unlock the keyboard. The red "LOCK" light will now blink on and off.
4. Press LOCK a second time, display will show



5. Using ^ v keys, re-enter your numerical password.
6. Press ENTER

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

IF YOU HAVE FORGOTTEN OR LOST YOUR PASSWORD, ENTER 257.

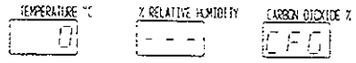
11.05.4 Factory Reset

NOTE

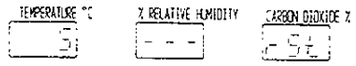
FOLLOWING A FACTORY RESET THE INCUBATOR MUST BE RECALIBRATED PRIOR TO USE. FOLLOW THE INITIAL OPERATING & CALIBRATION PROCEDURE, SECTION 10.0.

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

1. Press ^ v LOCK simultaneously, display will show



2. Press ^ until display reads



3. Press ENTER

The incubator will beep, display 8.8.8. 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

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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 v and then press ENTER. Display will show a sequential test pattern.

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



3. Press ^ until "7" is displayed in the temperature window and then press ENTER. The displays will show:



4. Use the ^ or v keys to select the desired value of "Uar" and then press ENTER. 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.

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 bicarbonate. 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 bisulfate 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.

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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 use detected (especially around immersion heaters) clean the bath 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	Potassium Thiocyanate
Carbonic Acid	Stannous Chloride
Sodium Hypochlorite	Mercuric Chloride
Tartaric Acid	

NEVER USE THE FOLLOWING:

Aqua Regia	Ferric Chloride	Iodine	Sulfuric
Fluorine	Sodium Azide	Bromine	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 form 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 Fisher Scientific 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.*

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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.

13.01 No Heat

Problem

Procedure

1. Verify that setpoint temperature is greater than actual temperature.

2. Check heaters.
   - A. Disconnect power cord. Remove rear cover.
   - B. Disconnect connectors J6 (bottom left) and J7 (bottom) from power supply board.
   - C. Check heater resistances with an ohmmeter. Approximate heater resistances (at ambient temperature) are shown below:

Heater	Connections	Resistance (in ohms) 115V~
Air	J6 Pins 1 & 2	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	At heater wires	120
	J7 Pins 1 & 2	

   - D. Replace any heater that does not match the approximate resistances above.

3. Check TRIAC
   - A. Turn power on.
   - B. Place an AC voltmeter between pins 1 & 2 (115 V unit) on wire side of connector J6 on power supply board.
   - C. Set temperature setpoint below actual chamber temperature. Voltmeter should read 0 VAC.
   - D. Set temperature setpoint to at least 5°C above actual chamber temperature. Voltmeter should read line voltage.
   - E. If voltmeter does not show correct values in either C or D, replace power supply board.

4. Check Safety Relay
   - A. Turn power on.
   - B. Place an AC voltmeter between chassis ground and right hand side of R38 on power supply board.
   - C. Set temperature setpoint to at least 5°C above actual chamber temperature.
   - D. Voltmeter should read line voltage. If voltmeter does not read line voltage, replace power supply board.

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Problem	Procedure
	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. A. Turn power on. B. Place a DC voltmeter between pins 1 and 3 on temperature sensor connector (J5) on power supply board. C. Voltage should read 5 VDC. If not, replace power supply board. 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.
13.02 Poor CO_2 Control (TC-CO_2 Sensor)	1. Verify that incubator is stable at setpoint temperature and R.H. levels. Calibrate the TC - CO_2 Sensor when the incubator is stable at setpoint temperature and R.H. levels. See section 10.
	2. Check power supply board. A. Turn power on. B. Check voltage between TP1 and TP2 on power supply board using a DC voltmeter. Voltage should read 7.00±.05V. C. Adjust R5 (pot at upper-right corner) until potential between TP1 and TP2 reads 7.00 ± 0.05V.
	3. Check power supply board A. Check resistance between TC - CO_2 connector (J3) Pin #1 and TP1 with TC - CO_2 sensor removed. B. Check resistance between TC - CO_2 connector (J3) Pin #3 and TP1 with TC - CO_2 sensor removed. C. Both resistances should be 150 ohms. If not, replace power supply board.
	4. Check gas flow lines. Assure that gas is getting to solenoid valve inlet.
	5. Check Solenoid A. Turn CO_2 setpoint up until CO_2 setpoint is 3 to 5% above the displayed actual CO_2 value. The green "on" light should be on. 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.

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Problem	Procedure
13.02 Poor CO_2 Control (TC Sensor) *continued*	C. There should be an audible "click" from the solenoid each time the valve is actuated. If not, replace solenoid.
	6. Check CO_2 Sensor The CO_2 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.
13.03 Poor CO_2 Control (IR - CO_2 Sensor)	1. Actual CO_2 percent does not agree with displayed CO_2 percent, displayed CO_2 percent drifts or will not inject CO_2, unit will not hold a calibration. May signal possible problems with the IRCO_2 sensor.
	2. After following the CO_2 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 IRCO_2 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% CO_2 to 20.0% CO_2.
	3. With the temperature and humidity stable for at least two (2) hours and with a CO_2 setpoint of 0.0% CO_2 and no CO_2 in the chamber, adjust the "FINE ZERO" potentiometer until the digital voltmeter reads 0.0 VDC+ 0.01 VDC. Enter a CO_2 setpoint between 5.0% CO_2 to 10.0% CO_2 and allow it to stabilize for about ten (10) minutes. Measure the CO_2 with a Fyrite. Multiply the measured CO_2 percentage by a factor of 0.05 and the value obtained will be the IRPCB output voltage, e.g. 5.5% - CO_2 measured X 0.05 0.275 VDC IRPCB volts out Slowly adjust the "ZERO" potentiometer until the proper output voltage is obtained. After completing the above procedure, follow the CO_2 calibration procedure Section 10.06.

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Problem	Procedure
13.04 Excessive Condensation	1. Check magnetic door gasket. 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.
	2. Check glass door gasket. 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. D. The door latch may be tightened by moving the collar inward. When doing so, it is also necessary to move the knob inward to keep it snug.
	3. Check glass door alignment. 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. 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.
	4. Check door heater and auxiliary heater. 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. If all results by following 13.04 are OK, see section 11.06 for Door Heater Control.

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Problem	Procedure
13.05 Noisy Fan	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. The motor is a small shade pole AC motor. The windings of the motor in the 120 VAC configuration have an approximate resistance of 25 ohms.

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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 four (4) 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 CO_2 Sensor

1. Disconnect incubator from power source.
2. Remove the four (4) 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 CO_2 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 CO_2 control following the procedure in Section 10.08.

14.03 Fan Motor

1. Disconnect incubator from power source.
2. Remove the four (4) 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 four (4) 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 four (4) 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.

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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 removeable 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.

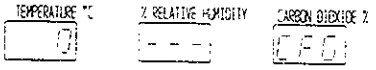
5. Install new Power Supply CPU/PCB reversing steps 3, 4.

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 the table. Note the unit id code for your model.

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

2. Press UP, DOWN and ENTER simultaneously, two times.

3. Display will show:

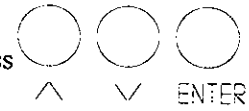


4. Enter configuration password 2 (use UP or DOWN keys).

5. Press ENTER.
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 UP or DOWN keys, enter the I.D. number for your model.

7. Press ENTER.

To check unit, press 

again and unit will scroll through a series of verifications:

- Software revision level.
- Unit id - this should match value you selected from table.
- CO_2 sensor type (T/C or IR)
- LED segment check

Calibration of the unit must be performed. See Section 10.0.

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Models	Unit ID
116885 1168810	5t
116885H 1168810H	5th
1168851 11688101	5f
1168851H 11688101H	5fh

14.09 CO_2 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 CO_2 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 CO_2 Calibration Procedure in Section 10.08.

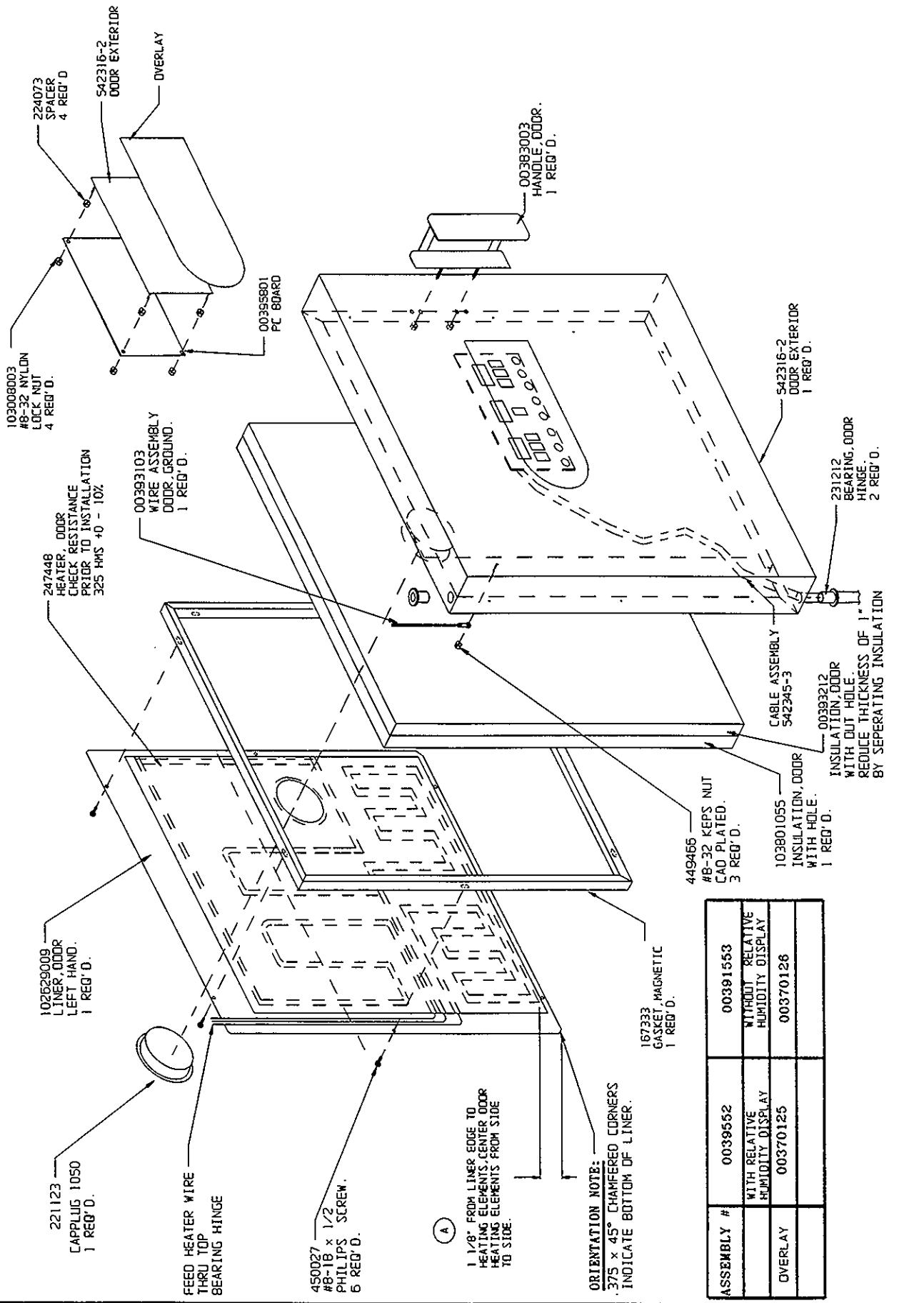
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Replacement and Accessory Parts	
Catalog Number	116885
	116885H
	1168851
	1168851H
	1168810
	1168810H
	11688101
	11688101H
Voltage	115~
	Part Number
Blower Wheel	1402-020
Cable Ass'y, CPU to Display	542345-2
Caplug (For Door Liner)	221123
Caster Kit	102204067
Clamp, 3/8" Self Tightening	450068
Clamp, (External Supply) Hose	257142
Clean Start Kit	102204070
CO2 Tank Regulator	220412500
Door Assembly, Glass	542383
Duct, Blower	102625010
Filter, EMI/RFI	101432015
Filter Kit, HEPA Gas	542575
Fuse, 5x20mm, 6.3A SLOBLO	289119
Fuseholder, 15A	288038
Gasket, Glass Door	232338
Gasket, Magnetic Outer Door	167333
Heater, Air	247431
Heater, 50W Auxillary (Above Chamber)	247450
Heater, 100W Cartridge (Water Jacket)	143305200
Heater, Door	247448

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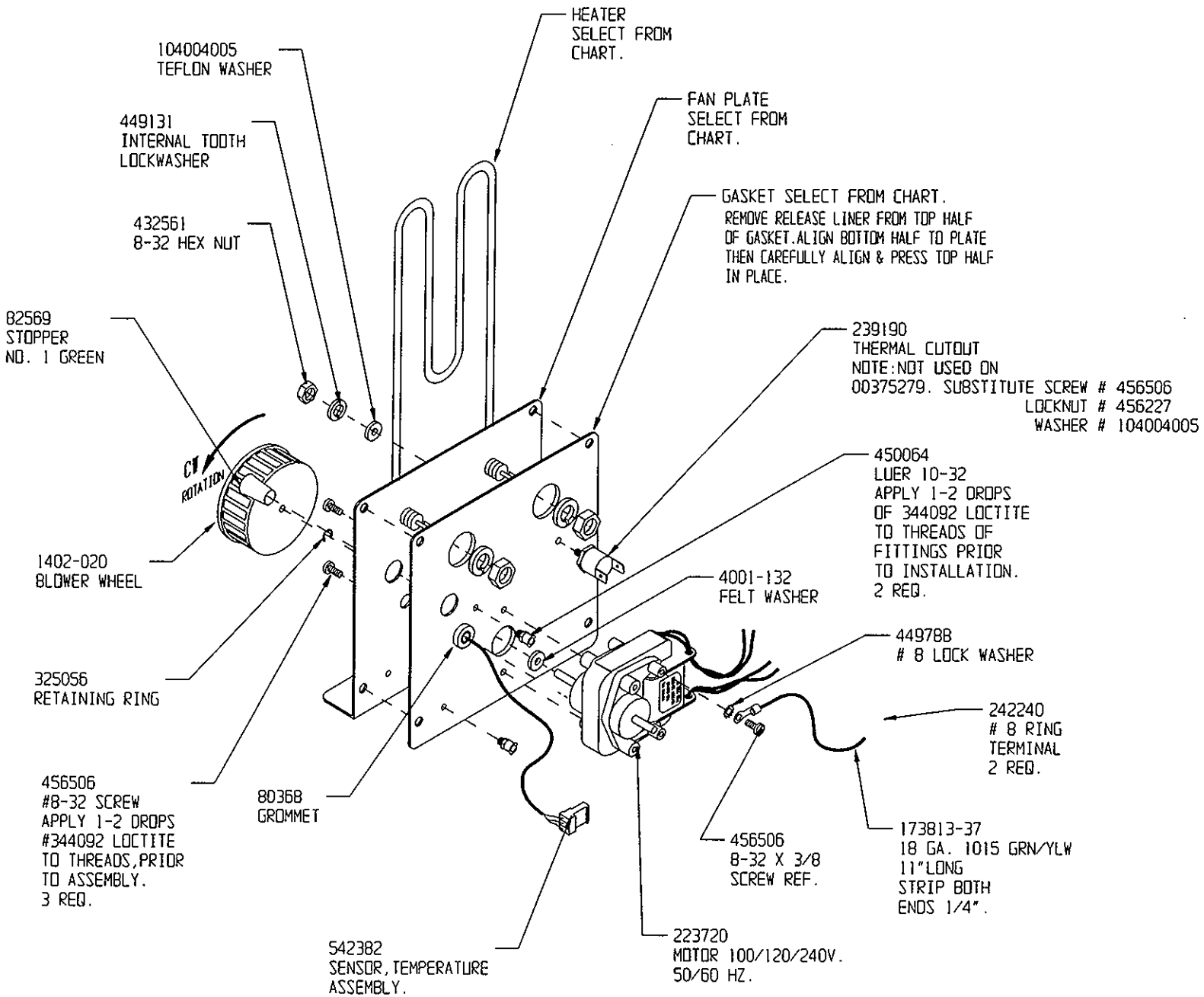
Replacement and Accessory Parts	
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	116885H
	1168851
	1168851H
	1168810
	1168810H
	11688101
	11688101H
Voltage	115~
	Part Number
Hose Assembly, Water Fill (8 ft w/Fitting)	108001004
Hose, CO2 Supply (8 ft)	98199
Leveler, 5/16-18 Foot	241077
Motor Replacement Kit, Fan	223707-1
Pan Kit, Humidity	542154
PCB, Power Supply/CPU Board	00396101K
PCB, Keypad/Disp.	00395801
Power Cord, 100/120Volt	353025
Sensor, Relative Humidity	00391410
Sensor Assembly, Temperature	542382
Sensor Assembly, TC CO2	542353
Sensor Kit, Infrared CO2 (Sensor & PCB)	102204101
Shelf	102644010
Shelf Kit (One Shelf & Two Slides)	00386505
Shelf Slide	102660011
Shelf Standard ,Left Front	102645003
Shelf Standard, Rear	102645004
Shelf Standard, Right Front	102645002
Stopper, #6 Solid Green (For Rear Port)	221172
Switch Assembly, Float	542380
Switch, Power	240618
Transformer Assembly, Power	542343
Valve Assembly, Solenoid	00392406

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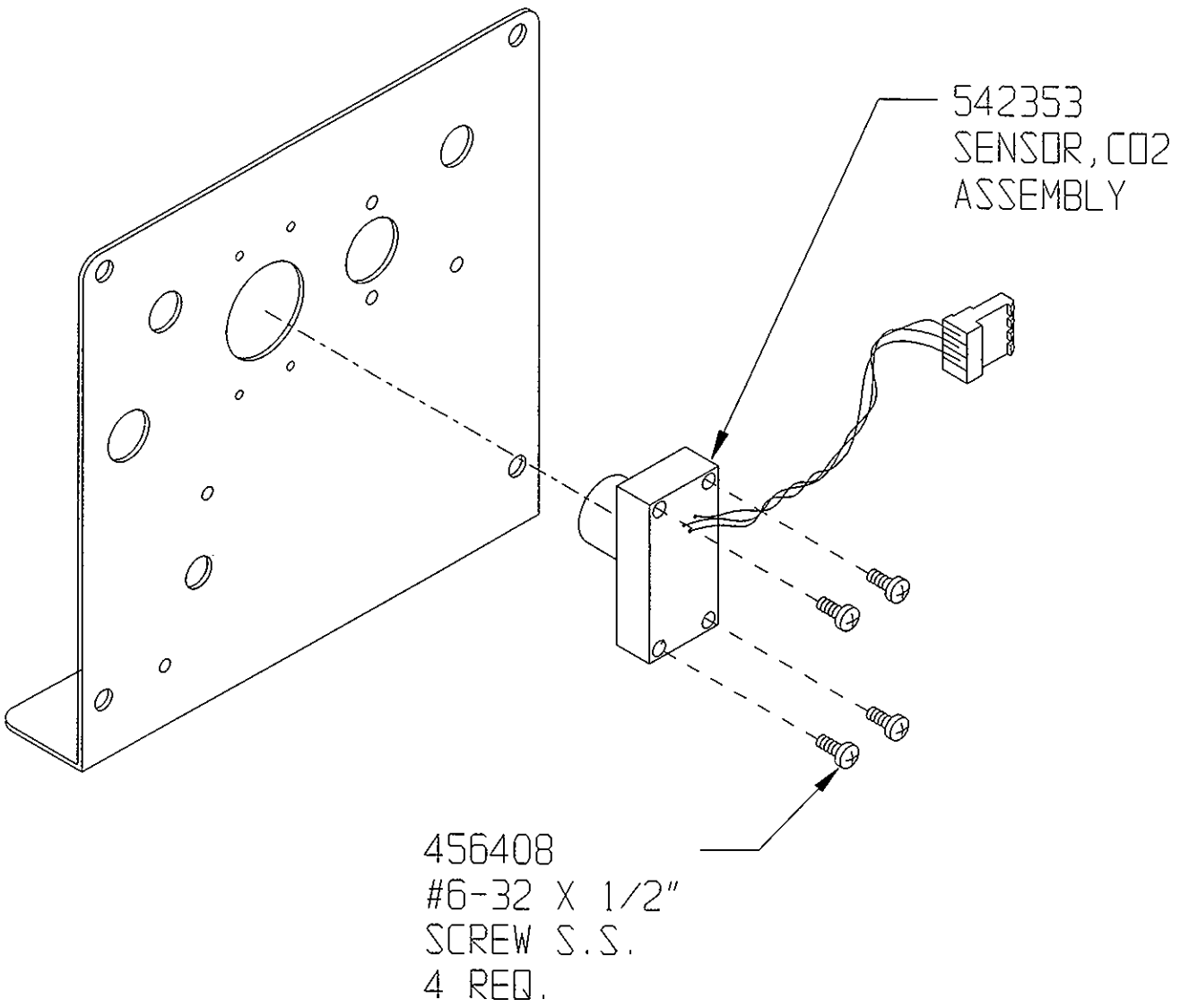


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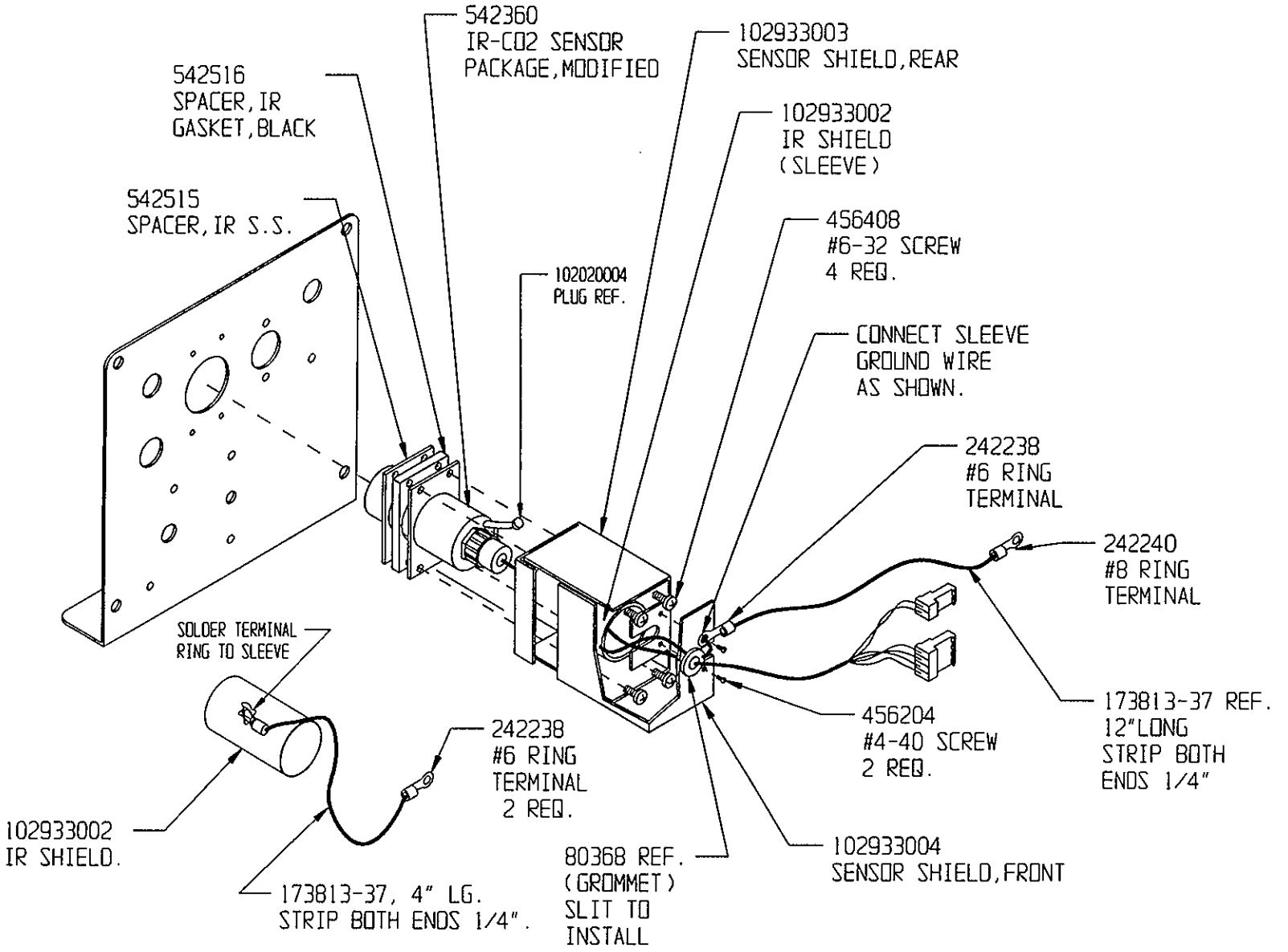
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TC CO2 SENSOR ASS'Y

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IR CO2 SENSOR ASS'Y

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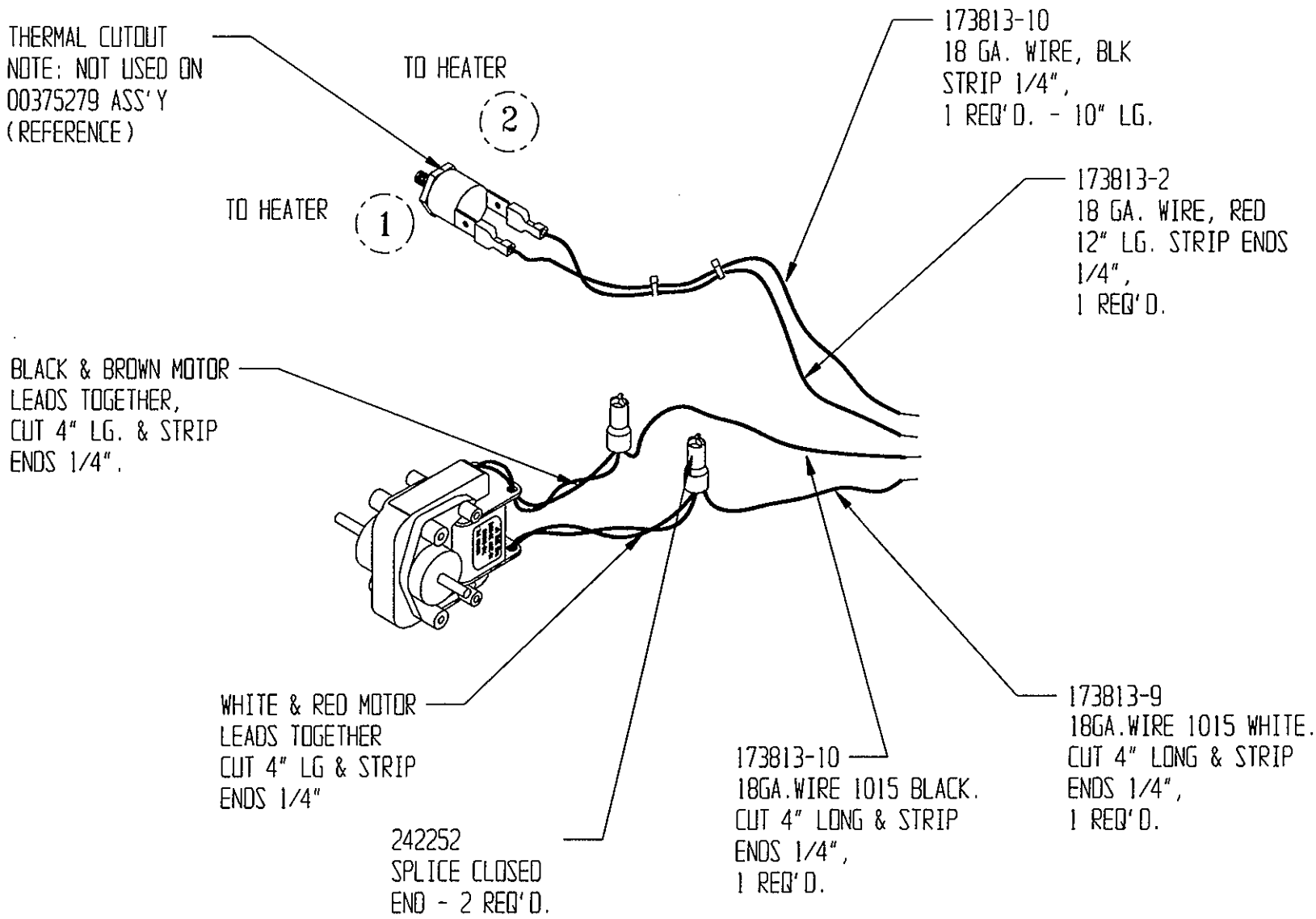
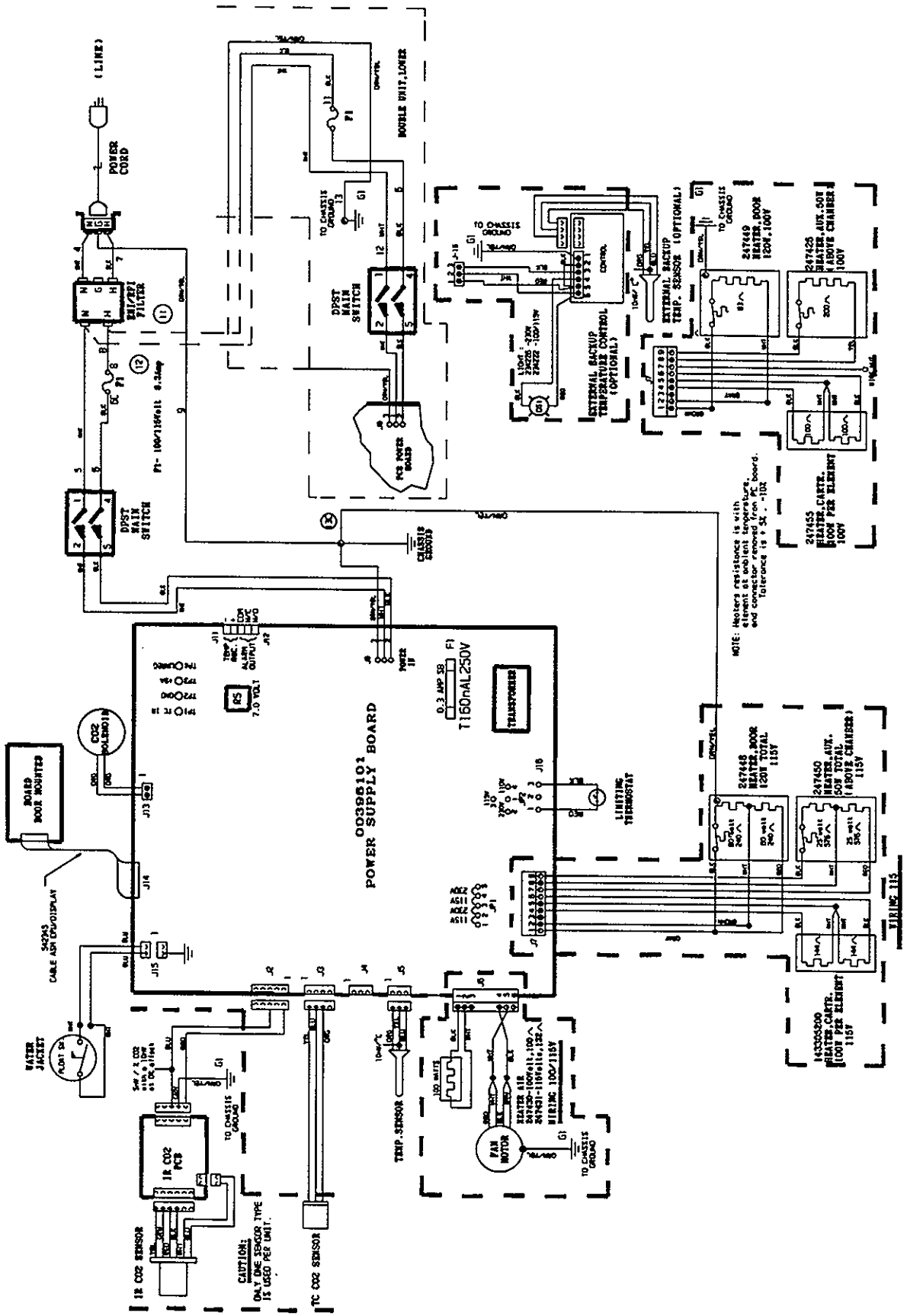


DIAGRAM "A"

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