BOD INCUBATORS

MODELS: 2020 and 2030

Installation and operations manual

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UNIT SPECIFICATIONS

SCHEMATICS

REV 7/99
4861400

These units are general purpose Biochemical Oxygen Demand (BOD) incubators for professional, industrial or educational use where the preparation or testing of materials is done at approximately atmospheric pressure and no flammable, volatile or combustible materials are being heated. These units are not intended for hazardous or household locations or use.

Section 1

RECEIVING AND INSPECTION

Your satisfaction and safety require a complete understanding of this unit. Read the instructions thoroughly and be sure all operators are given adequate training before attempting to put the unit in service. NOTE: This equipment must be used only for its intended application; any alterations or modifications will void your warranty.

1.1 **Inspection:** The carrier, when accepting shipment, also accepts responsibility for safe delivery and is liable for loss or damage. On delivery, inspect for visible exterior damage, note and describe on the freight bill any damage found and enter your claim on the form supplied by the carrier.

1.2 Inspect for concealed loss or damage on the unit itself, both interior and exterior. If necessary, the carrier will arrange for official inspection to substantiate your claim.

1.3 **Return Shipment:** Save the shipping crate until you are sure all is well. If for any reason you must return the unit, first contact your Customer Service representative for authorization. Supply data plate information including model number and serial number. For information on where to contact Customer Service, please see the manual cover.

1.4 **Accessories:** Verify that all of the equipment indicated on the packing slip is included with the unit. Carefully inspect all packaging before discarding. The 2020 incubator is supplied with five (5) shelves and the 2030 is supplied with seven (7) shelves.

Section 2

INSTALLATION

This unit should remain upright for 24 hours prior to operating to allow the oil in the refrigeration compressor to settle.

Local city, county or other ordinances may govern the use of this equipment. If you have any questions about local requirements please contact the appropriate local agency. Installation may be performed by the end user.

Under normal circumstances this unit is intended for use indoors, at room temperatures between 5° and 40°C, at no greater than 80% Relative Humidity (at 25°C) and with a supply voltage that does not vary by more than 10%. Customer Service should be contacted for operating conditions outside of these limits.

2.1 Power Source: Before connecting the unit to the power source, the electrical supply circuit must conform to all national and local electrical codes. The power source must match the cycle and ampere requirements as noted on the data plate located on the side of the incubator. This unit is intended for 50/60 HZ application. VOLTAGE SHOULD NOT VARY BY MORE THAN 10% FROM THE DATA PLATE RATING. A separate circuit is recommended to prevent possible loss of product due to the overloading or failure of other equipment on the same circuit.

2.2 Location: When selecting a site for the incubator, consider all conditions that may affect performance, such as extreme heat from radiators, stoves, ovens, autoclaves, etc. Avoid direct sun, fast moving air currents, heating and cooling ducts, and high traffic areas. To ensure air circulation around the unit, allow a minimum of 5cm (2”) between incubator and any walls or partitions that may obstruct free airflow.

2.3 Lifting and Handling: These units are heavy and care should be taken to use appropriate lifting devices that are sufficiently rated for these loads. Units should only be lifted from their bottom surfaces. Doors, handles and knobs are not adequate for lifting or stabilization. The unit should be completely restrained from tipping during lifting or transport. All moving parts, such as shelves and trays should be removed and doors need to be positively locked in the closed position during transfer to prevent shifting and damage.

2.4 Leveling: The unit must sit level and solidly. Turn the leveling feet counterclockwise to raise the level. If the unit must be moved, turn the leveling feet in all the way to prevent bending and damage.

2.5 Cleaning: The unit chamber should be cleaned and disinfected prior to use. Remove all of the interior parts, if assembled, and clean thoroughly, including all corners using a suitable disinfectant that is appropriate to your application. DO NOT use spray cleaners that might leak through openings and cracks and get on electrical components, or that may contain solvents that will harm coatings. DO NOT use chlorine-based bleaches or abrasives as they will damage the stainless steel interior. Regular periodic cleaning is required. Special care should be taken when cleaning around sensing heads to prevent damage.

WARNING: Never clean the unit with alcohol or flammable cleaners with the unit connected to the electrical supply. Always disconnect the unit from the electrical service when cleaning and assure all volatile or flammable cleaners are evaporated and dry before reattaching the unit to the power supply.

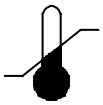
Section 3

GRAPHIC SYMBOLS

Your incubator is provided with a display of graphic symbols on the control panel which are designed to help identify the use and function of the adjustable components.

1.  Indicates that you should consult your manual for further description and discussion of a control or user item.

2.  Indicates **"Temperature"**

3.  Indicates **"Overtemperature"**

4. °C Indicates **"Degrees Centigrade"**

5.  Indicates **"AC Power**"

6.  Indicates **"Manual Adjustment"**

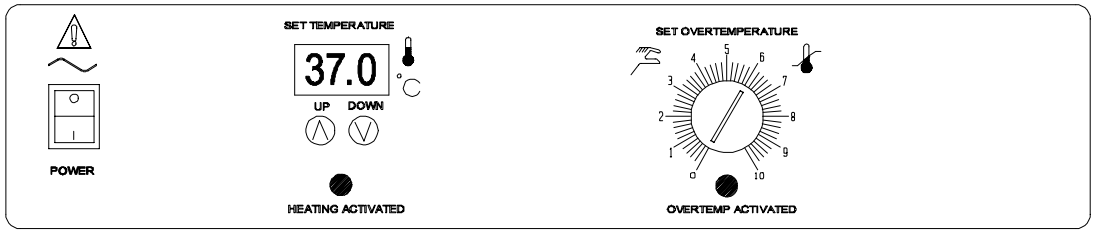
7.  Indicates **"Potential Shock Hazard"** behind partition

8.  Indicates **"Earth Ground"**

Section

4

CONTROLS OVERVIEW



450081 4M

4.1 **Power Switch:** The main power I/O (on/off) switch controls all power to the unit and must be in the I/ON position before any systems are operational.

4.2 **Main Temperature Control:** The Main Temperature Control is marked SET TEMPERATURE and consists of the digital display and UP and DOWN arrow pads for inputting set point temperatures and calibration.

4.3 **HEATING Light:** This pilot lamp is ON when the unit is heating up to set point and is blinking when controlling temperature at set point.

4.4 **Overtemperature Thermostat:** This controller is marked SET OVERTEMPERATURE and is equipped with an adjustment knob and a graduated dial from 0 to 10. Completely independent of the Main Temperature Controller, the Overtemperature Thermostat guards against any failure of the Main Temperature Controller which would allow temperature to rise past set point. If temperature rises to the Overtemperature set point, the Thermostat takes control of the heating element and allows continued use of the incubator until the problem can be resolved, or service can be arranged. It is not recommended that the unit be allowed to operate for an extended period of time using only the Thermostat as temperature uniformity will suffer.

4.5 **OVER TEMP Light:** This pilot light comes on when the Overtemperature Thermostat has been activated. Under normal operating conditions this light should never come on.

4.6 Low Limit Thermostat: Located on the lower right rear of the unit, the Low Limit Thermostat keeps the unit from freezing. It is factory set to activate at 1° and disengage at 3°C and should not be adjusted.

4.7 Defrost Switch: Used to defrost the unit if frost should form. It is an ON/OFF switch located on the upper right side of the unit.

4.8 Circuit Breaker (Non CE Units): Located on the upper right side of the unit adjacent to the defrost switch, the breaker is manually re-settable and offers protection against power source variations. Protection is in addition to the automatic high temperature limit designed into the heating element. When the circuit breaker is tripped the unit will be shut down. The extended button must be pushed in to reset the circuit breaker once the source of the interruption has been cleared.

4.9 Fuse (CE Units): Located adjacent t the defrost switch in place of the circuit breaker, the fuse offers protection against power source variations. Protection is in addition to the automatic high temperature limit designed into the heating element. If the fuse is blown, the unit will shut down and the cause should be determined and corrected before replacing the fuse.

Section 5

OPERATION

The refrigeration system, heater, and air circulating fan are used in conjunction with the temperature control circuit to achieve sensitive temperature control. The thermostat sensor located in the air stream senses any temperature deviation from the control point, and heat is provided to maintain desired temperature. The circulating fan provides even air distribution throughout the chamber and assures temperature uniformity.

Regardless if the temperature maintained, the compressor operates continuously. This constant operation minimizes component failure which are more frequently associated with a cycle type operation. Note that a factory set Low-Limit Thermostat will shut off the compressor when temperatures reach 1°C.

5.1 The power supply must match the unit's requirements listed on the data plate located on the side of the incubator.

5.2 Plug the service cord into the power supply and turn the Power Switch to the ON position. Turn the Overtemperature Thermostat to its maximum position, clockwise using a coin or flat edged tool.

5.3 Place a certified reference thermometer (not supplied) in the center of the chamber. Be certain the thermostat is not touching any shelving or chamber walls. Taping the thermometer to a petri dish raises it off the shelf and keeps the scale in view. Placing the reference thermometer in the chamber at this stage of operation will allow for calibrating the control with out the loss of processing time.

5.4 **Loading Procedure:** Adequate spacing should be allowed between items whenever possible. Proper spacing will allow maximum air circulation, which is necessary for temperature uniformity. The area below the lower shelf is most critical, and should **ALWAYS** be kept clear of objects.

5.5 **Set Main Temperature:** Enter desired set point temperature. To enter set point mode on the control, press either the UP or DOWN arrow pad one time. The digital display will begin to blink from bright to dim. While blinking, digital display is showing the current set point, which can be changed by pushing the UP and DOWN arrow pads until the desired value is reached. If the arrow pads are not touched within five (5) seconds the display will stop blinking and read the temperature in the chamber. Allow at least 24 hours for the temperature to stabilize at set point.

5.6 Calibrating Main Temperature Control: It is recommended that calibration is done once the unit is installed in its working environment and has been stabile at set point for several hours. Once stabile, compare the reference thermometer with the digital display. If there is an unacceptable difference, put the display into calibrate mode by pushing both UP and DOWN arrow pads at the same time until the display blinks on and off. While blinking, the display can be changed to match the reference thermometer by pushing the UP or DOWN arrow pads. If no arrow pads are pushed within five (5) seconds the display will revert to displaying the set point. Allow the incubator temperature to stabilize again, and repeat the process if necessary.

5.7 Set Overtemperture Thermostat: As mentioned in step 5.2, the Overtemperature Thermostat should be initially set to its maximum position to allow the unit to stabilize. Once the temperature is stabile at the desired set point, turn the Thermostat counterclockwise until the OVER TEMP light turns on. Next turn the Thermostat clockwise just until the pilot lamp turns off. Then turn the Thermostat clockwise two (2) of the smallest divisions on its scale past the point where the light went out. This will set the Overtemperature set point at approximately 1°C above the Main Temperature set point.

5.8 Low Temperature Control: This control is factory set and should NOT be adjusted. It is pre-set at 1°C and is an added feature that keeps samples from freezing.

5.9 High Temperature Control: Not to be confused with the Overtemperature Thermostat, this control is factory set and should NOT be adjusted. It is pre-set at 50°C and is an added feature that will shut down the compressor so that it will not burn up in the event of a temperature run away.

5.10 Accessory Outlet: There is an electrical outlet inside the chamber for use with equipment not exceeding one (1) amp. Note that equipment in the chamber may provide additional heat that could affect the temperature range of the incubator. It is recommended that testing be done with the incubator and any additional equipment to insure that the desired operating conditions can be met.

CAUTION: This incubator is capable of safely operating at conditions that might otherwise damage certain accessory equipment. Make absolutely certain accessory equipment is capable of operating under the conditions you intend to run your incubator.

5.11 Exterior Heat: Under normal operating conditions the internal condenser coils will generate enough heat to be felt by the hand when touching the sides of the unit. This is normal and does not indicate improper performance.

Section 6

MAINTENANCE

The design of the chamber is such that periodic maintenance is kept to a minimum. NO lubrication or adjustments of components is needed. If the incubator is used frequently at temperatures below ambient room temperature or in any manner that increases moisture build-up within the chamber, a frequent defrosting schedule is recommended.

6.1 Defrosting: Frost can appear inside the unit due to moisture accumulating and condensing on the coldest surface. The unit should be defrosted and cleaned on a regular basis. The unit can be defrosted either manually or automatically. The water drains from the chamber into a evaporate pan. Make sure to completely dry out the interior and evaporate tray in the bottom of the body when defrosting is complete.

A. Manual Defrost: Turn the unit off, open the door and allow the frost to melt. Then clean the chamber following the directions in 6.2.

B. Automatic Defrost: The automatic defrost switch is located on the back of the unit. It is an ON/OFF switch. In the ON position, the frost sensor is activated once every twelve (12) hours. If the sensor detects frost, the compressor is shut down until the frost has melted, and the compressor is reactivated. The amount of time the compressor is shut down is roughly one-half hour. During this time, the temperature in the chamber will spike and the Main temperature Controller will cycle off, shutting down the heating element. When the compressor is reactivated, the temperature will stabilize at set point.

6.2 Cleaning: Clean the incubator with a mild soap and water solution, rinse clean with water and wipe dry with a soft cloth.

6.3 Disinfecting: Disinfect the incubator on a regular basis. Remove all of the interior parts and clean thoroughly, including all corners using a suitable disinfectant that is appropriate for your application. DO NOT use spray cleaners that might leak through openings and cracks and get on electrical components, or that may contain solvents that will harm the coatings. DO NOT use abrasives of any kind as they will damage the interior. Special care should be taken when cleaning around sensing heads to prevent damage, and around the door gasket so as not to impair the positive seal.

WARNING: Never clean the unit with alcohol or flammable cleaners with the unit connected to the electrical supply. Always disconnect the unit from the electrical service when cleaning and assure all volatile or flammable cleaners are evaporated and dry before reattaching the unit to the power supply.

6.4 Compressor Compartment: Located at the back and bottom of the unit, the compressor compartment can collect dust which will inhibit proper airflow. This compartment should be vacuumed out at least once every six (6) months to ensure maximum efficiency. Note that the unit must be disconnected from the power supply during this procedure.

6.5 Electrical Components: There is NO maintenance to electrical components such as Temperature Controllers and Probes. If the incubator fails to operate properly, read the Troubleshooting guide prior to contacting Customer Service. If service is required, access to all electrical components is available by removing the panel cover at the top rear of the unit. Temperature Controllers are accessible from behind the control panel. Main Temperature Probe is located on the interior chamber back. Thermostat Probe is located in the element chamber. If the Low Limit Temperature Thermostat needs adjustment, contact the factory for assistance.

Section 7

TROUBLESHOOTING and SERVICE

When troubleshooting, always make a visual inspection of the incubator and it's control console to find loose or disconnected wires which may be source of the trouble. In the event the incubator does not operate properly, check the following before calling for service.

TEMPERATURE

Temp-1	**Temperature too high**	
		1/ controller set too high-see section 5.5 **2/ controller failed on – call Customer Service** **3/ wiring error – call Customer Service**
Temp-2	**Display reads "HI" or "400"+**	
		probe is unplugged, is broken or wire to sensor is broken – trace wire from display to probe; move wire and watch display to see intermittent problems
Temp-3	**Chamber temp spikes over set point and then settles to set point**	
		Recalibrate – see Section 5.6
Temp-4	**Temperature too low**	
		1/ Overtemperature set too low – see section 5.7 **2/ controller set too low – see section 5.5** **3/ unit not recovered from door opening – wait for display to stop changing.** **4/ unit not recovered from power failure or being turned off – incubators will need 24 hours to warm up and stabilize.** **5/ element failure – see if heating light is on; compare current draw to data plate.** **6/ controller failure – confirm with front panel lights that controller is calling for heat.** **7/ Overtemperature Thermostat failure – confirm with front panel lights that thermostat is operating correctly.**

		8/ wiring problem – check all functions and compare wiring to schematic in section 8.0 - especially around any areas recently worked on. **9/ loose connection – check shadow box for loose connections.**
Temp-5	**Display reads "LO"**	
		1/ sensor is plugged in backwards – reverse sensor wires to controller **2/ if ambient temperature is lower than range of unit – compare set points and ambient temperature to rated specifications in section 8, Unit Specifications.**
Temp-6	**Unit will not heat over a temperature that is below set point**	
		1/ confirm that fan is moving and that amperage and voltage match data plate – check fan motor motion in shadow box and feel for air movement in chamber **2/ confirm that set point is set high enough –turn Thermostat all the way clockwise and see if HEATING light or OVER TEMP light comes on** **3/ check connections to sensor** **4/ check calibration – using independent certified thermometer, follow instructions in section 5.6**
Temp-7	**Unit will not heat up at all**	
		1/ verify that controller is asking for heat by looking for controller light – if pilot light is not on continuously, there is a problem with the controller. **2/check amperage – amperage should be virtually at maximum rated (data plate) amperage.** **3/ do all controller functions work?** **4/ is the Thermostat set high enough? – for diagnostics, should be fully clockwise with the pilot light never on.** **5/ has the fuse/circuit breaker blown?**
Temp-8	**Indicated chamber temperature unstable**	
		1/ ±0.1 may be normal **2/ is fan working? – remove top panel and verify movement of cooling fan in center of shadow box** **3/ is ambient room temperature radically changing – either door opening or room airflow from heaters or air conditioning ? – stabilize ambient conditions.** **4/ sensor miss-located, damaged or wires may be damaged - check mounts for control and Thermostat sensors, then trace wires or tubing between sensors and controls.** **5/ calibration sensitivity – call Customer Service**

		6/ Overtemperature set too low – be sure that the thermostat is more than 5 degrees over desired set point; check if OVERTEMP pilot is on continuously; turn controller knob completely clockwise to see if problem solved then follow instructions in owner's manual for correct setting – see section 5.7 **7/ electrical noise – remove nearby sources of RFI including motors, arcing relays or radio transmitters.** **8/ bad connection on temperature sensor or faulty sensor – check connectors for continuity and mechanical soundness while watching display for erratic behavior; check sensor and wiring for mechanical damage.** **9/ bad connections or faulty relay – check connectors for mechanical soundness and look for corrosion around terminals or signs of arcing or other visible deterioration.**
Temp-9	**Will not maintain set point**	
		1/ assure that set point is at least 5 degrees over ambient - **2/ see if ambient is fluctuating**
Temp-10	**Display and reference thermometer don't match**	
		1/ calibration error – see section 5.6 **2/ temperature sensor failure – evaluate if pilot light is operating correctly.** **3/ controller failure – evaluate if pilot light is operating correctly** **4/ allow at least two hours to stabilize.** **5/ see if reference thermometer is certified.**
Temp-11	**Can't adjust set points or calibration**	
		1/ turn entire unit off and on to reset. **2/ if repeatedly happens, call Customer Service**
Temp-12	**Calibrated at one temperature, but not at another**	
		This can be a normal condition when operating temperature varies widely. For maximum accuracy, calibration should be done as close to the set point temperature.

REFRIGERATION

Refrig-1	**Temperature can't get up to set point**	
		1/ assure that power is going to heating coils. **2/ if the displacement is erratic, see if air is being circulated.** **3/ confirm that controller is calling for heat (check front panel light).** **4/ if light not coming on, check control set point and Overtemperature set point .** **5/ confirm that fan is operating and airflow is not blocked.** **6/ reset by turning unit off and on.**
Refrig-2	**Unit won't cool**	
		<u>If the compressor is running</u>: **1/ see if condenser is cold but free of ice.** **2/ be sure that fan is circulating air in the chamber and over the compressor.** **3/ confirm proper sensor location and operation.** **4/ look for leaks in the chamber or around the door gasket.** **5/ assure ample room around the unit as described in Installation section 2.2** **6/ adjust calibration on controller, see section 5.6** **7/ compare ambient specifications to Unit specifications in section 8.0** **8/ If 1 through 7 has been tried and still not functioning correctly, call customer service.** **<u>If compressor isn't running</u>:** **9/ if too cold inside adjust "cold control"** **- on 2020 is located outside on bottom right rear** **- on 2030 is located inside top center between two fans** **10/ check for non-operating relay** **11/ confirm that compressor cooling fan motor is operable.** **12/ check if motor has voltage to it.** **13/ see if refrigeration is running too hot and thermal cutoff activated:** **a- dirty coil or poor circulation** **b- coil next to heat source** **c- ambient temperature too high**
Refrig-4	**Ice build up in chamber**	
		1/ Search for leak in door gasket. **2/ door being opened too often.** **3/ open container inside the chamber.**

		4/ check tightness of seal around all chamber wire and plumbing access to outside. **5/ turn defrost switch on, Note: defrost switch must be turned off for best temperature uniformity; If no defrost option available, call Customer Service.**
Refrig-5	**Making noise**	
		1/ assure that fan is not miss-aligned. **2/ Steady internal clicking may be broken spring or valve – call Customer Service.**

MECHANICAL

Mech-1	**Motor doesn't move**	
		1/ if shaft spins freely: check connections to motor and check voltage to motor. **2/ if shaft rubs or is frozen, relieve binding and retest.**
Mech-2	**Motor makes noise**	
		1/ If noise is from the motor, tap the top of motor shaft with ball peen hammer. **2/ If the sound gets worse, tap the other end of the shaft - avoiding touching the fan blade.** **3/ If there is no change, call Customer Service.** **4/ If noise is from shaft or fan blade, realign shaft.**
Mech-3	**Door not sealing**	
		1/ Confirm that unit has not been damaged and body is not square.
Mech-4	**Water leaking**	
		1/ If leaking inside: dry chamber, run at temperature with door open. Check all seams with flashlight including front face. **2/ If leaking outside: dry out and see if leak repeats and find source of leak. Sources may include: fittings that need tightening, condensation due to missing insulation or evaporate pan needs to be emptied.**

OTHER

Other-1	**Controller on at all times - "locked-up"**	
		1/ Adjust set point to room temperature. If the light

		goes out but is still heating, replace the solid state relay. **2/ turn unit off and on to reset.** **3/ if cannot change any condition on the front panel, call Customer Service.**
Other-2	**Front panel displays are all off**	
		Check for wire damage.
Other-3	**Unit or wall fuse/circuit breaker is blown**	
		1/ check wall power source. **2/ compare current draw and compare to specs on data plate.** **3/ see what other loads are on the wall circuit.**
Other-4	**Unit will not turn on**	
		1/ check wall power source. **2/ check fuse/circuit breaker on unit or in wall.** **3/ see if unit is on, e.g., fan or heater, and just controller is off.** **4/ check all wiring connections, especially around the on/off switch.**
Other-5	**Unit is smoking – Out of box**	
		This is not uncommon for new units heating to temperature for the first time. Put unit under vent and run at full power for one hour.
Other – 6	**Contamination in chamber**	
		1/ see cleaning procedure in operator's manual **2/ develop and follow Standard operating procedure for specific application; include definition of cleaning technique and maintenance schedule.**

Service

If none of the suggestions listed above in the Troubleshooting guide have solved the problem Customer Service should be contacted for assistance.

Call 1-800-322-4897, and have the model number, serial number and voltage (listed on the date plate on the side of the incubator) as your service representative will require it.

Section 8

PARTS LIST

Description	120V	220V
Blower Motor	210002	210002
Circuit Breaker (Non CE Unit)	101758	101758
Control Relay	891024	891024
Convenience Outlet	100020	101483
Defrost Switch	X1000124	X1000124
Fuse, (CE Unit)	NA	103555
High Limit Control	1750506	1750506
I/O (on/off) Switch	103351	103351
Low Limit Control	1750538	1750538
Main Temperature Controller	1750633	1750633
Overtemperature Thermostat	100001	100001
Pilot Light, Green	200021	200021
Pilot Light, Red	200020	200020
Power Cord, European	NA	X1000778
Power Cord, USA	100014	101990
Transformer, step down	NA	103372

UNIT SPECIFICATIONS

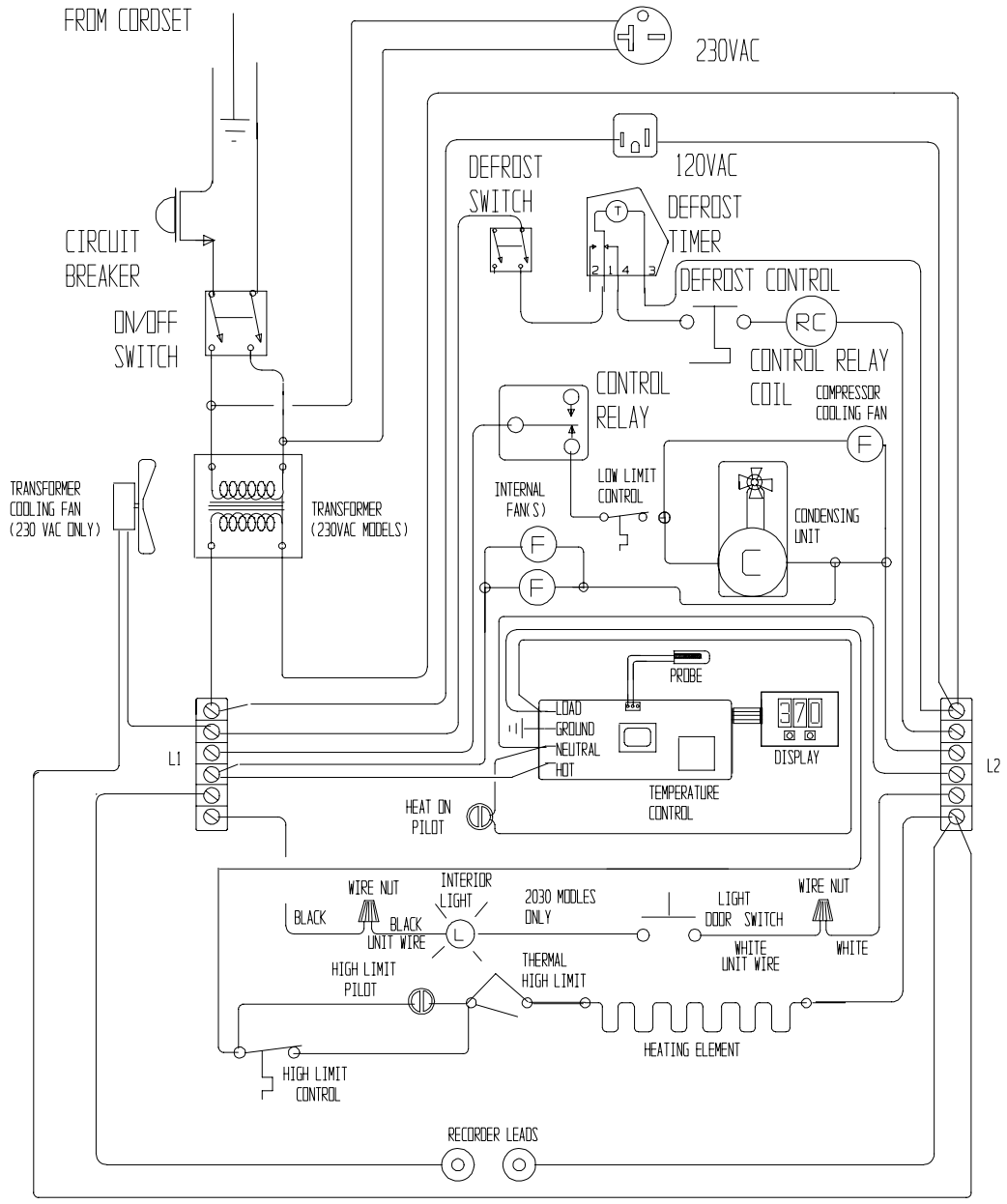
Weight	Shipping	Net
2020	380 lbs.	246 lbs.
2030	750 lbs.	Call Cust. Service

Dimensions	Exterior WxDxH (in.)	Interior WxDxH (in.)
2020	36 x 26.5 x 71.5	27 x 23 x 48
2030	35.75 x 33 x 82	32 x 22.5 x 65.25

Capacity	Cubic Feet
2020	18
2030	25

Temperature	Range	Uniformity
2020	-10 to 45°C	±0.5°C
2030	-10 to 45°C	±0.5°C

Wire Diagram

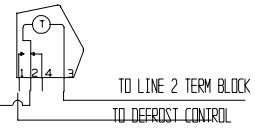


2030 MODELS HAVE (2) INTERNAL CIRCULATING FANS AND A FAN COOLED CONDENSING UNIT.
2020 MODELS HAVE (1) INTERNAL CIRCULATING FAN AND A GRAVITY COOLED CONDENSING UNIT.

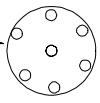
2030 UNIT KEEP FACTORY CHAMBER LIGHT AND DOOR SWITCH.

2020 AND 2015 DO NOT HAVE INTERNAL LIGHT WHEN DOOR IS OPENED.

NOTE:
2030 DEFROST TIMER WIRES AS SHOWN.



RTV OPEN PINS WHERE ELEMENT, FANS AND DRAIN HEATER WERE REMOVED. THESE PINS MUST BE WATER TIGHT.



SOCKET PLUG ON 2030 BEHIND ELEMENT ACCESS PANEL