

# **Thermo Forma**

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## **Models: 3980 and 3986**

**Reach-In Incubator  
29 cu. ft. capacity**

**Manual No. 7033980**

**Rev. 10**

### **Read this Instruction Manual!**

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

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

**Refer to the serial tag on the  
rear cover of this manual**



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<b>MANUAL NO. 7033980</b>			
<b>REV</b>	<b>ECN</b>	<b>DATE</b>	<b>DESCRIPTION</b>
10	19935	5/8/01	Updated 3940-71 drawing
9	IN-2858	3/13/01	Revised control panel and revised electrical schematics
8	19617	12/19/00	New door – updated electrical schematics
7	19187/IN-2816	7/24/00	Added line cord standard
6	18153/IN2816 19207/IN-2827	6/28/00	Updated electrical specs and schematics (ratings)
5	18972/IN-2791 18948/IN-2787	3/6/00	Updated humidity configs, clarified dehumidify indicator operation Updated 3980-72 & 3986-71 drawings
4	17861/IN-2439	8/4/99	Updated electrical schematics for CSA
3	18192	4/20/99	Updated Figure 5-1 wiring per G. Smith
<b>REV</b>	<b>ECN</b>	<b>DATE</b>	<b>DESCRIPTION</b>

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Our **Sales Support** staff can provide information on pricing and give you quotations. We can take your order and provide delivery information on major equipment items or make arrangements to have your local sales representative contact you. Our products are listed on the Internet and we can be contacted through our Internet home page.

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Whatever Thermo Forma products you need or use, we will be happy to discuss your applications. If you are experiencing technical problems, working together, we will help you locate the problem and, chances are, correct it yourself...over the telephone without a service call.

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

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

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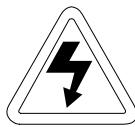
# General Safety Notes used in this Manual



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

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

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



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

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

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



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

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

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

	<p>Hot surface(s) present which may cause burns to unprotected skin or to materials which may be damaged by elevated temperatures</p> <p>Présence de surface(s) chaude(s) pouvant causer des brûlures sur la peau non protégée, ou sur des matières pouvant être endommagées par des températures élevées.</p> <p>Heiße Oberfläche(n) können ungeschützter Haut Verbrennungen zufügen oder Schäden an Materialien verursachen, die nicht hitzebeständig sind.</p>
---	---

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

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## Section 1 - Receiving

### 1.1 Preliminary Inspection

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

### 1.2 Visible Loss or Damage

If any loss or damage is discovered, note any discrepancies on the delivery receipt. Failure to adequately describe such evidence of loss or damage may result in the carrier refusing to honor a damage claim. Immediately call the delivering carrier and request that their representative perform an inspection. Do not discard any of the packing material and under no circumstances move the shipment from the receiving area.

### 1.3 Responsibility for Shipping Damage

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

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

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

## Section 2 - Installation and Start-Up

### 2.1 Location

Locate the unit on a firm, level surface in an area of minimum ambient temperature fluctuation. A minimum of 12 inches clearance is required at the top of the incubator and a minimum of three inches clearance is required at the rear of the incubator to facilitate adequate air flow around the refrigeration system.

### 2.2 Connecting the Water (Humidity) System



***Do not attempt to operate the humidity system without filling it with water. The humidification heater will overheat, and the overtemp safety thermostat will shut the humidification system down.***

The humidity reservoir will require approximately one quart (.946 liter) of water on the initial filling. To ensure continuous satisfactory operation of the incubator, only distilled water should be used in the humidity system. Purity of the distilled water used in the incubator humidifier reservoir must be within the 50K Ohm to 1 M Ohm range to protect and prolong the life of the stainless steel unit.

**Important:**

*Use of tap water, or distilled water outside the specified range, will decrease the operating life of the unit and will void warranty.*

The water inlet is the 1/8" NPT connection located on the rear top left corner of the incubator. Water inlet pressure at the unit should be from 15 to 40 PSI. A manual shut-off valve should be installed between the main water supply and the incubator.



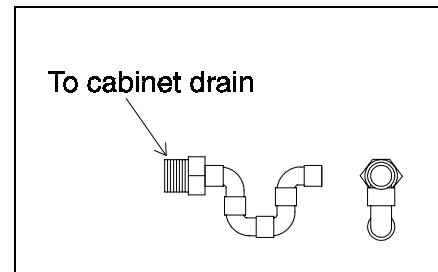
***To prevent mineral buildup on heater coils and humidity generator walls, it may be necessary to clean the humidity generator and immersion heaters with a non-metallic abrasive pad and flush thoroughly every two or three months. Refer to Section 5.8, Cleaning and Adjusting the Humidity Steam Generator.***

## 2.3 Attaching the Drain Lines

**Note:** For location of drain line connection, refer to Figure 2-2 on the following page.

The Condensate Drain is located at the rear of the cabinet on the lower left side (labeled DRAIN). A 3/8" MPT connection is required. The Door Condensate Drain (flexible tubing connected to the door condensate eliminator) should be fed into the hole in the rear of the chamber floor panel to return the condensate to the humidification reservoir.

The Chamber Drain (overflow from the humidification reservoir) is located on the rear of the cabinet in the lower center area. This drain must be trapped to prevent CO<sub>2</sub> drainage from the chamber. A copper p-trap (Figure 2-1 and Item A of Figure 2-2) is provided with the Model 3980 and must be installed. Attach vinyl tubing to the p-trap and route it to an open drain.



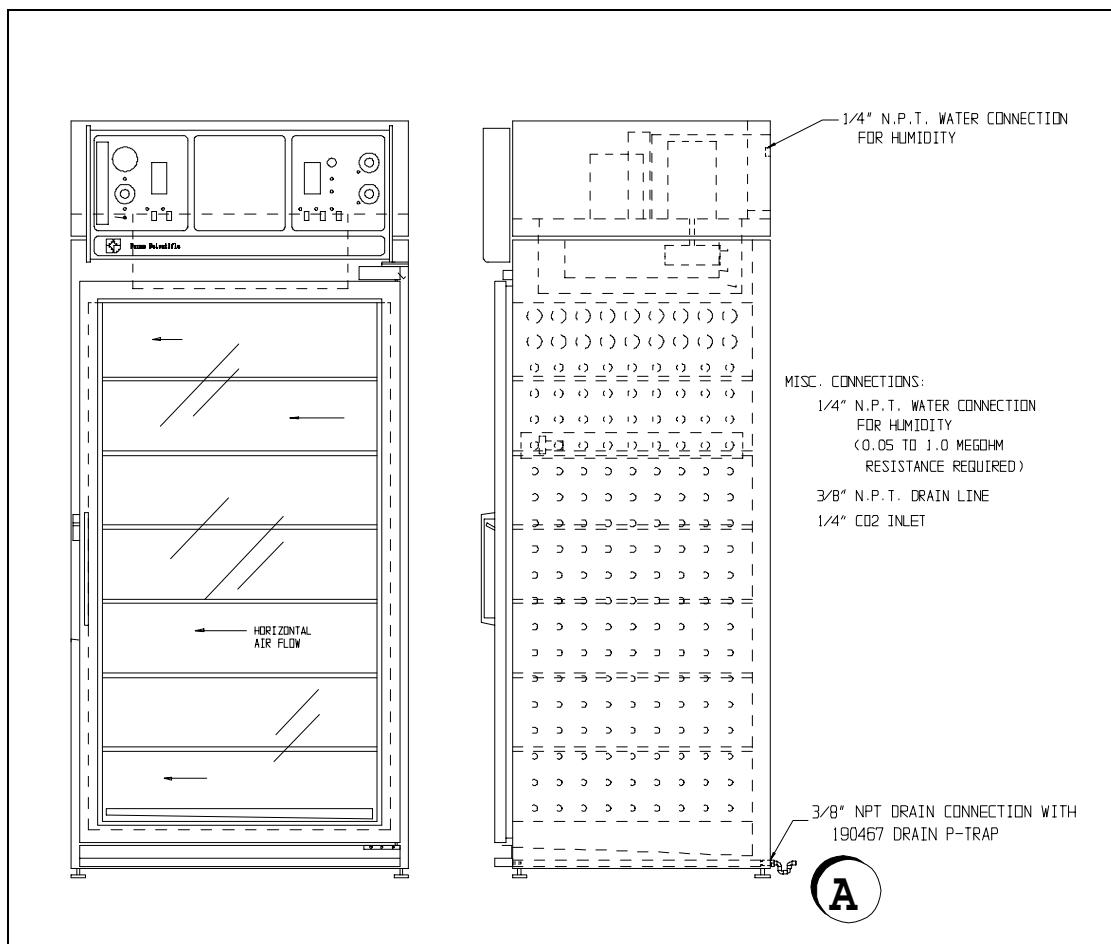
**Figure 2-1**  
**Cabinet Drain P-trap**

## 2.4 Connecting the CO<sub>2</sub> Source

For the most economical use, the liquid CO<sub>2</sub> should be supplied from tanks without siphon tubes, so that only CO<sub>2</sub> gas enters the incubator injection system. Two tanks may be joined together with a manifold to ensure a continuous supply of CO<sub>2</sub>.

A two-stage pressure regulator, with indicating gauges, should be installed at the supply cylinder outlet. The high-pressure gauge should have an indicating range of 0 to 2000 PSIG to monitor tank pressure. The low-pressure gauge should have an indicating range of 0 to 30 PSIG to monitor input pressure to the incubator injection system. A suitable two-stage pressure regulator is available from Thermo Forma.

The CO<sub>2</sub> source must be regulated at a pressure level between 5 and 10 PSIG. Higher pressure levels may damage the CO<sub>2</sub> control system. The user should determine the most economical pressure level, between 5 and 10 PSIG appropriate for the desired CO<sub>2</sub> percentage in the chamber. Thermo Forma recommends only sufficient pressure to maintain recovery time after door openings.



To connect the CO<sub>2</sub> supply:

- Insert the copper tubing provided with the unit as far as it will go into the nut of the CO<sub>2</sub> connection.
- Turn the nut until it is finger tight.
- For reference, scribe the nut at the 6:00 position.
- While holding the fitting body steady with a wrench, tighten the nut 1-1/4 turn until the mark is at the 9:00 position.
- Securely attach the CO<sub>2</sub> line to the open end of the copper tubing.
- Check the tubing connection for leaks.

## 2.5 RS-232 Interface and Remote Alarm Connector

The Model 3980/3986 is equipped with an RS-232 Serial Communication Interface for the remote transmission of temperature and humidity data. Remote alarm connections are also included on the terminal strip.

Key									
Pin #	Description								
1	Temperature, Transmit Data	RS232 - Temperature							
2	Temperature, Receive Data		↓						
3	Temperature, Common								
4	Humidity, Transmit Data	RS232 - Humidity							
5	Humidity, Receive Data		↓						
6	Humidity, Common								
7	Temperature, Common	Remote Alarm Contacts							
8	Temperature, N.O.	(Temperature and Humidity)							
9	Temperature, N.C.		↓						

**Terminal Pin Descriptions, RS-232 (1-6) and Remote Alarm Connections (7-9)**

**Figure 2-2**

### IMPORTANT USER INFORMATION

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

## 2.6 Power Connection

See the serial tag on the side of the unit for electrical specifications, or refer to the electrical schematics at the end of this manual.



***CAUTION! Connect the incubator to a grounded, dedicated circuit. The power cord connector is the mains disconnect device for the incubator. Position the incubator so the unit can be easily disconnected.***

For Model 3980, plug the provided 10 ft. power cord with the NEMA 14-20 plug into the power outlet connection on the back of the cabinet, then into the grounded, dedicated electrical circuit.

For Model 3986, the electrical junction box is located on the rear top section of the incubator. With the junction box switch in the "OFF" position, connect the incubator to an adequate power source.

## 2.7 Start-Up

When the humidification system is operational, the incubator may be placed into service. Set the controls:

Overtemp Safety Thermostat .....	(Fully Clockwise)
Undertemp Safety Thermostat.....	(Fully Clockwise)
Main Power Switch.....	ON
Humidity Controller.....	Desired Setpoint
Temperature Controller.....	Desired Setpoint
CO <sub>2</sub> Flowmeter .....	OFF
CO <sub>2</sub> Purge Control.....	OFF
Door Heater .....	40% (factory set)

For best overall performance, the refrigeration switch should be turned on. When running Low/No humidity and high temperatures, the refrigeration switch may be turned off.



***The defrost switch must be turned on when the temperature setpoint is 10°C, or below.***

## 2.8 Setting the Overtemp Safety Thermostat

Permit the chamber temperature and humidity to stabilize, then set the overtemp safety thermostat as follows:

1. Turn the overtemp control knob slowly counterclockwise until the audible alarm sounds and the overtemp indicator lights.
2. Turn the overtemp control knob clockwise approximately two units on the scale. The alarm should be silenced and the overtemp indicator light should go out.

The overtemp safety thermostat is now set a few degrees above the control temperature setpoint. When the chamber temperature rises to the overtemp control point, the alarm system will activate, power to the heaters will shut off, and the chamber temperature will be maintained at the overtemp control point.

When an overtemp condition occurs, the cause must be determined and corrected before normal operation under the main temperature controller can be resumed.

**Note:** When the chamber temperature control setpoint is changed, the overtemp safety thermostat must be reset to accommodate the change.

## 2.9 Setting the Undertemp Safety Thermostat

After the chamber temperature and humidity have stabilized, set the undertemp safety thermostat as follows:

1. Turn the undertemp control knob slowly clockwise until the audible alarm sounds and the undertemp indicator lights.
2. Turn the undertemp control knob counterclockwise approximately two units on the scale. The alarm should be silenced and the undertemp indicator light should go out.

The undertemp safety thermostat is now set a few degrees below the control temperature setpoint. When the chamber temperature drops to the undertemp control point, the alarm system will activate, power to the compressor will shut off and the chamber temperature will be maintained at the undertemp control point.

When an undertemp condition occurs, the cause must be determined and corrected before normal operation under the main temperature controller can be resumed.

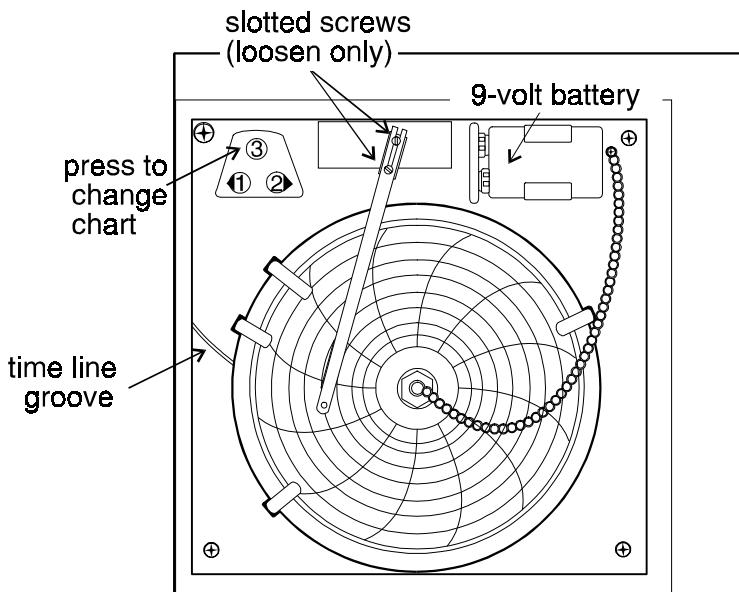
**Note:** When the chamber temperature control setpoint is changed, the undertemp safety thermostat must be reset to accommodate the change.

## 2.10 Preparing the (optional) CoBex Recorder

### a. Installing the Chart Recorder Battery

The seven-day circular chart recorder is located on the front of the incubator cabinet and is protected by a glass door.

To prepare the recorder for operation, open the glass door and snap the connector onto the 9-volt battery as shown in Figure 2-3. If the unit is operating, the green LED lights steady. If the unit is not turned on, the LED blinks.



**Figure 2-3**

If the battery is weak or not connected, the green LED will flash. If power is lost to the cabinet, the LED will also flash. When replacing the 9-volt battery, use only an alkaline-style battery.

### b. Changing the Chart Paper

1. Press the Change Chart button (#3) and hold it for 1 second until the pen begins to move to the left of the chart. See Figure 2-3.
2. Remove the existing chart by unscrewing the center knob securing it.
3. Install the new chart, positioning it so that the correct time line coincides with the time line groove on the chart plate.
4. Replace the center knob and screw it tightly against the chart.

### c. Changing the Pen

1. Using a small flat blade screwdriver, loosen the 2 screws holding the pen arm and remove the pen and arm as an assembly.
2. Unsnap the plastic hinge securing the pen. Remove and discard the old pen.
3. Install the new pen by snapping the hinge securely around the pen arm.
4. Re-install the pen assembly by sliding the pen arm under the screws, positioning the pen tip in the time line groove. Tighten the screws.
5. Push the Chart Change button and hold it for 1 second until the pen begins to move back onto the chart.

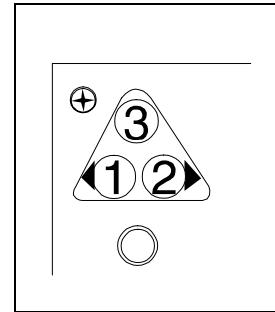


Figure 2-4

**Note:** Make sure that the pen is marking on the chart. It may be necessary to gently lift the pen onto the chart paper.

### d. Calibrating the Chart Recorder

1. Place an accurate thermometer(s) in the chamber next to the recorder's probe(s). After about three minutes, compare the thermometer with the chart recorder. For 2 pen operations, also compare the second thermometer.

**Note:** For 2 pen operations, first select the pen you wish to calibrate. Hold down the #1 arrow for the red (#1) pen or the #2 arrow for the blue (#2) pen, until the light goes out. Then adjust as necessary.

If an adjustment is necessary, press either the #1 or #2 button to move the pen left or right. The button must be held about five seconds before the pen begins to move. Release the button when the pen matches the thermometer.

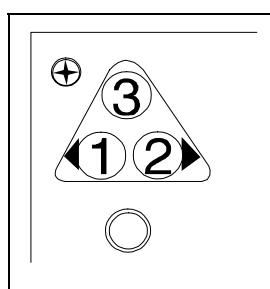


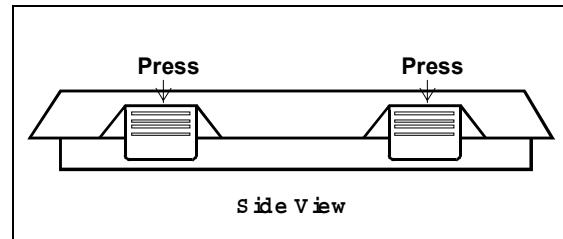
Figure 2-5

## 2.11 Offset Calibration

It may be necessary to calibrate the temperature or humidity controllers to match an independent temperature or humidity sensor. To do so, follow the next steps. *Wear a grounding wrist strap to avoid damaging any of the electrical components.*

1. Suspend an independent, calibrated sensor(s) in the center of the interior chamber. Allow approximately 30 minutes for the incubator to stabilize.
2. Turn OFF the main power switch.
3. Remove the 982 controller module(s) by pressing in the four retaining tabs, two on the right side, two on the left side. (Refer to Figure 2-6) Pull the controller module out by gently rocking it from side to side.
4. Looking at the top and left side of the controller module, locate the red DIP switches indicated in Figure 2-7. Use your fingernail or a small screwdriver, to turn *off* SW 2 by moving the white toggle towards the front of the module as shown in the illustration.
5. Return the controller into its frame and firmly press on the top and bottom of the bezel until all four locking tabs “click” into place.
6. Turn ON the main power switch.
7. Press the Up and Down Arrow keys simultaneously for 3 seconds. The word “InPt” will appear in the upper display, and “set” will appear in the lower display.
8. Press the Down Arrow once, then continue to press the Mode key until “LOC” appears in the lower display. The upper display will show 2. Press the Down Arrow until 0 appears.
9. Press the Mode key once, then the Up Arrow once. “InPt” will appear in the upper display, and “set” will be in the lower display. Press the Mode key until “CAL 1” appears in the lower display. Press the Up or Down Arrow key to either add or subtract an offset value. This would be the difference between the actual value shown on the controller and the reference sensor value.
10. Press the Display key once, then the up and down keys simultaneously for 3 seconds. The word “InPt” will appear in the upper display, and “set” will appear in the lower display.
11. Press the down arrow once and continue to press the mode key until “LOC” appears in the lower display. The upper display will show 0. Press the up arrow until 2 appears.

12. Press the display key once
13. Turn OFF the main power switch.
14. Remove the 982 controller module(s) by pressing in the four retaining tabs, two on the right side, two on the left side. (Refer to Figure 2-6) Pull the controller module out by gently rocking it from side to side.
15. Looking at the top and left side of the controller module, locate the red DIP switches indicated in Figure 2-7. Use your fingernail or a small screwdriver, to turn **on** SW 2 by moving the white toggle towards the rear of the module as shown.
16. Return the controller into its frame and firmly press on the top and bottom of the bezel until all four locking tabs “click” into place.
17. Turn ON the main power switch.
18. Looking at the top and left side of each controller module, locate the red DIP switches indicated in Figure 2-6.



**Figure 2-6**

19. With a fingernail or small screwdriver, turn off SW 2 by moving the white toggle towards the front of the module as shown. SW 2 is the top switch when looking at the module from the side.
20. Looking at the back of the module, set all three of the DIP switches at the bottom of the chassis to the ON position (up as shown in Figure 2-8).
21. Install the modules into their locations on the front panel and press on the top and bottom of the bezel until all four locking tabs “click” into place.
22. Restore electrical power to the unit.

23. To enter Setup (SET on the controller display), press the up and down keys simultaneously for 3 seconds. The word “InPt” will appear in the upper display, and “set” will appear in the lower display. If numbers appear in the bottom display and begin to scroll up or down, the keys have not been pressed simultaneously. Try again.

24. There are four menus under the “set” prompt: InPt (input menu), OtPt (output menu), gLbL (global menu), and COM (communications menu). Use the Up or Down keys to select a menu, and the Mode key to advance through the menus.

25. Follow the configurations on the back two pages of this instruction sheet. The function (Temperature or Humidity) is identified in the header section of the sheets under “control type.”

**Note:** Prompts on the configuration sheet marked NA indicated that they will not appear in the menus and therefore will not appear on the display.

26. Install the configurations in the order listed on the sheets: InPt, OtPt, gLbL, and COM. COM is required only if the RS-232 data communications port is to be used.

27. When all of the setup menus are completed, press the Display key to revert back to the actual/setpoint display. Then press the Mode key. The Operations Menu (OPER) should be showing in the lower display, (SyS) should be showing in the upper display.

28. Install the Operation menu consisting of SyS and PID according to the configuration sheets.

29. To enter the Setup (SET) prompt, press the Up and Down Arrow keys simultaneously for 3 seconds. The word “InPt” will appear on the upper display, and “set” will appear on the lower display. If numbers are displayed which begin to scroll up or down, the keys have not been pressed simultaneously. Try again.

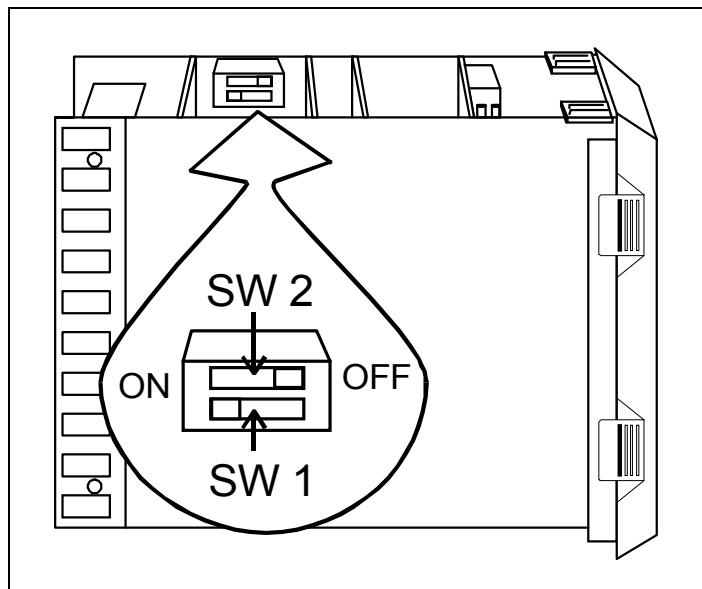


Figure 2-7

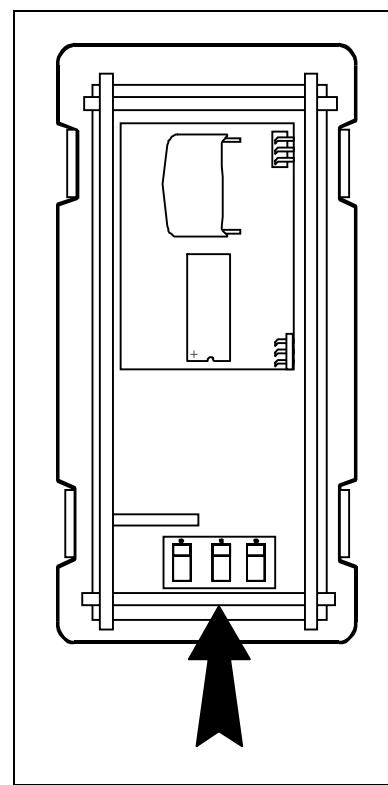


Figure 2-8

## 2.12 Controller Configuration

The controllers have been pre-configured at the factory. Reference copies of the Watlow Configuration records are included on the following pages.



*Do not re-configure the controllers without first consulting Thermo Forma Service Department at 1-888-213-1790.*

# 3980 (WATLOW 982) CONFIGURATION RECORD

**CUSTOMER:** \_\_\_\_\_

**JOB NUMBER:** \_\_\_\_\_

**UNIT SERIAL NUMBER:** \_\_\_\_\_

**CONTROL TYPE:** Temperature

**PREPARED BY:** \_\_\_\_\_ **DATE** \_\_\_\_\_

**COMPLETED BY:** \_\_\_\_\_ **DATE** \_\_\_\_\_

## Switch Configuration:

Main Boards	Input 1 Board		Output 3 Option board		Jumper switch setting: <b>Form B</b>
SW1 <u>ON</u>	SW1 <u>OFF</u>				
SW2 <u>ON</u>	SW2 <u>OFF</u>	SW3 <u>ON</u>			

## Software Configuration:

Operations Menus							
SYS: Ei1S	<u>NA</u>	Ent4	<u>NA</u>	A3LO	<u>-73.3</u>	A4Hi	<u>NA</u>
Ei2S	<u>NA</u>	A2LO	<u>NA</u>	A3Hi	<u>34.0</u>	Aut	<u>OFF</u>
Ent3	<u>NA</u>	A2Hi	<u>NA</u>	A4LO	<u>NA</u>		
PID: Pb1	<u>2.0</u>	dE1	<u>NA</u>	It2	<u>NA</u>	dB	<u>0.0</u>
rE1	<u>0.50</u>	Ct1	<u>5</u>	rA2	<u>0.25</u>		
It1	<u>NA</u>	Pb2	<u>1.0</u>	dE2	<u>NA</u>		
rA1	<u>0.19</u>	rE2	<u>0.25</u>	Ct2	<u>30</u>		

PROG: See Programming Sheets if required.

## Setup Menus

InPt:	In1	<b>RT.D</b>	CAL1	<b>**</b>	rL2	<b>NA</b>	CAL2	<b>NA</b>
	dEC1	<u>NA</u>	rtd1	<u>DIN</u>	rH2	<u>NA</u>	Hunt	<u>NA</u>
	rL1	<u>-20.0</u>	Ftr1	<u>2</u>	LrnL	<u>NA</u>		
	rHi	<u>80.0</u>	In2	<u>NA</u>	LrnH	<u>NA</u>		
OtPt:	Ot1	<b>Ht</b>	AL2	<b>NA</b>	LAt3	<b>nLA</b>	SIL4	<b>NA</b>
	PrC1	<u>NA</u>	Lat2	<u>NA</u>	SIL3	<u>OFF</u>	Aout	<u>NA</u>
	HyS1	<u>0.1</u>	SIL2	<u>NA</u>	Ot4	<u>NA</u>	PrC3	<u>NA</u>
	Ot2	<u>CL</u>	Ot3	<u>AL3</u>	AL4	<u>NA</u>	ArL	<u>NA</u>
	PrC2	<u>NA</u>	AL3	<u>Pr1</u>	HyS4	<u>NA</u>	ArH	<u>NA</u>
	HyS2	<u>0.1</u>	HyS3	<u>0.1</u>	LAt4	<u>NA</u>	ACAL	<u>NA</u>
gLbL:	C_F	<b>C</b>	Anun	<b>OFF</b>	PtyP	<b>ti</b>	PStr	<b>StPt</b>
	Err	<u>nLA</u>	LoP	<u>-100</u>	gSd	<u>0</u>	LOC	<u>2</u> *
	Ei1	<u>NO</u>	HiP	<u>100</u>	POut	<u>Cont</u>		
	Ei2	<u>NA</u>	AtSP	<u>90</u>	IdSP	<u>NA</u>		

\* LOC should be set at 0 until factory testing and calibration is complete.

\*\* This is a calibration factor and will vary from unit to unit.

COM: bAUd	<u>9600</u>	dAtA	<u>70</u>	PrOt	<u>FULL</u>	Addr	<u>0</u>
IntF	<u>NA</u>						

# 3980 (WATLOW 982) CONFIGURATION RECORD

**CUSTOMER:** \_\_\_\_\_

**JOB NUMBER:** \_\_\_\_\_

**UNIT SERIAL NUMBER:** \_\_\_\_\_

**CONTROL TYPE:** **Humidity**

**PREPARED BY:** \_\_\_\_\_ **DATE:** \_\_\_\_\_

**COMPLETED BY:** \_\_\_\_\_ **DATE:** \_\_\_\_\_

## Switch Configuration:

Main Boards	Input 1 Board		Output 3 Option board		Jumper switch setting: <b>Form B</b>
SW1 <b>ON</b>	SW1 <b>ON</b>		A3LO <b>0*</b>	A4Hi <b>NA</b>	
SW2 <b>ON</b>	SW2 <b>ON</b>	SW3 <b>ON</b>	A3Hi <b>100*</b>	Aut <b>OFF</b>	

## Software Configuration:

Operations Menus							
SYS: Ei1S <b>NA</b>		Ent4 <b>NA</b>		A3LO <b>0*</b>		A4Hi <b>NA</b>	
Ei2S <b>NA</b>		A2LO <b>NA</b>		A3Hi <b>100*</b>		Aut <b>OFF</b>	
Ent3 <b>NA</b>		A2Hi <b>NA</b>		A4LO <b>NA</b>			
* These values are customer setable to there alarm points.							
PID: Pb1 <b>8</b>	dE1 <b>NA</b>	It2 <b>NA</b>			dB	<b>0</b>	
rE1 <b>0.05</b>	Ct1 <b>5.0</b>	rA2 <b>0.35</b>					
It1 <b>NA</b>	Pb2 <b>7</b>	dE2 <b>NA</b>					
rA1 <b>0.35</b>	rE2 <b>0.03</b>	Ct2 <b>30</b>					

PROG: See Programming Sheets if required.

## Setup Menus

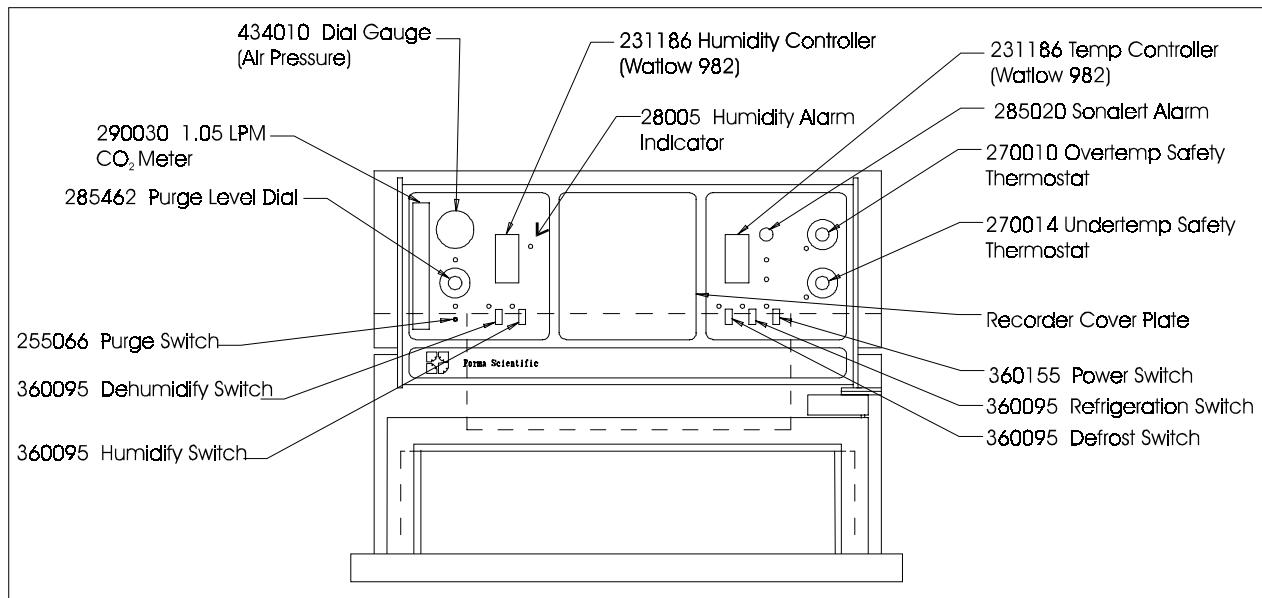
InPt: In1 <b>0-5</b>	CAL1 <b>**</b>	rL2 <b>NA</b>	CAL2 <b>NA</b>
dEC1 <b>0</b>	rtd1 <b>NA</b>	rH2 <b>NA</b>	Hunt <b>NA</b>
rL1 <b>0</b>	Ftr1 <b>2</b>	LrnL <b>NA</b>	
rHi <b>100</b>	In2 <b>NA</b>	LrnH <b>NA</b>	
OtPt: Ot1 <b>Ht</b>	AL2 <b>NA</b>	LAt3 <b>nLA</b>	SIL4 <b>NA</b>
PrC1 <b>NA</b>	Lat2 <b>NA</b>	SIL3 <b>ON</b>	Aout <b>NA</b>
HyS1 <b>1</b>	SIL2 <b>NA</b>	Ot4 <b>NA</b>	PrC3 <b>NA</b>
Ot2 <b>CL</b>	Ot3 <b>AL3</b>	AL4 <b>NA</b>	ArL <b>NA</b>
PrC2 <b>NA</b>	AL3 <b>Pr1</b>	HyS4 <b>NA</b>	ArH <b>NA</b>
HyS2 <b>1</b>	Hys3 <b>1</b>	LAt4 <b>NA</b>	ACAL <b>NA</b>
gLbL: C_F <b>NA</b>	Anun <b>ON</b>	PtyP <b>ti</b>	PStr <b>StPt</b>
Err <b>nLA</b>	LoP <b>-100</b>	gSd <b>0</b>	LOC <b>2</b>
Ei1 <b>NO</b>	HiP <b>100</b>	POut <b>Cont</b>	
Ei2 <b>NA</b>	AtSP <b>90</b>	IdSP <b>NA</b>	

\* LOC should be set at 0 until factory testing and calibration is complete.

\*\* This is a calibration factor and will vary from unit to unit.

COM: bAUd <b>9600</b>	dAtA <b>70</b>	PrOt <b>FULL</b>	Addr <b>0</b>
IntF <b>NA</b>			

## Section 3 - Control Panel Operation



**Figure 3-1**  
**Control Panel of the Model 3980 Incubator**

### 3.1 Main Power Switch and Indicator Light

The main power switch controls power to the incubator control systems. The main power indicator lights when the power switch is on and the unit is receiving power.

### 3.2 Refrigeration Switch and Indicator Light

The refrigeration switch controls power to the refrigeration system. The refrigeration indicator lights when the refrigeration switch is on and the compressor is receiving power.

### 3.3 Defrost Switch and Indicator Light

The defrost switch controls power to the defrost system. The defrost timer is factory-set to provide two 15-minute defrost cycles during a 24-hour period.



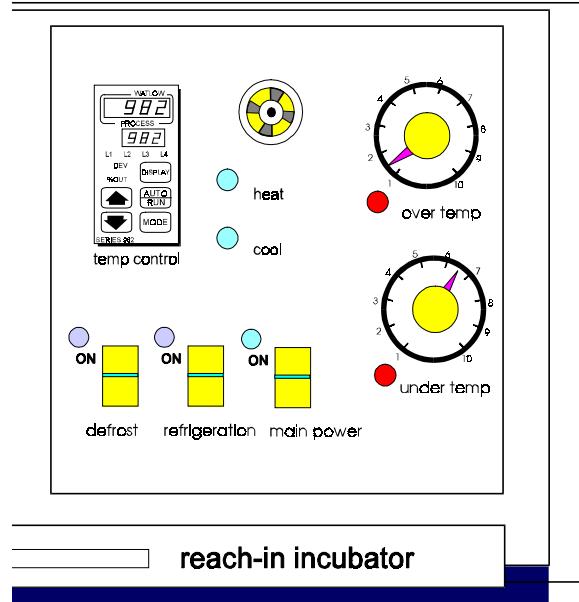
***The defrost switch must be turned on when the temperature setpoint is 10°C, or below.***

The defrost indicator lights when the defrost switch is on and the incubator is in a defrost cycle.

### 3.4 Overtemp Safety Control, Indicator Light and Audible Alarm (Refer to Figure 3-2)

The overtemp safety thermostat should be set slightly above the operating temperature of the incubator. In the event of an overtemp condition, the overtemp safety thermostat will:

1. Activate the audible alarm and the overtemp indicator light.



**Figure 3-2**  
**Temperature Controls Detail**

2. Interrupt power to the heaters and maintain the temperature at the overtemp control point.

The overtemp control is not directly calibrated. The numbers (0 to 10) on the dial are *for reference only* and do not correspond to any specific temperature. If an overtemp condition occurs, the cause of the problem must be determined and corrected before normal operation under the main temperature controller can be resumed.

### 3.5 Undertemp Safety Control, Indicator Light and Audible Alarm

The undertemp safety thermostat should be set slightly lower than the operating temperature of the incubator. In the event of an undertemp condition, the undertemp safety thermostat will:

1. Activate the audible alarm and the undertemp indicator light.
2. Shut off power to the refrigeration system and maintain the temperature at the undertemp control point.

The undertemp control is not directly calibrated. The numbers (0 to 10) on the dial are *for reference only* and do not correspond to any specific temperature. When an undertemp condition occurs, the cause of the problem must be determined and corrected before normal operation under the main temperature controller can be resumed.

### 3.6 Temperature/Humidity Controllers

The Watlow Series 982 microprocessor based controllers control the temperature and humidity functions of the incubator. Refer to Figure 3-3. Refer to the Watlow manual included with this manual and the Watlow configuration records at the end of Section 2.

#### Upper Display (PROCESS)

The four digit, LED upper display indicates either actual process value, the operating prompt values, or error codes. When powering up, the display will be blank for 3 seconds.

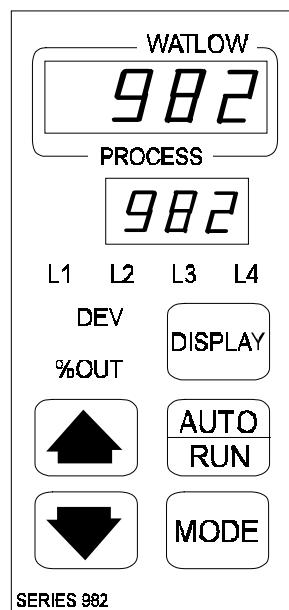
#### Lower Display

The four digit, LED lower display indicates the setpoint, deviation, percent power temperature unit, menu prompts or alarm codes.

#### L1, L2, L3, L4

When lit, these LEDs indicate when Output #1, #2, #3, or #4 are respectively active. Outputs can be configured as:

- OT1 Control
- OT2 Control or Alarm
- OT3 Alarm, Event or Re Transmit
- OT4 Alarm, Event or Communications  
Flashes on transmit and receive.



**Figure 3-3**  
**Controller Keys and Displays**

**Dev LED**

When lit, shows the deviation from the current setpoint in the lower display.

**% Out LED**

When lit, shows the current percent output in the lower display.

**Display Key**

Press the display key to enter the Display loop. Refer to Pages 21 and 22 of the Watlow manual.

**Up Key**

Press the Up Key to increase the value of the displayed prompt.

**Down Key**

Press the Down Key to decrease the value of the displayed prompt.

**Up/Down Key (simultaneously)**

Press the Up/Down keys simultaneously for three seconds, the Setup (SET) prompt appears. Press and hold the keys for six seconds and the Factory (FACTY) prompt appears.

**Hold/Run Key**

Press once to clear a latched alarm without altering the Hold/Run status. To run or halt a program refer to Chapter 7 of the Watlow manual.

**Hold/Run LED**

When lit, the control is Rning. When blinking, press the Hold/Run key again to begin RUN.

**Mode Key**

Steps the control through the menus. Enter new data after pressing the Mode key.

**Mode/Up Key**

First press the Mode Key then press the Up Key to scroll backwards to the top of the menu. Scrolling is disabled when the keys are released.

### 3.7 Audible Humidity Alarm and Indicator

The humidity alarm is a function of the humidity controller. When the cabinet humidity goes outside the set parameters of the controller, L3 indicator on the controller lights, the audible alarm sounds and the humidity alarm indicator on the control panel lights.

Pressing the Mode key on the controller silences the audible alarm and extinguishes the humidity alarm indicator. The L3 indicator on the controller remains on until the cabinet humidity returns to the parameter setpoint.

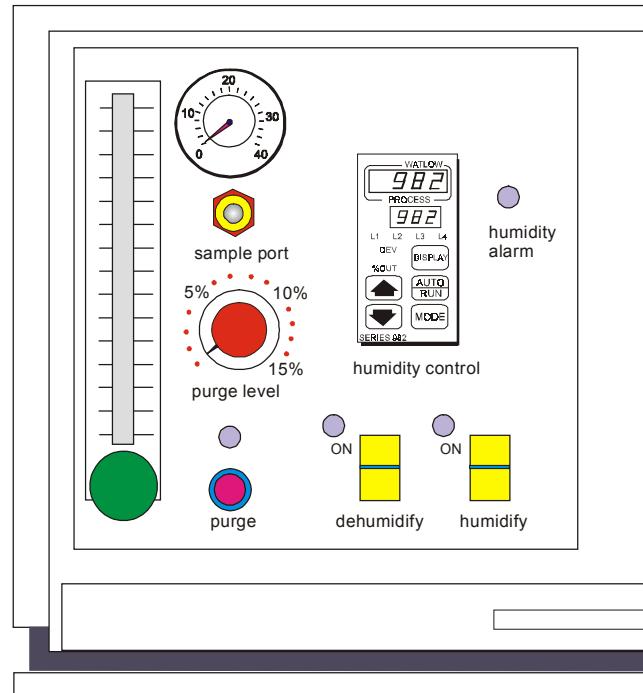
### 3.8 Dehumidify Switch and Indicator Light

The dehumidify switch will enable the refrigeration system if the refrigeration switch is currently off. When controlling humidity, the dehumidification switch should be in the ON position for most applications. The dehumidification light will cycle on and off as the humidity controller toggles between humidify and dehumidify. The dehumidify light will be de-energized when the system is in Defrost mode.

Humidity is removed from the cabinet by the refrigeration evaporator coil. Moisture accumulates on the coil and is collected into the evaporator pan. The accumulated moisture is then plumbed to the back of the cabinet, which can be emptied to a floor drain, or an evaporative device.

### 3.9 Humidify Switch and Indicator Light

The humidify switch controls the power to the humidification system circuit. The humidity indicator light will cycle as the controller toggles between humidify and dehumidify.



**Figure 3-4**  
**Humidity/CO<sub>2</sub> Detail**

### 3.10 Setting the CO<sub>2</sub> Flowmeter

The CO<sub>2</sub> flowmeter controls the flow of CO<sub>2</sub> into the incubator chamber. A float ball indicates the CO<sub>2</sub> flow rate against the 0 to 100 arbitrary scale. To provide approximately 5% of CO<sub>2</sub> content in the chamber, set the scale to 40.

CO<sub>2</sub> content should be checked with an independent test instrument to insure the desired percentage.

### 3.11 CO<sub>2</sub> Sample Port

A serrated gas sample port, located on lower left front corner of control panel has been provided for checking the CO<sub>2</sub> percentage by an independent measuring device.



*To prevent CO<sub>2</sub> loss, the sample port must be capped when it is not in use.*

### 3.12 Purge Level Dial

The purge level dial is used to set the duration of the CO<sub>2</sub> purges. For example, when the dial is set at 5%, the incubator will be purged with CO<sub>2</sub> for about 1 minute and 45 seconds. This is enough to replace approximately 5% of the air in the chamber with CO<sub>2</sub>.

The reference markings on the dial are 5%, 10% and 15%.

### 3.13 Purge Button and Indicating Light

The purge button permits manual injection of CO<sub>2</sub> into the chamber, to replace CO<sub>2</sub> loss due to door openings, etc. The purge duration is dependent upon the purge level dial setting. The purge indicating light is energized when CO<sub>2</sub> is being purged in the incubator chamber.



*Press the CO<sub>2</sub> purge button after each opening of the incubator door to regain the correct CO<sub>2</sub> percent in the chamber.*

### 3.14 Air Pressure Gauge

The CO<sub>2</sub> is propelled inside the chamber by air pumps. The air pressure gauge indicates the approximate air pump pressure in a range from 0 to 5 PSIG.

A minimum air pressure or 3/4 PSI is needed to maintain a 5% CO<sub>2</sub> content in the chamber.

### 3.15 Recorder (Optional)

The optional recorder provides a tracing of the chamber temperature and, on some recorder models, both temperature and humidity. Refer to the recorder supplement included with this manual.

### 3.17 Air Exchange Ventilator Caps



*When using CO<sub>2</sub> in the chamber, the ventilator caps must be completely closed to minimize CO<sub>2</sub> loss.*

Air exchange for the incubator is regulated through the manually adjustable intake and exhaust ventilator caps located on the top of the cabinet.

When viewed from the front of the incubator, the intake cap is on the left and the exhaust cap is on the right. The ventilator caps may be opened by turning counterclockwise and closed by turning clockwise.



## PREVENTIVE MAINTENANCE

### Incubators

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

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

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

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

#### Tips for all incubators:

- Do NOT use bleach or any disinfectant that has high chloros
- Use sterile, distilled or demineralized water.
- Avoid spraying cleaner on the CO<sub>2</sub> sensor.
- Do not use powdered gloves for tissue cultures.

## Preventive Maintenance for 3911/3920/3940/3980 Series Incubators

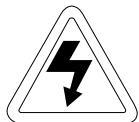
Refer to Manual Section	Action	Daily	Weekly	Yearly
--	Inspect door latch, hinges and door gasket seal.			✓
3.5 (3911), 3.4 (3920), 3.5 (3940), 3.17 (3980)	Check the air exchange ventilator caps for adjustment; open or closed as required			✓
4.1	Perform a complete decontamination procedure. Wipe down interior, shelves, side panels with disinfectant. Rinse everything well with sterile distilled water.	Between experiments <i>More frequent decontamination may be required, depending on use and environmental conditions</i>		
2.9/3911, 3920 and 3940 or 2.11/3980	* Verify and document all calibrations, at the minimum.			✓
5.6/3911 or 5.7/3940 or 5.8/3980	* Inspect and clean the humidity generator, at the minimum			✓
--	Clean drip pan and drain lines			✓
--	Clean refrigeration system condenser			✓
--	Verify defrost cycle for below 10°C operation			✓
--	Change filters (under normal conditions)			✓

✉ Qualified service technicians only

✉ Regular monitoring routines of the various levels in your unit is encouraged.

## Section 4 - Routine Maintenance

### 4.1 Cleaning the Incubator



*De-energize all potential sources of energy to this unit and lockout/tagout their controls.  
(O.S.H.A. Regulation, Section 1910-147.)*

The continued cleanliness of the stainless steel used in Thermo Forma products has a direct effect on the appearance and operation of the unit. Use the mildest cleaning procedure that will do the job effectively. Clean the outside of the incubator with soap and water or with any non-abrasive commercial spray cleaner. Clean the inside of the chamber with alcohol and/or soap and water. Disinfect the interior panels with a general use laboratory disinfectant, diluted according to the manufacturer's instructions. Rinse the surface thoroughly after each cleaning and wipe the surfaces dry. Always rub in the direction of the finish polish lines.



*Do not use chlorinated solvents on stainless steel as they can cause rusting and pitting.*



*Do not use volatile or aromatic solvents for cleaning inside the cabinet as their residue can contaminate the cabinet environment.*

The Thermopane glass door may be cleaned with commercial glass cleaner or a solution of ammonia and water.

## Section 5 - Service



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

### 5.1 Access to the Electrical Components



*De-energize all potential sources of energy to this unit and lockout/tagout their controls.  
(O.S.H.A. Regulation, Section 1910-147.)*

To gain access to the electrical components, remove the two screws located on the left side of the control panel with a phillips screwdriver. The control panel is hinged and will swing open.

### 5.2 Replacing the Overtemp/Undertemp Probe and Thermostat



*De-energize all potential sources of energy to this unit and lockout/tagout their controls.  
(O.S.H.A. Regulation, Section 1910-147.)*

1. Remove the incubator ceiling by removing the screws holding it in place.
2. Remove the top three screws from the top of the right duct cover.
3. Lean the duct sheet out and remove the Permagum seal from around the probe access hole.

4. Remove the 15" copper capillary overtemp probe by extracting the two plastic clips that hold the probe in place.
5. Open the control panel by removing the two screws located on the left side of the control panel.
6. Pull the overtemp probe up through the access hole and into the control panel.
7. Follow the wires from the probe to the thermostat mounted on the control panel. Clip the plastic ties holding the overtemp cable to the existing wiring.
8. Pull the overtemp knob on the control panel off.
9. Remove the two screws that hold the overtemp assembly to the control panel.
10. Disconnect the two wires from the back of the thermostat assembly.
11. Pull the entire assembly out of the panel, and remove the unit.
12. Replace the thermostat and probe.

**Note:** Reseal the probe access hole with Permagum and retie the overtemp cable to the existing wires after replacing the probe.

### 5.3 Replacing the Humidity/Temperature Sensor



*De-energize all potential sources of energy to this unit and lockout/tagout their controls. (O.S.H.A. Regulation, Section 1910-147.)*

1. Locate the probe mounting plate in the center of the right side of the incubator interior.
2. Open the mounting plate by removing the screws that hold it in place.
3. Locate the humidity sensor mounted on the inside of the panel in a black housing. Note the angle of the probe.
4. Grasp and unplug the probe from the probe cable.

5. When replacing the humidity sensor, be sure to mount the probe at the same angle as it was originally mounted.

#### 5.4 Replacing the Optional Recorder and Probe(s)



*De-energize all potential sources of energy to this unit and lockout/tagout their controls.  
(O.S.H.A. Regulation, Section 1910-147.)*

1. Open the incubator door and locate the probe mounting plate attached to the center of the right interior wall. Remove the mounting plate.
2. Single pen recorders have only one long stainless steel probe, attached to the lower end of the back of the mounting plate. Remove the probe by carefully sliding it out of the housing.
3. Remove the screws securing the ceiling of the incubator and remove the ceiling.
4. Remove the top three screws on both edges of the right duct sheet.
5. Lean the duct sheet out in order to remove the Permagum seal from around the probe access hole.
6. Remove the two screws located on the left side of the control panel door. Remove any Permagum from around the access hole.
7. Pull the probe(s) carefully up through the hole.
8. Follow the probe cable(s) to the back of the recorder and carefully clip any plastic ties holding the cable(s) to other wiring.
9. Remove the three screws securing the recorder and pull it carefully out from the front of the control panel.
10. Replace the recorder with the correct Forma part.

**Note:** When replacing the recorder and probe(s), retie the probe cable(s) to the existing wires.

***Avoid making sharp bends in the probe capillary tubes.***

## 5.5 Removing the Top Section



*De-energize all potential sources of energy to this unit and lockout/tagout their controls. (O.S.H.A. Regulation, Section 1910-147.)*

If it becomes necessary to remove the top of the incubator when moving it through low doorways, use the following procedure:

- Read the instructions completely before starting the removal process.
- Provide adequate space and sufficient lighting to perform the work.
- Disconnect the inlet water supply and the drain.
- Before lifting the top section from the incubator, provide sawhorses or another suitable support arrangement so that the underside of the top is suspended.

### Procedure:

1. Remove all test material from the incubator chamber.
2. All temperature and/or humidity sensing probes are mounted on a probe mounting bracket on the right side of the incubator chamber. Remove the nuts securing the bracket and then remove the probes from the bracket. Note the location and configuration of the probes.
3. The sensing bulb capillaries are routed behind the duct sheet up to the access port at the top of the unit behind the control panel. Route all of the probes between the duct sheet and the outside wall of the chamber so that when the top is raised, the probes will move freely up and out. Do not kink or bend the capillaries.
4. The humidification system drain line (3/8" clear Tygon) is routed down through the access port and is secured to the condensate drain tube on the center left side of the incubator, as viewed from the rear. Free the drain line, by pulling it away from the float tank (behind the control panel) and routing it down through the access port.
5. Open the control panel by removing the two screws located on the left side of the control panel.

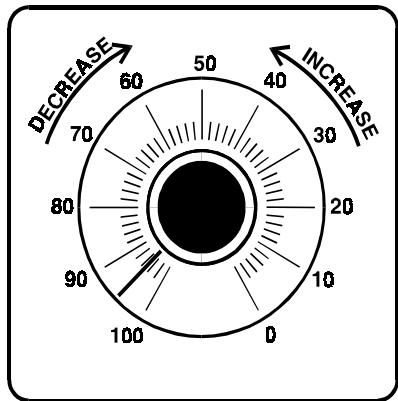
6. Loosen the top gasket around each of the air exhaust vents by turning the screw.
7. Remove the eight screws from the top cover of the incubator.
8. Remove the four screws from each of the vent caps on the top cover of the incubator. The top cover can now be removed.
9. Remove the nine 5/16" x 4" hex head bolts, lock washers, and two flat washers which secure the top assembly to the cabinet. Note the washer arrangement on the bolts.
10. Remove the black trim gasket located at the junction of the top assembly and the main incubator section. The ends of the gasket have been joined together at the rear of the incubator.

**Note:** When raising the top section, notice the gasket seal at the top opening of the incubator chamber. The gasket must be correctly positioned when reinstalling the top on the chamber.
11. *Slowly* lift the entire top assembly up and off the lower chamber section while *carefully* guiding the capillaries and sensing bulbs out of the chamber area. Place the top assembly onto the carpenter's horses or other support arrangement.
12. Reinstall the top assembly by reversing the above procedure. Exercise care particularly when:
  - Placing and aligning the sealer gasket on the 1/2" flange on top of the chamber when lowering the top in place.
  - Routing the temperature and/or humidity sensors and capillaries to prevent severe bending.
  - Mounting the temperature and/or humidity sensor bulbs on the mounting brackets.
  - Tightening the top mounting bolts alternately, to ensure an even pressure on the gasket.

## 5.6 Setting the Door Heater Control



*High voltage is present behind the control panel.  
Servicing must be performed only by qualified  
electrical service personnel.*



The infinite heater control is located in the right side of the incubator top compartment behind the control panel door. The heater varies the amount of door heat from no heat (zero) to full heat (100) as indicated by the control dial face. If the knob is turned past zero, a "click" will indicate that all power to the door is shut off. If turned past 100, a similar "click" will indicate that the heat is set at the maximum.

Initially the units leave the factory with the dial set at 40. If desired, the amount of heat can be reduced until moisture appears on the door, then the heat advanced. However, in fluctuating ambient conditions, it is recommended that a minimum of 40% door heat be used.

## 5.7 Replacing the Air Pump(s)



***De-energize all potential sources of energy to this unit and lockout/tagout their controls. (O.S.H.A. Regulation, Section 1910-147.)***

1. Access to the air pump(s) is obtained by opening the front of the control panel. Grasp the left side of the control panel housing and pull it gently but firmly, up and out.
2. The air pump(s) are located midway back toward the right side of the component area.
3. Remove the screws securing the air pump bracket(s). Remove bracket(s) and set aside.
4. Remove the clear outlet tubing from defective air pump(s).
5. Electrically disconnect air pump(s) from main wiring harness.

## 5.8 Cleaning and Adjusting the Humidity Steam Generator, P/N 505087

**Materials Required:** 6-foot stepladder

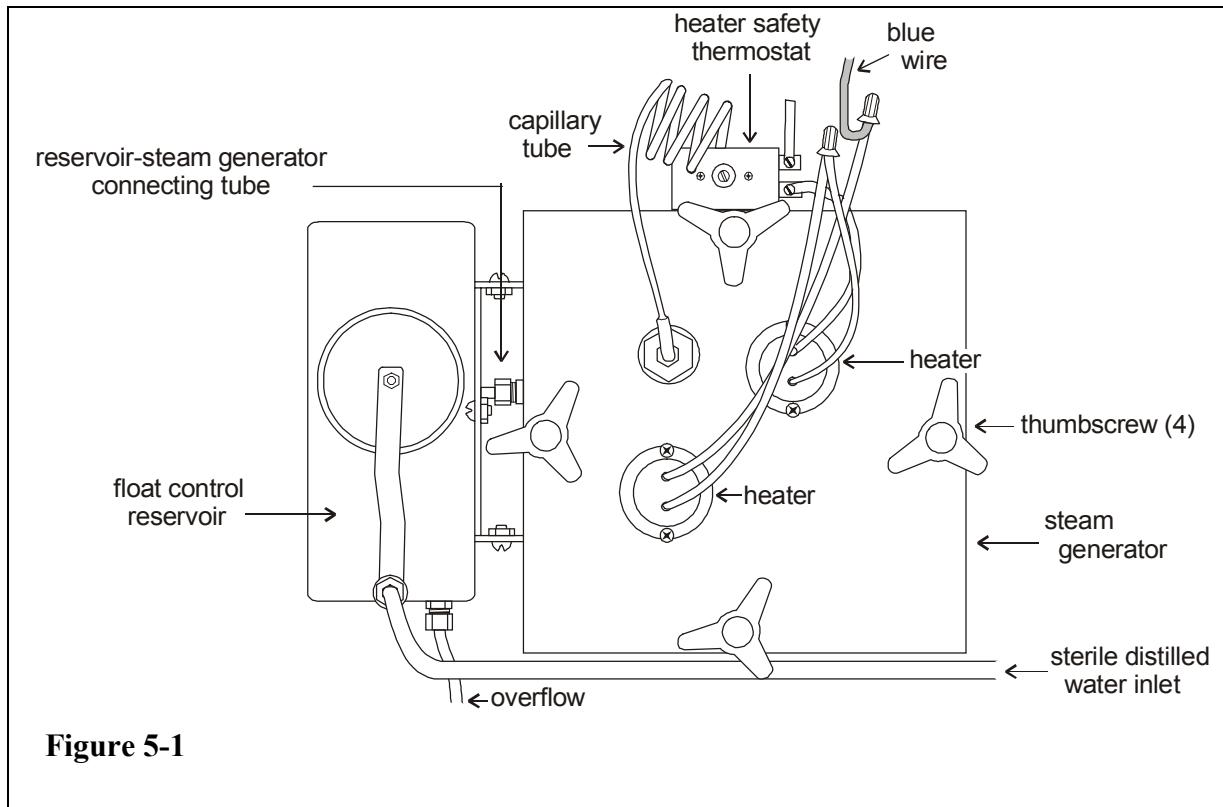
Clamp-on style Ammeter

Siphon, sponge, and cleaning materials

Flat and Phillips screwdrivers

Laboratory disinfectant

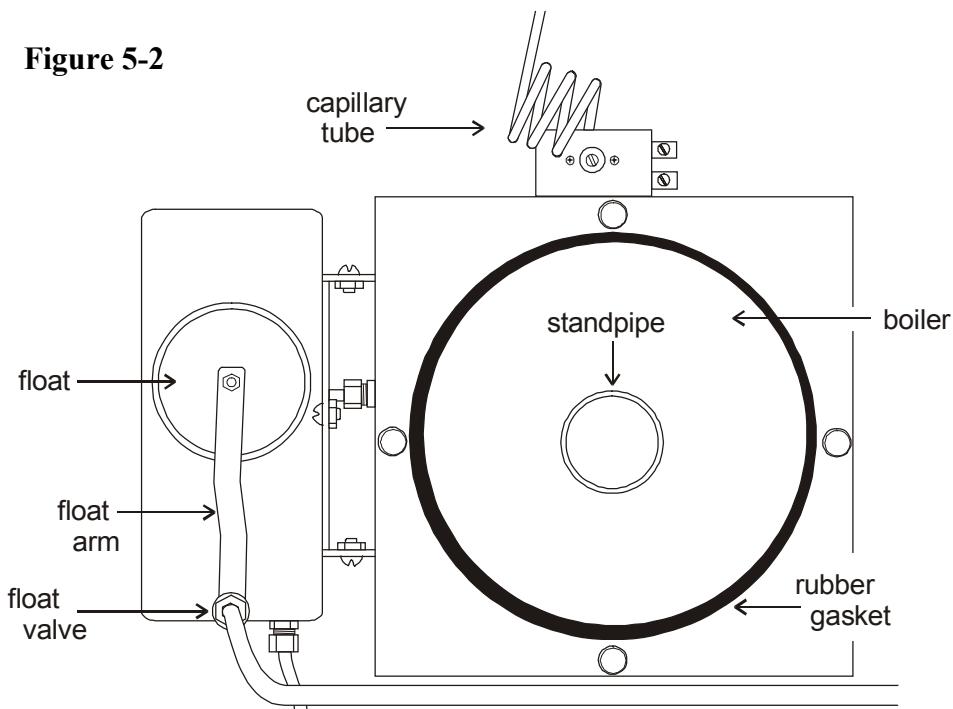
1. Remove all contents from the incubator, shut it off and disconnect the power.



2. Turn off the valve supplying the sterile distilled water.
3. From the stepladder, remove the eight Phillips screws securing the top of the incubator cabinet.
4. When the steam generator has cooled, remove the four thumbscrews.



*The internal temperature of the steam generator is hot enough to boil water. Make certain sufficient time is given to allow the unit to completely cool before removing the top.*

**Figure 5-2**

6. Lift the top off the steam generator and lay it aside, taking care not to crimp the copper capillary tube.
7. Siphon all of the water out of the steam generator and clean it with a good quality laboratory detergent and disinfectant. ***Do not use any type of chloride cleaner.*** A bristle brush may be needed for stubborn rust and scale. Also clean the inside of the standpipe using a test tube brush. Siphon and sponge the wash water out of the steam generator. Repeat cleaning with soap and water as necessary.
8. Carefully pry off the brass top of the float control reservoir. Clean and disinfect it and the connecting tube between the reservoir and the steam generator, being careful not to damage the float assembly.
9. Also clean the two heater elements and the part of the copper capillary tube attached to them.
10. When all surfaces are clean, rinse with sterile distilled water until all soap and disinfectant are removed.
11. Open the distilled water valve and allow the reservoir to fill. Measure the water level. Limits are three inches, plus or minus one-quarter of an inch. The water level is raised and lowered by carefully bending the float arm. When set, replace the cover.

12. Replace the top of the steam generator and alternately tighten the four thumbscrews to evenly compress the rubber gasket.

#### **Calibration Check for Steam Generator Safety Thermostat**

1. Turn the slotted rheostat shaft of the temperature control on the back of the steam generator fully clockwise.
2. Remove all tools and cleaning materials from the top of the incubator. Reconnect power to the unit and turn it on.
3. Set the RH level to 100% and open the incubator door. This will cause the heaters in the steam generator to be continuously energized.



*The next step requires working in the top section of the incubator where high voltages are present. This should only be done by qualified persons.*

4. Using a clamp-on ammeter, verify that there is current flow in the blue wire going to the heater connectors. Refer to Figure 1.
5. Proper current is about 3.6 amps. If there is no current flow and the humidity indicator is on, rotate the small slotted screw in the shaft of the safety thermostat counterclockwise, using a jeweler's screwdriver, until the current flows to the heaters.
6. Allow the steam generator to operate for about 30 minutes continuously. If the heaters cycle off due to the safety thermostat, rotate the small slotted screw further counterclockwise to maintain the heater's operation.
7. After 30 minutes, turn the small slotted screw clockwise *very slowly* until the heaters shut off.
8. Turn the slotted screwdriver 1-1/2 turns counterclockwise. The thermostat is now properly adjusted.
9. Replace the cabinet top and return the incubator to service.

## Section 6 - Specifications

### **Temperature**

Control	$\pm 0.1^\circ\text{C}$ @ $+37^\circ\text{C}$ (98.6°F)
Range	0°C (32°F) to +60°C (140°F)
Sensor	RTD
Controller	Digital electronic proportional
Setpoint	Digital
Display	Digital LED
Readability	0.1°C
Setability	0.1°C
Uniformity	$\pm 0.3^\circ\text{C}$ at 25°C to 37°C with six shelves installed*

### **CO<sub>2</sub>**

CO <sub>2</sub> Gas Control	Flowmeter
Range	0-20%
Inlet Pressure	10 PSIG
Controller	Flow ratio
Setpoint	Single flowmeter 0 to 1.05 LPM
Air Supply	Built-in air pump

### **Shelves**

Standard	6
Maximum	19
Dimensions	30.62"W x 25.81"F-B (77.78 cm x 65.56 cm)
Construction	Solid stainless steel reinforced
Surface Area	5.4 sq. ft. (.51 sq. m) /shelf
Max. Per Chamber	104.3 sq. ft. (9.69 sq. m)
Clearance	Adjustable on 3" (7.62 cm) centers
Loading	35 lbs. (16 kg) (slide in and out)  50 lbs. (23 Kg) (stationary)

### **Construction**

Volume	29 cu. ft. (823 liters)
Interior	304 2B stainless steel
Exterior	Cold rolled steel
Insulation	2" (5.1cm) foamed urethane
Outer Door Gasket	Four sided vinyl compression
Finish	Powder coated. Salt spray tests exceed 1000 hrs. per ASTM Standard B117-85.

### **Weights**

Net	800 lbs. (363 Kg)
<b>Shipping</b>	
Motor	860 lbs. (390 Kg)
Air	940 lbs. (476 Kg)
Ocean	985 lbs. (447 Kg)

### **Temperature Alarm**

Sensor	Thermostat
Controller	Thermostat
Setpoint	Analog reference dial
Alarm	Audible/visual

### **Humidity**

Humidity Control	$\pm 5.0\%$ RH
Range	Above ambient to 95%
Sensor	Bulk polymer
Controller	Electronic, direct set in %
R.H.	
Setpoint	Digital
Display	Digital LED
Readability	1.0%
Setability	1.0%
Steam Generator	Initial fill 1 qt. (0.946 liter)

**Fittings**

Fill Port 1/4" compression  
Drain Port 3/8" O.D. copper  
CO<sub>2</sub> Inlet 1/4" compression

**Unit Heat Load**

115V 5500 BTUH (1600W)  
220V 6000 BTUH (1750W)

**Refrigeration**

Compressor 1/4 Horsepower, air-cooled  
Refrigerant R-134A Non-CFC

**Electrical**

3980 208-220VAC, 60Hz, 1PH, 3P, 4W,  
14.0 FLA  
3986 220-240VAC, 50/60Hz, 1PH, 2P,  
3W,  
14.0 FLA  
Line Cord -  
3980 NEMA 14-20 plug  
3986 None (lockable disconnect  
provided)

**Dimensions**

Exterior 38.00"W x 87.50"H x 32.00"F-B  
(96.52 cm x 222.25 cm x 81.28 cm)

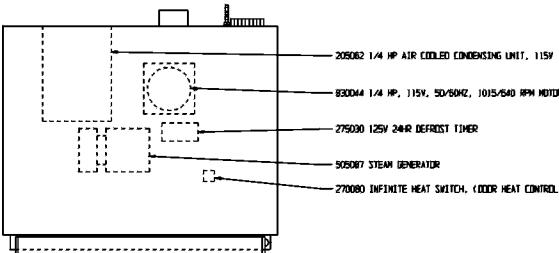
Interior 31.00"W x 60.00"H x 27.00"F-B  
(78.74 cm x 152.40 cm x 68.58 cm)

*Continuing research and improvements may result in specification changes at any time.  
Performance plus or minus the least significant digit unless otherwise specified.*

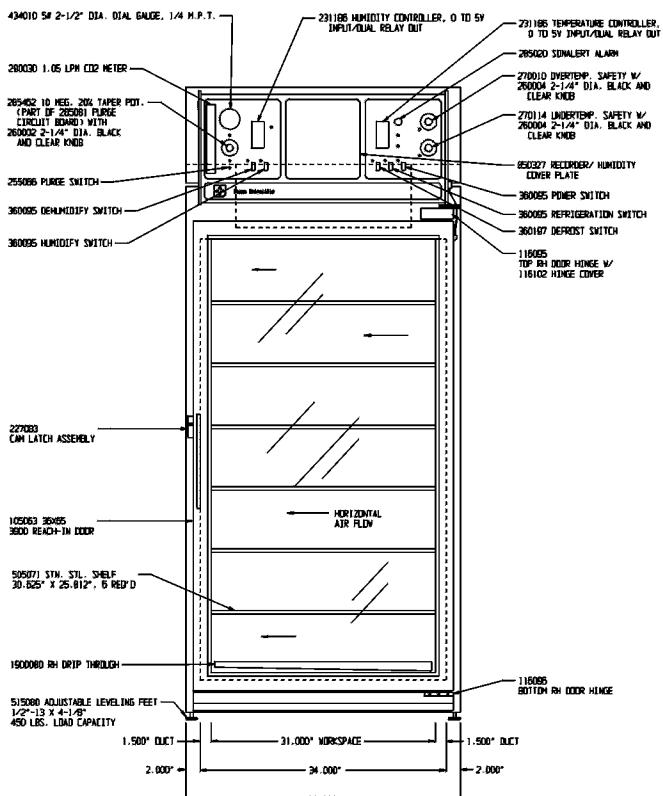
\* Better than ±0.5°C uniformity at all other temperature parameters

## SPECIFICATIONS

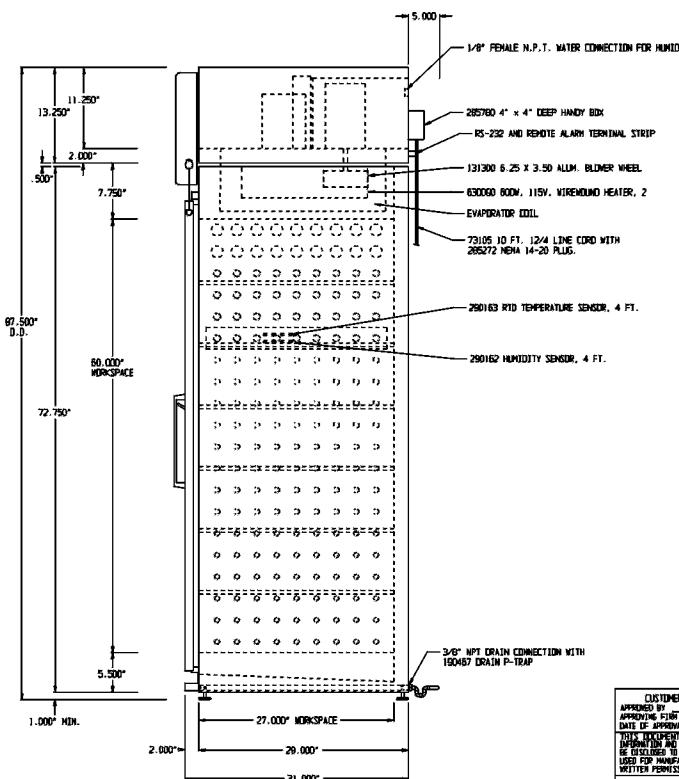
**MODEL:** 3060 20 CU. FT. INCUBATOR  
**INTERIOR MATERIAL:** 20 GA. STN. STL., TYPE 304, 2-B  
**EXTERIOR MATERIAL:** 18 GA. C.R.S.  
**PARTS AND ACCESSORIES:** STAINLESS STEEL, POWER COATED  
**INSULATION:** 2" FOAMED-IN-PLACE URETHANE, POWER COATED  
**SHELVING:** SIX SOLID STN. STL. 30.625" WIDE X 25.813" FRONT-TO-BACK,  
 ADJUSTABLE IN 1.5" INCHES CENTERS  
**TEMPERATURE RANGE:** 40°F TO 108°F +/-1.0°C  
**CONTROL:** +/-0.1°C +/-37°C  
**HUMIDITY RANGE:** ABOVE AMBIENT TO 95% +/-5%  
**CO<sub>2</sub> DILUTION:** 0.05% TO 1.0%  
**RANGE:** 0.2 TO 20%  
**REFRIGERATION:** 1/4 HP, AIR COOLED, HIGH TEMP CONDENSING UNIT, R134A  
**ELECTRICAL CONNECTIONS:** 208-220V, 1PH, 3P, 4W, 60HZ, NEMA  
**MISC. CONNECTIONS:**  
 1/4" N.P.T. WATER CONNECTION FOR HUMIDITY  
 (1.05" DIAMETER, 100MM RESISTANCE REQUIRED)  
 3/8" N.P.T. DRAIN LINE  
 1/4" CO<sub>2</sub> INLET



TOP VIEW



FRONT VIEW



SIDE VIEW

### CUSTOMER APPROVAL/REFERENCE

APPENDIX OF

APPROVED BY \_\_\_\_\_

DATE OF APPROVAL \_\_\_\_\_

REVISION NUMBER \_\_\_\_\_

INSTRUMENTS NECESSARY

FOR MANUFACTURE AND SELL INFORMATION IS MINT TO

BE USED FOR MANUFACTURING PURPOSES WITHOUT

WRITTEN PERMISSION FROM FORMA SCIENTIFIC

REV EDN NO DATE BY (initials) DESCRIPTION OF REVISION

J5 IN-2860 11-14-00 GLG CLG HSB CHANGE DOOR NUMBER

J5 IN-2810 07-01-00 GLS CLG LHM LHG DISCONNECT WITH LINE CORD

J4 IN-2810 05-28-00 GLS CLG LHM REV. ELECTRICAL POWER CORD, IMP.

J3 51-7740 02-18-00 DMS CLG LHM ADDED 1.500" 3/8" TUBE TO P-TRAP

J2 51-2765 02-27-00 JASPER LHM CSA UL CERTIFICATION UP-DATES

REV EDN NO DATE BY (initials) APPROVAL SCALE 1/8"

CUSTOMER \_\_\_\_\_

JOB TITLE 3060 20CF INCUBATOR, 0°C TO 60°C

ORG TITLE ASSEMBLY

LOCATION INCUBATOR

LOB NUMBER 3980-00-0-D

DATE 1-23-79 BY (initials) APPROVAL SCALE 1/8"

CUSTOMER \_\_\_\_\_

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ORG TITLE \_\_\_\_\_

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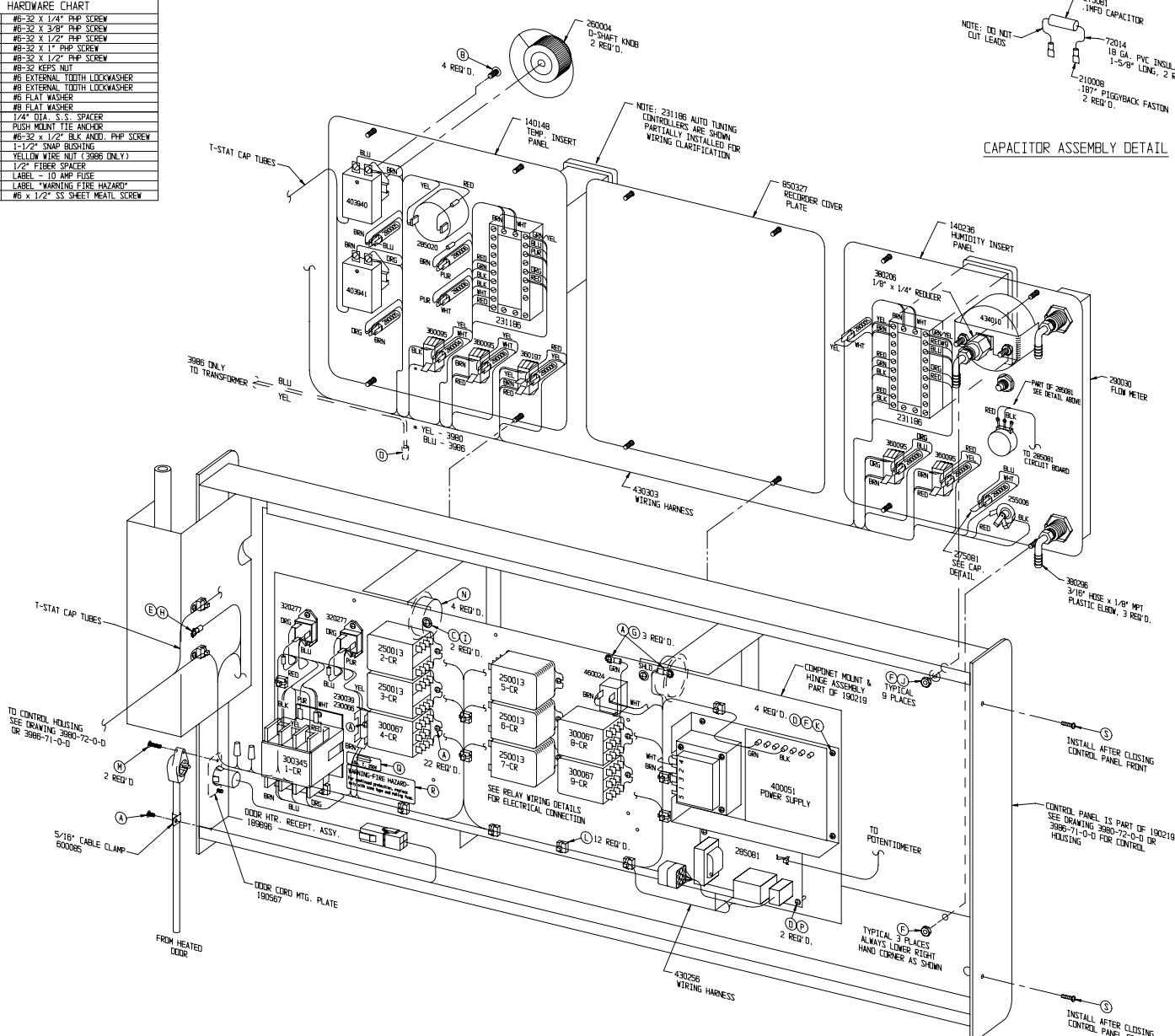
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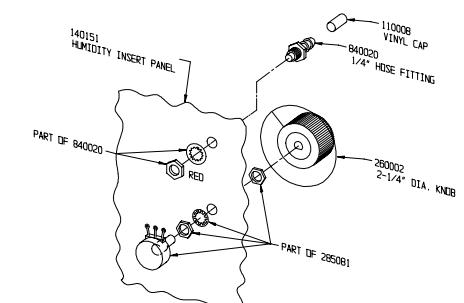
## Section 7 - Parts List

Stock #	Description
290162	RH/Temp Control Signal Board
290163	RH/Temp Control Sensor
400051	Power Supply
140148	Temp Insert Panel
231186	Controller, Microprocessor
250013	Relay, DPDT, 10A, 120V
300345	Contactor, 3P, 25A, 120V
230066	Ceramic Fuse, 10A, 250V
320277	Triac 25A 400V Flat Base
403941	B-20, 10 to 220F
285604	Safety Switch, 3P, 30A
285614	Fuse, Fusetron, 20A
403940	Thermostat, B10, Snap
505087	Steam Generator
620430	Heater, Steam Generator
980052	Float
270010	Thermostat, B10, (Steam Generator)
901900	Air Pump, 4.1 LPM, 115V 60Hz (Model 3980)
184022	Air Pump, 4.1 LPM, 115V 50Hz (Model 3986)
190467	Copper P-Trap
195080	Water Strainer 1/4 FPT
475510	Door
285020	Sonalert 110VAC, 2.9 KHz
285081	KWIK Purge Circuit Board
290030	1.05 LPM Meter
434010	2-1/2" Dial Gauge

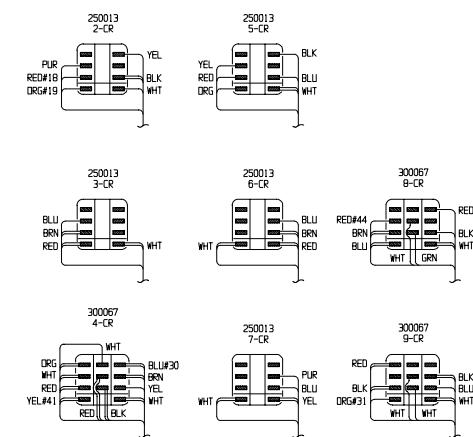
	HARDWARE CHART	
A	22115	#32-3 X 1/4" PL. SCREW
B	22349	#32-3 X 1/4" PH. SCREW
C	24016	#32-3 X 1/2" PH. SCREW
D	22166	#32-3 X 1" PH. SCREW
E	22653	#32-3 X 1/2" PH. SCREW
F	23002	#32 KEPS NUT
G	23058	#6 EXTERNAL TOOTH LOCKWASHER
H	23059	#6 INTERNAL TOOTH LUKWASHER
I	23020	M6 FLAT WASHER
J	23021	M6 FLAT WASHER
K	515085	1/4" DIA. S.S. SPACER
L	440024	PUSH MOUNT TIE ANCHOR
M	22058	#32-3 X 1/2" BLK AND. PH. SCREW
N	30077	1-1/2" SNAP BUSHING
O	22020	1/2" FIBER SPACER
P	511061	1/2" FIBER SPACER
Q	221960	LABEL - 10 AMP FUSE
R	224327	LABEL "WARNING FIRE HAZARD"
S	24016	W # 1/2" SS SHEET MEAL SCREW



## CAPACITOR ASSEMBLY DETAIL

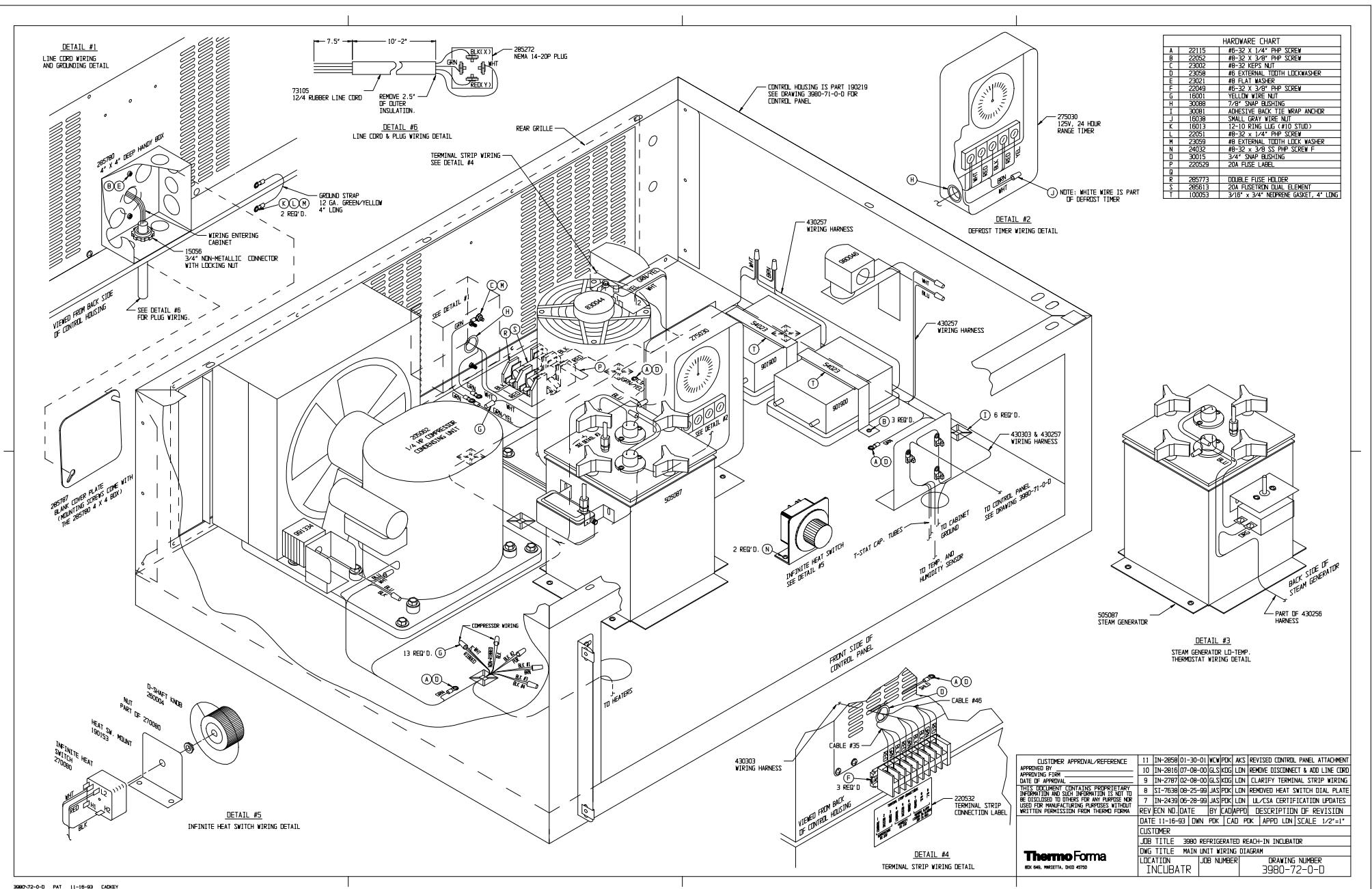


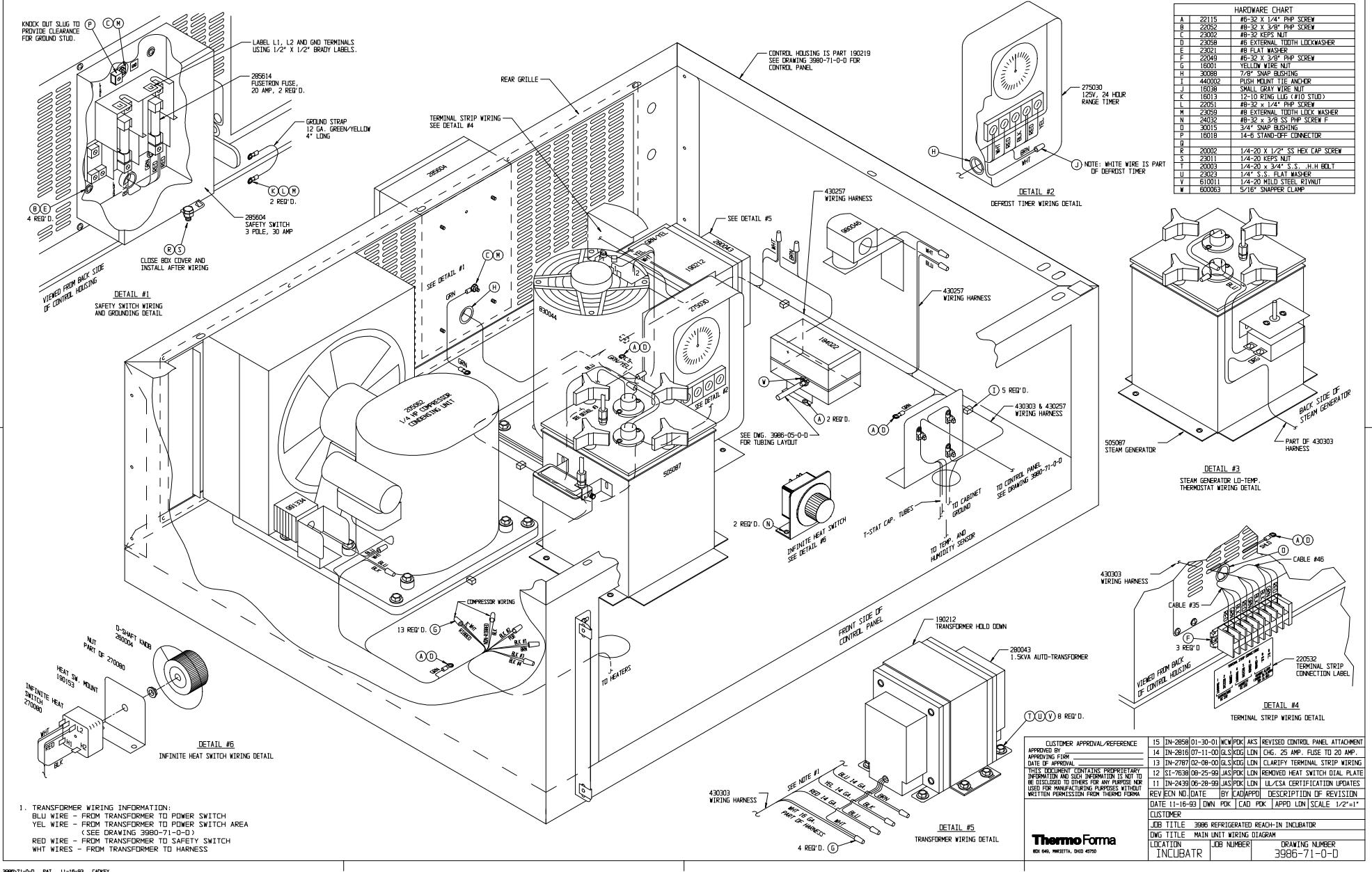
POTENTIOMETER & HOSE FITTING ASSEMBLY DETAIL



## RELAY WIRING DETAILS

CUSTOMER APPROVAL/REFERENCE		15 IN-2927 04-10-01 JSW JHK AKS	INSERT PANEL HOLE .0.375 TD .250
APPROVED BY APPROVING FIRM	16 IN-2658 01-30-01 NO KDN LKG	REVISED CONTROL PANEL ATTACHMENT	
DATE OF APPROVAL	17 SW-2689 11-14-01 JGJ GKG LKG	REVISED DOOR INFO	
THE INFORMATION CONTAINED, PROPRIETARY INFORMATION AND SUCH INFORMATION IS NOT TO BE DISCLOSED TO OTHERS FOR ANY PURPOSE NOR USED EXCEPT AS AUTHORIZED BY THE OWNER WITH WRITTEN PERMISSION FROM THEIR Firma		18 IN-2827 06-06-01 GLS LGS LON CHG 250200 REVISION TO 30045	
		19 IN-2439 06-28-99 JAS LON ADD DOOR CORD, RECEPT & CLAMP	
		20 IN-2439 06-28-99 JAS LON ADD DOOR CORD, RECEPT & CLAMP	
		21 IN-04-93 DWG PDK (CAD PDK APPD LON) SCALE 1/2"=1"	
CUSTOMER		JOB TITLE 3980-3906 REFRIGERATED REACH-IN INCUBATOR	
		DWG TITLE CONTROL PANEL WIRING DIAGRAM	
LOCATION	JOB NUMBER INCUBATR01	DRAWING NUMBER 3980-71-0-D	

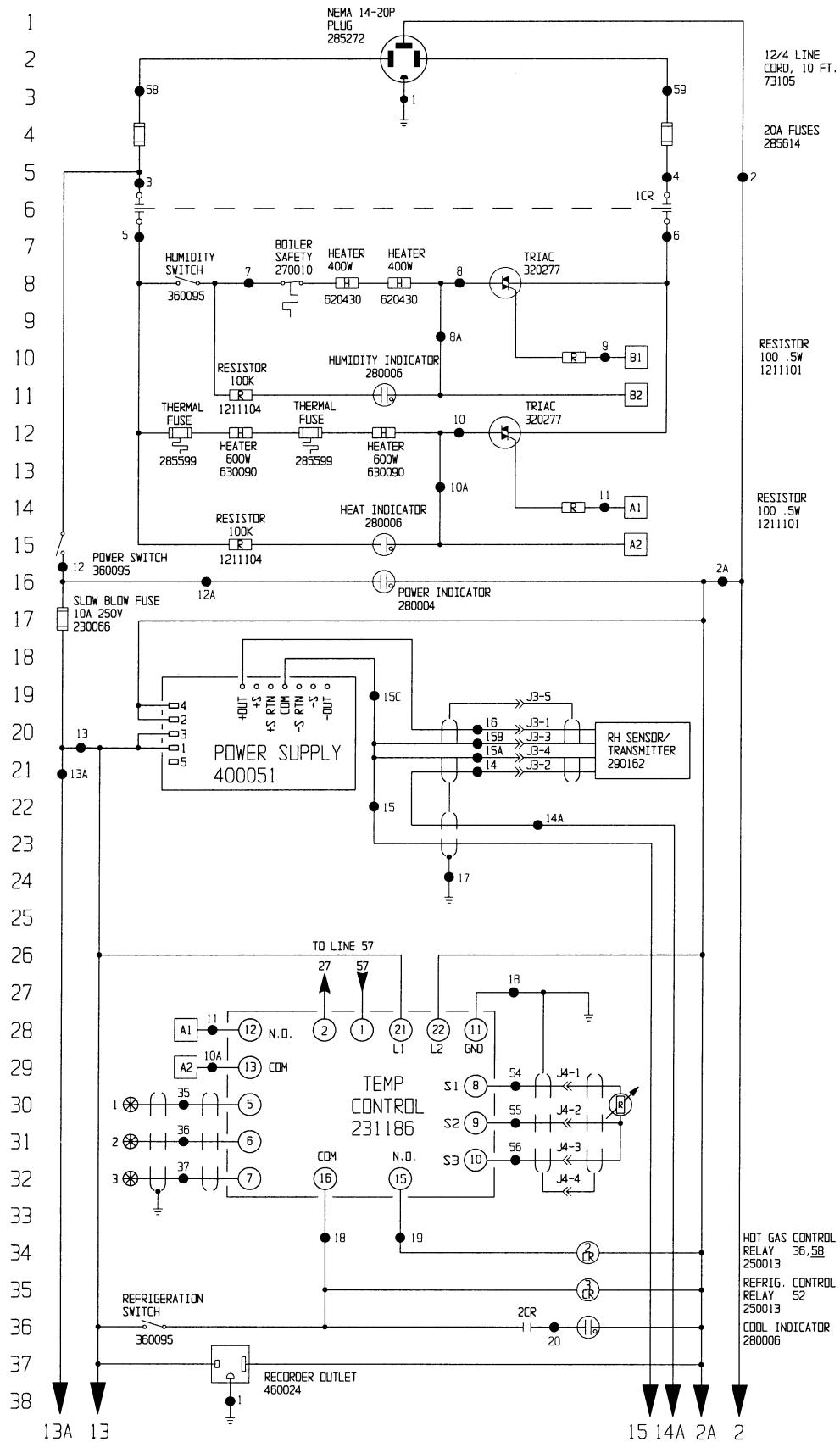




1. TRANSFORMER WIRING INFORMATION:  
BLU WIRE - FROM TRANSFORMER TO POWER SWITCH  
YEL WIRE - FROM TRANSFORMER TO POWER SWITCH AREA  
(SEE DRAWING 3980-71-0-D)  
RED WIRE - FROM TRANSFORMER TO SAFETY SWITCH  
WHT WIRES - FROM TRANSFORMER TO HARNESS

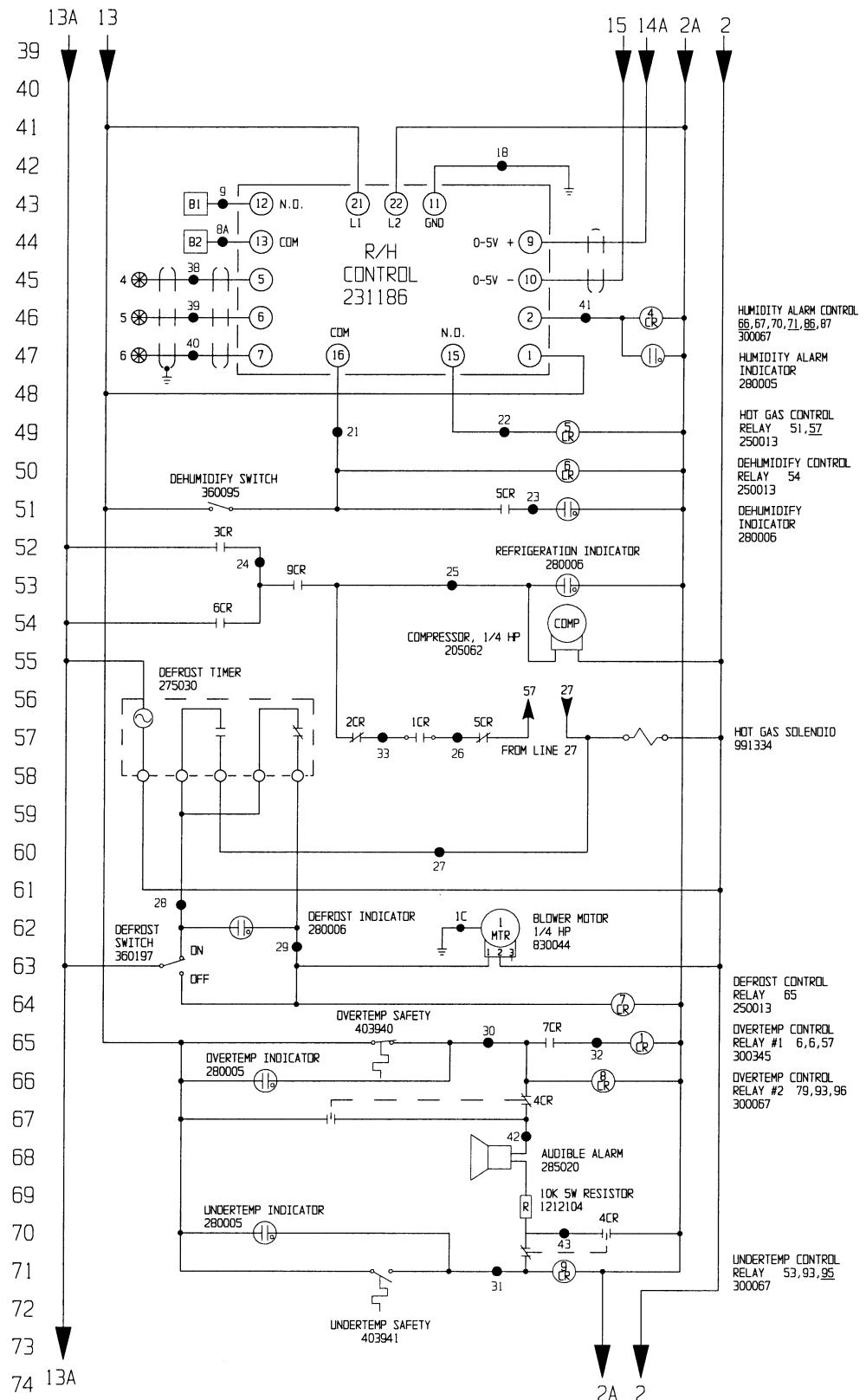
**Thermo Form**  
BOX 649, MARIETTA, OHIO 45750

POWER CONNECTION  
208-220V, 1PH, 3P, 4W, 60HZ, 14FLA



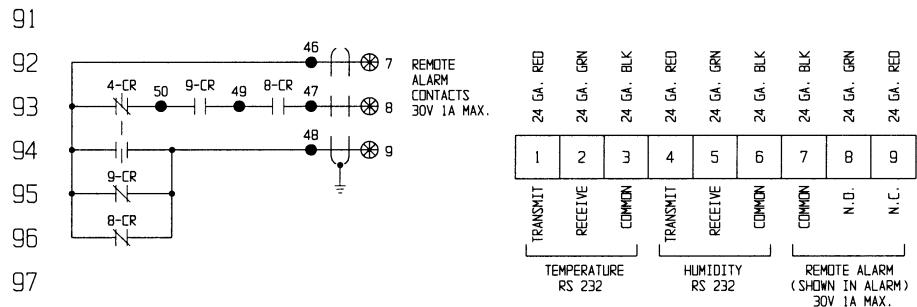
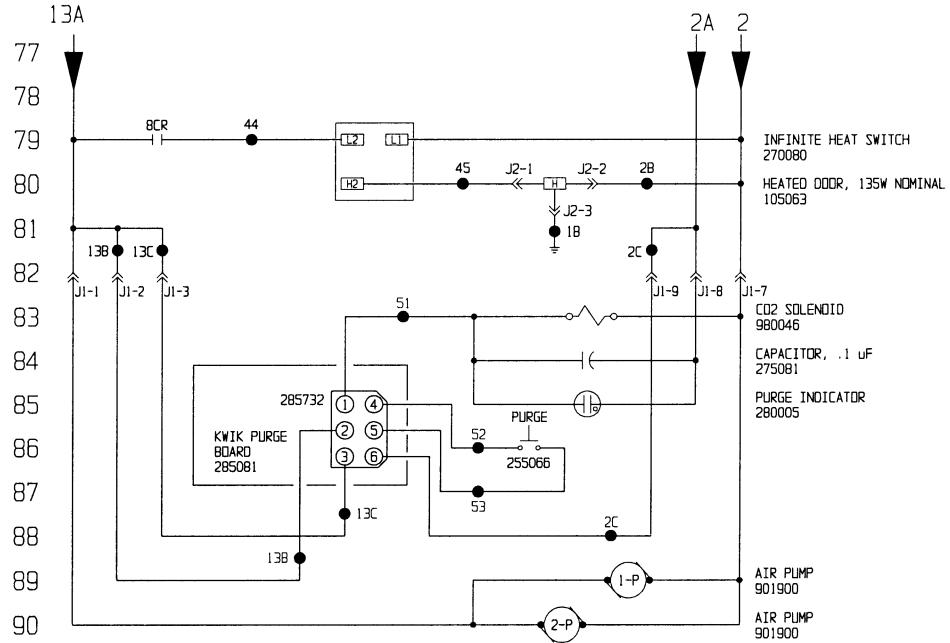
Electrical Schematic  
Model:  
3980  
Reach-In Incubator

3980-70-0-D REV. 18  
Page 1 of 3



Electrical Schematic  
Model :  
3980  
Reach-In Incubator

3980-70-0-D REV. 18  
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### WIRE CHART

WIRE NO.	GAUGE	COLOR	WIRE NO.	GAUGE	COLOR
1	12	GRN/YEL	14A	22	RED
1A	N/A	N/A	15	22	BLACK
1B	16	GRN/YEL	15A	22	BLACK
1C	14	GRN/YEL	15B	22	WHITE
2	14	WHITE	15C	22	BLACK
2A	20	WHITE	16	22	GREEN
2B	18	WHITE	17	22	SHIELD
2C	20	WHITE	18	20	RED
3	12	BLACK	19	20	ORANGE
4	12	RED	20	20	PURPLE
5	16	BROWN	21	20	RED
6	16	ORANGE	22	20	ORANGE
7	15	ORANGE	23	20	YELLOW
8	16	BLUE	24	16	BLUE
8A	20	BLUE	25	18	BLACK
9	20	RED	26	16	BLUE
10	16	PURPLE	27	18	BLACK
10A	20	PURPLE	28	18	RED
11	20	BLUE	29	16	YELLOW
12	16	YELLOW	30	20	BLUE
12A	20	YELLOW	31	20	ORANGE
13	20	BROWN	32	20	PURPLE
13A	16	BROWN	33	16	YELLOW
13B	20	BROWN	34	N/A	N/A
13C	20	BROWN	35	22	RED
14	22	RED			

### Terminal Strip Connection

TERMINAL	1	2	3	4	5	6	7	8	9
TRANSMIT	24 GA. RED	24 GA. GRN	24 GA. BLK	24 GA. RED	24 GA. GRN	24 GA. BLK	24 GA. BLK	24 GA. GRN	24 GA. RED
RECEIVE									
COMMON									

NOTES:  
 Denotes Terminal Strip Connection      Parts List Reference Number  
 9CR Last Relay Number       Assembly  
 9 Last Terminal Number       Panel  
 59 Last Wire Number       Refrigeration  
 Wiring

CUSTOMER APPROVAL/REFERENCE  
 APPROVED BY \_\_\_\_\_  
 DATE OF APPROVAL \_\_\_\_\_

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18 IN-2858 01-30-01 NOD KOG AKS ADDED 1C BLOWER MOTOR GROUND  
 17 IN-2869 11-14-00 GJG GJG LON REVISED DOOR INFO

16 IN-2816 06-27-00 GLS KOG LON MADE LINE CORD STANDARD

15 IN-2827 06-06-00 GLS GLS LON CHG 250200 CONTACTOR TO 300345

14 IN-2816 05-26-00 GLS KOG LON REV. ELECTRICAL POWER CONN. INFO

REV ECN NO. DATE BY CAD APPD DESCRIPTION OF REVISION

DATE 5-18-92 OWN ED CAD JO APPD LON SCALE NONE

CUSTOMER

JOB TITLE 3980 REACH-IN INCUBATOR

DWG TITLE ELECTRICAL SCHEMATIC

LOCATION INCUBATR JOB NUMBER DRAWING NUMBER

3980-70-0-D

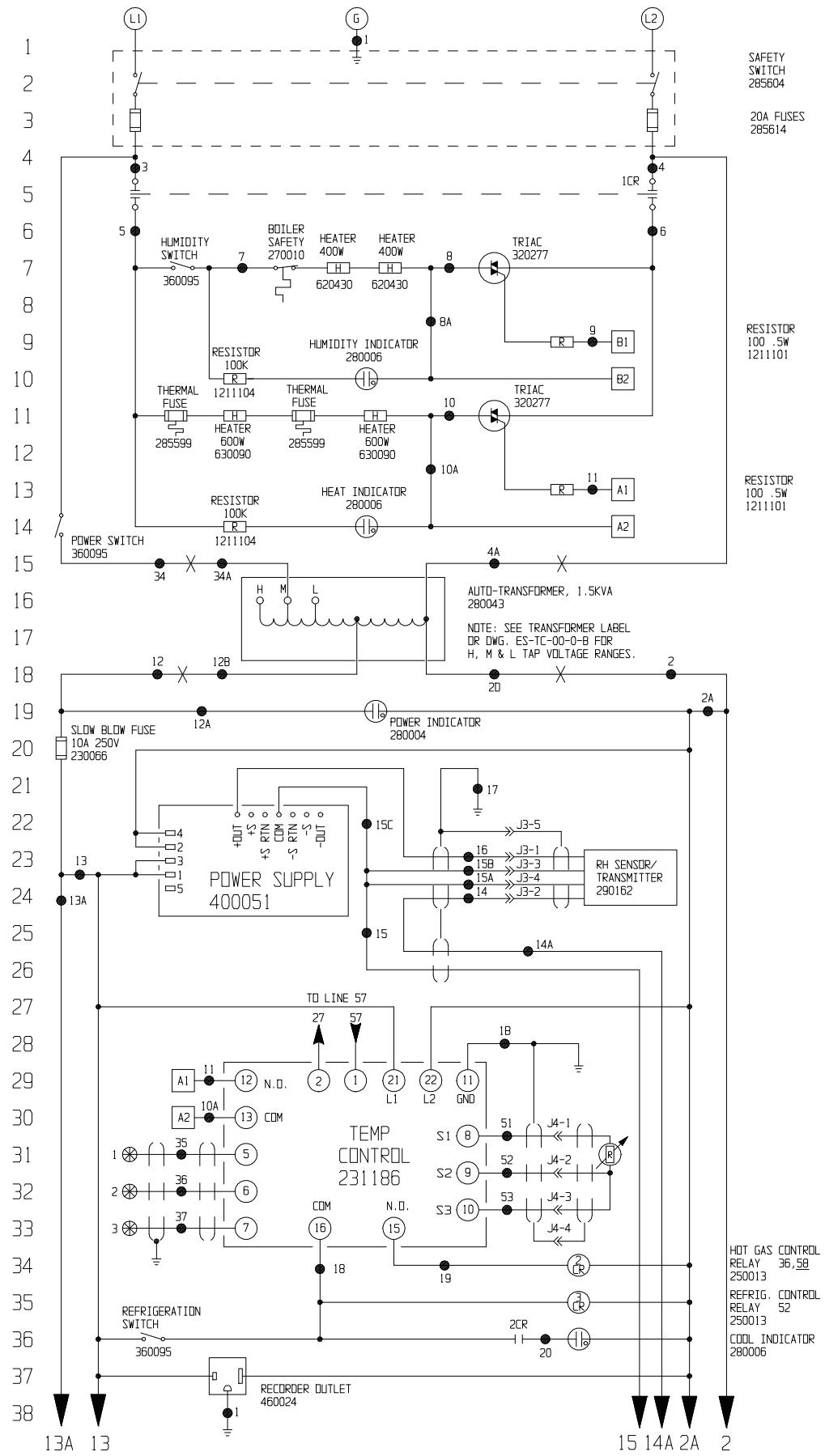
Electrical Schematic Model: 3980

Reach-In Incubator

3980-70-0-D REV. 18

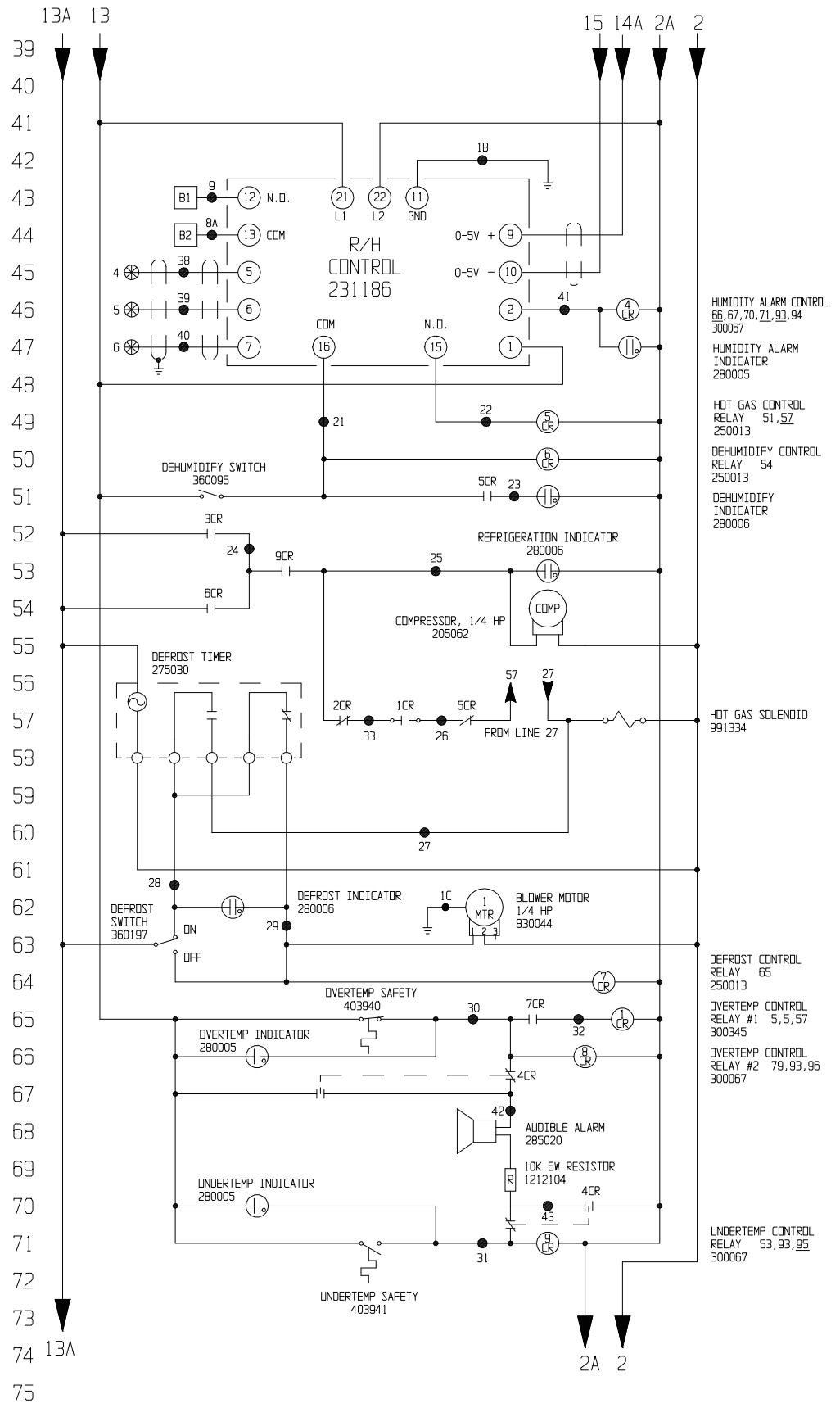
Page 3 of 3

POWER CONNECTION  
220-240V, 1PH, 2P, 3W, 50/60HZ, 14FLA



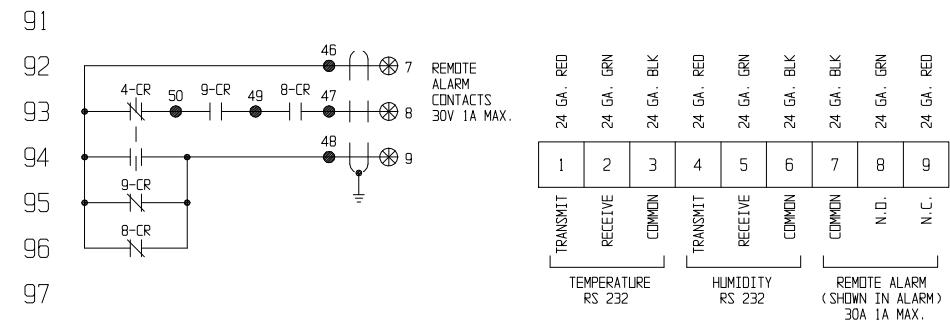
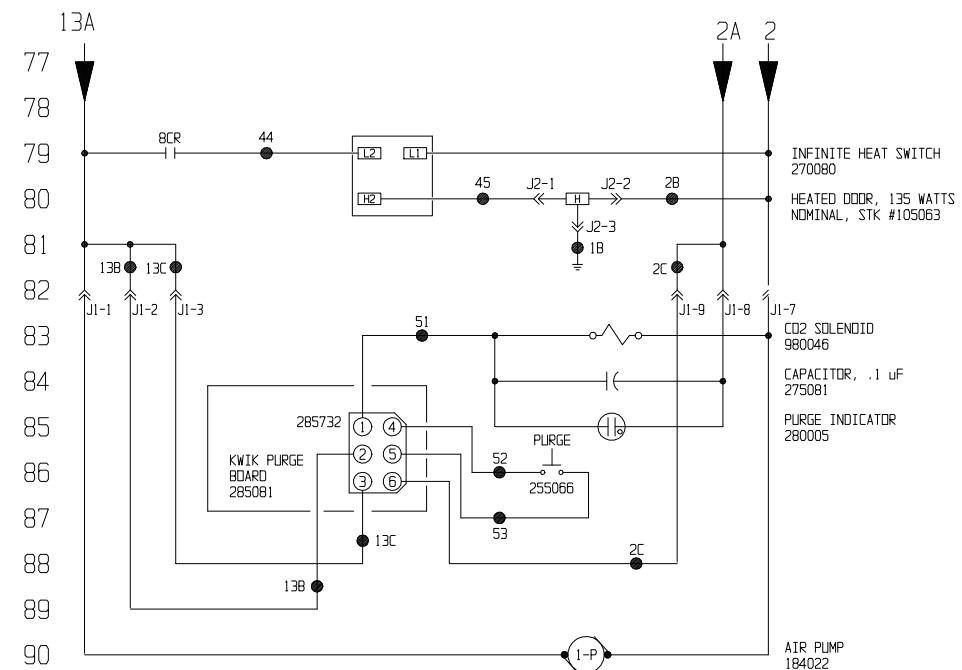
Electrical Schematic  
Model:  
3986  
Reach-In Incubator

3986-70-0-D REV. 21  
Page 1 of 3



Electrical Schematic  
Model:  
3986  
Reach-In Incubator

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Page 2 of 3



WIRE CHART

Terminal Strip Connection

WIRE NO.	GAUGE	COLOR	WIRE NO.	GAUGE	COLOR	WIRE NO.	GAUGE	COLOR
1	12	GRN/YEL	13B	20	BROWN	33	16	YELLOW
1A	N/A	N/A	13C	20	BROWN	34	16	YELLOW
1B	16	GRN/YEL	14	22	RED	34A	16	BROWN
1C	14	GRN/YEL	14A	22	RED	35	22	RED
2	14	WHITE	15	22	BLACK	36	22	GREEN
2A	20	WHITE	15A	22	BLACK	37	22	BLACK
2B	18	WHITE	15B	22	WHITE	38	22	RED
2C	20	WHITE	15C	22	BLACK	39	22	GREEN
2D	16	WHITE	16	22	GREEN	40	22	BLACK
3	12	BLACK	17	22	SHIELD	41	20	YELLOW
4	12	RED	18	20	RED	42	20	YELLOW
4A	16	BLUE	19	20	ORANGE	43	20	RED
5	16	BROWN	20	20	PURPLE	44	18	RED
6	16	ORANGE	21	20	RED	45	18	BLACK
7	16	ORANGE	22	20	ORANGE	46	24	BLACK
8	16	BLUE	23	20	YELLOW	47	24	GREEN
8A	20	BLUE	24	16	BLUE	48	24	RED
9	20	RED	25	18	BLACK	49	24	WHITE
10	16	PURPLE	26	16	BLUE	50	24	WHITE
10A	20	PURPLE	27	18	BLACK	51	20	BLUE
11	20	BLUE	28	18	RED	52	20	BLACK
12	16	YELLOW	29	16	YELLOW	53	20	RED
12A	20	YELLOW	30	20	BLUE	54	22	BLACK
12B	16	BLACK	31	20	ORANGE	55	22	WHITE
13	20	BROWN	32	20	PURPLE	56	22	RED
13A	16	BROWN				57	18	BROWN

NOTES:

④ Denotes Terminal Strip Connection	Parts List Reference Number
gCR Last Relay Number	○ Assembly
9 Last Terminal Number	□ Panel
56 Last Wire Number	□ Refrigeration
	□ Wiring

CUSTOMER APPROVAL/REFERENCE

APPROVING FIRM \_\_\_\_\_

DATE OF APPROVAL \_\_\_\_\_

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21 IN-2858 01-30-01 N/D KDG AKS ADDED 1C BLOWER MOTOR GROUND

20 IN-2869 12-22-00 GLG JGJ LDN REVISED DOOR INFO

19 IN-2816 06-27-00 GLS KOG LDN CHANGE 285615 FUSE TO 285614

18 IN-2827 06-06-00 GLS GLS LDN CHG 250200 CONTACTOR TO 300345

17 IN-2816 05-26-00 GLS KOG LDN REV. ELECTRICAL POWER CONN. INFO

REV ECN NO. DATE BY CAD/APPO DESCRIPTION OF REVISION

DATE 5-18-92 DWN ED CAD JD APPD LDN SCALE NONE

CUSTOMER \_\_\_\_\_

JOB TITLE 3986 REACH-IN INCUBATOR

DWG TITLE ELECTRICAL SCHEMATIC

LOCATION INCUBATR JOB NUMBER DRAWING NUMBER

INCUBATR 3986-70-0-D

Electrical Schematic

Model :

3986

Reach-In Incubator

3986-70-0-D REV. 21

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