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Models:

3940/3949

29 cu. ft. Capacity
Reach-In Incubator

Manual No. 7013940

Rev. 5

IMPORTANT!

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.







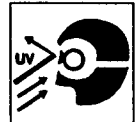
Caution: All internal adjustments and maintenance must be performed by qualified service personnel.

NOTE:

The material in this manual is for information purposes only. The contents and the product it describes are subject to change without notice. Forma Scientific, Inc. makes no representations or warranties with respect to this manual. In no event shall Forma Scientific, Inc. be held liable for any damages, direct or incidental, arising out of or related to the use of this manual.

MANUAL NO. 7013940			
---	IN-2103	7/96	Added shipping tape removal. heg
5	14683	2/96	Change Temp and Humidity Configuration
4	13887	7/95	Over temperature contactor changed.
3	13426	5/95	Added p-trap to installation. heg
2	12158	7/94	Updated refrigeration schematic, parts list and electrical schematic to reflect phenolic coated coil now standard.
1		4/94	Manual edited to current format.
REV	ECR	DATE	DESCRIPTION

General Safety Notes used in this Manual

	Important operating and/or maintenance instructions. Read the accompanying text carefully.
	Potential electrical hazards. Only qualified persons should perform procedures associated with this symbol.
	Extreme temperature hazards. Do not touch. Proper protective equipment and procedures must be used.
	Potential biological hazards. Proper protective equipment and procedures must be used.
	Equipment being maintained or serviced must be turned off and locked off to prevent possible injury.
	Hot surface(s) present which may cause burns to unprotected skin or to materials which may be damaged by elevated temperatures
	Potential eye damage may result from viewing the light produced by ultra violet light sources installed in this equipment. Never work in this unit with the ultra violet light operating.

- √ 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 Forma Scientific, Inc. ends when the merchandise is loaded onto the carrier's vehicle.

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

Whenever possible, Forma Scientific, Inc. 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 3 inches clearance is required at the rear of the incubator to facilitate adequate air flow around the refrigeration system.

2.2 Removing the shipping tape

Adhesive shipping tape is applied to the screws securing the perforated duct sheet to the rear side wall of the chamber. Remove this tape when preparing the incubator for operation.

2.3 Water (Humidity System) and Drain Connections

a. Connecting the Water Inlet for the 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 water used in the incubator humidifier reservoir must be within the 50K Ohm to 1 Meg 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 the 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 4.2, Cleaning the Humidity Generator and Immersion Heaters.

b. Connecting the Drain Line

The cabinet's 3/8" MPT drain line connection is located on the rear (lower left side) of the cabinet. A P-trap (Figure 2-1) is included with the unit and must be installed on the connection. To install the drain connection:

1. Using Teflon pipe thread tape, tape the threads on the cabinet drain connection.
2. Using an open end adjustable wrench, install the P-trap onto the connection. Make sure that the trap is positioned *down*.
3. Push a piece of 3/8" ID tubing onto the trap and direct the tubing to a convenient drain. Install a hose clamp on the tubing, if desired.

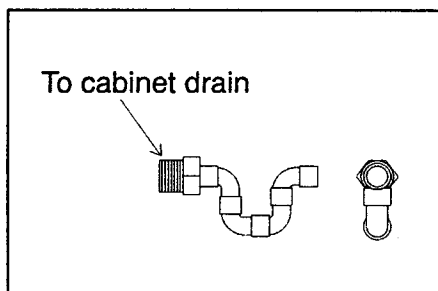


Figure 2-1
Cabinet drain p-trap

2.4 Power Connection

The electrical junction box is located on the rear top section of the incubator. With the junction box switch OFF, connect the incubator to an adequate power source. See the electrical data plate mounted on the unit for exact electrical specifications.

2.5 Start-Up Procedure

When the humidification system is operational, the incubator may be started. Preset the controls as follows:

Overtemp Safety Thermostat..... (Fully Clockwise)
 Undertemp Safety Thermostat..... (Fully Counter-clockwise)
 Main Power Switch.....ON
 Humidity Controller.....Desired Setpoint
 Temperature Controller.....Desired Setpoint

For best overall performance the refrigeration switch should be turned on for most applications. When running Low/No humidity, at 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.

2.6 Setting the Overtemp Safety Thermostat

Allow 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.

2.7 Setting the Undertemp Safety Thermostat

Allow the chamber temperature and humidity to stabilize then 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.

SECTION 3 - CONTROL PANEL OPERATION

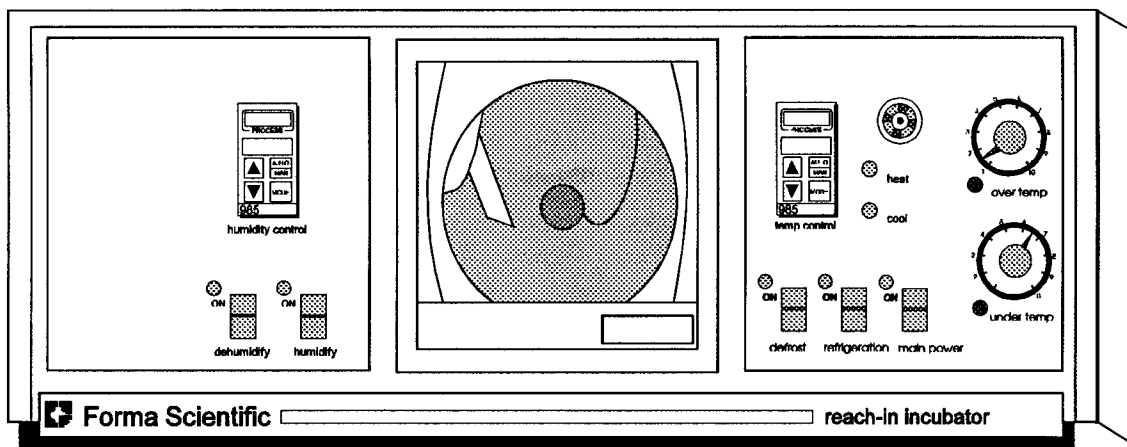


Figure 3-1
Model 3940, Control panel

3.1 Main Power Switch and Indicator Light (Refer to Figure 3-2)

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

3.2 Refrigeration Switch and Indicator Light (Refer to figure 3-2)

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 (Refer to Figure 3-2)

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

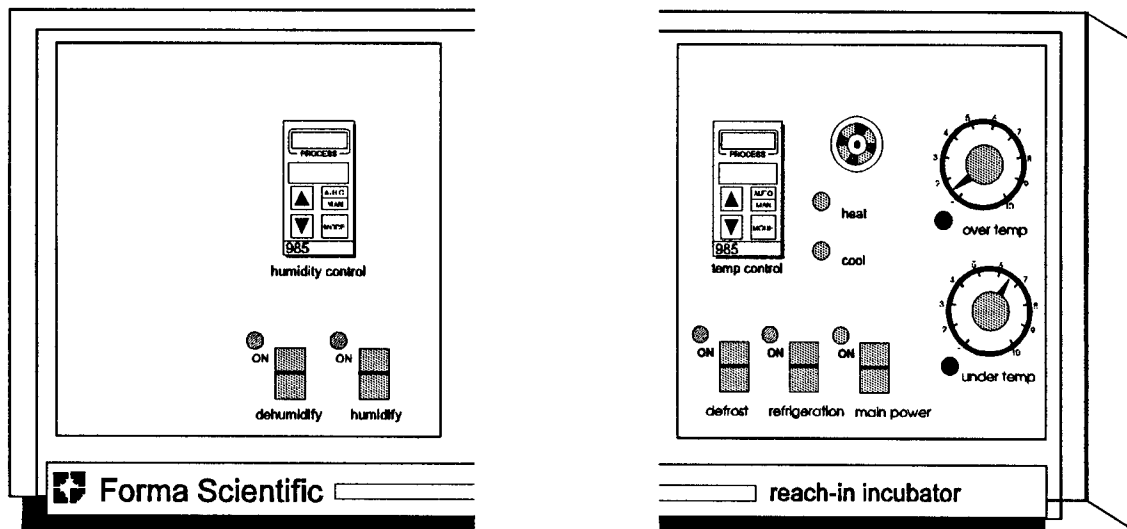


Figure 3-2
Control Panel Detail

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.
2. Shut off 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. When 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 (Refer to Figure 3-2)

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 Humidify Switch and Indicator Light (Refer to Figure 3-2)

The humidify switch controls the power to the humidification system circuit. The heaters will operate *only* if there is a sufficient amount of water in the humidification system. The humidity indicator lights when the humidify switch is on.

3.7 Dehumidify Switch and Indicator Light (Refer to Figure 3-2)

When the dehumidify switch is on, power to the humidification system heaters are turned off, and the refrigeration system comes on to provide control for drying. The dehumidify indicator lights when the dehumidify switch is on. When a defrost cycle occurs, the dehumidify light may cycle on and off to reflect the action of the humidity controller. The dehumidify switch should be on when:

- The incubator is being operated without refrigeration
- A lower level of RH (above ambient) is desired.

Humidity removed from the cabinet is processed through the evaporator in the refrigeration system.

3.8 Temperature/Humidity Controllers

The incubator features separate but identical, microprocessor based controllers, that control the temperature and humidity functions of the incubator.

The controllers have been factory-configured with LOC 2 level of operator lock-out to operate in the Auto mode. This lock-out level permits setpoint adjustment *only*. Use the up and down arrow keys to set the temperature and humidity value. Use Figure 3-3 to become familiar with the microprocessor controller and the keypad function.

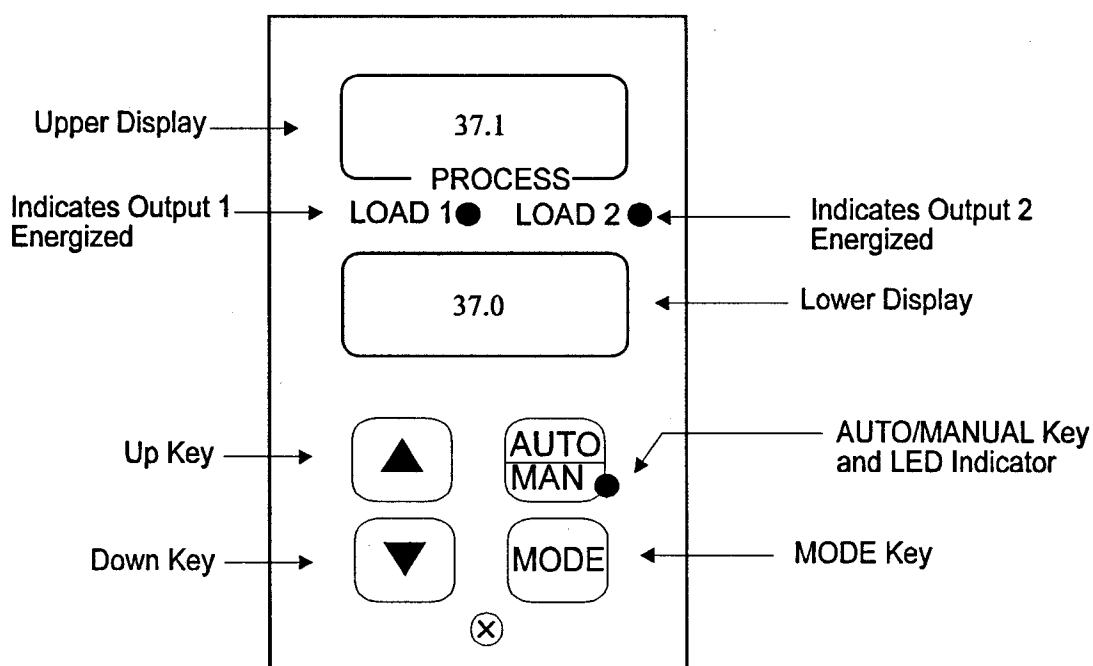


Figure 3-3
Microprocessor Controller

UP/DOWN Keys: When both keys are pressed simultaneously for 3 seconds, the Setup Menu appears displaying the LOC parameter. Press both keys again and the Calibration Menu appears.

UP Key: Press to increase the value by one. Press and hold to increase the value rapidly.

DOWN Key: Press to decrease the value by one. Press and hold to decrease the value rapidly.

AUTO/MAN Key: Press *once* to clear an alarm. Press the key twice within 5 seconds and the controller toggles between the auto and manual operation. When in Manual mode, percent power is displayed in the lower display.

Note: Manual operation has been locked-out on this application.

AUTO/MANUAL LED: The LED lights when the control is in manual operation. The LED blinks to indicate that the controller is toggling between auto and manual operation. After five seconds without pressing the Auto/Manual key, the LED stops blinking and returns to its previous state.

3.9 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 the manual.

3.10 Door Lighting (Optional)

The optional, factory-installed door lighting package provides light to the incubator chamber. The package consists of four fluorescent lamps, mounted on the inside of the door, a twenty-four hour timer, and a three position light selector switch.

The switch has Auto, Manual and Off positions. The Manual and Off positions turn the lights on and off *manually*.

The Auto position places the lights under the control of the timer. Program the timer as follows:

1. Set the OFF trippers by pushing them outward from the center of the dial to control the desired off-time.
2. Set the ON trippers by pushing them toward the center of the dial to control the desired on-time. The orange or red band is exposed when the trippers are on.

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 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.

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

Caution: 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 with a solution of ammonia and water.

4.2 Cleaning the Humidity Generator and Immersion Heaters



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

Depending upon the quality of water used in the humidification system, it may be necessary to clean the humidity generator and immersion heaters, every 2 to 3 months.



Always allow the humidity system to cool down before attempting to clean the humidity generator. Steam can cause severe burns.

Open the front of the control panel to gain access to the steam generator. Grasp the left side of the control panel housing and pull it gently, but firmly, up and out.

The steam generator is the "box" in the center of the component area.

Remove the four large plastic nuts securing the lid of the steam generator. The heaters and thermostat are mounted through the lid. Remove the lid to gain access to the heaters.

Clean the humidity generator with Lime-Away™ (or a similar product), following the manufacturer's instructions on the package. The heaters may be cleaned using a Scotch-Brite™ pad and a common abrasive household cleanser. After cleaning, flush thoroughly with water having a quality within the 50K Ohm to 1 Meg Ohm range.



Do not use solutions of sodium hypochlorite (bleach).

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, open the control panel and grasp the left side of the control panel housing. Pull it gently, but firmly, up and out.

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 remove 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.
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.

Dual pen recorders have the stainless steel probe plus a wet bulb probe attached to the back of the mounting plate. Remove the screws securing the mounting plate and slide the wet bulb probe out of its 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. Open the control panel door, and 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.

IMPORTANT:

Use extreme care when installing the new recorder to avoid severely bending 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 Carpenter's horses 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.

Note: Route all the probes between the duct sheet and the outside wall of the chamber so that when the top is raised, all 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 (up to 90 degrees) by grasping the left side and pulling out until the catch releases.
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 severely bending them.
 - Mounting the temperature and/or humidity sensor bulbs on the mounting brackets.
 - Tightening the top mounting bolts alternately, to ensure a balanced pressure on the gasket.

5.6 Calibration Offset (Refer to Figure 5-1)

It may become necessary to calibrate the temperature offset to match an independent thermometer. The controller must first be changed from operator Lock-Out level 2, as it was configured from the factory, to Lock-Out level 0.

The Setup Menu displays the parameters that configure the microprocessor features to the user's application.

To enter the Setup Menu press the UP and DOWN keys *simultaneously* for three seconds. The Lower Display shows the LOC parameter and the Upper Display shows its current level. All keys are inactive until the keys are released.

Scroll through the menu using the MODE key and select Setup data using the UP/DOWN keys. Depending upon the controller's model number and configuration, some parameters may not appear on the menu. After scrolling through the menu, the controller will return to the control setpoint parameter under the Operation Menu.

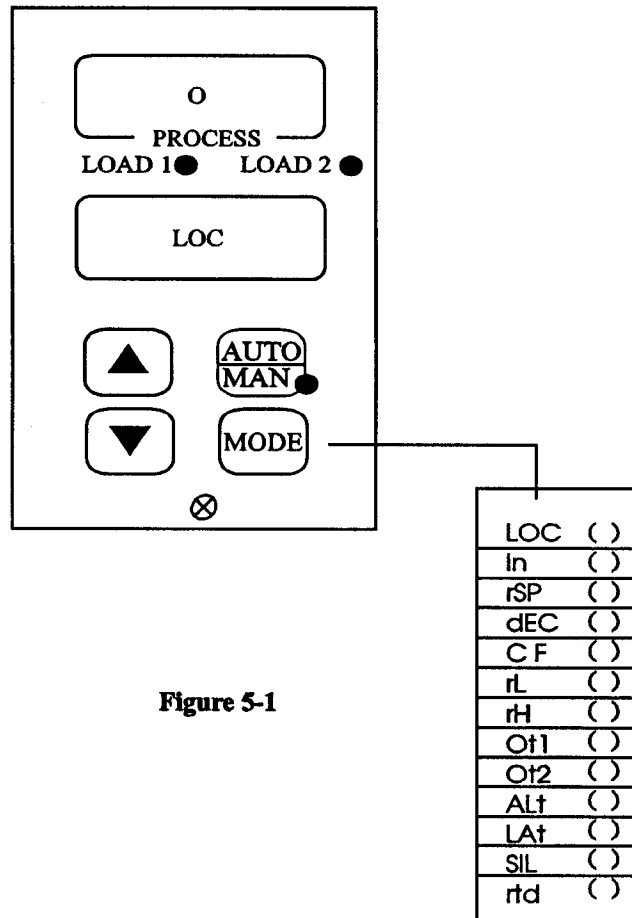


Figure 5-1

SETUP PARAMETERS

At the top of the menu, the controller displays the user level of operation in the Upper display, and LOC parameter in the Lower display. When pressing the MODE key, the value of the next parameter appears in the Upper display, and the parameter itself in the Lower display.

LOCK Selects the level of operator lock-out. This parameter's range is from 0-3. The factory default is 2. The levels of operator lock-out are defined as follows:

LOC 0: All operating parameters may be viewed or changed. Manual operation is permitted.

LOC 1: The setpoint and actual are the only visible parameters the setpoint is adjustable in this level of lock-out. Manual operation *is* permitted.

LOC 2: The setpoint and actual are the only visible parameters, the setpoint is adjustable in this level of lock-out. Manual operation is *not* permitted. Bumpless transfer is defeated.

LOC 3: The setpoint and actual are the only visible parameters, the setpoint is *not* adjustable in this level of lock-out. Manual operation is *not* permitted. Bumpless transfer is defeated.

Note: Select the "LOC 0" level to change the CALIBRATION OFFSET parameter. Press the "MODE" key to cycle through the menu until "CAL" appears in the display.

The Calibration Offset range is from +/-55C. The default is 0C. Calibration Offset adds or subtracts degrees from the input signal. Match the Calibration Offset displayed value with the independent test instrument value.

5.7 Controller Configuration

The controllers have been pre-configured at the factory. Reference copies of the Configuration records are included with the manual.



The controller should not be re-configured without first consulting Forma Scientific, Inc., Service Department at 1-800-848-3080.

TEMPERATURE CONFIGURATION

Operation Parameters	Value	Range	Factory Default
Pb1	2.0	0 to 999°F/0 to 555°C or 0 to 99.9°F/0 to 55.5°C 0=ON/OFF control with 3°F or 1.7° switching differential. 0.3°F or 0.17°C for 0.1° units.	25°F/13°C (3 or 4 digit)
Pb2	1.0	Same as Pb1. Only appears if Ht/CL or CL/Ht operation.	0°F/0°C (3 or 4 digit)
rE1	0.50	0.00 to 9.99 repeats/min. 0.00=No Reset Action	0.00 repeats/min.
rE2	0.25	Same as rE1. Appears only if Ht/CL or CL/Ht operation. Will not appear if Pb2=0.	0.00 repeats/min.
rA1	0.19	0.00 to 9.99 min. 0.00= No Rate Action	0.00 min.
rA2	0.25	Same as rA1. Only appears if Ht/CL or CL/Ht operation. Will not appear if Pb2=0.	0.00 min. -99° -999°
Ct1	5	1 to 60 seconds	
Ct2	30	1 to 60 seconds Appears if Ht/CL or CL/Ht. Will not appear if PB2=0.	0
db	0.0	±99°F (±55°C)	0
CAL	0.0*	Appears if Ht/CL or CL/Ht. ±99°F (±55°C)	0
AUt	0	0-3 Appears if Ot1 = Ht.	
LOC	0*	0-3	0
In	0-5	J, K, t, n, Pt2, rtd, rt.d, 0-5, 420 Depending upon model number.	J
DEC	0.0	0, 0.0 or 0.00 Depending upon input type.	0
rL	-20.0	rL to rH	Input selection
rH	80	rH to rL	Input selection
Ot1	ht	Ht or CL	Ht
Ot2	CL	Ht, CL, AL or no	Al

*CAL is used to make display agree with test instrument.

Rev 3, 2/19/96

HUMIDITY CONFIGURATION

Operation Parameters	Value	Range	Factory Default
Pb1	7	0 to 999°F/0 to 555°C or 0 to 99.9°F/0 to 55.5°C 0=ON/OFF control with 3°F or 1.7° switching differential. 0.3°F or 0.17°C for 0.1° units.	25°F/13°C (3 or 4 digit)
Pb2	2	Same as Pb1. Only appears if Ht/CL or CL/Ht operation.	0°F/0°C (3 or 4 digit)
rE1	0.01	0.00 to 9.99 repeats/min. 0.00=No Reset Action	0.00 repeats/min.
rE2	0.00	Same as rE1. Appears only if Ht/CL or CL/Ht operation. Will not appear if Pb2=0.	0.00 repeats/min.
rA1	1.33	0.00 to 9.99 min. 0.00= No Rate Action	0.00 min.
rA2	0.00	Same as rA1. Only appears if Ht/CL or CL/Ht operation. Will not appear if Pb2=0.	0.00 min. -99° -999°
Ct1	5	1 to 60 seconds	
Ct2	30	1 to 60 seconds Appears if Ht/CL or CL/Ht. Will not appear if PB2=0.	0
db	0.0	±99°F (±55°C)	0
CAL	0.0*	Appears if Ht/CL or CL/Ht. ±99°F (±55°C)	0
AUt	0	0-3 Appears if Ot1 = Ht.	
L-4		L or r. Appears if rSP = 0-5 or 420	
LOC	0*	0-3	0
In	0-5	J,K, t, n, Pt2, rtd, rt.d, 0-5, 420 Depending upon model number.	J
DEC	0	0,0.0 or 0.00 Depending upon input type.	0
rL	30	rL to rH	Input selection
rH	95	rH to rL	Input selection
Ot1	ht	Ht or CL	Ht
Ot2	CL	Ht, CL, AL or no	Al

*CAL is used to make display agree with test instrument.

Rev 3, 2/19/96

5.8 Handling Error Codes on the Microprocessor

Note: Microprocessor errors may originate from the following conditions:

- Electrical noise
- A noise event
- Excess environmental moisture
- Excess environmental temperature

If error cause is not otherwise apparent, check for the following listed below.

Three dashes, "---", in the upper display indicates a microprocessor error.

If operator access is LOC 0 or 1:

Press the AUTO/MAN key twice to see the error code for one second.

If operator access is LOC 2 or 3:

The error code is already in the lower display. Listed below are the error code definitions and actions.

Er 1 - Sensor overrange error

The sensor input is generating a value that is higher than that allowed for the range of this sensor, or the A/D circuitry is not functioning properly.
Enter a valid input.

Er 2 - Sensor underrange error

The sensor input is generating a value that is lower than that allowed for the range of this sensor, or the A/D circuitry is not functioning properly.
Enter a valid input.

Er 3 - Ambient error

Check the specification for the ambient temperature range.

Er 4 - Configuration error

The unit's microprocessor is faulty; call the factory.

Er 5 - Non volatile checksum error

The nonvolatile memory checksum has discovered a checksum error. Unless a momentary power interruption occurred while the unit was storing data, the nonvolatile memory is bad. Call the factory.

Er 7 - A/D overflow error

The A/D circuit is over-or under-range. An open or reversed polarity sensor is the most likely cause. Check the sensor; if it is connected and functioning properly, then call the factory.

To clear a corrected error:

Cycle power to the control. (Turn the main power switch Off and back to ON).

SECTION 6 - SPECIFICATIONS

Temperature

Control	±0.1°C @ +37°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	±0.3°C at 25°C to 37°C with six shelves installed*

CO₂ 3980/3986 (Only)

CO ₂ 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) per 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" (5.1 cm) 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)
Shipping	
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	±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. (.946 liter)

Fittings

Fill Port	1/4" compression
Drain Port	3/8" OD Copper
CO ₂ Inlet	1/4" compression 3980 (3986)

Unit Heat Load

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

Refrigeration

Compressor	1/4 Horsepower, air-cooled
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Electrical

3940/3980	220 Volts AC 60HZ, 1PH, 17.0 FLA
(3949/3986)	220-240 Volts AC 50HZ, 1PH, 17.0 FLA
Power Switch	1 Pole
Line Cord	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.*

SECTION 7 - PARTS LIST

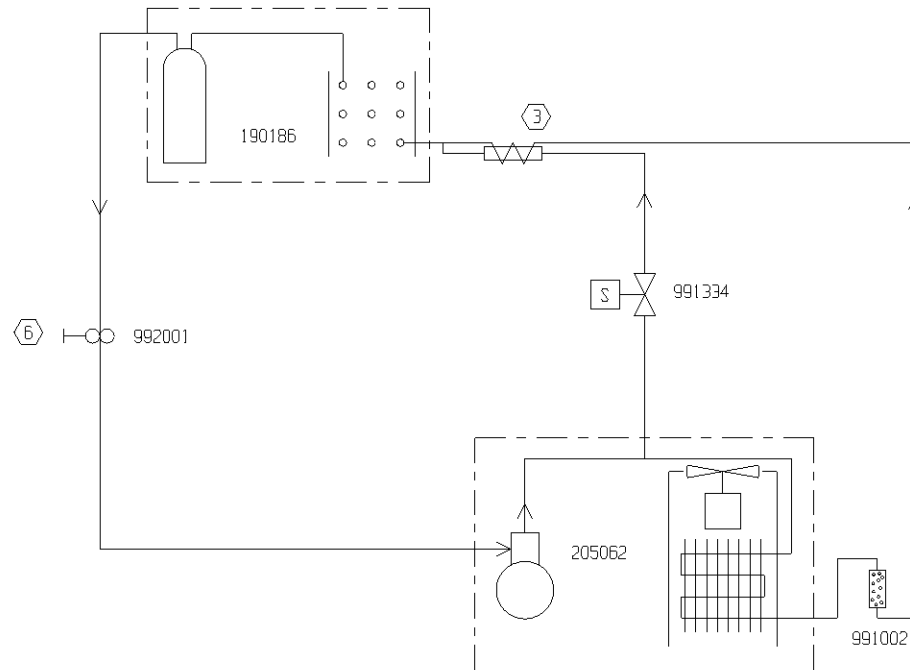
Model 3940 - Parts

STOCK #	DESCRIPTION
231161	Sensor RH/Temp
231159	RH/Temp Control Signal Board
231160	Controller, Microprocessor
250013	Relay, DPDT, 10A, 120V
250200	Contactor, 3P, 25A, 120V
403941	B-20, 10 to 220F
320277	Triac, 25A
285604	Safety Switch, 3P, 30A
285615	Fuse, Fusetron, 25A
403940	T-Stat. B10, Snap
620430	Heater, Steam Generator
900052	Float
270010	T-Stat. B10, (Steam Generator)
190467	P-Trap

Model 3940 - Parts (addition to above)

280043	1.5 KVA Transformer
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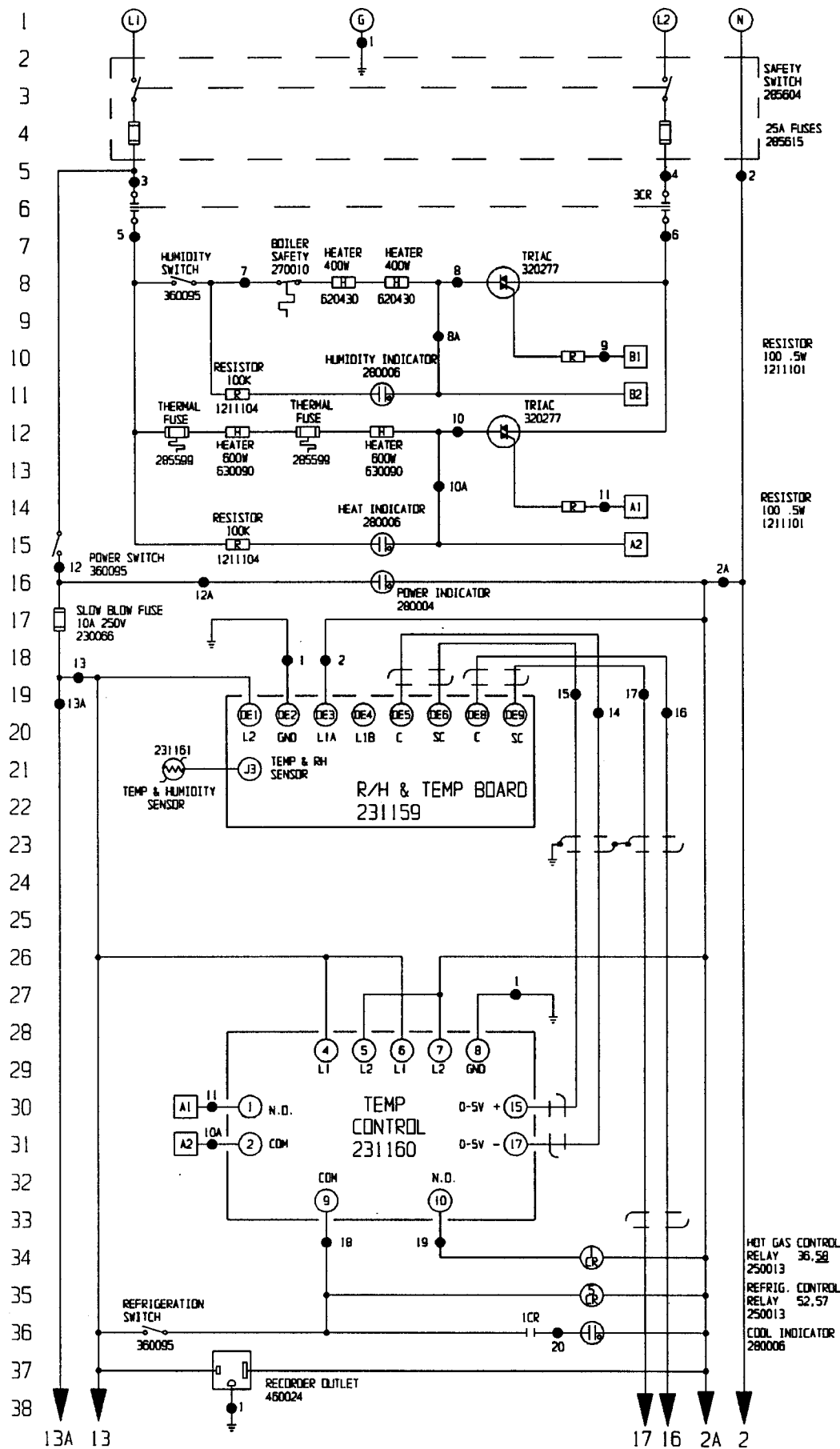
SECTION 8 - SCHEMATICS

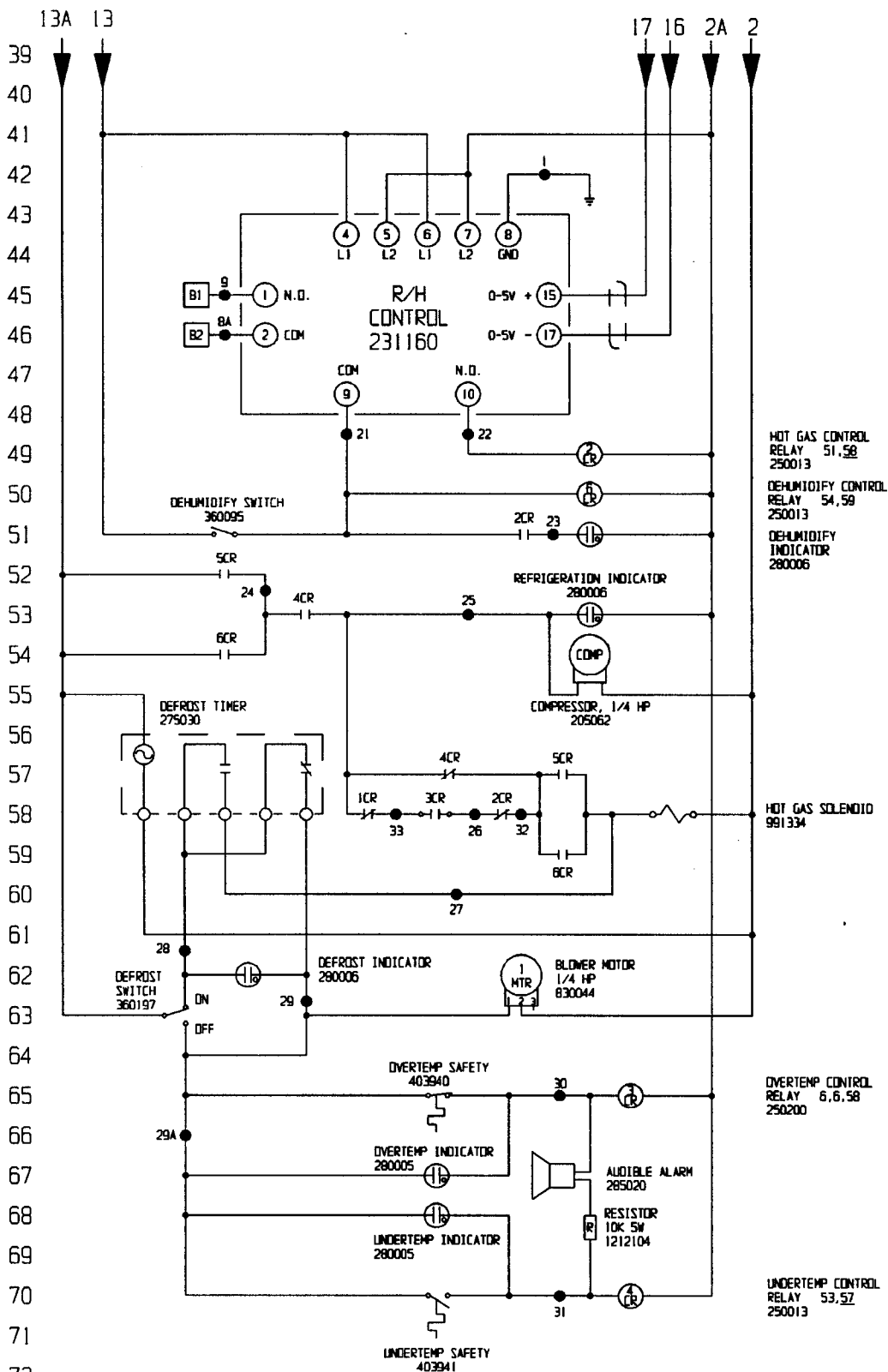


6. CAP TUBE ITEM **3** , 6' OF .050
5. WRAP 5' OF CAP TUBE TO 1/2" HOT GAS TUBE.
4. SUCTION LINE: 3/8" O.D.
3. HOT GAS LINE: 1/4" O.D.
2. SET CPR VALVE **6** AT 25 LBS.
1. REFRIGERANT 134A: 13.5 OZS.

CUSTOMER APPROVAL/REFERENCE							
APPROVED BY _____							
APPROVING FIRM _____							
DATE OF APPROVAL _____							
THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION IS NOT TO BE DISCLOSED TO OTHERS FOR ANY PURPOSE NOR USED FOR MANUFACTURING PURPOSES WITHOUT WRITTEN PERMISSION FROM FORMA SCIENTIFIC							
Forma Scientific BOX 649 MARIETTA, OHIO 45750 TELEX 24-5304 TOLL FREE USA 800-848-3080, OHIO 614-373-4763							
1	IN-1718	03-08-94	JHV	POK	LDN	134A REFRIGERANT NON-CFC REVISION	
REV	ECN NO.	DATE	BY	CAD	APPD	DESCRIPTION OF REVISION	
DATE	01-25-93	OWN	LDC	CAD	LDC	APPD	LDN SCALE NONE
CUSTOMER							
JOB TITLE 190219 REFRIG. TOP HOUSING							
DWG TITLE REFRIGERATION SCHEMATIC							
LOCATION			JOB NUMBER		DRAWING NUMBER		
STKND001					190219-90-0-B		

POWER CONNECTION
208-220V, 1PH, 3W, 60HZ, 13FLA





Electrical Schematic
Forma Models:
3940 and 4940

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WIRE CHART

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

NOTES:

⊗ Denotes Terminal Strip Connection	Parts List Reference Number
BCR Lost Relay Number	○ Assembly
N/A Lost Terminal Number	○ Panel
33 Lost Wire Number	○ Refrigeration
	□ Wiring

CUSTOMER APPROVAL/REFERENCE	
APPROVED BY _____	DATE OF APPROVAL _____
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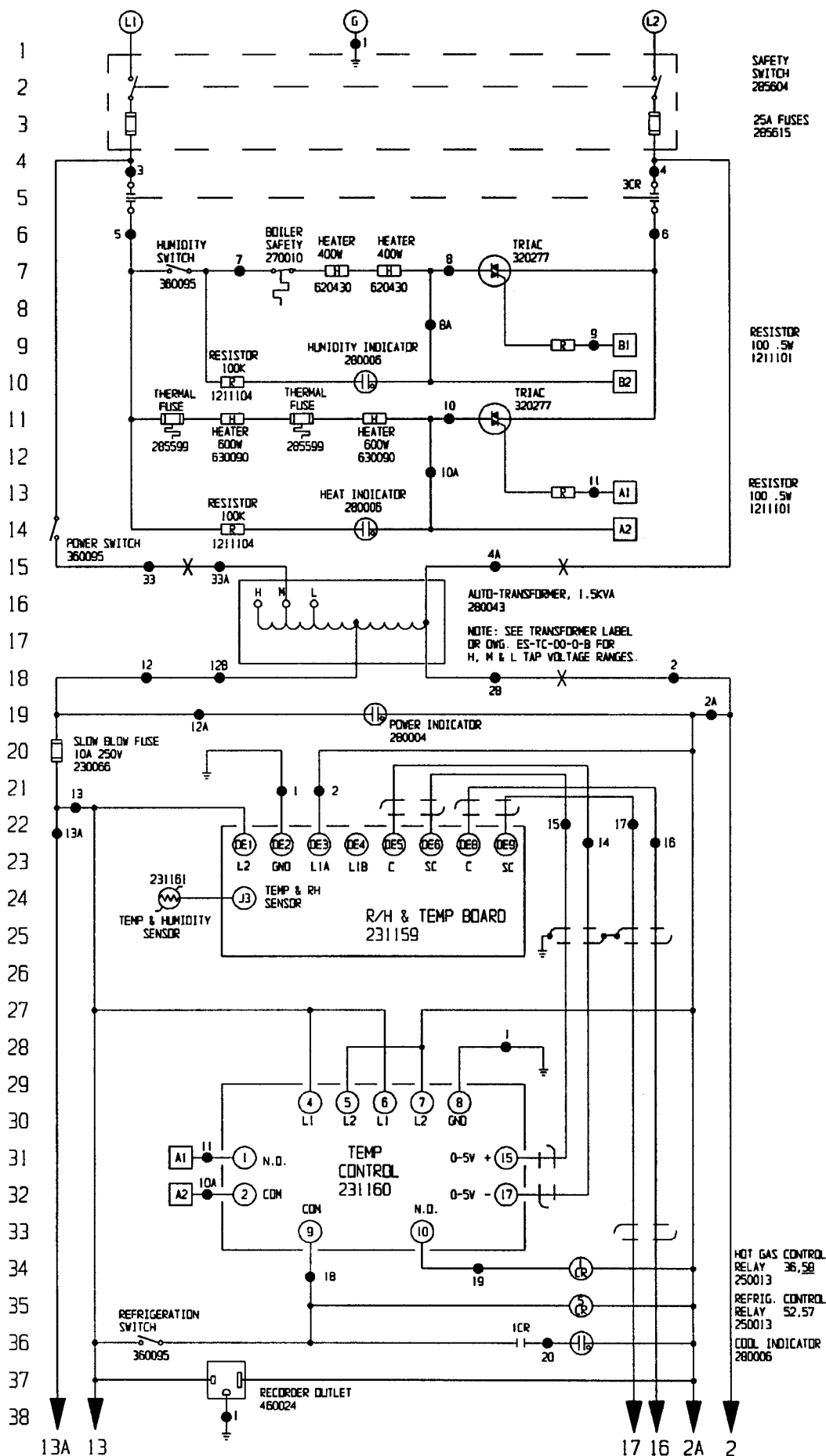
Forma Scientific

BOX 640 MARIETTA, OHIO 45750 TELE 31-3281
TELE FREE USA 800-948-2889, OHIO 614-373-4783

7	SI-4458	11-17-95	LON	KDG		CHG. TO PHENOLIC COATED T-STAT
6	IN-1959	07-17-95	JAS	POK	LON	REVISED SOLENOID WIRING
5	IN-1718	06-19-95	JHV	POK	LON	R-134A REFRIGERANT NON-OPC REVISION
4	IN-1740	03-02-94	JAS	KDG	LON	CHG. STK# 250012 TO STK# 250013
3	IN-1685	11-9-93	JAS	JAS	LON	REV. SPECS, RELAY LINE REF.
REV	ECN NO.	DATE	BY	CAD	APPO	DESCRIPTION OF REVISION
DATE	5-18-92	DWN	ED	CAD	JO	APPO LON SCALE NONE
CUSTOMER						
JOB TITLE 3940/4940 REACH-IN INC. (REL. 2)						
DWG TITLE ELECTRICAL SCHEMATIC						
LOCATION		JOB NUMBER		DRAWING NUMBER		
INCLUBATR				3940-70-0-D		

Electrical Schematic
Forma Models:
3940 and 4940

POWER CONNECTION
220-240V, 1PH, 2W, 50/60HZ, 13FLA




Electrical Schematic Forma Models: 3949 and 4949

3949-70-0-D Rev. 7
Page 1 of 3

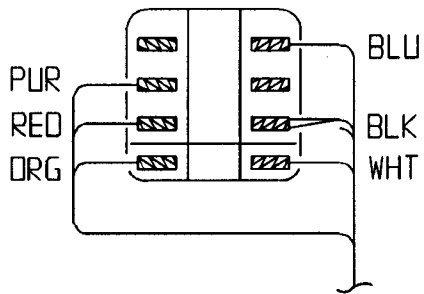
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WIRE CHART

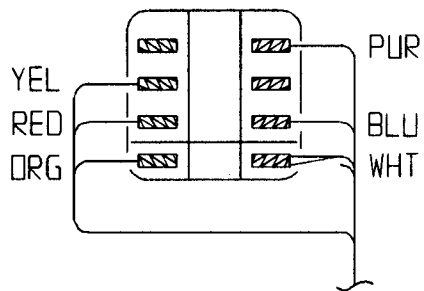
WIRE NO.	GAUGE	COLOR
1	16	GREEN
2	16	WHITE
2A	20	WHITE
2B	16	WHITE
3	12	BLACK
4	12	RED
4A	16	BLUE
5	14	BROWN
6	14	ORANGE
7	14	ORANGE
8	14	BLUE
8A	20	BLUE
9	20	RED
10	14	PURPLE
10A	20	PURPLE
11	20	BLUE
12	16	YELLOW
12A	20	YELLOW
12B	16	BLACK
13	20	BROWN
13A	16	BROWN
14	24	CLEAR
15	24	BLACK
16	24	CLEAR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

NOTES: ● Denotes Terminal Strip Connection GCR Last Relay Number N/A Last Terminal Number 34 Last Wire Number		CUSTOMER APPROVAL/REFERENCE APPROVED BY _____ APPROVING FIRM _____ DATE OF APPROVAL _____ THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION IS NOT TO BE DISCLOSED TO OTHERS FOR ANY PURPOSE NOR USED FOR MANUFACTURING PURPOSES WITHOUT WRITTEN PERMISSION FROM FORMA SCIENTIFIC		<table><tr><td>7</td><td>SI-5589</td><td>02-13-96</td><td>BKH</td><td>KDG</td><td></td><td>CHANGED 280043 WIRE COLORS</td></tr><tr><td>6</td><td>SI-4458</td><td>11-17-95</td><td>LON</td><td>KDG</td><td>LON</td><td>CHG. TO PHENOLIC COATED T-STATS</td></tr><tr><td>5</td><td>IN-1959</td><td>07-17-95</td><td>JAS</td><td>POK</td><td>LON</td><td>REVISED SOLENOID WIRING</td></tr><tr><td>4</td><td>IN-1740</td><td>03-02-94</td><td>JAS</td><td>KDG</td><td>LON</td><td>CHG. STK# 250012 TO STK# 250013</td></tr><tr><td>3</td><td>IN-1685</td><td>11-9-93</td><td>JAS</td><td>JAS</td><td>LON</td><td>REV. SPECS, RELAY LINE REF.</td></tr><tr><td colspan="2">REV ECN NO.</td><td>DATE</td><td>BY</td><td>CAD</td><td>APPD</td><td>DESCRIPTION OF REVISION</td></tr><tr><td colspan="2">DATE 5-18-92</td><td>OWN ED</td><td>CAD JO</td><td>APPD LON</td><td>SCALE</td><td>NONE</td></tr><tr><td colspan="7">CUSTOMER</td></tr><tr><td colspan="7">JOB TITLE 3949/4949 REACH-IN INC. (REL. 2)</td></tr><tr><td colspan="7">DWG TITLE ELECTRICAL SCHEMATIC</td></tr><tr><td colspan="2">LOCATION</td><td colspan="2">JOB NUMBER</td><td colspan="3">DRAWING NUMBER</td></tr><tr><td colspan="2">INCUBATRO1</td><td colspan="2"></td><td colspan="3">3949-70-0-D</td></tr></table>		7	SI-5589	02-13-96	BKH	KDG		CHANGED 280043 WIRE COLORS	6	SI-4458	11-17-95	LON	KDG	LON	CHG. TO PHENOLIC COATED T-STATS	5	IN-1959	07-17-95	JAS	POK	LON	REVISED SOLENOID WIRING	4	IN-1740	03-02-94	JAS	KDG	LON	CHG. STK# 250012 TO STK# 250013	3	IN-1685	11-9-93	JAS	JAS	LON	REV. SPECS, RELAY LINE REF.	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 3949/4949 REACH-IN INC. (REL. 2)							DWG TITLE ELECTRICAL SCHEMATIC							LOCATION		JOB NUMBER		DRAWING NUMBER			INCUBATRO1				3949-70-0-D		
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		 Forma Scientific <small>801 849 4482/114, 8010 42550 10421 24-2504 TEL. FORM USA 800-940-2850, 0110 514-273-7181</small>		Electrical Schematic Forma Models: 3949 and 4949																																																																																					
		3949-70-0-D Rev. 7 Page 3 of 3																																																																																							

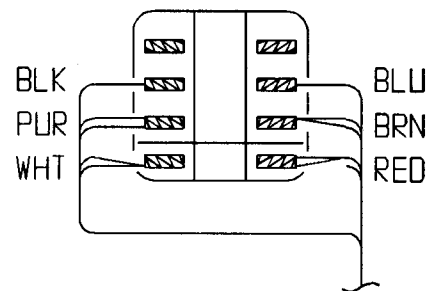
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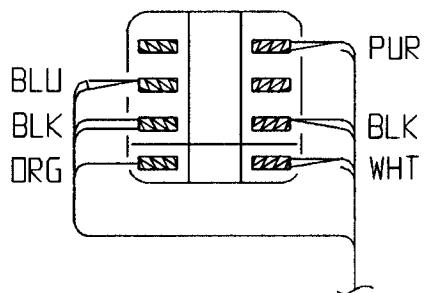
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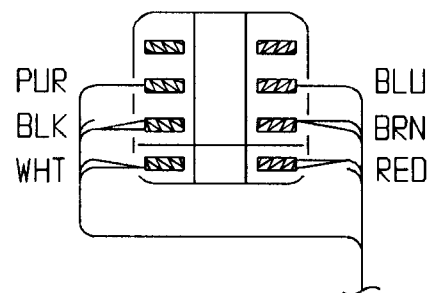
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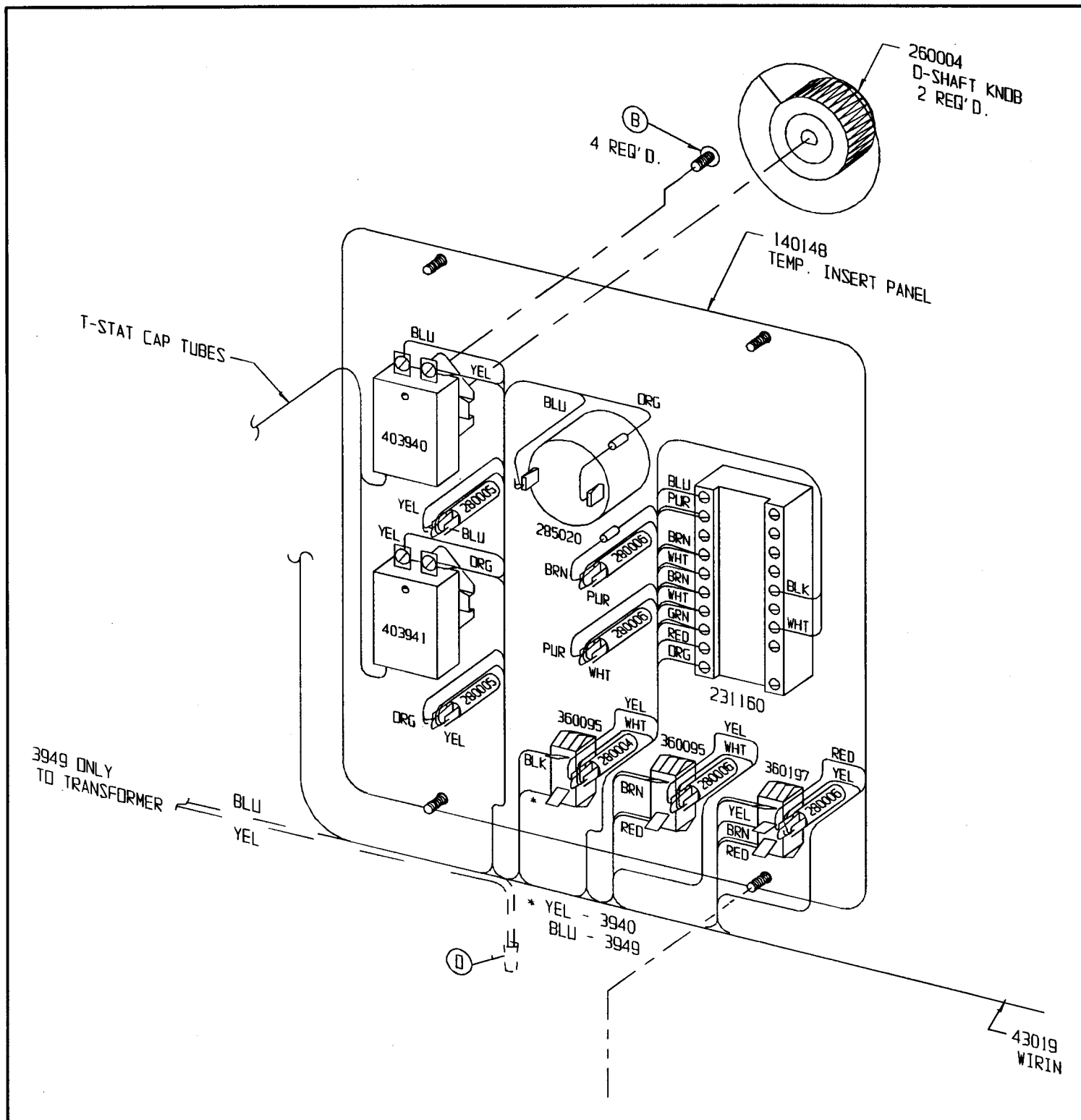
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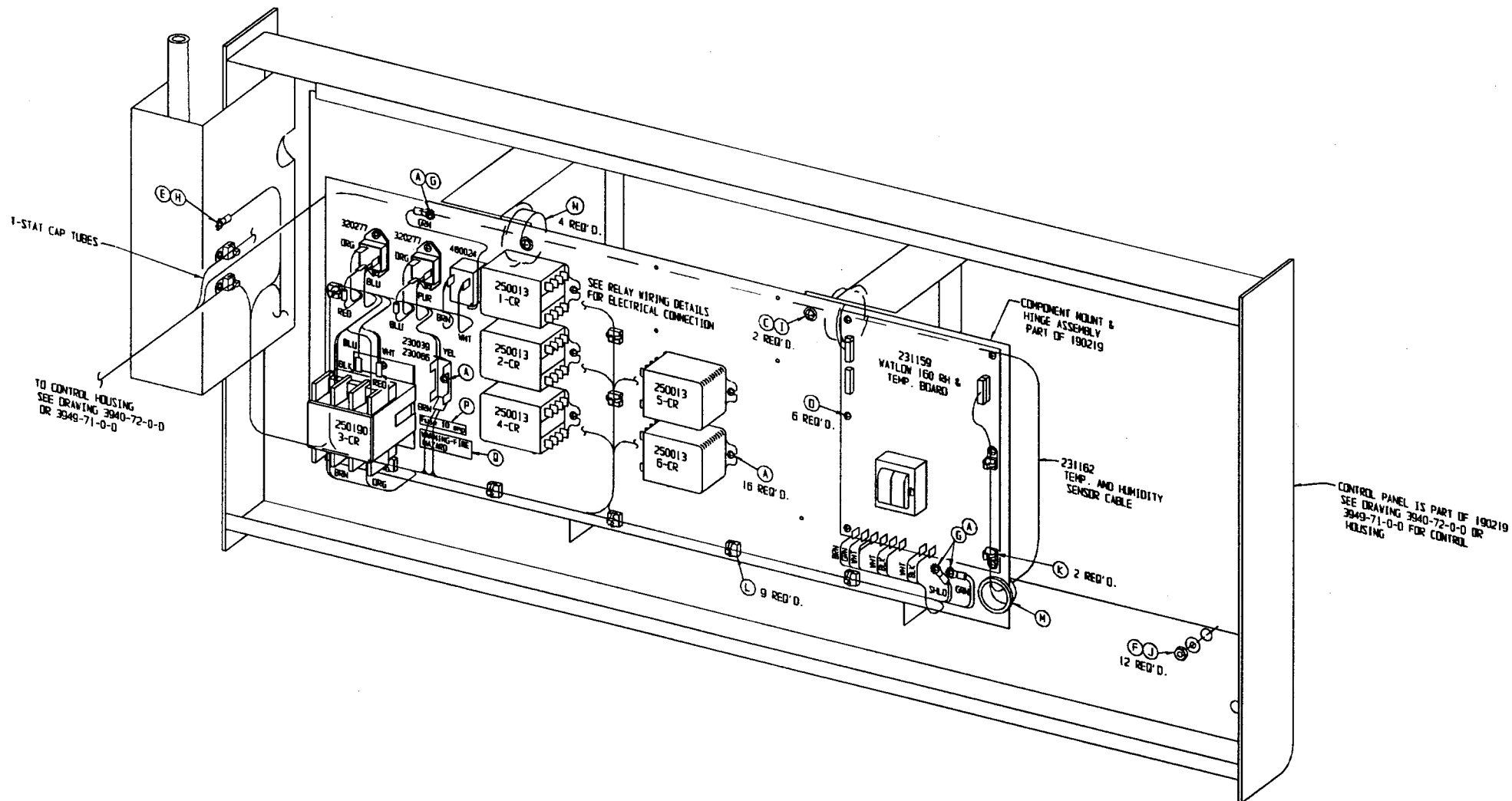


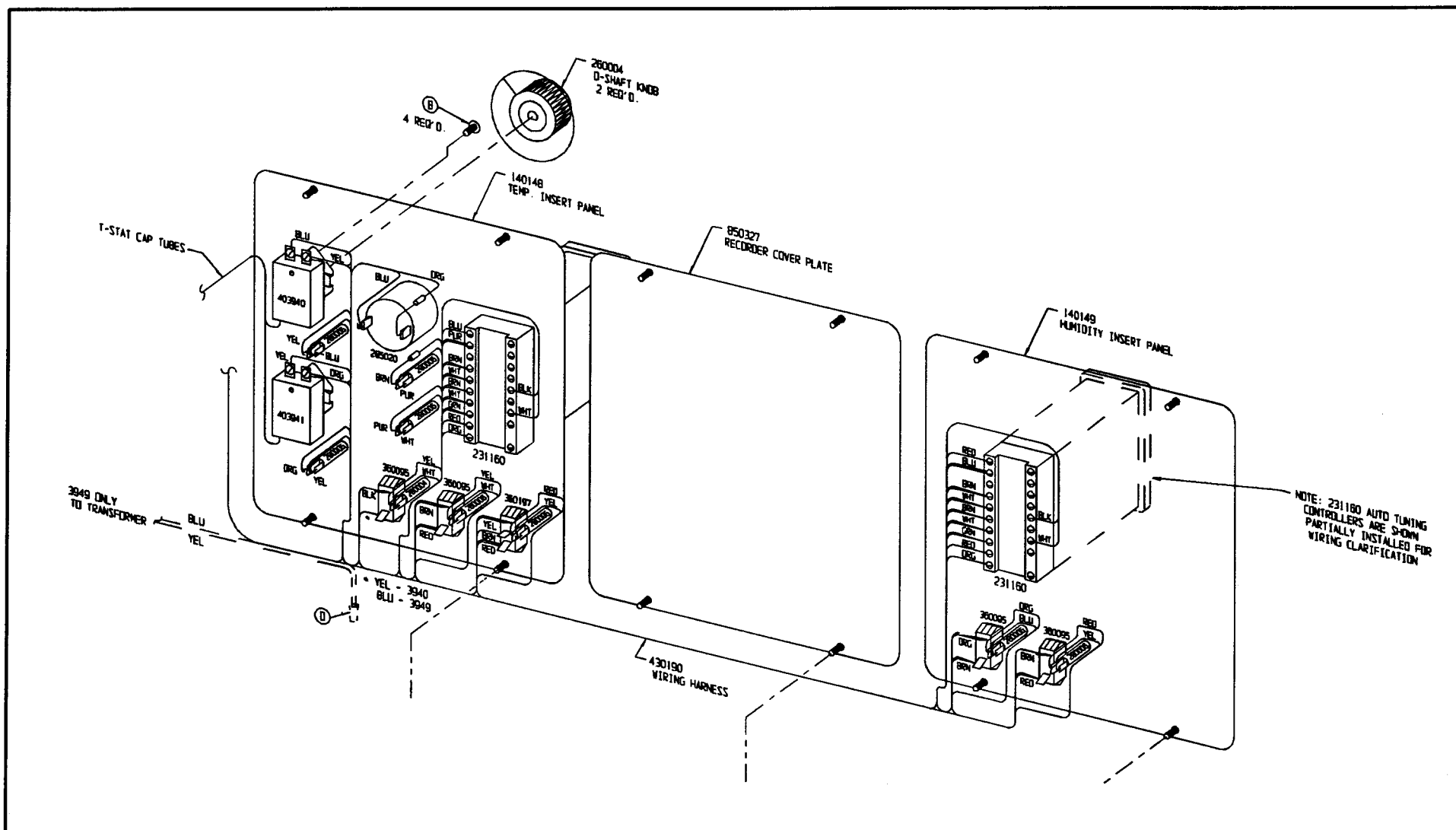
250013
6-CR



RELAY WIRING DETAILS







HARDWARE CHART

A	22115	#6-32 X 1/4" PHP SCREW
B	22049	#6-32 X 3/8" PHP SCREW
C	24016	#6-32 X 1/2" PHP SCREW
D	22008	#6-32 X 3/4" PHP SCREW
E	22053	#8-32 X 1/2" PHP SCREW
F	23002	#8-32 KEPS NUT
G	23058	#6 EXTERNAL TOOTH LOCKWASHER
H	23059	#8 EXTERNAL TOOTH LOCKWASHER
I	23020	#6 FLAT WASHER
J	23021	#8 FLAT WASHER
K	30001	STA STRAP ANCHOR
L	440002	PUSH MOUNT TIE ANCHOR
M	30088	7/8" SNAP BUSHING
N	30077	1-1/2" SNAP BUSHING
O	16001	YELLOW WIRE NUT (3949 ONLY)
P	220360	LABEL - 10 AMP FUSE
Q	220437	LABEL "WARNING FIRE HAZARD"