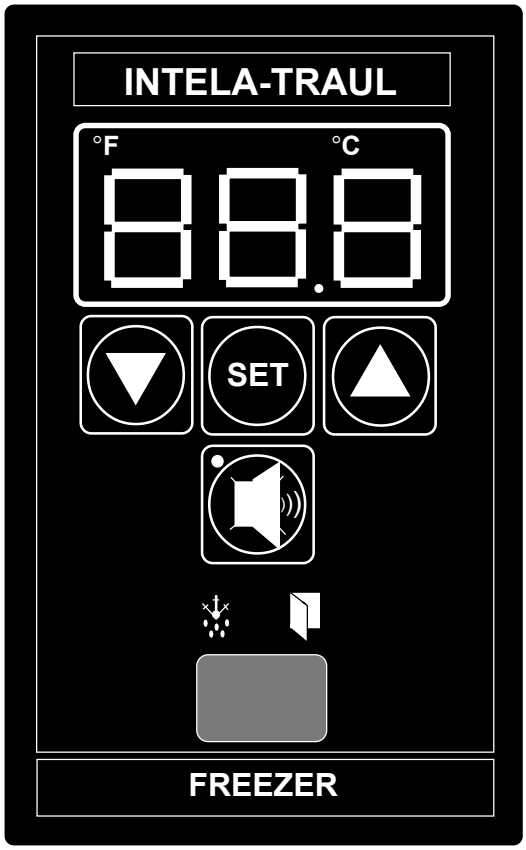
Quality Refrigeration

INTELA-TRAUL®
MASTER SERVICE MANUAL



For All Full Size Undercounter, G-Series and R&A Series Refrigerator, Freezer, Dual-Temp and Hot Food Unit Controllers

Traulsen
4401 Blue Mound Road - Fort Worth, Texas 76106
Phone: (800) 825-8220 or (817) 625-9671
Fax-Service (817) 740-6757

Form Number TR35705, Revised 4/03

TABLE OF CONTENTS

I. GENERAL INFORMATION

I. a - HOW TO USE THIS MANUAL:

Traulsen & Co. provides this manual as an aid to the service technician in installation, operation, and maintenance of INTELA-TRAUL® Controllers. When used properly, this service manual can help the service technician maintain, troubleshoot and diagnose most of the problems and malfunctions that may occur with the Controllers.

This manual covers the four different types of Controllers (**Full Size Undercounter, G-Series, R&A Series Refrigerator & Freezer,** and **R&A Series Hot Food**). These vary slightly from one another, all exceptions are noted, and where appropriate separate sections are provided.

While we believe that most aspects of the controllers are covered in this manual, should you encounter a condition not addressed, or require a wiring diagram please contact:

Traulsen & Co. Inc.
4401 Blue Mound Road
Fort Worth, TX 76106
Attn: Service Department

Phone: (800) 825-8220 or
(817) 625-9671
Fax: (817) 740-6757

All service communication must include:

- Model Number & Serial Number Of Unit
- A detailed explanation of the problem

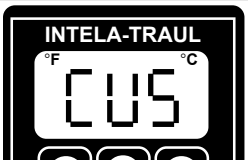
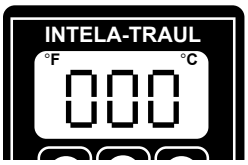
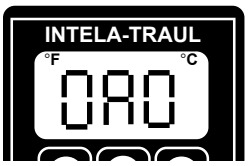
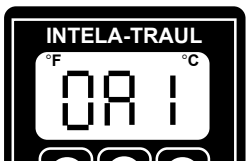
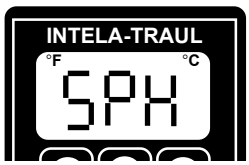
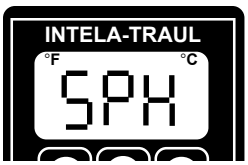
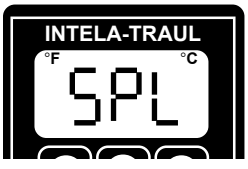
I. b - ABOUT INTELA-TRAUL:

The Traulsen INTELA-TRAUL and G-Series microprocessor controls are microprocessor based systems which replace several electromechanical components typically built into refrigeration products, such as: time clocks, thermometers, defrost limit switches and temperature controls, all combined into one solid state modular unit.

These microprocessor controls both monitor a cabinet air sensor and a coil sensor. The INTELA-TRAUL on the R & A Series also includes a discharge line sensor and a relative humidity sensor (H1 versions only). In conjuction with the programmed parameters of the control, and the information received, it cycles the refrigeration system ON and OFF at set temperatures, initiates and/or terminates defrost cycles, and initiates one of several alarm features if a problem is sensed (R & A Series only). Both controls also allow the operator to cycle the door perimeter heaters ON/OFF as needed.

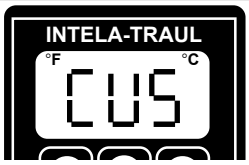
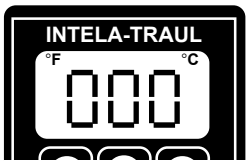
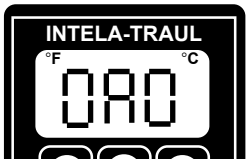
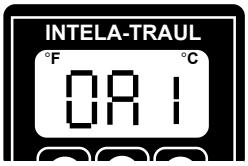
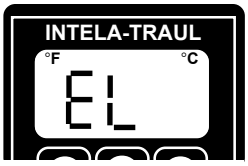
II. BASIC SERVICE PROCEDURES

II. a - ADJUSTING THE TEMPERATURE:

Step No.	Instructions For Programming The Control	The Display Will Read
1.	Press SET. Display will read **"CUS"**.	
2.	Press SET. Display will read **"000"** with the left digit flashing,	
3.	Press SET. Display will read **"000"** with the center digit flashing. Press ▼ until the center digit changes to an **"A"**.	
4.	Press SET. Display will read **"0A0"** with the right digit flashing. Press ▲ until right digit changes to a **"1"**. Press SET and 🔇. Display will read **"SPH"**. Press SET again.	 
5.	Press ▲ or ▼ to adjust temperature to the desired setting (38°F to 40°F for refrigerators and 0°F for freezers) . When display reads the desired temperature, press SET.	
6.	Press ▼ until display reads **"SPL."** Press SET. Press ▲ or ▼ to adjust temperature to the desired setting (34°F for refrigerators and -4°F for freezers). Press SET. Press 🔇 to exit (not on G-Series).	

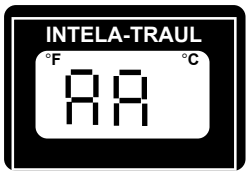
III. TROUBLESHOOTING

III. a - CHECKING FOR DEFECTIVE SENSORS:

Step No.	Instructions For Programming The Control	The Display Will Read
1.	Press SET. Display will read **"CUS"**.	
2.	Press SET. Display will read **"000"** with the left digit flashing,	
3.	Press SET. Display will read **"000"** with the center digit flashing. Press ▼ until the center digit changes to an **"A"**.	
4.	Press SET. Display will read **"0A0"** with the right digit flashing. Press ▲ until right digit changes to a **"1"**. Press SET.	
5.	Press ▲ until display reads **"EL"**. Press SET. If the display now reads **"-40,"** check for a loose connection on the EVAPORATOR sensor. If the display has a very high reading such as **"266,"** replace the EVAPORATOR sensor. ***NOTE: Erroneous readings may be the result of a faulty sensing circuit (open or shorted) in the Controller.***	

III. TROUBLESHOOTING

III. a - CHECKING FOR DEFECTIVE SENSORS (CONT'D):

Step No.	Instructions For Programming The Control	The Display Will Read
6.	Press ▲ until display reads **"DL"**. Press SET. If the display now reads **"-40,"** check for a loose connection on the DISCHARGE LINE sensor. If the display has a reading of **"220"** or higher, check for lack of adequate air flow through the condenser, a bad condenser fan motor, or any condition around the unit which could cause a high temperature, such as a steam table or a crossdraft. Otherwise, replace the DISCHARGE LINE sensor. ***NOTE: Erroneous readings may be the result of a faulty sensing circuit (open or shorted) in the Controller.***	
7.	Press ▲ until display reads **"AA"**. Press SET. Display should read the approximate ambient air temperature behind the louver panel. If the display reads **"111"** check for a loose connection on the RH/AMBIENT AIR sensor. If the display reads **"32.0"** check the sensor for a short circuit. ***NOTE: Erroneous readings may be the result of a faulty sensing circuit (open or shorted) in the Controller.***	 **NOTE:** Ambient Air Sensor not included on MIT version controllers.

III. TROUBLESHOOTING

III. b - CHECKING FOR FAILED RELAYS:

Checking For A Failed Internal Controller Relay:

1. Gain access to Controller compressor relay (see REMOVAL INSTRUCTIONS within this service manual for the specific type of Controller you are dealing with).

2. Locate the connector with the black/blue/purple wires and unplug it. Refer to the schematic on the side of the Controller, or refer to the appropriate Wiring Diagram (contact factory, referencing the serial number of the unit being worked on in order to obtain the appropriate wiring diagram).

3. Using a volt/ohm meter (VOM) with the power OFF, check the resistance across the black to blue wires of the Controller connector. If a completed circuit is indicated (with no power to the Controller), the contacts are stuck closed and the Controller should be replaced (on MIT versions either the relay box or one of the other relays within the unit need to be replaced).

Checking For A Failed External "Slave" Relay:

1. Gain access to Controller compressor relay (see REMOVAL INSTRUCTIONS within this service manual for the specific type of Controller you are dealing with).

2. Locate the external "slave" relay and unplug the harness connectors.

3. Using a volt/ohm meter (VOM), check the resistance from the "COM" terminal to the "NO" terminal. If a completed circuit is indicated, the contacts are stuck closed and the "slave" relay should be replaced.

Checking For A Failed Door/Light Relay: **NOTE**

This procedure is for the R&A Series Refrigerator and Freezer Models only.

1. Gain access to Controller door relay (see REMOVAL INSTRUCTIONS within this service manual for the specific type of Controller you are dealing with).

2. Remove the wire from the door relay coil.

3. Using a volt/ohm meter (VOM), check across the relay contacts. If an open across the contacts is not indicated, replace the door relay.

4. Physically check the switch for evidence of water. If the switch has water in it, replace the switch.

III. TROUBLESHOOTING

III. c - CHECKING FOR OTHER FAILED COMPONENTS:

Checking For A Failed Door Switch:

1. Remove door(s) from unit you are working on.

2. Locate door switch (it is located behind the top door hinge).

3. Remove the switch from the cabinet.

4. Using a volt/ohm meter (VOM), check across the switch contacts. "COM" to "NC" should have continuity. "COM" to "NO" should read open. If not, replace the switch.

5. Reinstall the switch and hinge onto the cabinet.

NOTE: If the unit has more than one door, check ALL door switches in the same manner as described in the previous steps.

Checking For A Failed Controller Transformer:

1. Check incoming voltage. Voltage at the unit must be within the voltage range shown in the table below.

2. If Controller has a battery backup, disconnect it. Otherwise, unplug Controller, then plug it back in.

3. If Controller display does not come back on, use a volt/ohm meter (VOM) and check the output voltage of the Controller transformer.

4. If the output voltage from the transformer is NOT within the range shown in the table bat right, replace the transformer. If the transformer tests OK, replace the Controller.

VOLTAGE		
MIN	**MAX**	**STANDARD**
104 VAC	**126 VAC**	**115/60/1**
187 VAC	**253 VAC**	**208-230/60/1**
10.2 Volts (MIT 12.4)	**13.8 Volts (MIT 14.7)**	**Transformer Output Voltage**

Checking Cabinet, Coil, or Discharge Line Sensors:

1. Gain access to CABINET, COIL, or DISCHARGE LINE sensor and disconnect it.

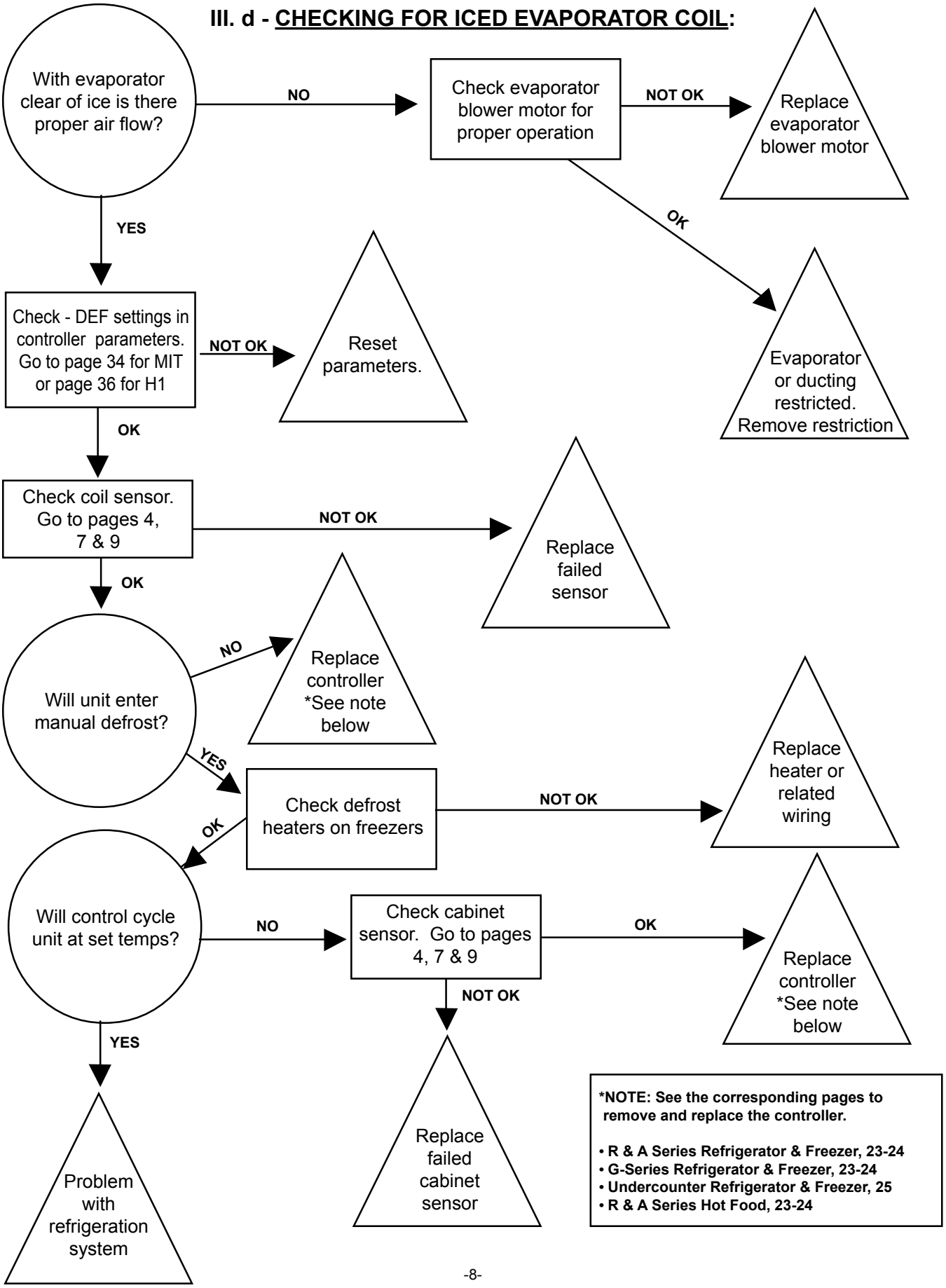
2. Place tip of sensor probe in a mixture of icewater for several minutes. Allow enough time for sensor probe to aclimate to the icewater.

3. At 32°F, probe resistance should be 32.7K Ohms, +/- 10%. If resistance is not within this range, replace the sensor.

NOTE: For other resistance values for the CABINET, COIL and DISCHARGE sensors at temperatures from -5°F to 212°F, refer to page 14.

III. TROUBLESHOOTING

III. d - CHECKING FOR ICED EVAPORATOR COIL:



III. TROUBLESHOOTING

III. e - CABINET COIL & DISCHARGE SENSOR RESISTANCE VALUES:

Temp (°F)	R (Ohms)	Temp (°C)
-5°	99.9 K Ω	-20.5°
0°	85.2 K Ω	-17.7°
5°	72.9 K Ω	-15.0°
10°	62.4 K Ω	-12.2°
15°	53.7 K Ω	-9.4°
20°	46.2 K Ω	-6.7°
25°	39.9 K Ω	-3.9°
30°	34.6 K Ω	-1.1°
32°	32.7 K Ω	0.0°
Water Freezes		
35°	30.1 K Ω	1.7°
40°	26.1 K Ω	4.4°
45°	22.8 K Ω	7.2°
50°	19.9 K Ω	10.0°
55°	17.4 K Ω	12.8°
60°	15.3 K Ω	15.6°
65°	13.5 K Ω	18.3°
70°	11.9 K Ω	21.1°
75°	10.5 K Ω	23.9°
80°	9.31 K Ω	26.7°
85°	8.25 K Ω	29.4°
90°	7.34 K Ω	32.2°
95°	6.53 K Ω	35.0°
100°	5.82 K Ω	37.8°

Temp (°F)	R (Ohms)	Temp (°C)
105°	5.22 K Ω	40.6°
110°	4.66 K Ω	43.3°
115°	4.18 K Ω	46.1°
120°	3.76 K Ω	48.9°
125°	3.38 K Ω	51.7°
130°	3.05 K Ω	54.4°
135°	2.75 K Ω	57.2°
140°	24.9 K Ω	60.0°
145°	2.25 K Ω	62.8°
150°	2.05 K Ω	65.6°
155°	1.86 K Ω	68.3°
160°	1.68 K Ω	71.1°
165°	1.54 K Ω	73.9°
170°	1.40 K Ω	76.7°
175°	1.28 K Ω	79.4°
180°	1.17 K Ω	82.2°
185°	1.07 K Ω	85.0°
190°	975 Ω	87.8°
195°	899 Ω	90.6°
200°	837 Ω	93.3°
205°	759 Ω	96.1°
210°	700 Ω	98.8°
212°	679 Ω	100.0°
Water Boils		

III. f - RELATIVE HUMIDITY SENSOR RESISTANCE VALUES:

Relative Humidity

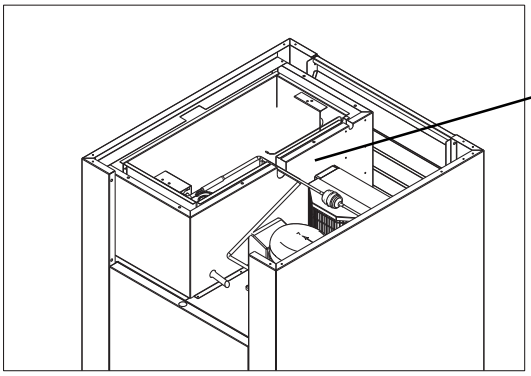
RH	R (Ohms)
20	13595
25	13829
30	14063
40	15000
50	16874
55	18542

Relative Humidity

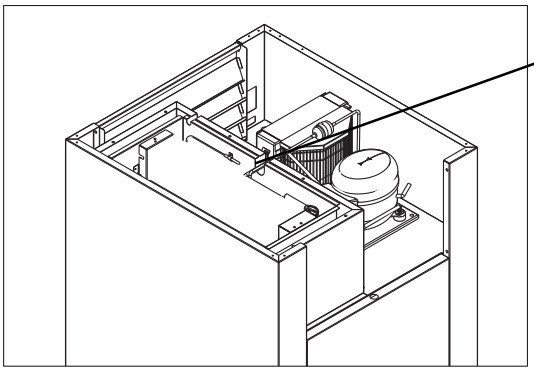
RH	R (Ohms)
60	20725
65	23422
70	27743
75	31629
80	36538
85	51344

III. TROUBLESHOOTING

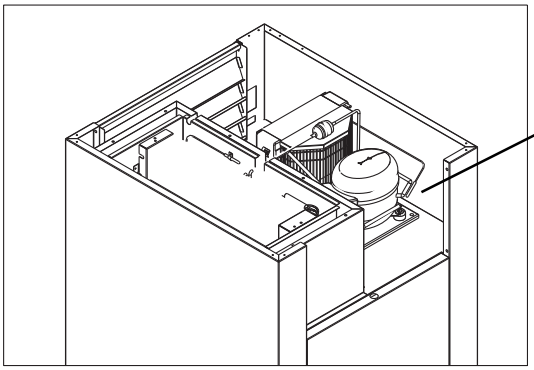
III. g - <u>PROPER SENSOR PLACEMENT</u>:



The coil sensor should be inserted into the return air side of the evaporator coil. The sensor should be centered approximately 2" (two inches) from the top (horizontally through coil - centered in coil).



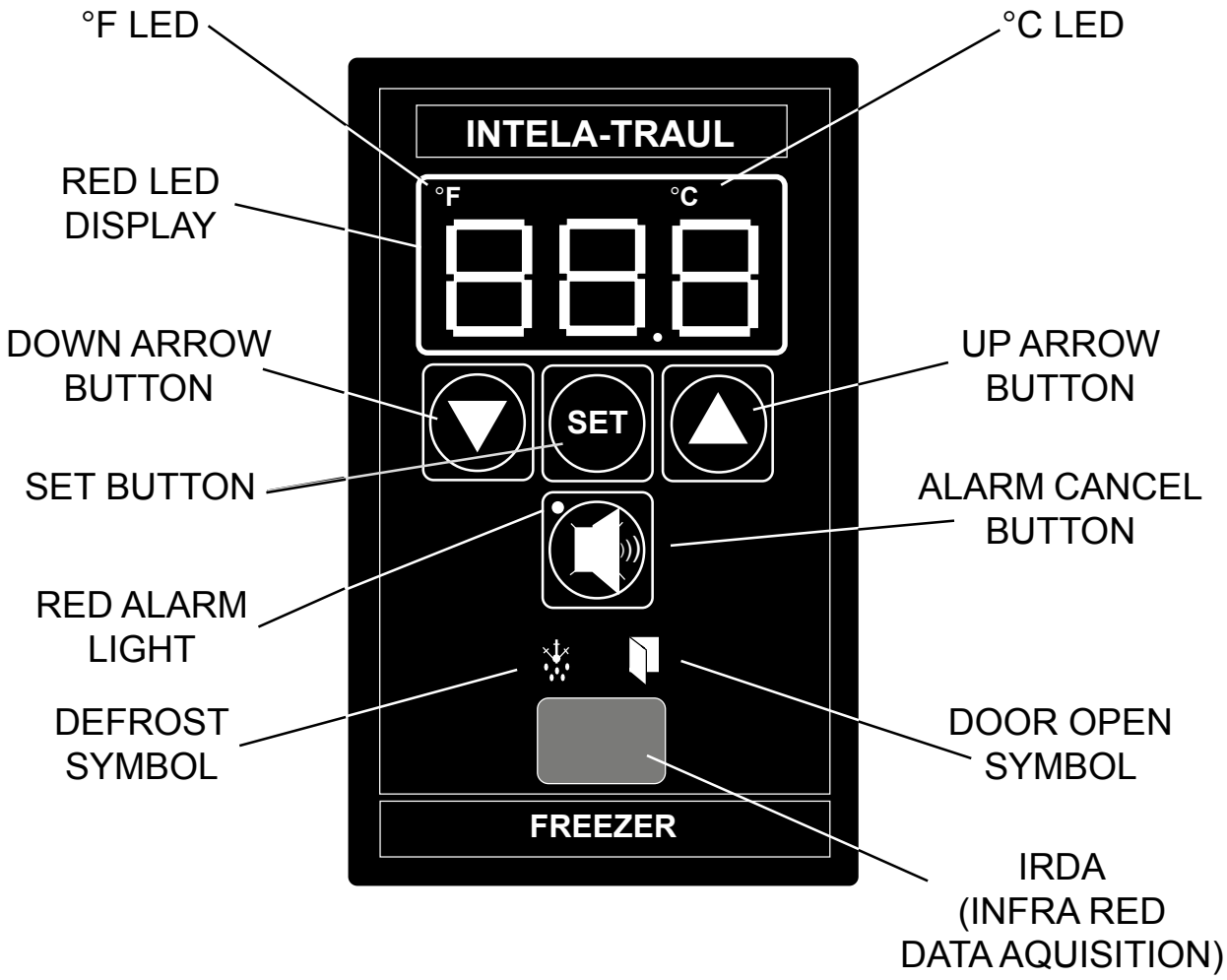
The cabinet air sensor should be mounted inside the hump on the return air side of the evaporator coil.



The discharge sensor should be mounted on the hot gas side of the compressor. Placement should be as close to the compressor as possible and must be before the hot gas loop. Discharge sensors must also be insulated.

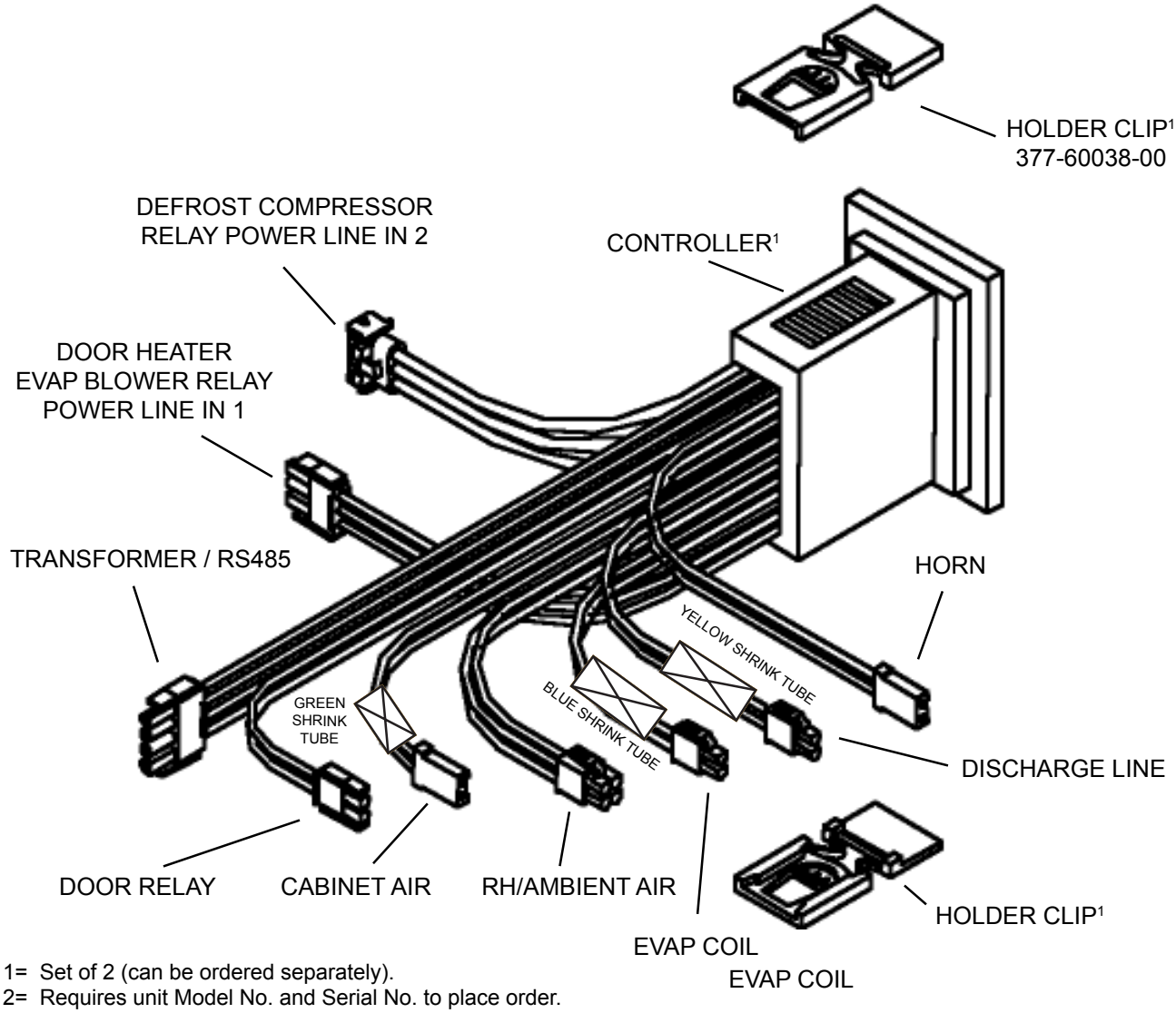
IV. CONTROL ARCHITECTURE

IV. a - <u>R & A SERIES REFRIGERATOR & FREEZER VERTICAL CONTROLLERS</u>:
(p/n's 337-60090-00, 337-60091-00 & 337-60092-00, please note these controllers replace p/n 337-60063-00)



NOTE:
See parts assembly on pages 12 and 13.

IV. CONTROL ARCHITECTURE



1= Set of 2 (can be ordered separately).
2= Requires unit Model No. and Serial No. to place order.

COIL SENSOR[3]
337-60071-02

DISCHARGE SENSOR[3]
337-60072-00

CABINET SENSOR[3]
337-60069-02

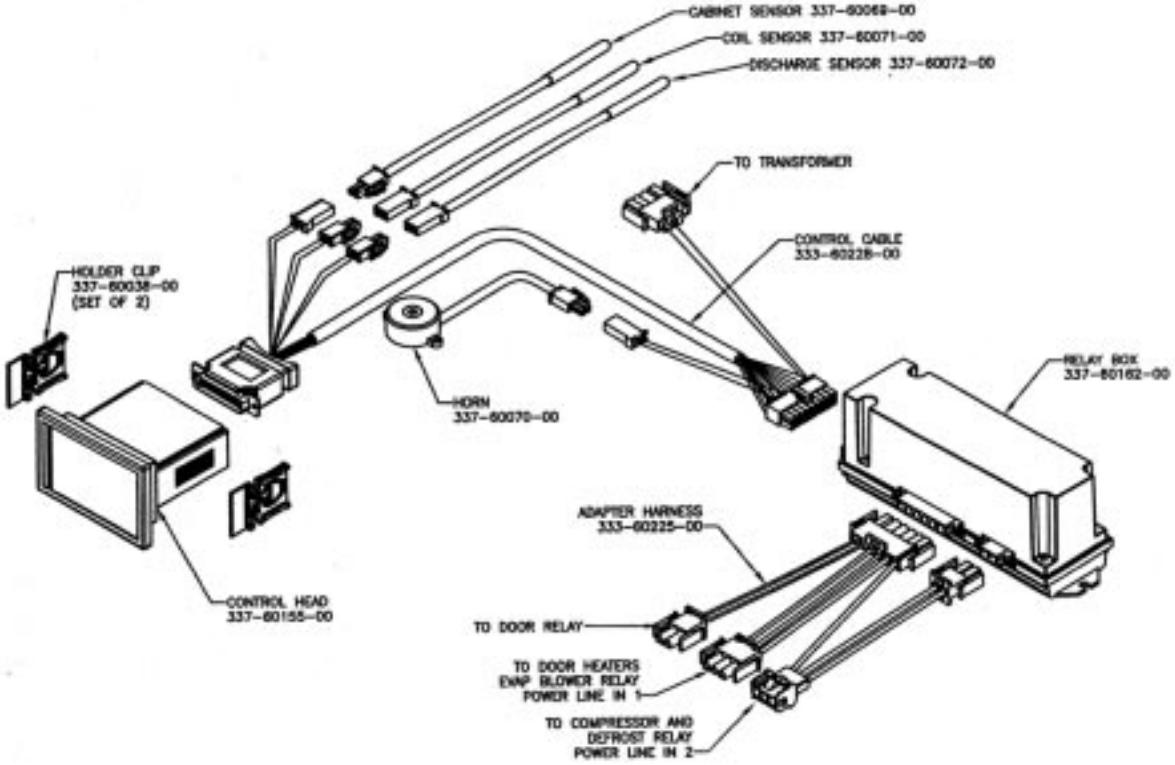
HORN[3]
337-60070-00

RH SENSOR
337-60068-00
(Rev G software
and below)
337-60080-00
(Rev H software
and higher)

3= Can be ordered separately.

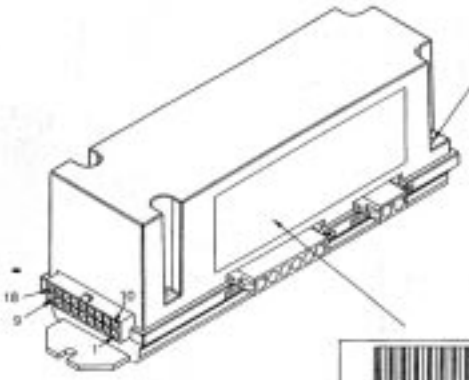
IV. CONTROL ARCHITECTURE

IV. b - <u>R & A SERIES REFRIGERATOR & FREEZER VERTICAL CONTROLLERS</u>:
(parts assembly for MIT Version only)



MIT CONTROL TROUBLE-SHOOTING DIAGRAM
(PLEASE RETAIN FOR YOUR RECORDS)

REVISION A
10-24-01

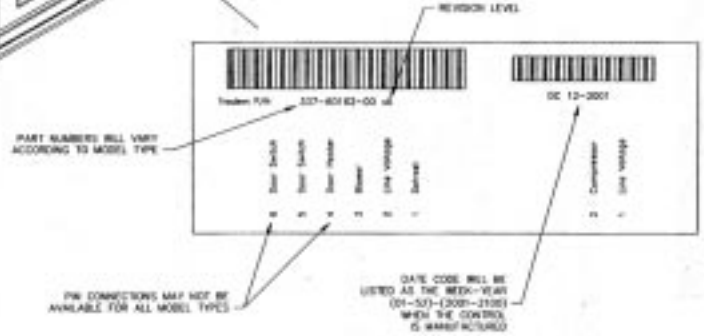


NOTE: ALL PINS IN THIS CONNECTOR SHOULD NOT READ MORE THAN 20 VAC

CONNECTOR PIN NUMBER	COLOR	SIGNAL
1	GRAY	BLOWER
2	ORANGE	DOOR HEATER
3	GREEN	ALARM FROM CONTROLLER
4	BLACK	RETURN FROM HORN
5		
6		
7	WHITE/PURPLE	-RS485
8	BLACK	GROUND
9	WHITE	12VAC
10	BLUE	COMPRESSOR
11	PURPLE	DEFROST
12	YELLOW	DOOR OPEN SIGNAL
13	RED	POWER TO HORN
14		
15		
16	PINK	+RS485
17	RED	12VDC TO CONTROLLER
18	BLACK	12VAC

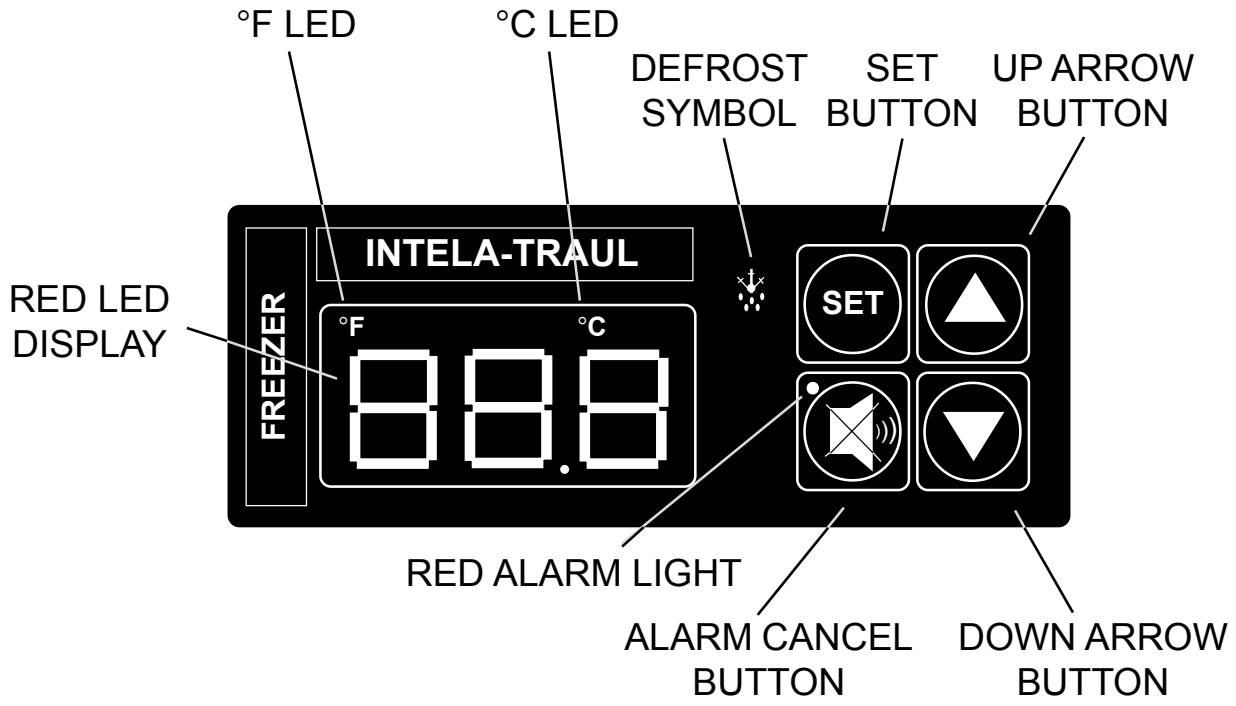
VOLTAGE SHOULD NOT BE MORE THAN 5 DC WHEN MEASURED TO GROUND (PIN 8)

NOTE: ALL PINS IN THESE TWO CONNECTORS SHOULD BE READING LINE VOLTAGE



IV. CONTROL ARCHITECTURE

IV. b - <u>UNDERCOUNTER REFRIGERATOR & FREEZER HORIZONTAL CONTROLLERS</u>:
(p/n's 337-60096-00 & 337-60097-00, please note these controllers replace p/n 337-60062-00)

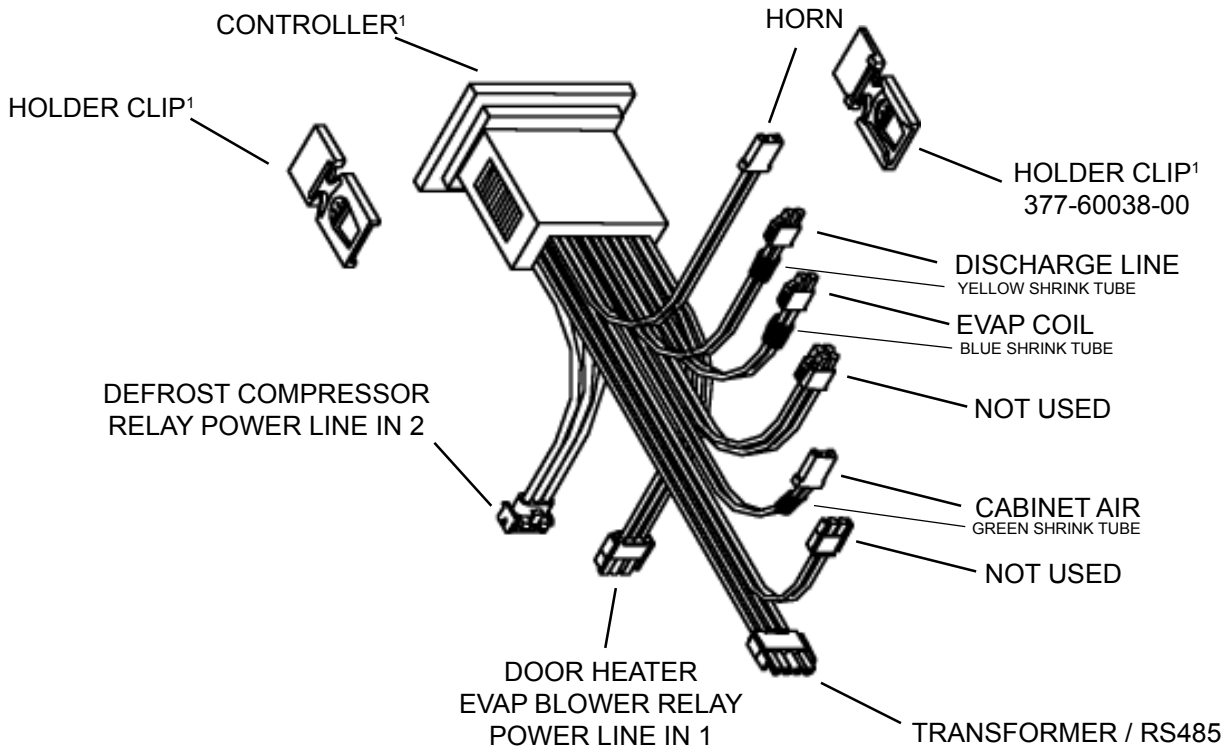


NOTE:
See parts assembly on following pages 15 & 16.

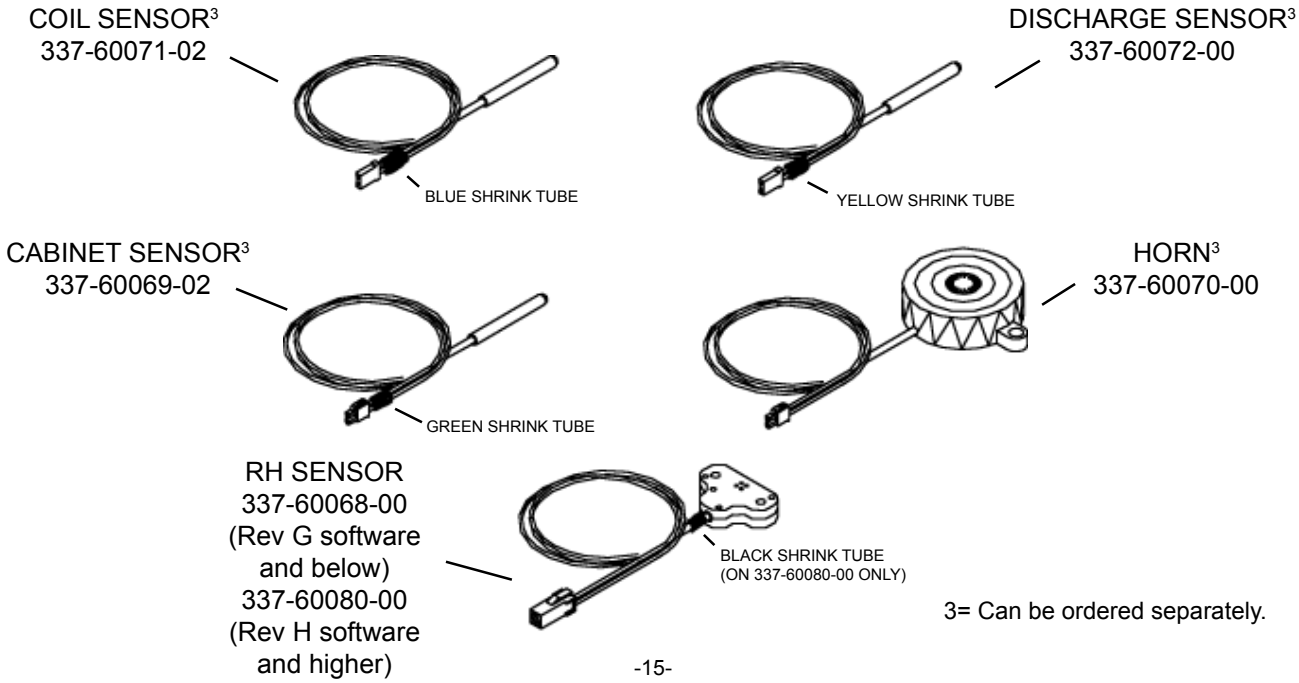
IV. CONTROL ARCHITECTURE

IV. b - <u>UNDERCOUNTER REFRIGERATOR & FREEZER HORIZONTAL CONTROLLERS</u>:

(p/n's 337-60096-00 & 337-60097-00, please note these controllers replace p/n 337-60062-00)



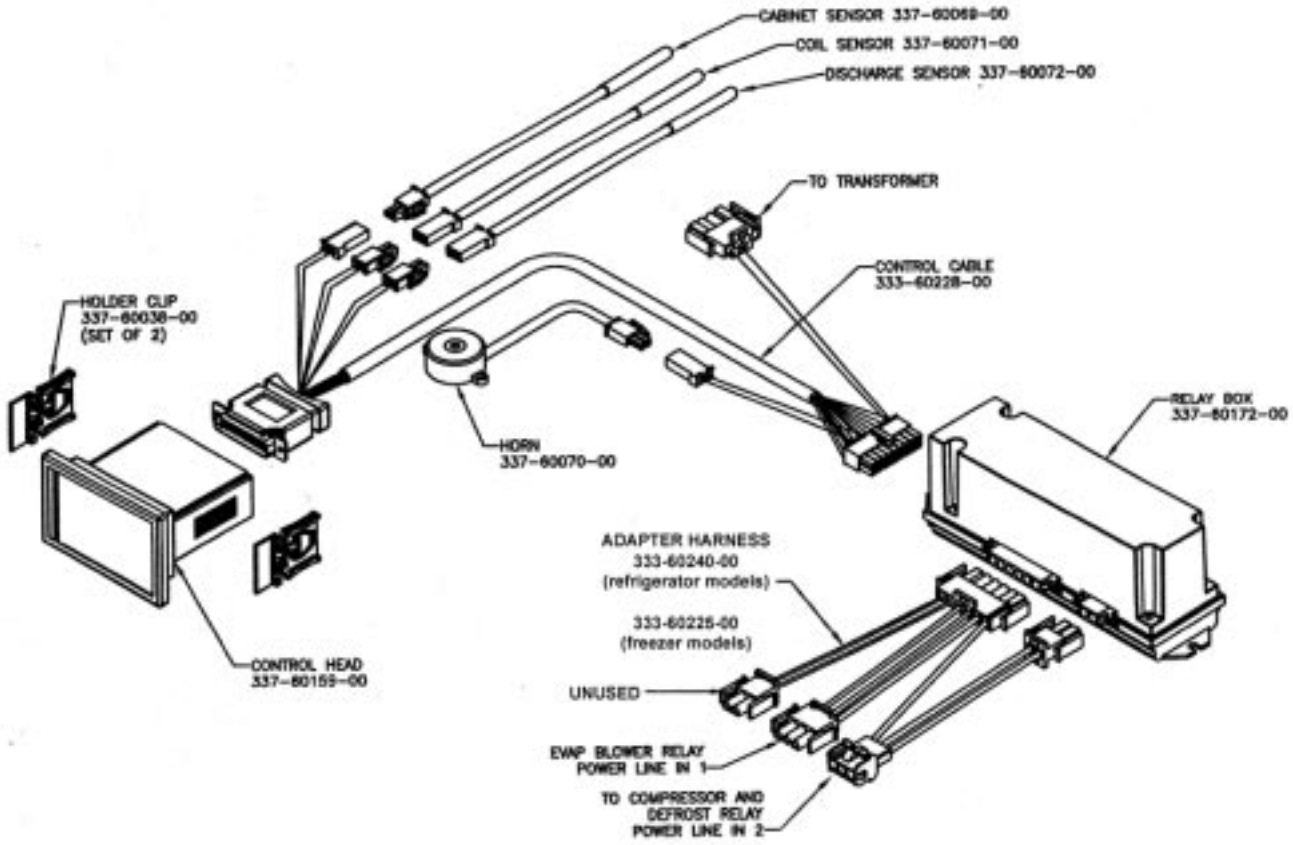
1= Set of 2 (can be ordered separately).
2= Requires unit Model No. and Serial No. to place order.



3= Can be ordered separately.

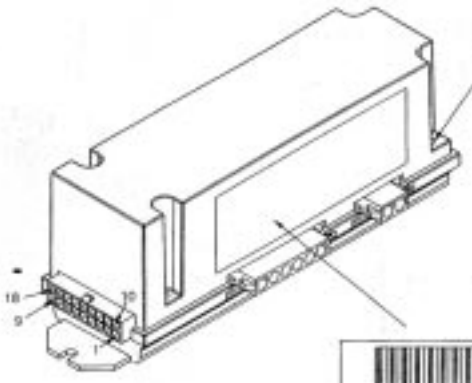
IV. CONTROL ARCHITECTURE

IV. b - <u>UNDERCOUNTER REFRIGERATOR & FREEZER HORIZONTAL CONTROLLERS</u>:
(parts assembly for MIT Version only)

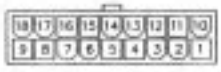


MIT CONTROL TROUBLE-SHOOTING DIAGRAM
(PLEASE RETAIN FOR YOUR RECORDS)

REVISION A
10-24-01



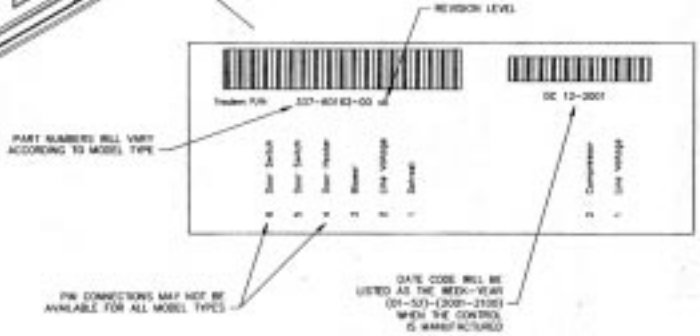
NOTE: ALL PINS IN THIS CONNECTOR SHOULD NOT READ MORE THAN 20 VAC



NOTE: ALL PINS IN THESE TWO CONNECTORS SHOULD BE READING LINE VOLTAGE

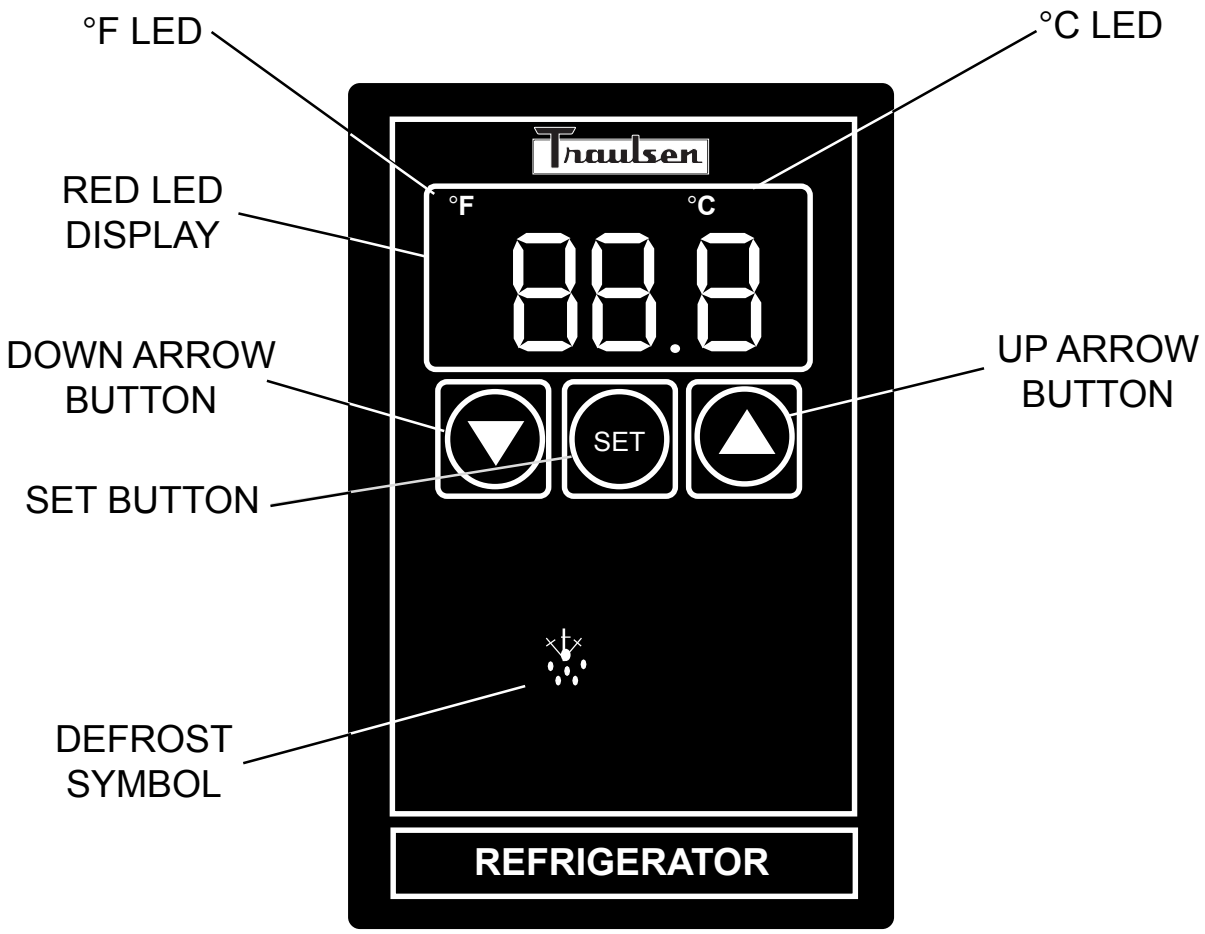
CONNECTOR PIN NUMBER	COLOR	SIGNAL
1	GRAY	BLOWER
2	ORANGE	DOOR HEATER
3	GREEN	ALARM FROM CONTROLLER
4	BLACK	RETURN FROM HORN
5		
6		
7	WHITE/PURPLE	+RS485
8	BLACK	GROUND
9	WHITE	12VAC
10	BLUE	COMPRESSOR
11	PURPLE	DEFROST
12	YELLOW	DOOR OPEN SIGNAL
13	RED	POWER TO HORN
14		
15		
16	PINK	+RS485
17	RED	12VDC TO CONTROLLER
18	BLACK	12VAC

VOLTAGE SHOULD NOT BE MORE THAN 5 DC WHEN MEASURED TO GROUND (PIN 8)



IV. CONTROL ARCHITECTURE

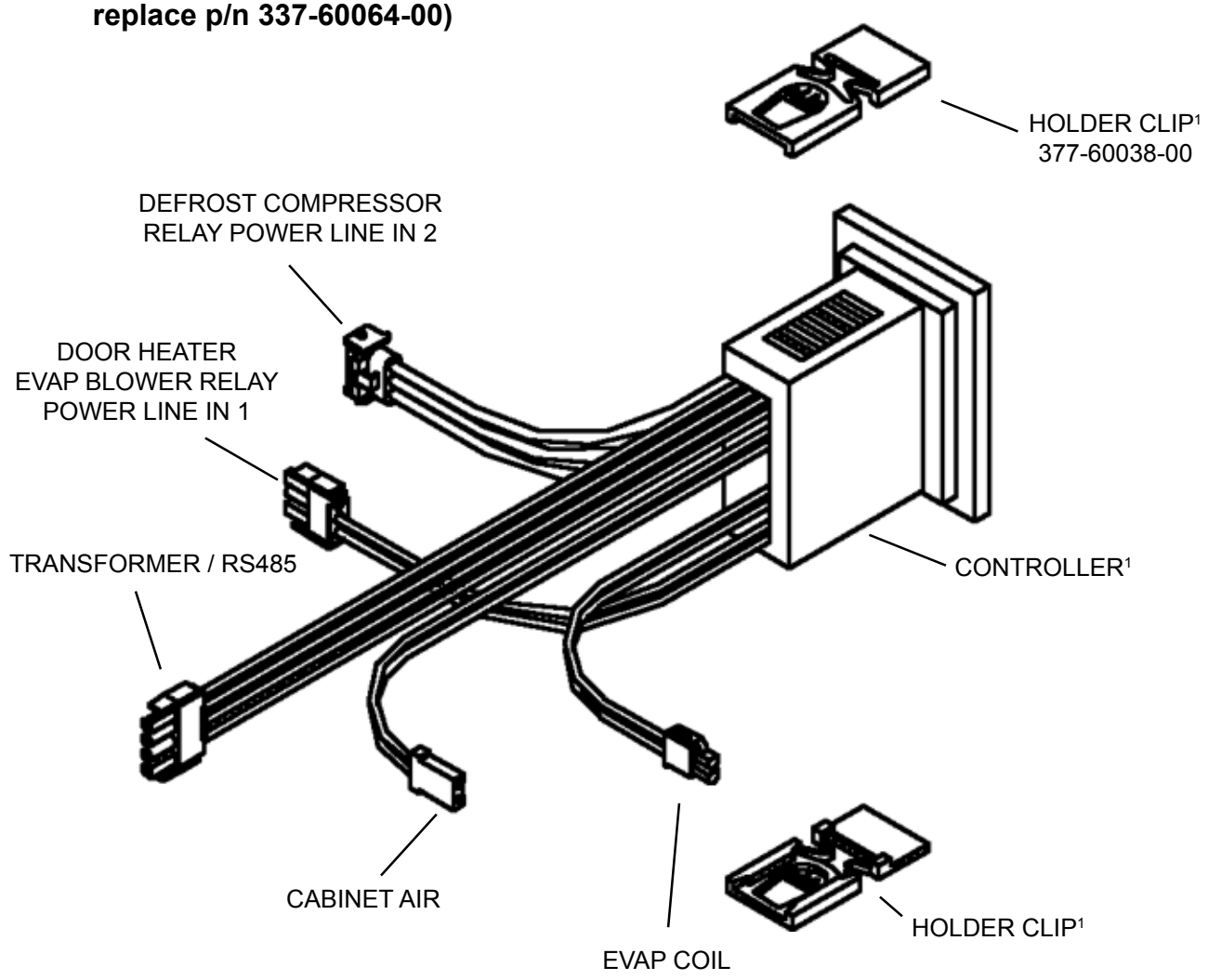
IV. c - <u>G-SERIES REFRIGERATOR & FREEZER VERTICAL CONTROLLERS</u>:
(p/n's 337-60093-00, 337-60094-00 & 337-60095-00, please note these controllers replace p/n 337-60064-00)



NOTE:
See parts assembly on pages 18 and 19.

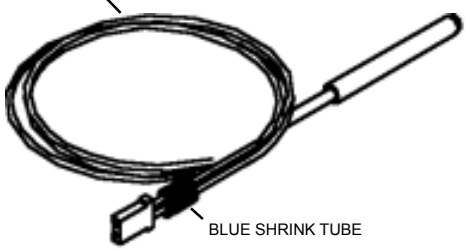
IV. CONTROL ARCHITECTURE

IV. c - G-SERIES REFRIGERATOR & FREEZER VERTICAL CONTROLLERS:
(p/n's 337-60093-00, 337-60094-00 & 337-60095-00, please note these controllers replace p/n 337-60064-00)

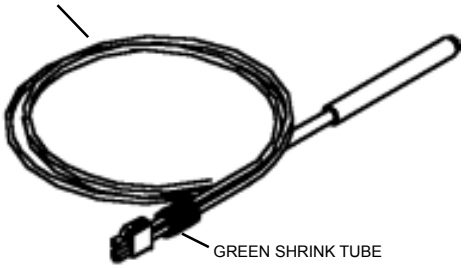


1= Set of 2 (can be ordered separately).
2= Requires unit Model No. and Serial No. to place order.

COIL SENSOR[3]
337-60071-02



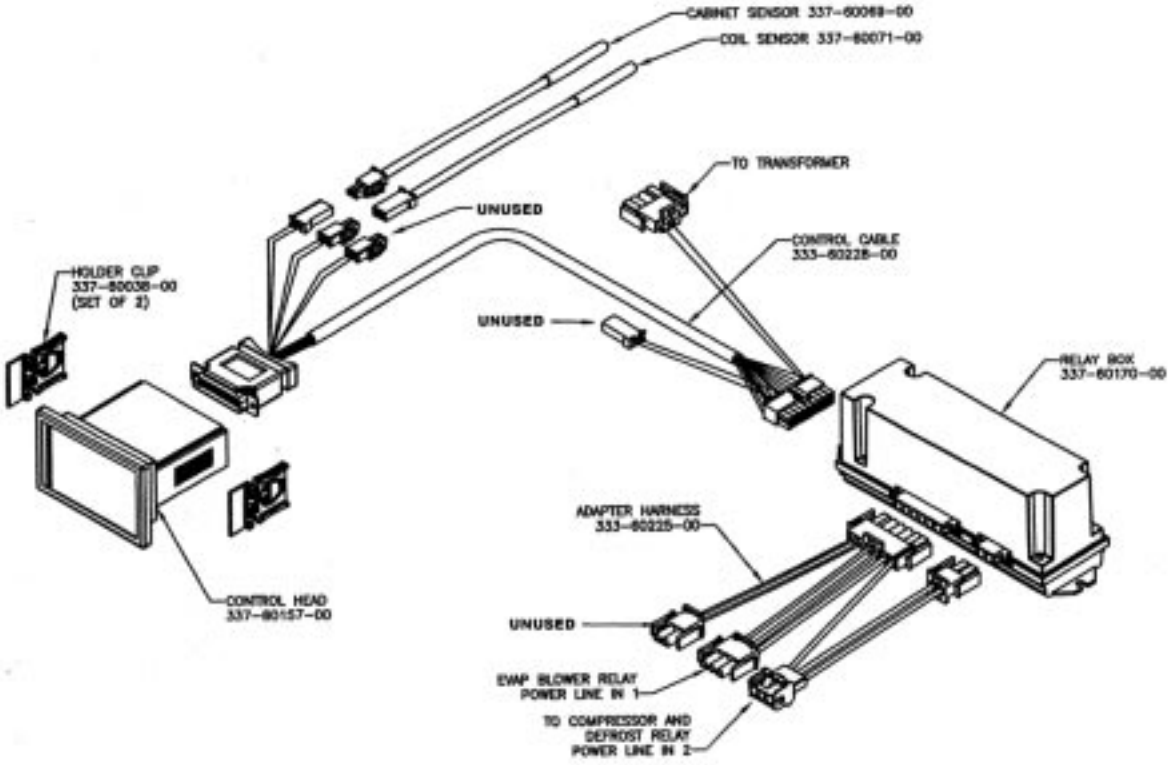
CABINET SENSOR[3]
337-60069-02



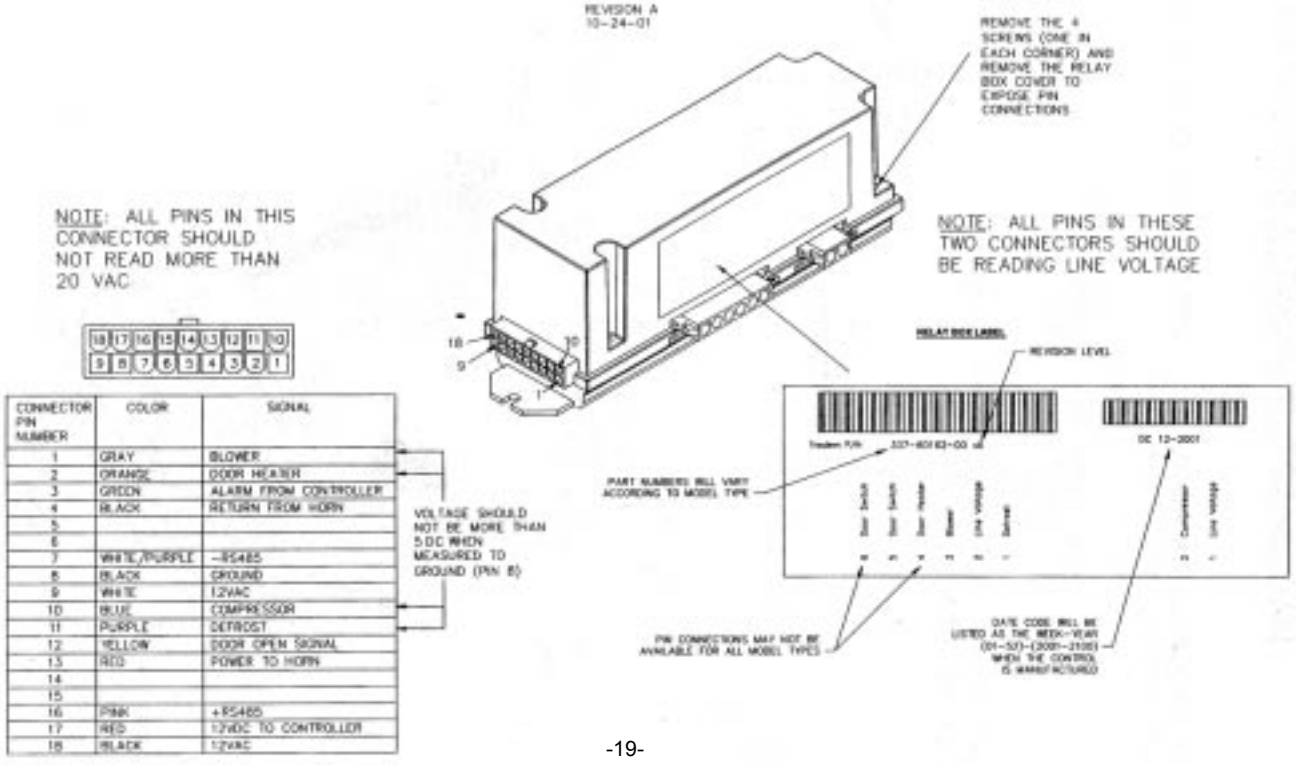
3= Can be ordered separately.

IV. CONTROL ARCHITECTURE

IV. c - G-SERIES REFRIGERATOR & FREEZER VERTICAL CONTROLLERS:
(parts assembly for MIT Version only)



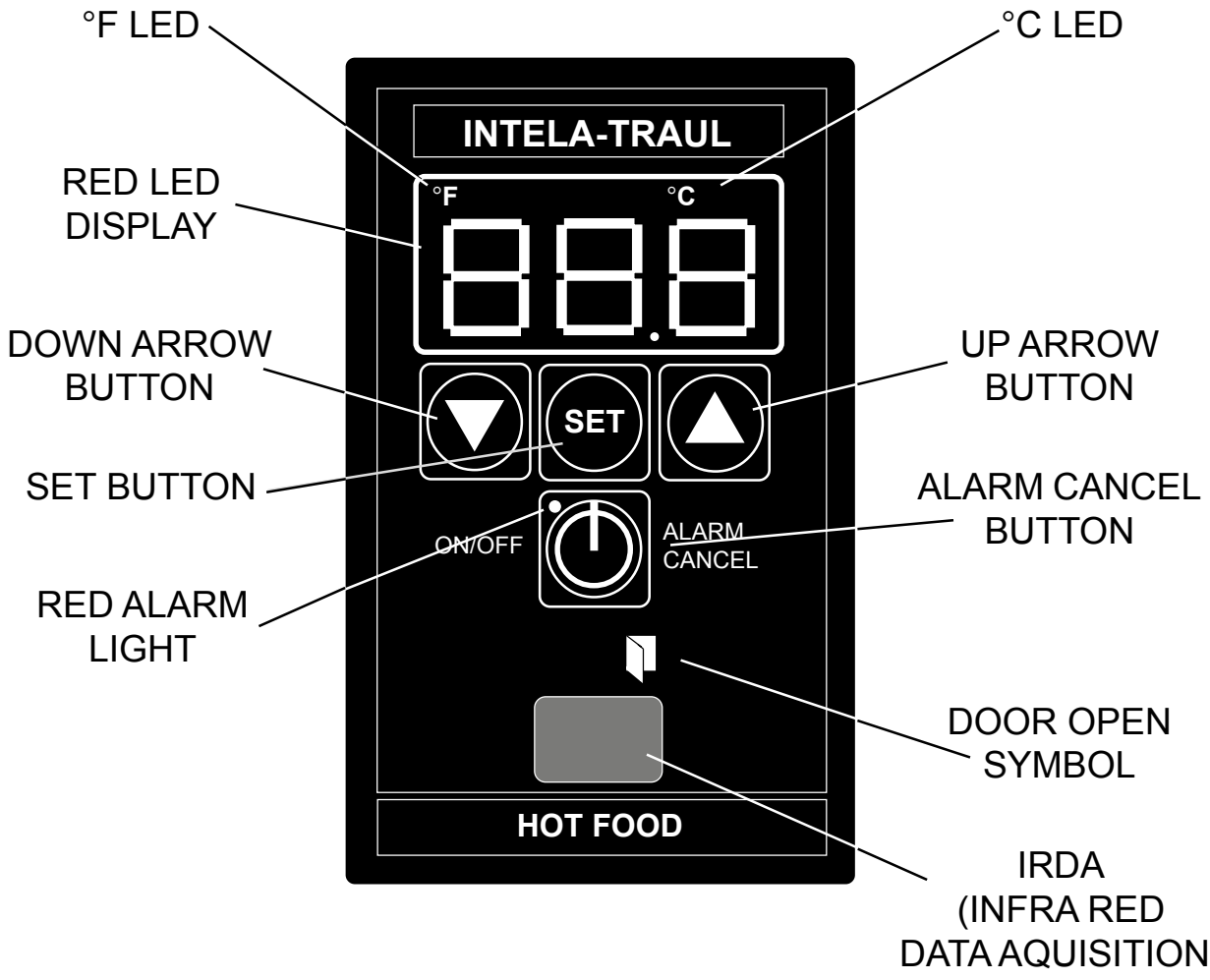
MIT CONTROL TROUBLE-SHOOTING DIAGRAM
(PLEASE RETAIN FOR YOUR RECORDS)



CONNECTOR PIN NUMBER	COLOR	SIGNAL
1	GRAY	BLOWER
2	ORANGE	DOOR HEATER
3	GREEN	ALARM FROM CONTROLLER
4	BLACK	RETURN FROM HORN
5		
6		
7	WHITE/PURPLE	-RS485
8	BLACK	GROUND
9	WHITE	12VAC
10	BLUE	COMPRESSOR
11	PURPLE	DEFROST
12	YELLOW	DOOR OPEN SIGNAL
13	RED	POWER TO HORN
14		
15		
16	PINK	+RS485
17	RED	12VDC TO CONTROLLER
18	BLACK	12VAC

IV. CONTROL ARCHITECTURE

IV. d - <u>R & A SERIES HEATED CABINET VERTICAL CONTROLLERS</u>:
(p/n 337-60090-08, please note this control replaces p/n 337-60065-00)



HOT FOOD CABINET START-UP (pre-MIT version):
When power is first applied to the unit, you must set the temperature by pressing the "SET" and "UP ARROW" buttons at the same time using equal pressure with both thumbs, until the temperature appears on the display. Next, use the "UP" button to reach the 160° level, then press and release the "SET" button to lock it in.

After this is done you can turn the control ON and OFF by pressing and releasing the "ALARM CANCEL" button.

Be aware to watch for the display constantly reading "OFF". This is an indication of a possible faulty cabinet sensor. To remedy, replace the sensor and rest the operating temperature.

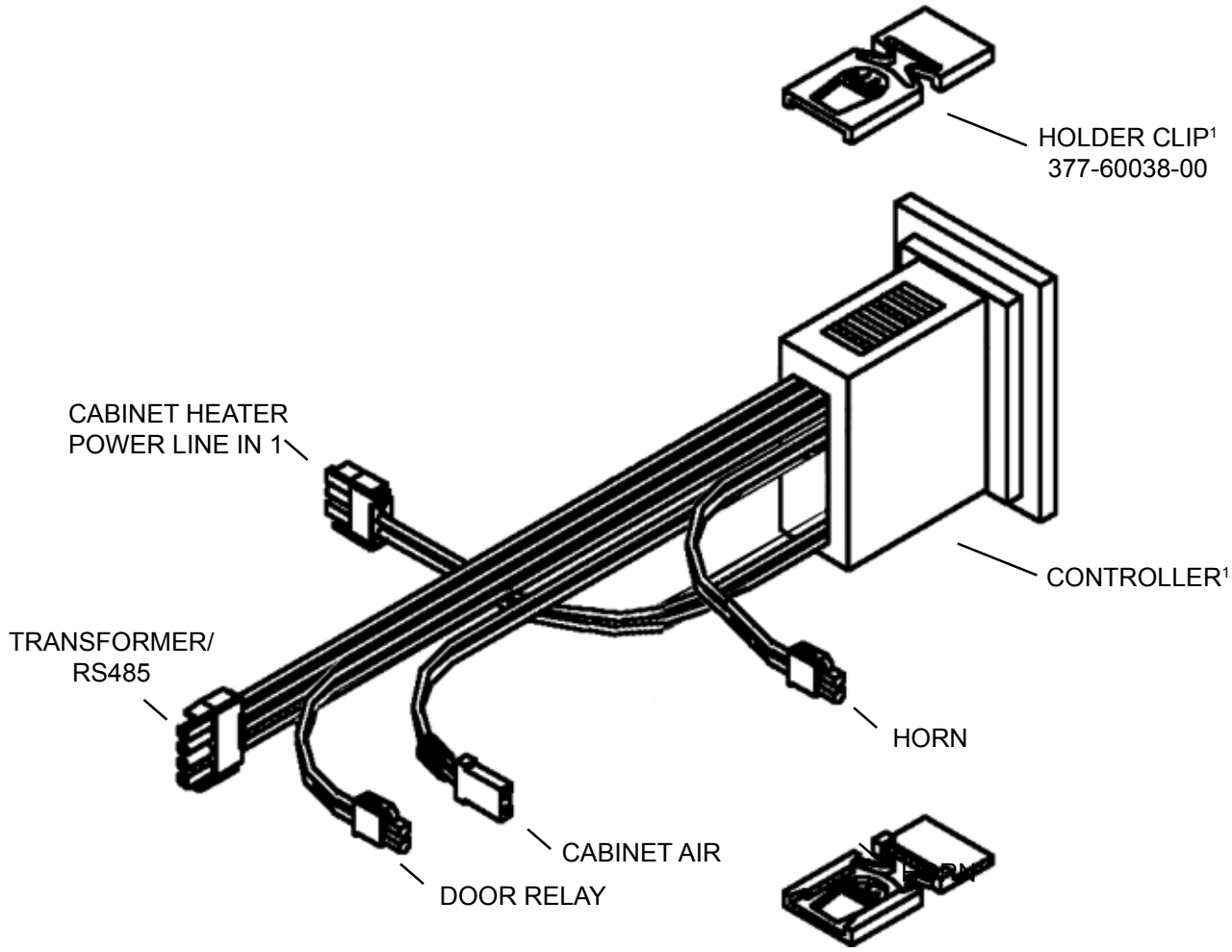
HOT FOOD CABINET START-UP (MIT version):
The MIT control offers an additional means of turning the cabinet heaters ON and OFF. After the operating temperature has been set, the operator can continuously turn the unit OFF and then back ON again to the same operating temperature by pressing the "ON/OFF" button on the face of the control.

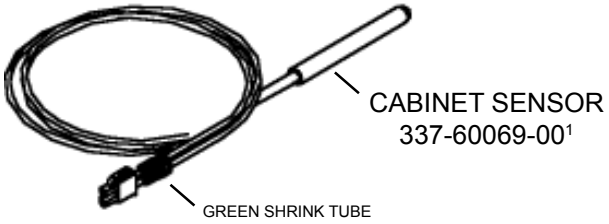
Please note that this feature will not function if the control is in an alarm state with the alarm LED illuminated.

NOTE:
See parts assembly on pages 21 and 22.

IV. CONTROL ARCHITECTURE

IV. d - <u>R & A SERIES HEATED CABINET VERTICAL CONTROLLERS</u>:
(p/n 337-60090-08, please note this control replaces p/n 337-60065-00)

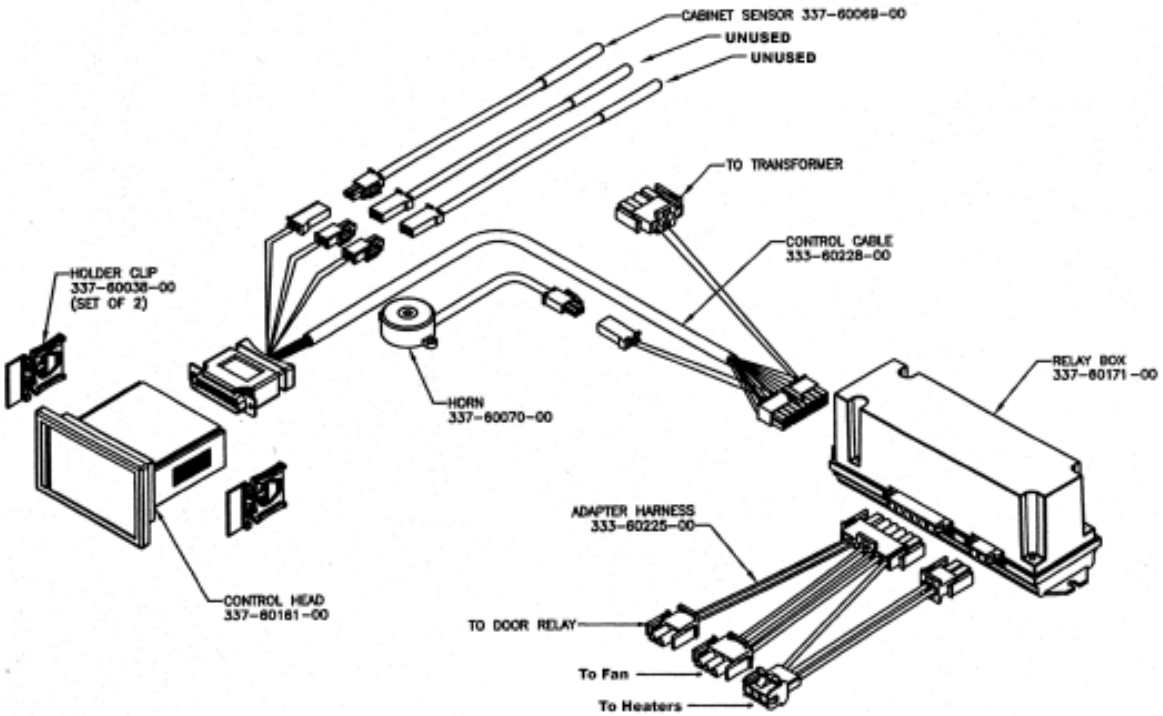




1= Set of 2 (can be ordered separately).
2= Requires unit Model No. and Serial No. to place order.

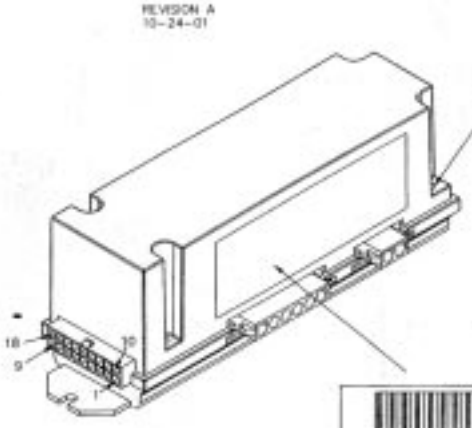
IV. CONTROL ARCHITECTURE

IV. d - <u>R & A SERIES HEATED CABINET VERTICAL CONTROLLERS</u>:
(parts assembly for MIT Version only)

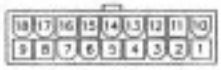


MIT CONTROL TROUBLE-SHOOTING DIAGRAM
(PLEASE RETAIN FOR YOUR RECORDS)

REVISION A
10-24-01



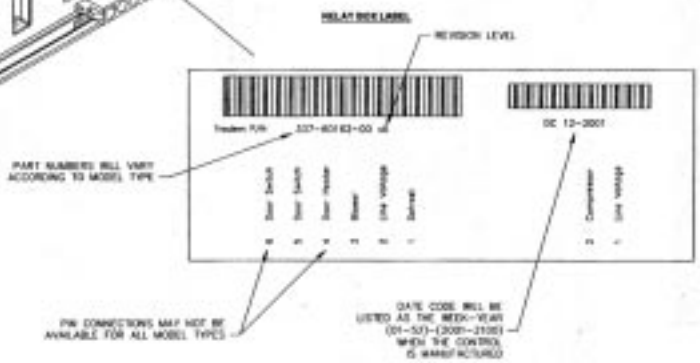
NOTE: ALL PINS IN THIS CONNECTOR SHOULD NOT READ MORE THAN 20 VAC



CONNECTOR PIN NUMBER	COLOR	SIGNAL
1	GRAY	BLOWER
2	ORANGE	DOOR HEATER
3	GREEN	ALARM FROM CONTROLLER
4	BLACK	RETURN FROM HORN
5		
6		
7	WHITE/PURPLE	-RS485
8	BLACK	GROUND
9	WHITE	12VAC
10	BLUE	COMPRESSOR
11	PURPLE	DEFROST
12	YELLOW	DOOR OPEN SIGNAL
13	RED	POWER TO HORN
14		
15		
16	PINK	+RS485
17	RED	12VDC TO CONTROLLER
18	BLACK	12VAC

VOLTAGE SHOULD NOT BE MORE THAN 5 DC WHEN MEASURED TO GROUND (PIN 8)

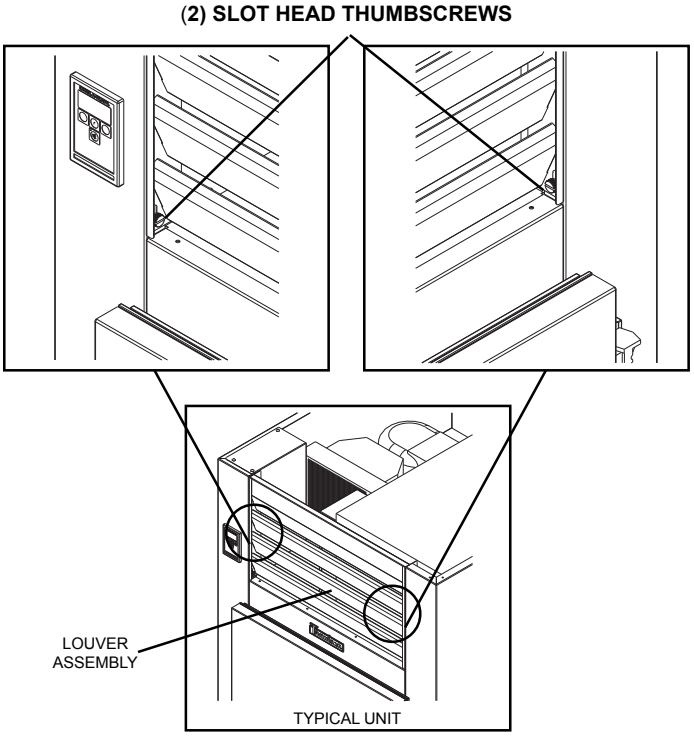
NOTE: ALL PINS IN THESE TWO CONNECTORS SHOULD BE READING LINE VOLTAGE



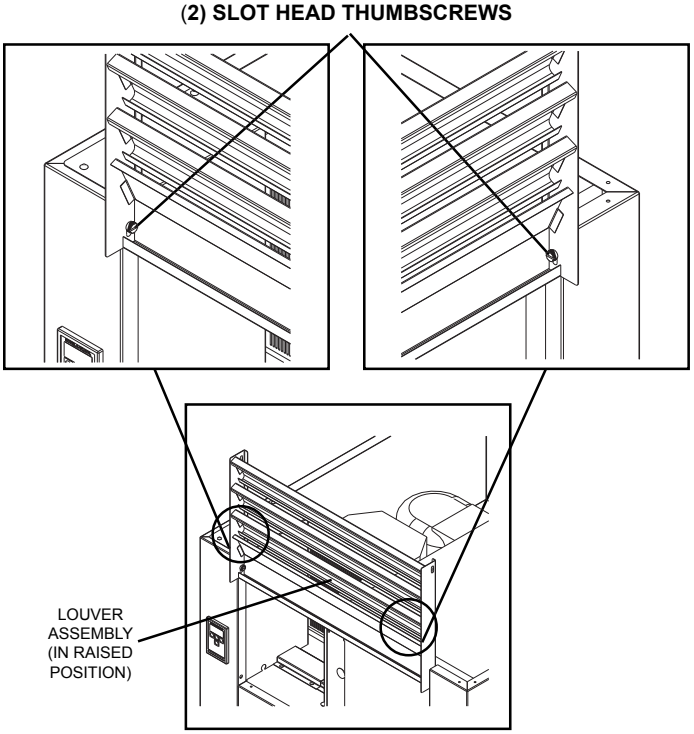
V. REMOVAL/INSTALLATION INSTRUCTIONS

V. a - ALL VERTICAL CONTROLLERS:

To remove INTELA-TRAUL™ (p/n's 337-60090-00, 337-60091-00 & 337-60092-00) and G-Series (p/n's 337-60093-00, 337-60094-00 & 337-60095-00) Vertical Controller from the unit in which it is installed, proceed as follows (If unable to access the unit from the rear perform steps 1 through 3, otherwise, proceed to step 4):



1. At front of unit, remove two (2) slot head thumbscrews from bottom corners of louver assembly. Set thumbscrews aside.



2. Swing louver assembly up and away from front of unit until it stops.

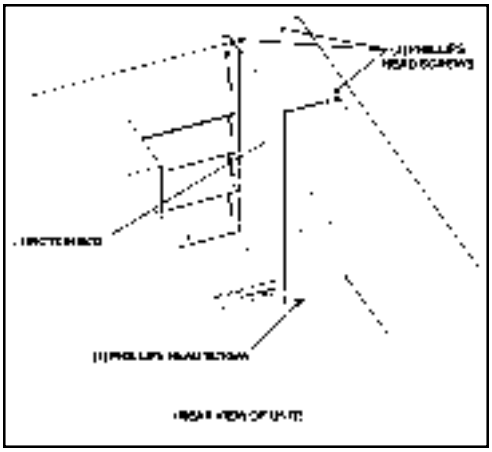
3. Remove two (2) Slot head thumbscrews from top of louver assembly. Set thumbscrews and louver assembly aside.

V. REMOVAL/INSTALLATION INSTRUCTIONS

WARNING: DISCONNECT ALL POWER BEFORE PROCEEDING

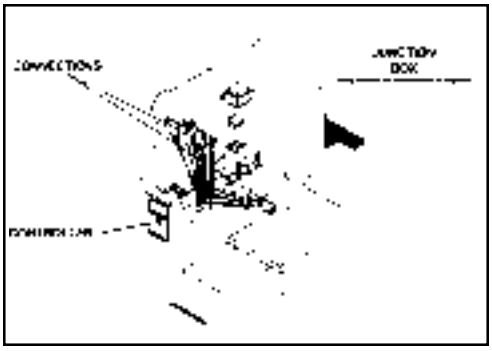
4. At the top of the junction box, remove three (3) Phillips head screws. Set screws aside.

5. Locate one (1) Phillips head screw at bottom of junction box, and remove. Set screw aside.

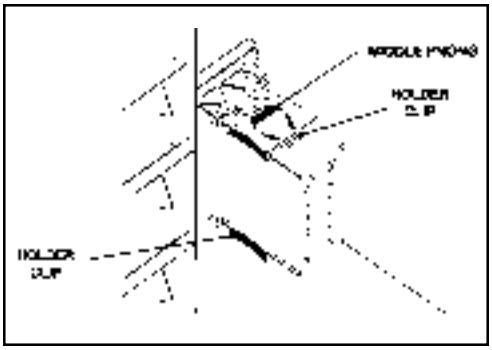


6. Carefully slide junction box away from front of unit until all wiring and connections to the controller are exposed.

7. Locate all nine (9) Controller connections (five for G-Series), then carefully disconnect each one.

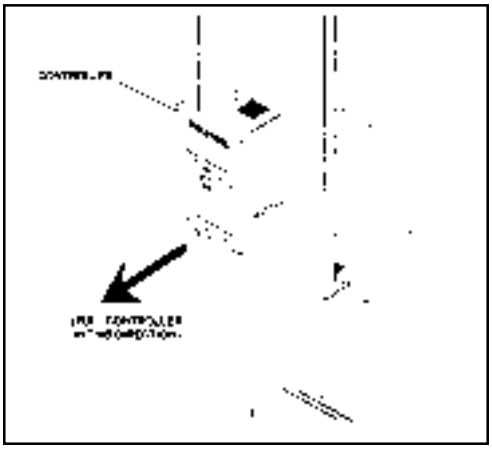


8. Firmly grasp and compress the rounded portion of the middle prong on each holder clip. Slowly slide each holder clip off the controller. Set clips aside.



NOTE:
Be sure ALL components have been disconnected from the Controller before performing the next step.

9. Slowly pull Controller through mounting hole and set aside.



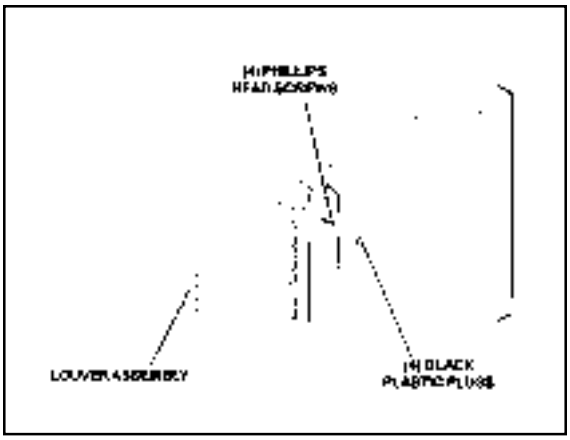
TO RE-INSTALL CONTROLLER, REVERSE THE PRECEEDING PROCEDURE.

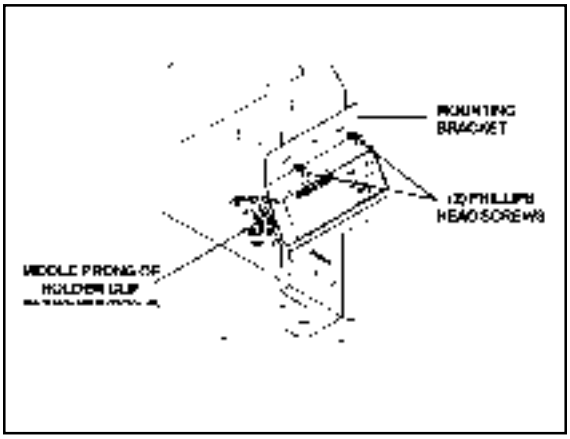
V. REMOVAL/INSTALLATION INSTRUCTIONS

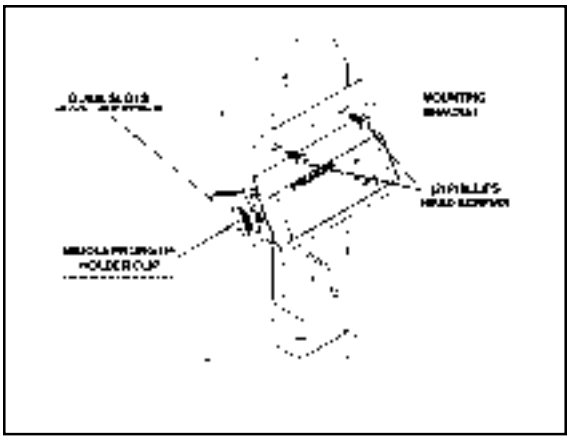
V. b - <u>ALL HORIZONTAL CONTROLLERS</u>:

To remove INTELA-TRAUL™ (p/n's 337-60096-00 & 337-60097-00) Horizontal Controller from the unit in which it is installed, proceed as follows:

WARNING: DISCONNECT ALL POWER BEFORE PROCEEDING







1. Check to make sure that the power cable is disconnected from the wall.
2. Remove the four (4) black plugs that are located in each corner of the power pack louver assembly. Set plugs aside.
3. Remove the four (4) Phillips head screws holding the louver assembly in place. Set screws and louver assembly aside.
4. Remove the two (2) Phillips head screws thathold the Controller and the bracket assembly to the condenser fan assembly. Set screws aside.
5. Locate all nine (9) Controller connections, then carefully disconnect each one.
6. Firmly grasp and compress the rounded portion of the middle prong on each holder clip. Slowly slide each holder clip off the Controller. Set clips aside.
7. Slowly remove Controller from mounting holes and set aside.

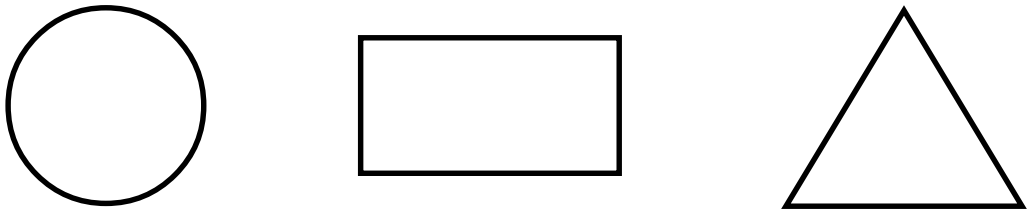
TO RE-INSTALL CONTROLLER, REVERSE THE PRECEEDING PROCEDURE.

VI. PROBLEM DIAGNOSIS

VI. a - HOW TO USE THE TROUBLESHOOTING TREES:

The troubleshooting trees on the following pages were developed as an aid to the service technician in determining the exact solution to a certain problem or malfunction. When used as designed, the troubleshooting trees can lead you from a general symptom to the most likely component to suspect as the cause of the problem.

The trees are made up of three different types of boxes:



QUESTION **CHECK** **SOLUTION**

QUESTION boxes ask a yes/no question and the answer will lead to either another question box, a check box, or a solution box.

CHECK boxes will suggest a point to check for proper operation, and will often refer you to a page in either the SERVICE INFORMATION or the REMOVAL/INSTALLATION sections of this manual. The result of the check may lead to another box, or a solution box.

SOLUTION boxes suggest the most likely component to cause the malfunction described in the heading of the tree. When reaching a solution box, do not immediately assume the component is defective. The final step is to use the SERVICE INFORMATION section of this manual to verify that the component is defective.

To use the troubleshooting trees, first find the page with the heading describing the type of problem occurring. Begin at the top of the page and follow the tree, step-by-step. When a check box is reached, refer to the suggested section to make the check suggested. Once a solution box is reached, refer to the suggested section to verify that the component in the solution box is indeed defective, and repair or replace per the direction in that section.

VI. b - PROBLEM DIAGNOSIS - HI TEMP ALARM

Doors open longer than 5 minutes?

YES → **Close Door(s)**

NO

Excessive amount of hot product placed in unit?

YES → **Reduce volume of hot product**

NO

Is evaporator coil frozen-up?

YES → **Defrost the evaporator coil. Go to page 8.**

NO

Check compressor for low refrigerant

IS NOT OK → **Add refrigerant**

IS OK

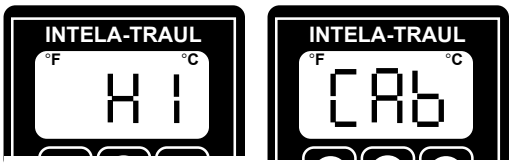
Check that sensor probe(s) properly connected

NO → **Connect probe(s)**

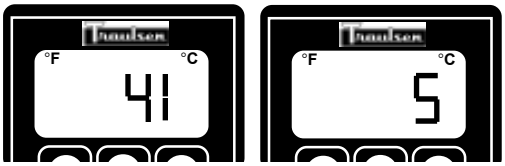
YES

Replace failed sensor. Go to pages 4, 7 & 9.

R & A Series Controllers



G-Series Controllers



REFRIGERATOR **FREEZER**

VI. c - PROBLEM DIAGNOSIS - LO TEMP ALARM

Is temperature setting for unit set too low?

YES → **Increase temperature. Go to page 3**

NO

Is there a food product in unit?

NO → **Add product to the unit**

YES

Check for failed compressor relay. Go to page 6

IS NOT OK → **Replace failed controller or slave relay. Go to page 23-24**

IS OK

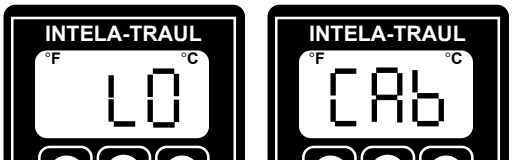
Check that sensor probe(s) properly connected

NO → **Connect probe(s)**

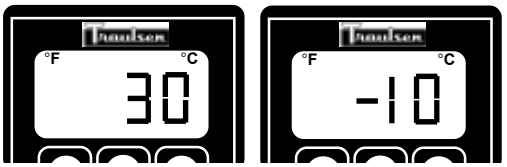
YES

Replace failed sensor. Go to pages 4, 7 & 9.

R & A Series Controllers



G-Series Controllers

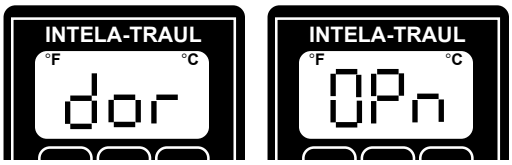


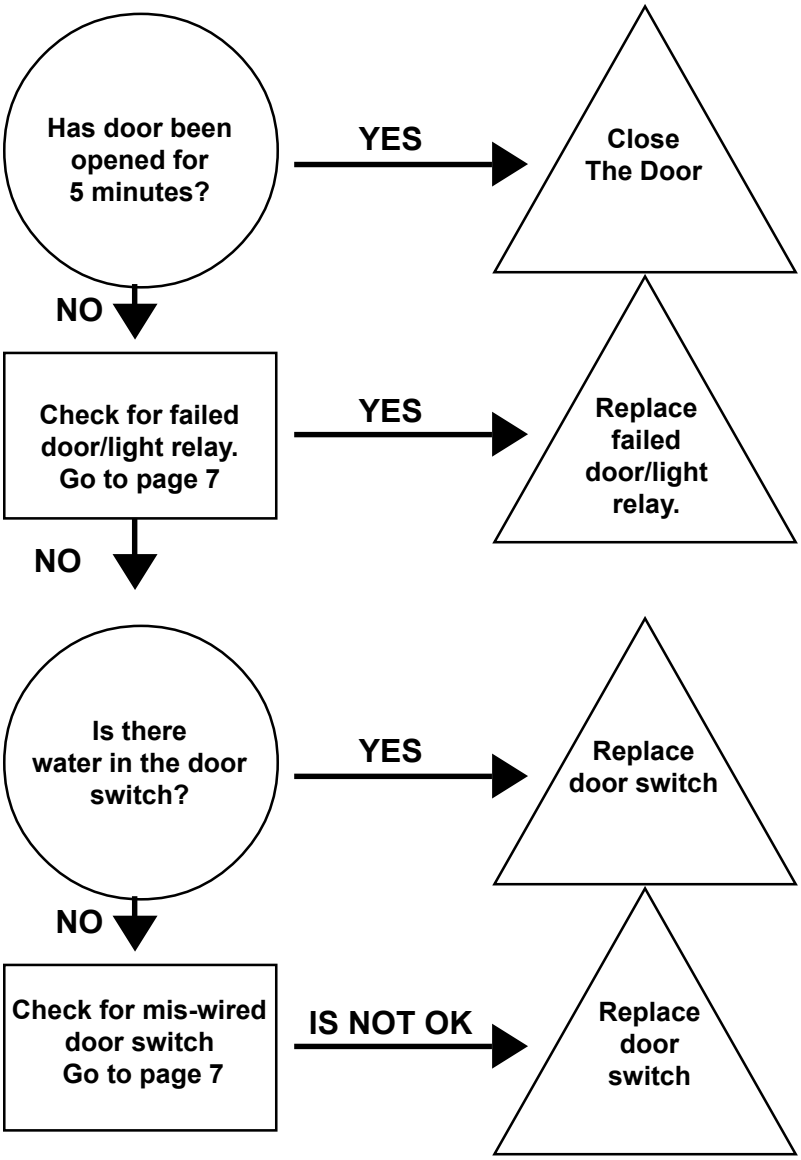
REFRIGERATOR **FREEZER**

NOTE ON HOT FOOD UNITS ONLY
Hot food units are designed to hold hot food at set temperature. The cabinet is not designed to heat cold products.

VI. d - PROBLEM DIAGNOSIS - DOOR OPEN ALARM

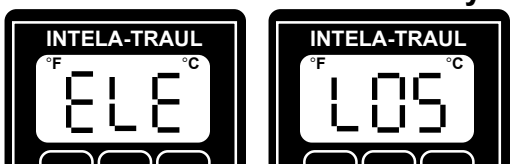
R & A Series Controllers Only





VI. e - PROBLEM DIAGNOSIS - POWER LOSS ALARM

R & A Series Controllers Only



Is unit plugged in?

NO → **Plug Unit in**

YES

Has unit suffered a loss of power due to bad weather?

YES → **Full operation will return when electrical service is restored**

NO

Is unit receiving low voltage input?

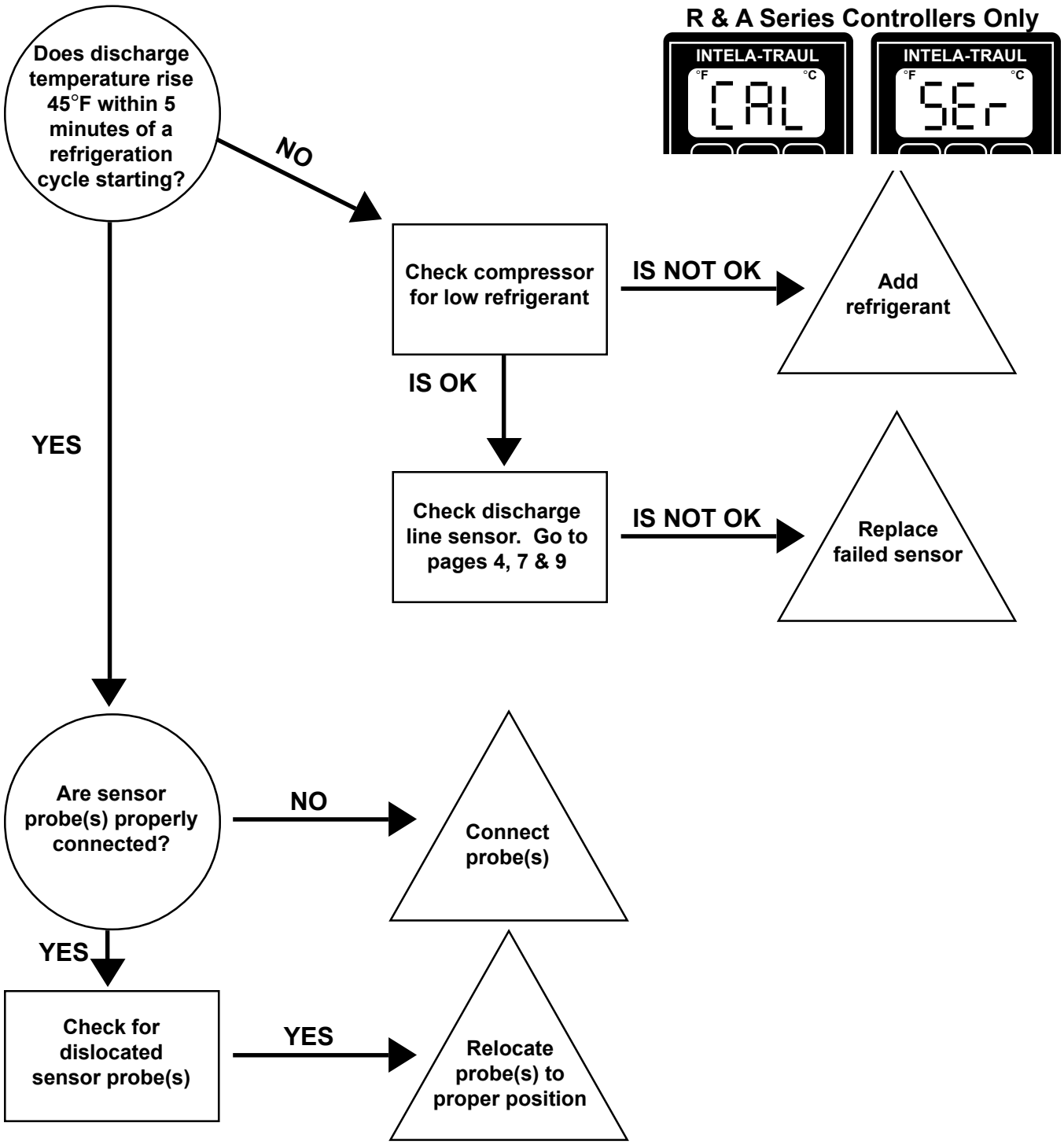
YES → **Contact local utility provider**

NO

Check for failed Controller transformer. Go to page 7

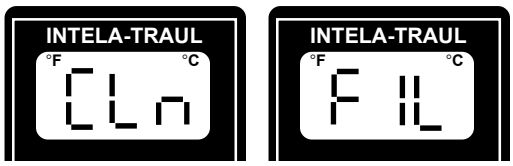
YES → **Replace Controller transformer**

VI. f - PROBLEM DIAGNOSIS - SYSTEM LEAK ALARM



VI. g - PROBLEM DIAGNOSIS - CONDENSERCLEAN ALARM

R & A Series Controllers Only



Is condenser coil dirty?

YES → **Clean Condenser Coil**

NO

Is condenser fan disconnected?

YES → **Properly connect fan**

NO

Check for a failed condenser fan

YES → **Replace fan**

NO

Are there obstructions at top or rear of unit?

YES → **Remove obstructions**

NO

Is room temperature too hot?

YES → **Lower the room temperature**

NO

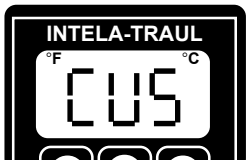
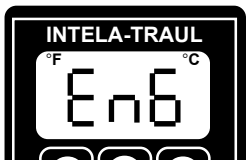
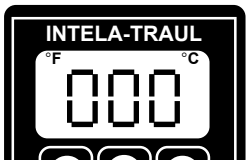
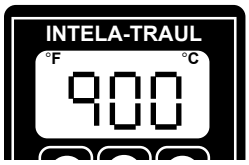
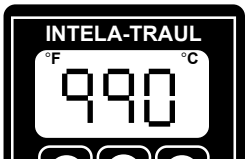
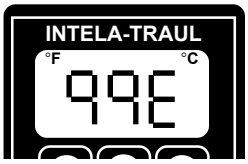
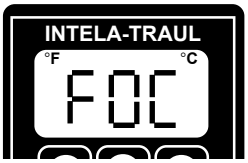
Are there any objects in the way that may be causing restricted air flow?

YES → **Move unit or objects for better air flow**

VII. ACCESSING THE ENGINEERING LEVEL

VII. a - ACCESSING THE ENGINEERING LEVEL:

Not all control parameters can be adjusted at the customer level of access. To adjust these parameters it is first necessary to enter the ENGINEERING LEVEL of access. Please follow the procedure below to do so.

Step No.	Instructions For Programming The Control	The Display Will Read
1.	Press SET. Display will read **"CUS"**.	
2.	Press ▼ until **"EnG"** is displayed.	
3.	Press SET. Display will read **"000"** with the left digit flashing. Press ▼ until the left digit changes to a "9".	 
4.	Press SET. Display will read **"900"** with the center digit flashing. Press ▼ until the center digit changes to a **"9"**.	
5.	Press SET. Display will read **"990"** with the right digit flashing. Press ▼ until right digit changes to an **"E"**. The display will read "**99E**". Press SET.	
6.	Press 🔇. Display will read **"FOC"**. (for G-Series models press ▼. Display will read **"FOC"**).	

VIII. PARAMETER DEFINITIONS

CODE	PARAMETER	DEFINITION	RANGE	SEC. LEVEL	REFRG PRESET	FREEZER PRESET
FOC	Feature Option Per Controller	Defines the model & type of unit the controller will control	n4 & n2	FAC & ENG	n4	n2
SPH	Thermostat Set-Point High	High point of desired cabinet temperature range	SHH to SHL	CUS & ENG	38°F	0°F
SPL	Thermostat Set-Point Low	Low point of desired cabinet temperature range	SLH to SLL	CUS & ENG	34°F	-4°F
SHL	Set-Point High/Low	Lowest temperature of allowed range for setting SPH	-40°F up to current setting for SHH	ENG	40°F	0°F
SHH	Set-Point High/High	Highest temperature of allowed range for setting SPH	From current setting for SHL up to 266°F	ENG	36°F	-2°F
SLL	Set-Point Low/Low	Lowest temperature of allowed range for setting SPL	-40°F up to current setting for SLH	ENG	32°F	-6°F
SLH	Set-Point Low/High	Highest temperature of allowed range for setting SPL	From current setting for SLL up to 266°F	ENG	34°F	-4°F
HI	Upper Set-Point Limit	The highest temp the cabinet air is allowed to reach - triggers HI TEMP alarm	-40°F to 266°F	ENG	41°F	5°F
LO	Lower Set-Point Limit	The lowest temp the cabinet air is allowed to reach - triggers LO TEMP alarm	-40°F to 266°F	ENG	30°F	-10°F
AC	Anticycling (therm. out)	The amount of time in minutes that the compressor must be OFF between cycles	1-10 min. in 1 min. incr.	ENG	1	1
HAd	High Temp Alarm Delay at Start-Up & Defrost End	The time in minutes that the controller delays triggering the HI TEMP alarm at any power up or defrost end	0-60 min. in 1 min. incr.	ENG	60	60
Ibd	Interval Time Between Defrosting	The amount of time in hours between the end of the drip time & the start of the next defrost cycle	1-9 hrs. in 1 hr. incr.	ENG	1	4
ddc	Max. Duration of Defrost Cycle	The maximum amount of time in minutes that the defrost heaters will be turned ON during one defrost cycle	0-30 min. in 5 min. incr.	ENG	10	20
CdE	Coil Temp at Defrost End	The temperature of the evap. coil that triggers the end of the defrost cycle	40°F to 80°F in 5°F incr.	ENG	45°F	75°F
ddE	Drip Time at Defrost End	The time in minutes between the defrost heaters turning OFF & the compressor turning ON	1-5 min. in 1 min. incr.	ENG	2	2
CFA	Clogged Filter Alarm	Allows the clogged filter option to be turned OFF on units that include the hardware	ON-OFF	ENG	ON	ON
doA	Door Open Alarm	Allows the door open option to be turned OFF on units that include the hardware	ON-OFF	ENG	ON	ON
**HA	Relative Humidity Ability	Allows the relative humidity option to be turned OFF on units that include the hardware	ON-OFF	ENG	ON	ON
odd	Max. Thermostat Operating Delay After Defrost End	The maximum amount of time in minutes that the display will read the last temp recorded before entering defrost cycle	0-30 min. in 5 min. incr.	ENG	10	10
bdP	Evap. Blower Delay At Power ON	The time in minutes, after the unit is powered ON, that will pass before the evap blower is turned ON	0-5 min. in 1 min. incr.	ENG	1	1
bdd	Evap. Blower Delay After Drip Time	The time in minutes, after the drip time ends, that will pass before the evap blower is turned ON	0-5 min. in 1 min. incr.	ENG	0	3
bsd	Evap. Blower Start Set-Point After Defrost End	The temp of the evap coil that triggers the evap blower to turn ON after drip time ends	30°F to 40°F in 1°F incr.	ENG	32°F	32°F
SCL	Temperature Scale	Sets the type of temp scale the display will read	F or C	FAC, CUS & ENG	°F	°F
dEF	Defrost Type	Defines the type of heat used to defrost the coil Electric, Hot Gas, None or Off-Cycle	E, G, N or O	ENG	O	E
con	Time Compressor Is “ON” In Case Of Cabinet Air Sensor Failure	The amount of time in minutes that the compressor will remain On during one cycle in case of a sensor failure	5-30 min. in 1 min. incr.	ENG	11	19
COF	Time Compressor Is “OFF” In Case Of Cabinet Air Sensor Failure	The amount of time in minutes that the compressor will remain OFF during one cycle in case of a sensor failure	5-15 min. in 1 min. incr.	ENG	10	7
dAd	Door Visual Alarm Delay	The amount of time in minutes that any one or more doors can remain open before a visual alarm is set	1-10 min. in 1 min. incr.	ENG	2	2
dAA	Door Audible Alarm Delay	The amount of time in minutes that any one or more doors can remain open before an audible alarm is set	1-15 min. in 1 min. incr.	ENG	15	15

VIII. PARAMETER DEFINITIONS

CODE	PARAMETER	DEFINITION	RANGE	SEC. LEVEL	REFRG PRESET	FREEZER PRESET
APd	Alarm / Pause Delay	The amount of time in seconds that any visual alarm text will remain on the display. The pause will always be half	2-10 sec. in 2 sec. incr.	ENG	4	4
AAS	Audible Alarm Style	Style of audible alarm: OFF, 3-second burst, or continuous	OFF, BSt, Cnt	CUS & ENG	OFF	OFF
dIS	Temp. Display	The amount of time in minutes that the temp will be displayed between visual alarm messages	1-5 min. in 1 min. incr.	ENG	1	1
CL	Time of Day (24 hour clock)	Default time setting for clock	00:00 to 23:59 setting for SHH	CUS & ENG	00:00	00:00
dAy	Date	Default date for recording		CUS & ENG	1/1/1999	01/01/1999
dS	Daylight Savings Time	Allows the clock to automatically update for daylight savings time	yes-no	CUS & ENG	YES	YES
Sd	Start Manual Defrost	Allows the customer/service tech to manually start a defrost cycle	yes-no	CUS & ENG	NO	NO
DL1	Defrost Lockout 1	The time frame during which the customer does tnot want the unit to go into a defrost cycle	2:00 to 8:00 in 30 min. incr. & OFF	CUS & ENG	OFF	OFF
DL2	Defrost Lockout 2	The time frame during which the customer does tnot want the unit to go into a defrost cycle	8:00 to 14:00 in 30 min. incr. & OFF	CUS & ENG	OFF	OFF
DL3	Defrost Lockout 3	The time frame during which the customer does tnot want the unit to go into a defrost cycle	14:00 to 20:00 in 30 min. incr. & OFF	CUS & ENG	OFF	OFF
DL4	Defrost Lockout 4	The time frame during which the customer does tnot want the unit to go into a defrost cycle	20:00 to 2:00 in 30 min. incr. & OFF	CUS & ENG	OFF	OFF
dCF	Dew Point Compensation Factor (H1 control only)	An approx. temperature difference to compensate for the placement of ambient air sensor (only req'd on units with RH sensor)	0-100	FAC, CUS & ENG	100	100
dCF	Dew Point Compensation Factor (MIT control only)	The % of time during a 6 minute interval that the door heaters are turned ON		FAC, CUS & ENG	100	100
ro	Room Temperature Offset	The difference in degrees between displayed temp and the actual temp	+/- 3°. in 1/2° incr.	CUS & ENG	0	0
Sdd	Smart Defrost Delay (n/a on MIT version)	The delay time in minutes between the end of the drip time and the time the evap soil sensor starts monitoring for smart defrost	0-120 min. in 1 min. incr.	ENG	60	60
CrF	Compressor Run Time Factor	The multiplier used to figure compressor run time for smart defrost	2-6 in 1 incr.	ENG	4	4
Sd1	Smart Defrost 1 (n/a on MIT version)	The maximum time in minutes allowed from last door alarm (used to initiate smart defrost)	1-60 min. in 1 min. incr.	ENG	30	30
Sd2	Smart Defrost 2 (n/a on MIT version)	The minimum amount of time in minutes that the door must remain closed to initiate smart defrost	1-30 min. in 1 min. incr.	ENG	15	15
Sd3	Smart Defrost 3 (n/a on MIT version)	The percent of rise in evap coil temp needed to initiate smart defrost)	1-99% in 1% incr.	ENG	50	50
CCr	Clogged Compressor Run-Time	The minimum amount of time in minutes that the compressor must be running before generating a clogged filter alarm	1-20 min. in 1 min. incr.	ENG	20	20
CdL	Clogged Filter Discharge Line Temperature	The target temperature that indicates that the filter is clogged.	160°F to 220°F in 5°F incr.	ENG	220°F	220°F
LCr	Line Leak Alarm Compressor Run Time	The amount of time in minutes the compressor will run before the discharge line temperature is examined to detemine if a line leak exists	1-20 min. in 1 min. incr.	ENG	10	10
LLD	Line Leak Temperature Difference	The minimum rise in temperature in time indicated by the the Line Leak Alarm Compressor run time	0-60°F	ENG	45°F	45°F
**AA	Ambient Air Sensor Temperature (n/a on MIT version)	Display the Ambient Air temperature for 20 seconds	N/A	CUS & ENG		
EL	Evap Coil Sensor Temperature	Display the Evaporator Core temperature for 20 seconds	N/A	CUS & ENG		
dL	Discharge Line Sensor Temperature (n/a on MIT version)	Display the Discharge Line temperature for 20 seconds	N/A	CUS & ENG		
**RH	Relative Humidity Sensor Temperature	Display the Relative Hunidity temperature for 20 seconds	N/A	CUS & ENG		
Adr	RS485 Address	Address assigned to controller for communication with Master and Service tool audible alarm is set	0-31	ENG	0	0

VIII. PARAMETER DEFINITIONS - H1 Control

CODE	PARAMETER	DEFINITION	RANGE	SEC. LEVEL	REFRG PRESET	FREEZER PRESET
FOC	Feature Option Per Controller	Defines the model & type of unit the controller will control	n4 & n2	FAC & ENG	n4	n2
SPH	Thermostat Set-Point High	High point of desired cabinet temperature range	SHH to SHL	CUS & ENG	38°F	0°F
SPL	Thermostat Set-Point Low	Low point of desired cabinet temperature range	SLH to SLL	CUS & ENG	34°F	-4°F
SHL	Set-Point High/Low	Lowest temperature of allowed range for setting SPH	-40°F up to current setting for SHH	ENG	36°F	-2°F
SHH	Set-Point High/High	Highest temperature of allowed range for setting SPH	From current setting for SHL up to 266°F	ENG	40°F	0°F
SLL	Set-Point Low/Low	Lowest temperature of allowed range for setting SPL	-40°F up to current setting for SLH	ENG	32°F	-6°F
SLH	Set-Point Low/High	Highest temperature of allowed range for setting SPL	From current setting for SLL up to 266°F	ENG	34°F	-4°F
HI	Upper Set-Point Limit	The highest temp the cabinet air is allowed to reach - triggers HI TEMP alarm	-40°F to 266°F	ENG	41°F	5°F
LO	Lower Set-Point Limit	The lowest temp the cabinet air is allowed to reach - triggers LO TEMP alarm	-40°F to 266°F	ENG	30°F	-10°F
AC	Anticycling (therm. out)	The amount of time in minutes that the compressor must be OFF between cycles	1-10 min. in 1 min. incr.	ENG	1	1
HAd	High Temp Alarm Delay at Start-Up & Defrost End	The time in minutes that the controller delays triggering the HI TEMP alarm at any power up or defrost end	0-60 min. in 1 min. incr.	ENG	60	60
Ibd[1]	Interval Time Between Defrosting	The amount of time in hours between the end of the drip time & the start of the next defrost cycle	1-9 hrs. in 1 hr. incr.	ENG	1	6
ddc[1]	Max. Duration of Defrost Cycle	The maximum amount of time in minutes that the defrost heaters will be turned ON during one defrost cycle	0-30 min. in 5 min. incr.	ENG	10	15
CdE[1]	Coil Temp at Defrost End	The temperature of the evap. coil that triggers the end of the defrost cycle	40°F to 80°F in 5°F incr.	ENG	45°F	70°F
ddE	Drip Time at Defrost End	The time in minutes between the defrost heaters turning OFF & the compressor turning ON	1-5 min. in 1 min. incr.	ENG	2	2
CFA	Clogged Filter Alarm	Allows the clogged filter option to be turned OFF on units that include the hardware	ON-OFF	ENG	ON	ON
doA	Door Open Alarm	Allows the door open option to be turned OFF on units that include the hardware	ON-OFF	ENG	ON	ON
**HA	Relative Humidity Ability	Allows the relative humidity option to be turned OFF on units that include the hardware	ON-OFF	ENG	ON	ON
odd	Max. Thermostat Operating Delay After Defrost End	The maximum amount of time in minutes that the display will read the last temp recorded before entering defrost cycle	0-30 min. in 5 min. incr.	ENG	10	10
bdP	Evap. Blower Delay At Power ON	The time in minutes, after the unit is powered ON, that will pass before the evap blower is turned ON	0-5 min. in 1 min. incr.	ENG	1	1
bdd	Evap. Blower Delay After Drip Time	The time in minutes, after the drip time ends, that will pass before the evap blower is turned ON	0-5 min. in 1 min. incr.	ENG	0	3
bsd	Evap. Blower Start Set-Point After Defrost End	The temp of the evap coil that triggers the evap blower to turn ON after drip time ends	30°F to 40°F in 1°F incr.	ENG	32°F	32°F
SCL	Temperature Scale	Sets the type of temp scale the display will read	F or C	FAC, CUS & ENG	°F	°F
dEF	Defrost Type	Defines the type of heat used to defrost the coil Electric, Hot Gas, None or Off-Cycle	E, G, N or O	ENG	O	E
con	Time Compressor Is “ON” In Case Of Cabinet Air Sensor Failure	The amount of time in minutes that the compressor will remain On during one cycle in case of a sensor failure	5-30 min. in 1 min. incr.	ENG	11	19
COF	Time Compressor Is “OFF” In Case Of Cabinet Air Sensor Failure	The amount of time in minutes that the compressor will remain OFF during one cycle in case of a sensor failure	5-15 min. in 1 min. incr.	ENG	10	7
dAd	Door Visual Alarm Delay	The amount of time in minutes that any one or more doors can remain open before a visual alarm is set	1-10 min. in 1 min. incr.	ENG	2	2
dAA	Door Audible Alarm Delay	The amount of time in minutes that any one or more doors can remain open before an audible alarm is set	1-15 min. in 1 min. incr.	ENG	15	15

1= Undercounter models utilize a hot gas defrost with settings: Ibd = 4, ddc = 20, & dEF = G.

VIII. PARAMETER DEFINITIONS - H1 Control

CODE	PARAMETER	DEFINITION	RANGE	SEC. LEVEL	REFRG PRESET	FREEZER PRESET
APd	Alarm / Pause Delay	The amount of time in seconds that any visual alarm text will remain on the display. The pause will always be half	2-10 sec. in 2 sec. incr.	ENG	4	4
AAS	Audible Alarm Style	Style of audible alarm: OFF, 3-second burst, or continuous	OFF, BSt, Cnt	CUS & ENG	OFF	OFF
dIS	Temp. Display	The amount of time in minutes that the temp will be displayed between visual alarm messages	1-5 min. in 1 min. incr.	ENG	1	1
CL	Time of Day (24 hour clock)	Default time setting for clock	00:00 to 23:59 setting for SHH	CUS & ENG	00:00	00:00
dAy	Date	Default date for recording		CUS & ENG	1/1/1999	01/01/1999
dS	Daylight Savings Time	Allows the clock to automatically update for daylight savings time	yes-no	CUS & ENG	YES	YES
Sd	Start Manual Defrost	Allows the customer/service tech to manually start a defrost cycle	yes-no	CUS & ENG	NO	NO
DL1	Defrost Lockout 1	The time frame during which the customer does tnot want the unit to go into a defrost cycle	2:00 to 8:00 in 30 min. incr. & OFF	CUS & ENG	OFF	OFF
DL2	Defrost Lockout 2	The time frame during which the customer does tnot want the unit to go into a defrost cycle	8:00 to 14:00 in 30 min. incr. & OFF	CUS & ENG	OFF	OFF
DL3	Defrost Lockout 3	The time frame during which the customer does tnot want the unit to go into a defrost cycle	14:00 to 20:00 in 30 min. incr. & OFF	CUS & ENG	OFF	OFF
DL4	Defrost Lockout 4	The time frame during which the customer does tnot want the unit to go into a defrost cycle	20:00 to 2:00 in 30 min. incr. & OFF	CUS & ENG	OFF	OFF
dCF	Dew Point Compensation Factor (H1 control only)	An approx. temperature difference to compensate for the placement of ambient air sensor (only req'd on units with RH sensor)	0-100	FAC, CUS & ENG	100	100
ro	Room Temperature Offset	The difference in degrees between displayed temp and the actual temp	+/- 3°. in 1/2° incr.	CUS & ENG	0	0
Sdd	Smart Defrost Delay (n/a on MIT version)	The delay time in minutes between the end of the drip time and the time the evap soil sensor starts monitoring for smart defrost	0-120 min. in 1 min. incr.	ENG	60	60
CrF	Compressor Run Time Factor	The multiplier used to figure compressor run time for smart defrost	2-6 in 1 incr.	ENG	4	4
CCr	Clogged Compressor Run-Time	The minimum amount of time in minutes that the compressor must be running before generating a clogged filter alarm	1-20 min. in 1 min. incr.	ENG	20	20
CdL	Clogged Filter Discharge Line Temperature	The target temperature that indicates that the filter is clogged.	160°F to 220°F in 5°F incr.	ENG	220°F	220°F
LCr	Line Leak Alarm Compressor Run Time	The amount of time in minutes the compressor will run before the discharge line temperature is examined to detemine if a line leak exists	1-20 min. in 1 min. incr.	ENG	10	10
LLD	Line Leak Temperature Difference	The minimum rise in temperature in time indicated by the the Line Leak Alarm Compressor run time	0-60°F	ENG	45°F	45°F ENG
Adr	RS485 Address	Address assigned to controller for communication with Master and Service tool audible alarm is set	0-31	ENG	0	0

IX. INDEX

HOURS OF OPERATION:
Monday thru Friday 7:30 am - 4:30 pm CST

Quality Refrigeration

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