



**INSTALLATION AND SERVICING
INSTRUCTIONS FOR THE GARLAND PHD PLUS
PRODUCT HOLDING DRAWER**

FOR YOUR SAFETY:

**DO NOT STORE OR USE GASOLINE OR
OTHER FLAMMABLE VAPORS AND
LIQUIDS IN THE VICINITY OF THIS OR
ANY OTHER APPLIANCE**

WARNING:

**IMPROPER INSTALLATION, ADJUSTMENT,
ALTERATION, MAINTENANCE OR SERVICE CAN
CAUSE PROPERTY DAMAGE, INJURY OR DEATH.
READ THE INSTALLATION,
OPERATING AND MAINTENANCE
INSTRUCTIONS THOROUGHLY BEFORE
INSTALLING OR SERVICING
THIS EQUIPMENT.**

THIS MANUAL SHOULD BE HANDED TO THE EQUIPMENT OWNER AND RETAINED FOR FUTURE REFERENCE.

THE FOLLOWING INSTRUCTIONS SHOULD BE READ CAREFULLY AS THE MANUFACTURER CANNOT BE HELD RESPONSIBLE FOR ANY DAMAGE TO PROPERTY OR PERSONS CAUSED BY INCORRECT INSTALLATION OR OPERATION OF THE EQUIPMENT

Please read all sections of this manual. This product has been listed as commercial cooking equipment and must be installed by professional personnel as specified.

We suggest installation, maintenance and repairs should be performed by your local authorized service agency listed in your information manual pamphlet.

Factory specified replacement parts must be used to maintain listing. Use of "generic" replacement parts may create a hazard and will void listing.

NOTE: This product is designed for commercial use only and is not approved for residential use.



GARLAND COMMERCIAL INDUSTRIES
185 East South Street
Freeland, Pennsylvania 18224
Phone: (570) 636-1000
Fax: (570) 636-3903

GARLAND COMMERCIAL RANGES, LTD.
1177 Kamato Road, Mississauga, Ontario L4W
1X4 CANADA
Phone: 905-624-0260
Fax: 905-624-5669

GARLAND CATERING EQUIPMENT LTD.
Swallowfield Way, Hayes, Middlesex UB3 1DQ
ENGLAND
Telephone: 081-561-0433
Fax: 081-848-0041

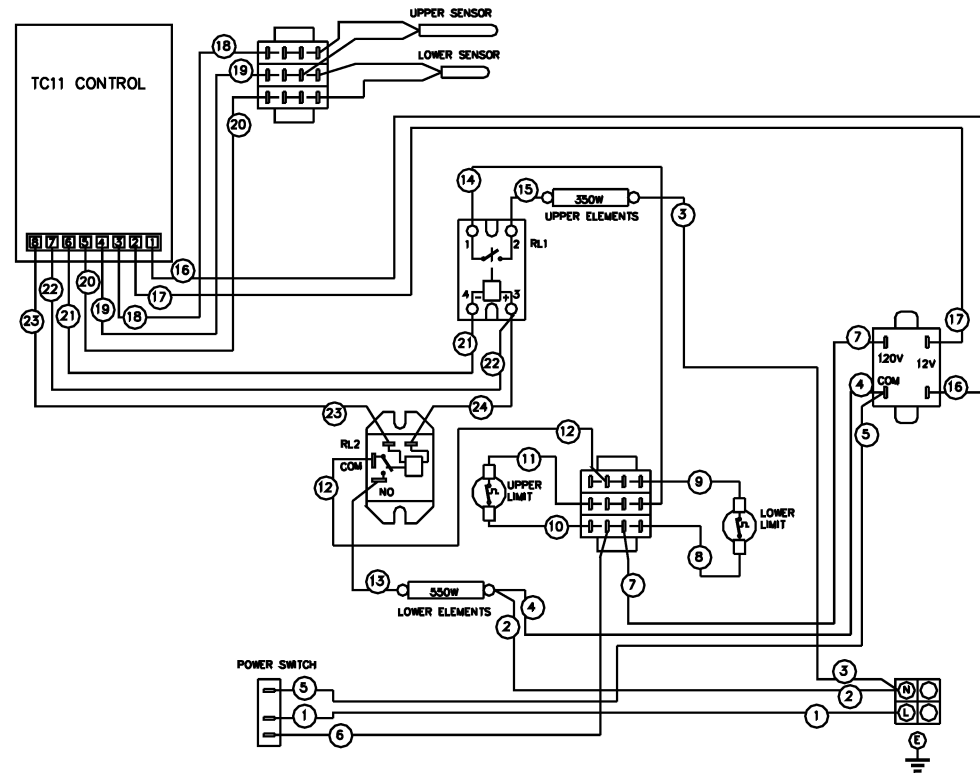
Part # 1844067 (8/99)

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NOTES

GENERAL INSTALLATION INFORMATION



DRAWING # 3009501

MODEL: PHD PLUS (230-240 VAC)

GARLAND COMMERCIAL RANGES LIMITED
MISSISSAUGA, ONTARIO, CANADA

1. Check the crate for possible damage sustained during transit. Carefully remove the unit from the crate and again check for damage. Any damage to the appliance must be reported to the carrier immediately.
2. Any protective material covering stainless steel parts must be removed.
3. The type of voltage supply that the equipment was manufactured for at the factory is noted on the data plate and on the packaging. This type of supply must be used.
4. Do not remove permanently affixed labels, warnings or data plates from the appliance, for this may void approvals and create a safety hazard.

interpretation of any of the literature, please contact your Authorized Service Agency or our Customer Service Department at the phone number listed in the information pamphlet.

A qualified person must make the installation of these products in accordance with the local codes.

Always follow these safety precautions when operating the product holding drawer.

The unit must only be operated by qualified persons. **DO NOT** operate without reading this manual and the separate Users manual provided.

DO NOT operate the product unless it has been properly installed and earthed.

Introduction:

The Garland PHD PLUS 120V and 240V complies with the standards CSA C22.2 no. 109 - latest edition, the UL197 - latest edition and the NSF#4 - latest edition. The installation & connection of this appliance must comply with current codes. In Canada - the Canadian Electrical Code Part 1 and in the USA - The National Electrical Code.

DO NOT operate the product unless all service and access panels are in place and fastened properly.

DO NOT attempt to repair or replace any part of this product unless all main power supplies have been disconnected.

WARNING: to avoid serious personal injury:

USE EXTREME CAUTION in setting up, operating and cleaning this product to avoid coming in contact with hot surfaces. Suitable protective clothing should be worn or proper utensils used to prevent the risk of burns.

NOTE: All warning labels and markings on the product, which call attention to further dangers and necessary precautions.

WARNING: this appliance must not be cleaned with a water jet.

Safety:

This manual pertains to the PHD PLUS Garland product holding drawer. The reader/operator must interpret its contents to applicable needs. If there is any question of

MODEL	TOTAL K.W. LOADING		K.W. LOADING PER PHASE						NOMINAL AMPS PER PHASE							
	230V	240V	X-Y	Y-Z	X-Z	X-Y	Y-Z	X-Z	1 PHASE			3 PHASE				
PHD PLUS	0.90	0.98							230V	240V	X	Y	Z	X	Y	Z
									3.92	4.01						

Assembly Number: 3009599 Date: 4-Jun-99 Revision:		Title: PHD PLUS WIRE SPECIFICATIONS Description: Power Wires By: VC									
Item	wire mark	part number	usage	type	colour	description	length	terminal A	terminal A description	terminal B	terminal B description
1	H108	14GA	TEW	BLACK	STRANDED	22	X8	F468	STRIP 1/2"	F468	TERMINAL-1/4" FEM INS 18-14AWG
2	H112	18GA	TEW	WHITE	STRANDED	7	X8	F475	STRIP 1/2"	F475	TERMINAL-#10 RING 16-14GA
3	H112	18GA	TEW	WHITE	STRANDED	10	X8	F148	STRIP 1/2"	F148	TERMINAL-#10 RING 16-14GA OPEN BA
4	H120	18GA	TEW	WHITE	STRANDED	11	WITH 2B	#N/A	F144	F144	TERMINAL-FEM_250X.032 14-10GA
5	H120	18GA	TEW	WHITE	STRANDED	27	WITH 4B	#N/A	F480	F480	TERMINAL-1/4"FAST FEM 22-18GA
6	H109	14GA	TEW	BLACK	STRANDED	15	F488	F488	TERMINAL-1/4" FEM INS 18-14AWG	F488	TERMINAL-1/4" FEM INS 18-14AWG
7	H119	18GA	TEW	BLACK	STRANDED	19	F480	F480	TERMINAL-1/4"FAST FEM 22-18GA	F480	TERMINAL-1/4"FAST FEM 22-18GA
8	H110	18GA	TEW	RED	STRANDED	9	F143	F143	TERMINAL-FEM_250X.032 18-14GA	F475	TERMINAL-#10 RING 16-14GA
9	H111	18GA	TEW	BLACK	STRANDED	15	F143	F143	TERMINAL-FEM_250X.032 18-14GA	F475	TERMINAL-#10 RING 16-14GA
10	H110	18GA	TEW	RED	STRANDED	15	F475	F475	TERMINAL-#10 RING 16-14GA	F475	TERMINAL-#10 RING 16-14GA
11	H111	18GA	TEW	BLACK	STRANDED	13	F475	F475	TERMINAL-#10 RING 16-14GA	F475	TERMINAL-#10 RING 16-14GA

Assembly Number: 3009598 Date: 4-Jun-99 Revision:		Title: PHD PLUS WIRE SPECIFICATIONS Description: Limit Wires By: VC									
Item	wire mark	part number	usage	type	colour	description	length	terminal A	terminal A description	terminal B	terminal B description
1	H20	18GA	TGS	RED	STRANDED	15	F143	F143	TERMINAL-FEM_250X.032 18-14GA	F143	TERMINAL-FEM_250X.032 18-14GA
2	H20	18GA	TGS	RED	STRANDED	15	F143	F143	TERMINAL-FEM_250X.032 18-14GA	F143	TERMINAL-FEM_250X.032 18-14GA
3	H20	18GA	TGS	RED	STRANDED	19	F143	F143	TERMINAL-FEM_250X.032 18-14GA	F143	TERMINAL-FEM_250X.032 18-14GA
4	H11	H20	18GA	TGS	RED	STRANDED	19	F143	TERMINAL-FEM_250X.032 18-14GA	F143	TERMINAL-FEM_250X.032 18-14GA

Assembly Number: 3009597 Date: 4-Jun-99 Revision:		Title: PHD PLUS WIRE SPECIFICATIONS Description: Control Wires By: VC									
Item	wire mark	part number	usage	type	colour	description	length	terminal A	terminal A description	terminal B	terminal B description
1	H18	H132	18GA	TEW	YELLOW	STRANDED	20	1431538	SOCKET 20-14GA, AMP 350536-1	F143	TERMINAL-FEM_250X.032 18-14GA
2	H17	H132	18GA	TEW	YELLOW	STRANDED	20	1431538	SOCKET 20-14GA, AMP 350536-1	F143	TERMINAL-FEM_250X.032 18-14GA
3	H18	H151	20GA	TEW	BLUE	WIRE	18	1431538	SOCKET 20-14GA, AMP 350536-1	F143	TERMINAL-FEM_250X.032 18-14GA
4	H19	H151	20GA	TEW	BLUE	WIRE	18	1431538	SOCKET 20-14GA, AMP 350536-1	F143	TERMINAL-FEM_250X.032 18-14GA
5	H20	H151	20GA	TEW	BLUE	WIRE	18	1431538	SOCKET 20-14GA, AMP 350536-1	F143	TERMINAL-FEM_250X.032 18-14GA
6	H21	H133	18GA	TEW	BROWN	STRANDED	11	1431538	SOCKET 20-14GA, AMP 350536-1	F475	TERMINAL-#10 RING 16-14GA
7	H22	H121	18GA	TEW	RED	STRANDED	11	1431538	SOCKET 20-14GA, AMP 350536-1	F475	TERMINAL-#10 RING 16-14GA
8	H23	H133	18GA	TEW	BROWN	STRANDED	16	1431538	SOCKET 20-14GA, AMP 350536-1	F152	TERMINAL-187 20-18 GA UNINSULATED
9	H24	H121	18GA	TEW	RED	STRANDED	7	F475	TERMINAL-#10 RING 16-14GA	F152	TERMINAL-187 20-18 GA UNINSULATED

MODEL NO:	DATE:	DR:
PHD PLUS	JUN 4/99	V.C.
230-240VAC	3009501	

TECHNICAL INFORMATION

Dimensions & Specifications:

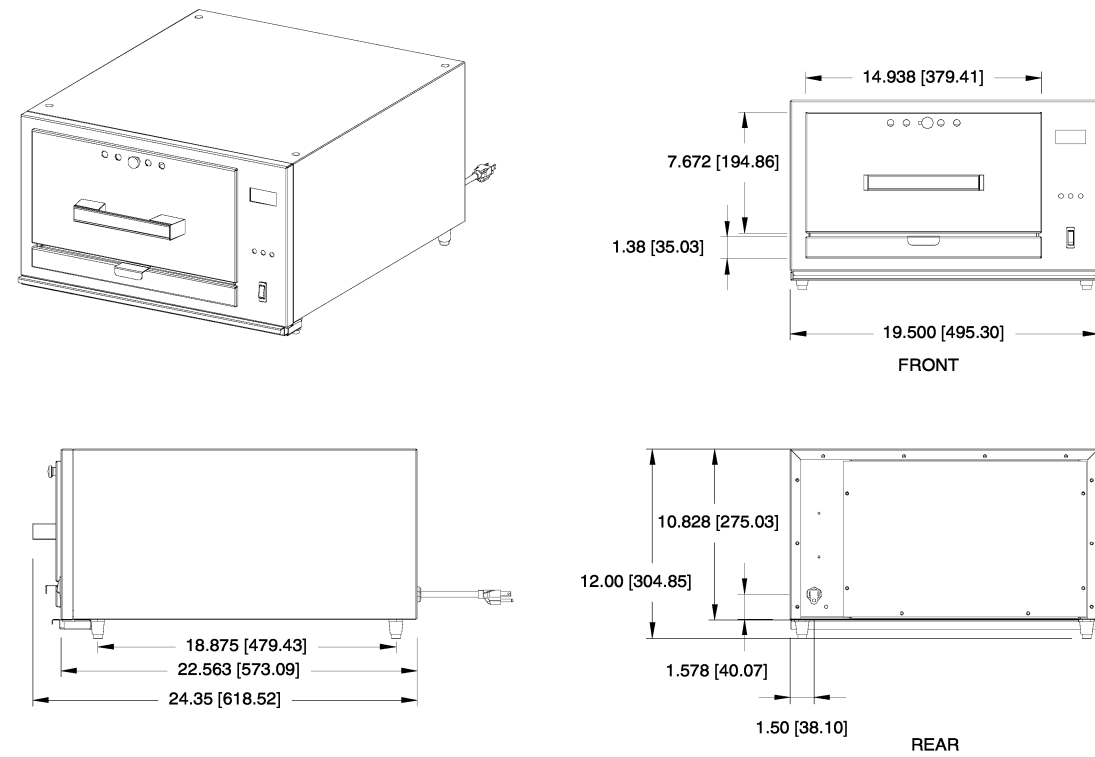
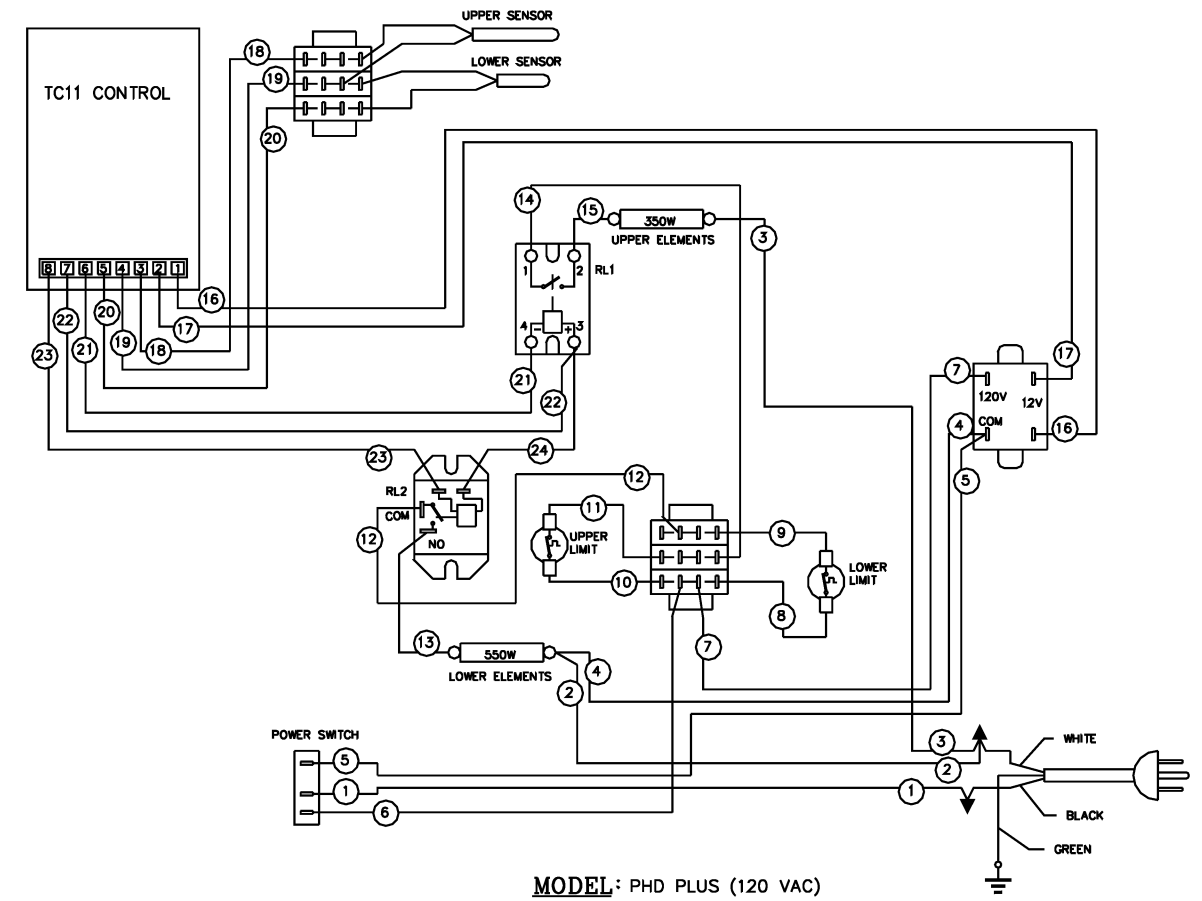


Figure 1

TABLE A: Loading Chart, (maximum current draw)

Model Designation	Total kW load	120V 1 phase	230V 1 phase	240V 1 phase
PHD PLUS	0.90	7.5	3.92	---
PHD PLUS	0.98	---	---	4.01



MODEL: PHD PLUS (120 VAC)

GARLAND COMMERCIAL RANGES LIMITED
 MISSISSAUGA, ONTARIO, CANADA

DRAWING # 3009500

MODEL	TOTAL K.W. LOADING	K.W. LOADING PER PHASE						NOMINAL AMPS PER PHASE						
		X-Y	Y-Z	X-Z	X-Y	Y-Z	X-Z	1 PHASE			3 PHASE			
PHD PLUS	0.90							120V	X	Y	Z	X	Y	Z
								7.5						

Assembly Number: 3009599 Title: PHD PLUS WIRE SPECIFICATIONS
 Date: 4-Jun-99 Description: Power Wires
 Revision: By: VC

Item	wire mark	part number	gauge	type	colour	description	length	terminal A	terminal A description	terminal B	terminal B description
1	1	H109	14GA	TEW	BLACK	STRANDED	22	X8	STRIP 1/2"	F466	TERMINAL-1/4" FEM INS 16-14AWG
2	2	H112	18GA	TEW	WHITE	STRANDED	7	X8	STRIP 1/2"	F475	TERMINAL-#10 RING 16-14GA
3	3	H112	18GA	TEW	WHITE	STRANDED	10	X8	STRIP 1/2"	F145	TERMINAL-#10 RING 16-14GA OPEN BA
4	4	H120	18GA	TEW	WHITE	STRANDED	11	WITH 2B	#N/A	F144	TERMINAL-FEM 250X.032 14-18GA
5	5	H120	18GA	TEW	WHITE	STRANDED	27	WITH 4B	#N/A	F460	TERMINAL-1/4"FAST FEM 22-18GA
6	6	H109	14GA	TEW	BLACK	STRANDED	15	F466	TERMINAL-1/4" FEM INS 16-14AWG	F466	TERMINAL-1/4" FEM INS 16-14AWG
7	7	H119	18GA	TEW	BLACK	STRANDED	19	F460	TERMINAL-1/4"FAST FEM 22-18GA	F460	TERMINAL-1/4"FAST FEM 22-18GA
8	12	H110	18GA	TEW	RED	STRANDED	8	F143	TERMINAL-FEM 250X.032 18-14GA	F475	TERMINAL-#10 RING 16-14GA
9	13	H111	18GA	TEW	BLACK	STRANDED	15	F143	TERMINAL-FEM 250X.032 18-14GA	F475	TERMINAL-#10 RING 16-14GA
10	14	H110	18GA	TEW	RED	STRANDED	15	F475	TERMINAL-#10 RING 16-14GA	F475	TERMINAL-#10 RING 16-14GA
11	15	H111	18GA	TEW	BLACK	STRANDED	13	F475	TERMINAL-#10 RING 16-14GA	F475	TERMINAL-#10 RING 16-14GA

Assembly Number: 3009598 Title: PHD PLUS WIRE SPECIFICATIONS
 Date: 4-Jun-99 Description: Limit Wires
 Revision: By: VC

Item	wire mark	part number	gauge	type	colour	description	length	terminal A	terminal A description	terminal B	terminal B description
1	8	H20	18GA	TGS	RED	STRANDED	15	F143	TERMINAL-FEM 250X.032 18-14GA	F143	TERMINAL-FEM 250X.032 18-14GA
2	9	H20	18GA	TGS	RED	STRANDED	15	F143	TERMINAL-FEM 250X.032 18-14GA	F143	TERMINAL-FEM 250X.032 18-14GA
3	10	H20	18GA	TGS	RED	STRANDED	19	F143	TERMINAL-FEM 250X.032 18-14GA	F143	TERMINAL-FEM 250X.032 18-14GA
4	11	H20	18GA	TGS	RED	STRANDED	19	F143	TERMINAL-FEM 250X.032 18-14GA	F143	TERMINAL-FEM 250X.032 18-14GA

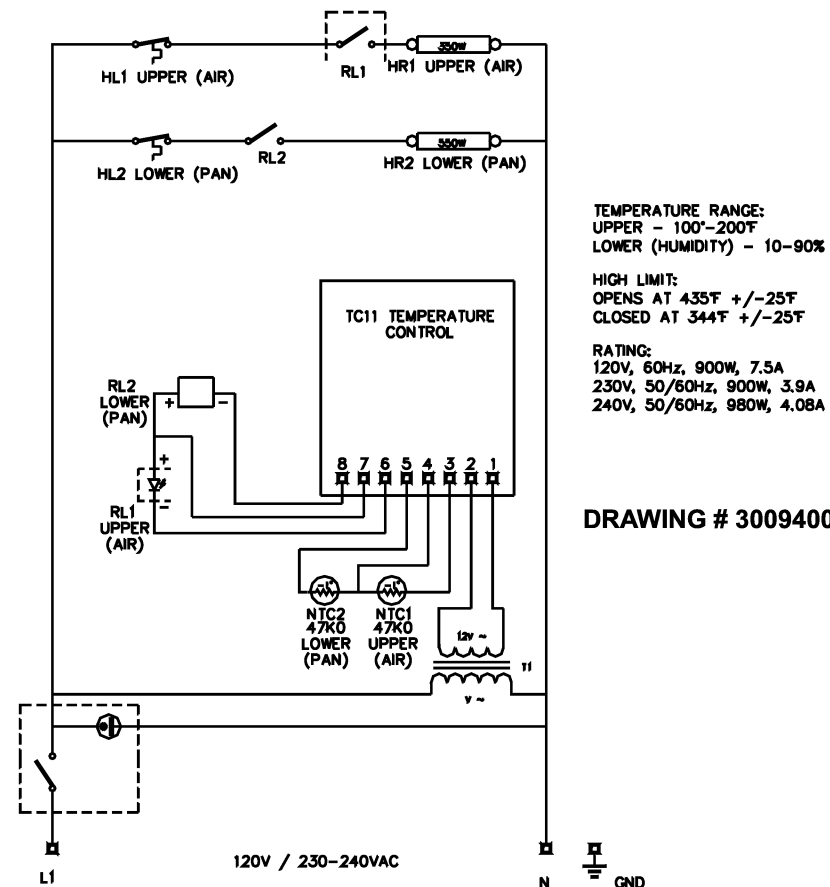
Assembly Number: 3009597 Title: PHD PLUS WIRE SPECIFICATIONS
 Date: 4-Jun-99 Description: Control Wires
 Revision: By: VC

Item	wire mark	part number	gauge	type	colour	description	length	terminal A	terminal A description	terminal B	terminal B description
1	16	H132	18GA	TEW	YELLOW	STRANDED	20	1431538	SOCKET 20-14GA, AMP 350536-1	F143	TERMINAL-FEM 250X.032 18-14GA
2	17	H132	18GA	TEW	YELLOW	STRANDED	20	1431538	SOCKET 20-14GA, AMP 350536-1	F143	TERMINAL-FEM 250X.032 18-14GA
3	18	H151	20GA	TEW	BLUE	WIRE	18	1431538	SOCKET 20-14GA, AMP 350536-1	F143	TERMINAL-FEM 250X.032 18-14GA
4	19	H151	20GA	TEW	BLUE	WIRE	18	1431538	SOCKET 20-14GA, AMP 350536-1	F143	TERMINAL-FEM 250X.032 18-14GA
5	20	H151	20GA	TEW	BLUE	WIRE	18	1431538	SOCKET 20-14GA, AMP 350536-1	F143	TERMINAL-FEM 250X.032 18-14GA
6	21	H133	18GA	TEW	BROWN	STRANDED	11	1431538	SOCKET 20-14GA, AMP 350536-1	F475	TERMINAL-#10 RING 16-14GA
7	22	H121	18GA	TEW	RED	STRANDED	11	1431538	SOCKET 20-14GA, AMP 350536-1	F475	TERMINAL-#10 RING 16-14GA
8	23	H133	18GA	TEW	BROWN	STRANDED	18	1431538	SOCKET 20-14GA, AMP 350536-1	F152	TERMINAL-187 20-18 GA UNINSULATED
9	24	H121	18GA	TEW	RED	STRANDED	7	F475	TERMINAL-#10 RING 16-14GA	F152	TERMINAL-187 20-18 GA UNINSULATED

MODEL NO:	DATE:	DR:
PHD PLUS	JUN 4/99	V.C.
120VAC	3009500	

APPENDIX

Wiring diagrams and Loading Charts



GENERAL INSTALLATION

Electrical Supply:

Before attempting the electrical connection, the rating plate should be checked to ensure that the equipment's electrical characteristics and the supply electrical characteristics agree. 120 volt models are supplied with a NEMA 5-15P plug and cord. Some 230 and 240 volt models may not be supplied with a plug and cord but are supplied with a terminal block accessible on the right side by removing the Top Cover Assembly. The electrical supply must be adequate for the voltage, phase & current marked on the rating plate.

WARNING: THIS APPLIANCE MUST BE GROUNDED. The Garland Product Holding Drawer operating at 120V, 60Hz, 1ph, AC is equipped with a three prong grounding cord and plug for your protection against possible shock hazards. Be sure to plug only into a properly grounded three-prong wall receptacle. If you have any questions with regard to adequate wiring or grounding in your building, a qualified electrician should be contacted before using your PHD.

DO NOT UNDER ANY CIRCUMSTANCES CUT OR REMOVE THE GROUNDING PRONG FROM THE PLUG.

Data Plate Location:

The data plate is readily accessible, located above the cable entrance on the rear of the unit. It contains all of the pertinent information required by the installer.

Precautions:

230, 240 VOLT MODELS: Models not supplied with a plug and cord must be installed by a qualified person as required by the local electrical authorities.

CE MODELS: This appliance should be connected to a potential equalization system. To facilitate this a labeled

equipotential bonding point is fitted to the rear of the unit.

CAUTION - Prior to installation, check the electrical supply to ensure input voltage and phase match the equipment voltage rating and phase. See data plate located above the cable entrance on the rear of the unit.

Siting:

The base on which the PHD PLUS is to be sited must be capable of adequately supporting the weight of the appliance (80lbs./ 36kg.) and any ancillary equipment. Once in position check that the equipment is level, both front to back and side to side. Adjust the height of the feet if necessary. Do not remove the feet.

Stacking:

Order Stacking Kit F4.01 PHD for stacking 2 units and F4.02 PHD for stacking 3 units. Part number 2641900 will provide improved stability when stacking the PHD PLUS. Level the units to be stacked then remove the two (2) screws at the rear top of the bottom unit and the two (2) screws from the rear bottom of the top unit. Replace the screws securing the plate to both units as shown in the diagram below.

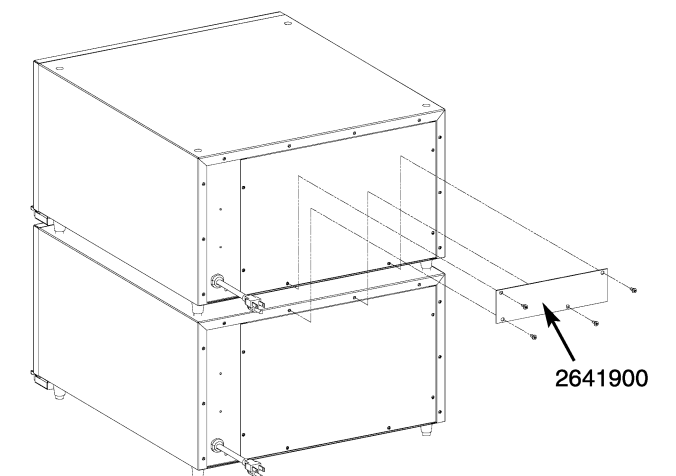


Figure 1

Ventilation Air:

This product is not required to be positioned under a ventilation hood.

Clearances:

The space in which the appliance is to be sited must include the minimum installation clearances to combustible surfaces shown in Table B.

**TABLE B: Minimum Installation Clearances
Clearance to Combustible Material (with 25mm / 1" legs)**

MODEL	TOP		LEFT SIDE		RIGHT SIDE		REAR		TYPE OF FLOOR OR BASE
	in.	mm	in.	mm	in.	mm	in.	mm	
PHD PLUS	*	*	0	0	0	0	0	0	COMBUSTIBLE

* NOTE: Do not remove legs when stacking units.

OPERATION

The following sections provide instructions on operating the PHD PLUS. For more detailed operating instructions refer to 1844066 Operating Instructions.

The PHD PLUS provides two heating zones. The upper element rated at 350 Watts is the primary air heat source. The lower element rated at 550 Watts is used to heat the water when operating in humidity mode and assists in heating the air in dry operating modes.

The temperature control provides the following features:

- Continuous actual air temperature display provides an accurate indication for food safety.

- The temperature can be displayed in Celsius or Fahrenheit degrees.

- Four Menu settings. Up to four preset air and humidity setting can be made.

- A unique humidity program provides an accurate and repeatable method of controlling the humidity throughout the air temperature range.

- Air temperature settings up to 200°F/93°C.

- Humidity settings up to 90%.

4. Replace the sensor in reverse order using fresh food grade silicone such as Dow Corning 732.

Lower Sensor:

1. Remove the outer wrap.
2. Remove the bottom element access cover.
3. The sensor is secured to the cavity bottom. Remove the nut and bracket securing the sensor. Feed the sensor back to the control compartment.
4. Remove the wires from the junction block.
5. Thermal compound was used on the sensor. Clean the cavity bottom and replace the sensor in reverse order using fresh thermal compound, Garland Part Number 1813501 or Wakefield 120.

Control Overlay:

1. Remove the outer wrap.
2. Remove the power switch.
3. Remove the old overlay.
4. Before installing the new overlay the old adhesive must completely be removed from the front panel. Use an acetone based solvent or similar to remove the old adhesive. Always observe warning labels when using solvents and only use in a ventilated area where no open flames are present.

5. Remove the protective cover from the adhesive on the overlay.

6. Carefully align the overlay. Start at the bottom and align the switch opening. An alternate technique is to use the protective adhesive cover as a release sheet. Position a piece, shiny side against the adhesive. Align the overlay and stick one exposed area. Remove the sheet and smooth the rest of the overlay on the panel.

7. Smooth the overlay in one direction, from bottom to top making sure the entire surface of the overlay adheres.

Control Board:

ESD SENSITIVE DEVICE - USE PRECAUTIONS.

1. Remove the outer wrap.
2. Depress the tabs on the control connector and unplug the control board.
3. Remove the four (4) screws securing the control board.
4. Before installing the new control clean the display window with a mild soap and water solution if necessary.
5. Replace the four (4) screws securing the control board and plug in the connector.
6. Make any programming changes that may be required by the customer.

MAINTENANCE

This appliance should be cleaned on a regular basis (see Operating Instructions 1844066). In addition to regular cleaning, all corners and crevices sealed with silicone should be checked monthly. If any area begins to peel, clean off the old silicone and replace with Dow Corning 732 silicone.

Failure to follow this procedure may result in water seepage into the element or control area causing damage or may foster unsanitary conditions.

Examine the overlay on a regular basis. The overlay should be replaced immediately if the display window or keypads are cracked.

PARTS REPLACEMENT

Caution: Qualified personnel must perform the following operations.

Disconnect the appliance from the power supply before proceeding.

Upper Heating Elements:

1. Remove the outer wrap.
2. Remove the insulation from the top.
3. Disconnect the element electrical connections.
4. Using pliers, remove the insulation retaining clips near the element terminals.
5. Remove the ten (10) nuts from the two (2) elements clamps.
6. Remove the element and notice the orientation.
7. To replace the element, repeat the above steps in reverse order. Before making the electrical connections to the elements, examine the terminals and replace if any damage has occurred.

Lower Heating Elements:

1. Remove the outer wrap.
2. Remove the element access cover on the bottom of the unit.
3. Disconnect the element electrical connections.
4. Using pliers, remove the insulation retaining clips near the element terminals.
5. Remove the ten (10) nuts from the two (2) elements clamps.

6. Remove the element and notice the orientation.
7. To replace the element, repeat the above steps in reverse order. Before making the electrical connections to the elements, examine the terminals and replace if any damage has occurred.

Solid State Relay:

1. Remove the outer wrap.
2. Disconnect the wires from the relay. Note their positions and refer to the wiring diagrams in the Appendix.
3. Remove the two (2) screws securing the relay.
4. Wipe the thermal compound from the heat sink the relay was mounted on.
5. Make sure there is no dust or particles on the relay base. Apply fresh thermal compound Garland Part Number 1813501 or Wakefield 120 to the relay base. Smooth and distribute the compound evenly over the base.
6. When replacing the relay, tighten the screws alternately, little by little until tight. This will avoid applying too much torque to one side of the relay. In this way the relay will have optimum thermal contact with the heat sink.

7. Rewire the relay and replace the wrap.

Air Sensor:

1. Remove the outer wrap.
2. The air sensor is sealed to the cavity wall with silicone. Peel back enough insulation from the cavity wall and remove the silicone seal and slide the sensor out.
3. Remove the wires from the junction block.

Explanation of Controls:

°F DISPLAY LED: Indicates that the °F display is selected.

°C DISPLAY LED: Indicates that the °C display is selected.





PARAMETER ADJUST MODE LED: Indicates that the parameter adjust mode is selected.

DIGITAL DISPLAY: Normally displays the actual air temperature and pre-programmed menus. In set mode displays other parameters.

SERVICE / SELECT KEY (Hidden on some models): Used to enter the parameter adjust mode or select a pre-programmed menu.

INCREASE KEY: Increases the selected parameter value. Views the air temperature set point in operation mode.

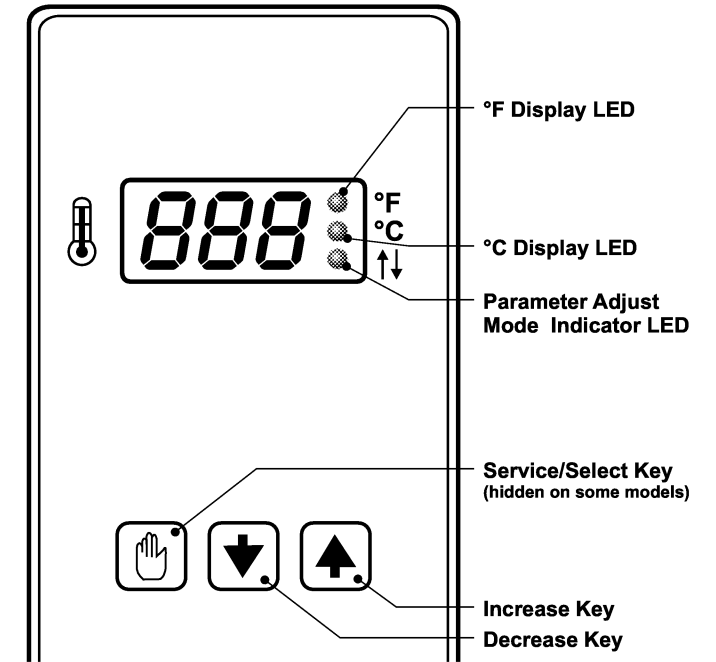
DECREASE KEY: Decreases the selected parameter value. Views the humidity set point in operation mode.

NOTE: The display parameters may be changed in steps by pushing the  or  keys repetitively, or automatically by holding down the same key longer. Digits will increment or decrement at accelerating rates as the  or  key is continually pressed.

Control Basics:

There are a number of control features, which need to be understood before proceeding with programming and operating the PHD PLUS.

1. Default air temperature of 150°F or 66°C and 50% humidity has been programmed in.
2. No preset temperature and humidity has been programmed.
3. When the unit powers up the control defaults to the last programmed settings.



Getting Started:

Connect the power supply and turn the power switch to the "1" position.

When power is first applied to a factory unit:

The display will show [888] and the 3 status LED's will come on for 10 seconds and then go off for 1 second.

The actual air temperature will be displayed.

Controller Memory Definition:

To better understand some of the control functions it is necessary to understand the type of memory used in the control. The core-operating program resides in ROM (Read Only Memory). This area is not accessible and will remain unchanged from the factory. The other type of memory is EEPROM (Electrically Erasable Programmable Read Only Memory). This area provides a non-volatile memory location used to store such things as calibration data and special configurations. This area is accessible to the user when programming Menu Presets and by service personnel as describe throughout this manual.

Adjusting Air Temperature & Humidity Setpoints:

Setpoint Ranges:		Controller Showing °F	Controller Showing °C
AIR	Air temperature:	50°F to 200°F	10°C to 93°C
Hu	Humidity:	10% to 90%	10% to 90%
P1A	Air temperature of the pre-programmed menu P1	50°F to 200°F	10°C to 93°C
P1H	Humidity of the pre-programmed menu P1	10% to 90%	10% to 90%
P2A	Air temperature of the pre-programmed menu P2	50°F to 200°F	10°C to 93°C
P2H	Humidity of the pre-programmed menu P2	10% to 90%	10% to 90%
P3A	Air temperature of the pre-programmed menu P3	50°F to 200°F	10°C to 93°C
P3H	Humidity of the pre-programmed menu P3	10% to 90%	10% to 90%
P4A	Air temperature of the pre-programmed menu P4	50°F to 200°F	10°C to 93°C
P4H	Humidity of the pre-programmed menu P4	10% to 90%	10% to 90%

The control is shipped with setpoints at 150 °F for air temperature, 50% for humidity, and the minimum value for both temperature and humidity of pre-programmed menus.

To enter the user mode, press down the service key, for 3 seconds, until the display show the message Air.

Use the **▲** arrow to increase the setpoint on the selected mode.

Use the **▼** arrow to decrease the setpoint on the selected mode

Adjust the setpoints to required value.

When humidity setpoint is 10%, the pan temperature setpoint is equal to the air temperature setpoint.

FAULT FINDING

DIAGNOSTICS TABLE		
PROBLEM	POSSIBLE CAUSES	SOLUTIONS
Power switch is illuminated. Unit not heating. No display.	Control Transformer is defective.	Replace Control Transformer.
	Bad connection between Control Transformer and Control Board.	Repair wiring.
Display continuously flashes temperature, (temperature too low, no other displayed codes)	Defective heating element.	Replace heating element.
	Defective relay.	Replace relay.
	Drawer was left open too long and can't recover. Air sensor is defective.	Close the drawer and allow 45 minutes to stabilize. Replace air sensor.
Display continuously flashes temperature, (temperature too high, no other displayed codes)	Defective relay (contacts shorted).	Replace relay.
	Control PID settings are incorrect.	Check PID settings, pages 11 and 12, consult factory.
	Air sensor is defective.	Replace air sensor.
Condensation inside the display window.	Defective seal on the overlay.	Replace overlay.
	Moisture entering the control area.	Examine all seals and repair as required.
Humidity levels are inconsistent.	Too little water in the water pan.	Add water more frequently.
Water temperature is not correct.	Water has pooled under the water pan.	Remove the water pan, dry the cavity bottom and replace the water pan.
	Lower sensor is not clamped to the base properly.	Adjust sensor position or tighten clamp.
	Lower sensor thermal compound has dried or is missing. Lower sensor is defective.	Remove sensor, clean and apply fresh thermal compound. Replace lower sensor.

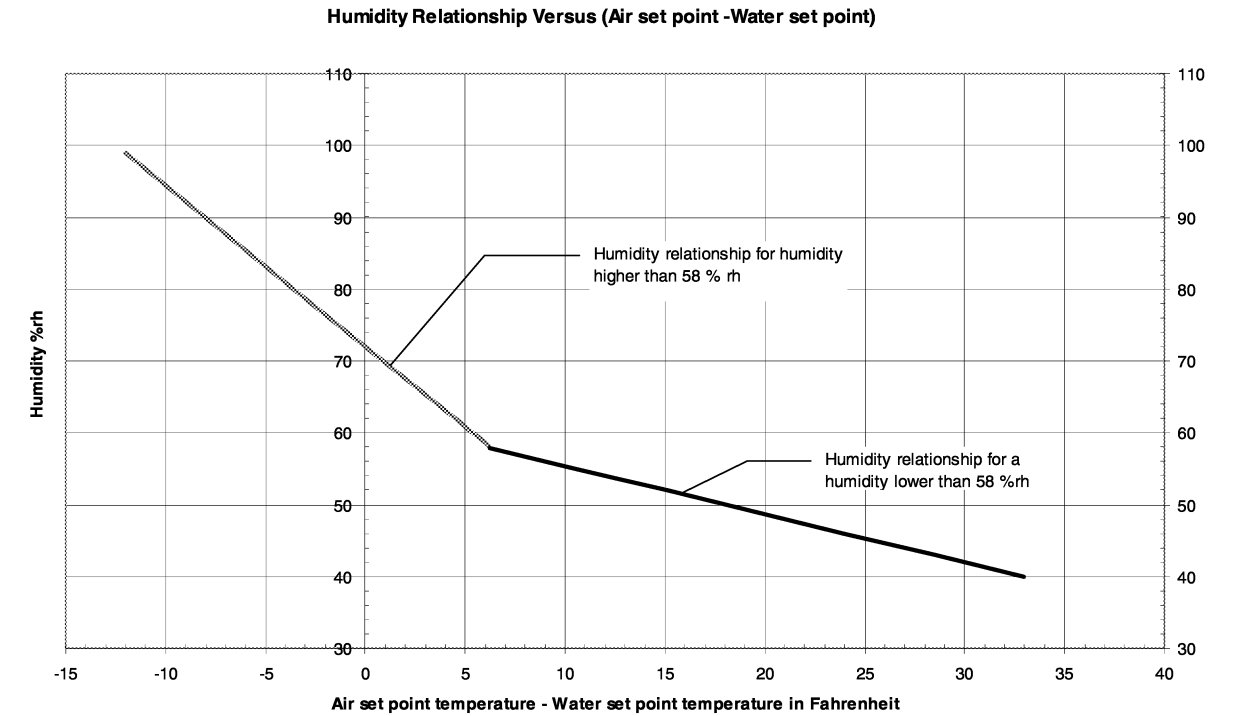
TEMPERATURE SENSOR RESISTANCE TEMPERATURE CHART

Temperature °F	Temperature °C	Sensor Resistance
220.0°F	104.4°C	2.798K Ω
215.0°F	101.7°C	3.032K Ω
210.0°F	98.9°C	3.290K Ω
205.0°F	96.1°C	3.574K Ω
200.0°F	93.3°C	3.886K Ω
195.0°F	90.6°C	4.230K Ω
190.0°F	87.8°C	4.609K Ω
185.0°F	85.0°C	5.029K Ω
180.0°F	82.2°C	5.494K Ω
175.0°F	79.4°C	6.011K Ω
170.0°F	76.7°C	6.585K Ω
165.0°F	73.9°C	7.224K Ω
160.0°F	71.1°C	7.933K Ω
155.0°F	68.3°C	8.725K Ω
150.0°F	65.6°C	9.610K Ω
145.0°F	62.8°C	10.596K Ω
140.0°F	60.0°C	11.700K Ω
135.0°F	57.2°C	12.943K Ω
130.0°F	54.4°C	14.342K Ω
125.0°F	51.7°C	15.912K Ω
120.0°F	48.9°C	17.682K Ω
115.0°F	46.1°C	19.679K Ω
110.0°F	43.3°C	21.940K Ω
105.0°F	40.6°C	24.506K Ω
100.0°F	37.8°C	27.412K Ω
95.0°F	35.0°C	30.720K Ω
90.0°F	32.2°C	34.483K Ω
85.0°F	29.4°C	38.785K Ω
80.0°F	26.7°C	43.704K Ω
75.0°F	23.9°C	49.348K Ω
70.0°F	21.1°C	55.834K Ω
65.0°F	18.3°C	63.282K Ω
60.0°F	15.6°C	71.866K Ω
55.0°F	12.8°C	81.801K Ω
50.0°F	10.0°C	93.340K Ω
45.0°F	7.2°C	106.709K Ω
40.0°F	4.4°C	122.298K Ω
35.0°F	1.7°C	140.440K Ω
30.0°F	-1.1°C	161.670K Ω
25.0°F	-3.9°C	186.545K Ω
20.0°F	-6.7°C	215.805K Ω
15.0°F	-9.4°C	250.356K Ω
10.0°F	-12.2°C	291.100K Ω
5.0°F	-15.0°C	339.500K Ω
0.0°F	-17.8°C	396.830K Ω

Calculating the Water Temperature:

To provide a simple and consistent means of setting the chamber humidity we have created a relationship between the water temperature and the air temperature where the lower heat source is scaled in percent relative humidity. By setting the humidity to minimum (10%),

the lower temperature will match the air temperature. In applications where it is necessary to set the lower element temperature less than the air temperature in dry mode or for a reference in humidity mode we provide the following chart to calculate the set point.



Selecting Pre-Programmed Menus:

Pre-programmed menus, with both temperature and humidity settings, are used for making easier of set-point change.

To select a pre-programmed menu, press down the Service key for less than 2.5 seconds. After that, one of the pre-programmed menus (P1, P2, P3 or P4) will be displayed when the Service key is depressed. Pressing the Service key repetitively will scroll down all pre-programmed menus. 5 seconds after the last Service key is depressed, the air temperature and the humidity setpoints will be modified with the corresponding settings of the last selected pre-programmed menu, and the modified values will be stored into EEPROM memory.

As soon as a pre-programmed menu is selected, the air temperature and the selected pre-programmed menu will be displayed in turn.

NOTE: Only the pre-programmed menus whose air temperature setting is not equal to its minimum value can be selected.

Alarm:

If air temperature is < (Air setpoint - 10°C or 18°F) or > (Air setpoint + 10°C or 18°F), the air temperature display will flash. Pressing any key will stop the display from flashing.

EEPROM Recovery:

If a flashing PLE or CSE error message appears, hold down the Service / Select key until the error message disappears (approximately 4 seconds). The control will be re-initiated to factory default.

Re-enter the setpoints parameter.

CONTROL CALIBRATION AND CONFIGURATION

ONLY QUALIFIED PERSONNEL SHOULD PERFORM CALIBRATION AND RECONFIGURATION WITH CAUTION

To enter the service mode, press down the Service key, for 8 seconds, until the display show the message Loc. You have 12 seconds from the time the last key was touched to make an adjustment. 12 seconds after the last

key was depressed, any modified value will be stored into EEPROM memory. After that, the unit will return to normal operation mode.

Adjustable Parameters:		
Loc	Lock code	Adjustable from -1 to 999 (00 is no lock mode at all). Factory default value is 50
F_C	Display change between °F or °C	Touch the ↑ arrow key to select °F or touch the ↓ arrow key to select °C. Factory default is °F
tSC	Air temperature calibration (shows the actual air temperature)	Adjustment is ± 21°F (± 12°C)
dSC	Pan temperature calibration. (Shows the actual pan temperature; viewable in calibration mode only)	Adjustment is ± 21°F (± 12°C)
Pb1	Proportional band for air control	Adjustable from 1 to 999 Factory default value is 40
rES	Reset time for air control	Adjustable from 0 to 500 (0=no reset action) Factory default value is 148 Reset time = 12.8 * display value (second)
rat	Rate time for air control	Adjustable from 0 to 999 (0=no rate action) Factory default value is 999 Rate time = 0.3 * display value (second)
Pb2	Proportional band for pan control	Adjustable from 1 to 999 Factory default value is 40
rE2	Reset time for pan control	Adjustable from 0 to 500 (0=no reset action) Factory default value is 148 Reset time = 12.8 * display value (second)
ra2	Rate time for pan control	Adjustable from 0 to 999 (0=no rate action) Factory default value is 999 Rate time = 0.3 * display value (second)

Pressing the Service / Select key repetitively will scroll down all parameters. Go to the desired parameter. The display will show the parameter name.

Use the - or ← arrow once to display the actual value of the selected parameter.

Use the - or ← arrow to adjust the parameter to the selected value, (The display may be changed in steps by pushing the arrows briefly, or faster by holding down the desired arrow key).

NOTE: Any modified parameter value will be stored 12 seconds after the last arrow key was touched.

The new value will be stored into EEPROM memory and the unit will return to normal operation mode.

Important Note: Any time a new parameter value is stored, the display will blank out momentarily.

Lock Code (Loc):

The lock code provides security against unauthorized tampering of parameter values.

If the lock feature is enabled, pressing the [Service/ Select] key for 8 seconds, will make the "Loc" message appear on the display. Enter the Loc code value using the arrows.

If an incorrect code is entered, the unit will exit the service mode, and the entire process will have to be repeated. Once the proper lock code is entered, the lock value can be modified the second time the Loc parameter

appears while scrolling down the parameters. If the Loc code is forgotten, proceed with the following procedures:

1. Remove the power from the instrument.
2. Press and hold the [Service / Select] key while powering-up the instrument.

The message F_C will appear. The lock function is temporarily disabled.

To enter a new lock code, step to Loc parameter, and re-enter a new value as described in the above procedure.

TROUBLESHOOTING USING CONTROL ERROR CODES

The instrument is capable of detecting a number of malfunctions that may occur during operating conditions.

2. The instrument goes into power-up and restart sequences.

When a malfunction occurs:

If the malfunction persists this process is repeated.

1. The display flashes an error code for 5 seconds.

Error Codes:		
dPo	Pan temperature sensor connection opened	Check for cut or loose sensor wiring or defective pan sensor.
Po	Air temperature sensor connection opened	Check for cut or loose sensor wiring or defective air sensor.
dPc	Pan temperature sensor connection shorted	Check for a short in sensor wiring or defective pan sensor.
Pc	Air temperature sensor connection shorted	Check for a short in sensor wiring or defective air sensor.
PLE	EEPROM memory data loss	If the PLE or CSE error message appears, hold down the Service / Select key. The error message will disappear after approximately 4 seconds. The control will be re-initiated to factory default. Re-enter the Air / Pan setpoints.
CSE	EEPROM memory data loss	

Error management: Errors codes will not prevent access to user and service mode.