CENTRIFUGAL HEATER - CSA

INSTALLATION & OPERATING MANUAL

P/N 416274 Rev 0

NATURAL GAS
CH1015T-NGE/NGEM
CH2025T-NGE/NGEM

LIQUID PROPANE
CH1015T-LPGE / LPGEM
CH2025T-LPGE / LPGEM

VAPOR PROPANE
CH1015T-VPGE
CH2025T-VPGE

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Installation Manual

WARNING: If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

- **Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.**
- **WHAT TO DO IF YOU SMELL GAS**
  - **Do not try to light any appliance.**
  - **Extinguish any open flames.**
  - **Do not touch any electrical switch.**
  - **Immediately call your gas supplier. Follow the gas supplier's instructions.**
  - **If you cannot reach your gas supplier, call the fire department.**
- **Installation and service must be performed by a qualified installer, service agency or the gas supplier.**

WARNING: Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death. Read the installation, operating and maintenance instructions thoroughly before installing or servicing this equipment.

FOR YOUR SAFETY

The use and storage of gasoline and other flammable vapors and liquids in open containers in the vicinity of this appliance is hazardous.

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For more information about Chief Industries, Inc. and additional products or services please visit our website
www.agri.chiefind.com

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Introduction

Thank you for purchasing a Caldwell Centrifugal Heater compliant to the Canadian Standards Association performance guidelines. Proper installation will ensure you the best overall experience with your heater and guarantee smooth operation. This manual is for the installation and operation of the Caldwell Centrifugal Heater system that has been 100% factory quality control inspected, field simulated and stress tested prior to shipment.

This proprietary information is loaned with the expressed agreement that the drawings and information therein contained are the property of Chief Industries, Inc. and will not be reproduced, copied, or otherwise disposed of, directly or indirectly, and will not be used in whole or in part to assist in making or to furnish any information for the making of drawings, prints or other reproduction hereof, or for the making of additional products or equipment except upon written permission of Chief Industries, Inc. first obtained and specific as to each case. The acceptance of this material will be construed as an acceptance of the foregoing agreement.

The technical data contained herein is the most recent available at the time of publication and is subject to modification without notice. Chief Industries, Inc. reserves the right to modify the construction and method of operation of their products at any time without any obligation on their part to modify any equipment previously sold and delivered.

Model Number Description

The heater model nomenclature distinguishes the application of the heater. The information includes a designation of the applicable fan and type of fuel to be utilized (natural gas, vapor propane, or liquid propane). The model number is stamped on the serial number plate and the definition of the model number nomenclature is as follows:

Example:	CH	1015	-	T	-	NGE
	(a)	(b)	-	(c)	-	(d)

(a) CH = Heater Unit (Canadian)
(b) 1015 = Fan Model Required by Horsepower
Where: 1015 = C27-10 or C27-15
Where: 2025 = C30-20 or C30-25
(c) T = Transformer and Flame Probe Ignition System
(d) NGE = Type of Fuel to be Utilized

Where

NGE = Natural Gas Fuel (Electric)
VPGE = Vapor Propane Gas Fuel (Electric)
LPGE = Liquid Propane Gas Fuel (Electric)
LPGEM = Liquid Propane Gas Fuel (Electric) with Modulating Valve

Packing List

The shipment should contain the following items. Verify and inspect all items carefully when unpacking and before installing. In case of any shortage, contact your dealer. In case of damage during shipment, file a claim with the carrier.

Quantity	Component	Description
1	Heater	Heater Assembly
1	Warranty Registration Card	Bulletin
1	Manual	Bulletin (464D)
1	Bolt Bag	Assembly
1	Orifice	Package

Note: Before starting the installation of the heater, verify that all items called out on the packing list have been received.

Please note that this manual, part number 416274 includes and references Bulletin 464D. This manual is for the installation, operation and maintenance of heater models with serial numbers 15F and above, and is effective 5/1/2015.

Before You Begin

Read this manual thoroughly before operating this heater. Keep this manual in a location for quick access and reference.

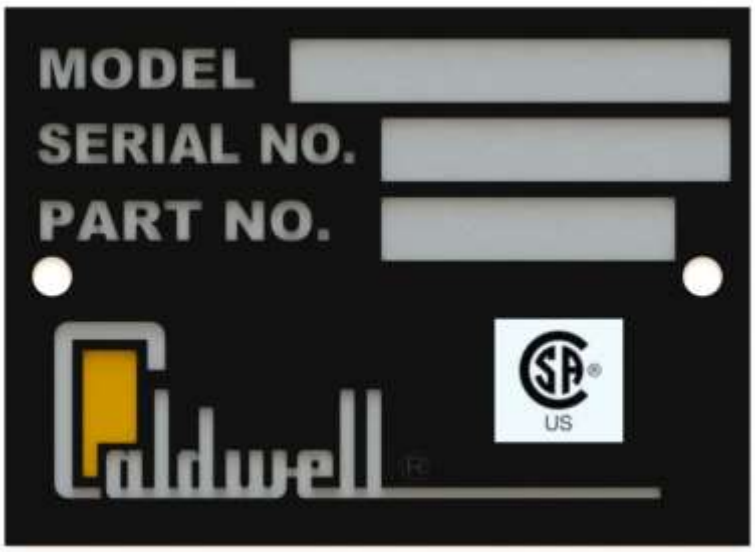
"The equipment shall be installed in accordance with the Natural Gas and Propane Installation Code, CSA B149.1 and the Propane Storage and Handling Code, CSA B149.2, or applicable provincial regulations, which should be carefully followed in all cases. Authorities having jurisdiction should be consulted before installations are made."

Your Caldwell heater is designed for safe and reliable operation when properly installed in combination with a Caldwell fan. However the heater requires electricity and flammable gas, which when improperly installed or when operated improperly, can be potentially dangerous. Anyone who will operate this unit should read the manual before installing or operating this unit. The following table, provided for your convenience, will aid in verifying that these individuals understand the proper operation of the heater. After completely reading the manual, this table should be filled in.

Date	Operator Signature	Owner Signature

Special Service Note: If you are unable to remedy any service problem after thoroughly studying this manual, contact the dealer from whom you purchased the unit. Your dealer is your first line of service. The following information is required for service:

1. Heater model number: _____
2. Heater serial number: _____
3. Fan model number: _____
4. Fan serial number: _____
5. Type of fuel: _____
6. Type of external plenum control used: _____
7. Setting of the external plenum control: _____
8. Approximate operating pressure: _____
9. Hours the unit has been in operation: _____
10. Diameter and eave height of bin: _____
11. Grain depth: _____
12. Type of grain stored: _____
13. Moisture content of the grain: _____
14. Dealer purchased from: _____
15. Dealer address and phone number: _____
16. Date purchased: _____
17. Service contractor:
    a. Name: _____
    b. Address: _____
    c. Phone: _____



Safety and Precautions

Your safety and the safety of others is a primary concern to Chief Industries, Inc. This manual was written to assist in the safe installation and operation of the Caldwell Heater.

It is your responsibility as the owner, builder, operator, or supervisor to know what specific requirements, precautions and hazards exist and to make these known to all personnel working with equipment or on the jobsite so that they can observe any necessary safety precautions.

All personnel, including the installation crew, must read and understand the information contained in this manual before starting construction. Chief Industries, Inc. is not responsible or liable for the misuse of equipment or operation of personnel or equipment in an unsafe manner.

Chief Industries, Inc. assumes no liability with respect to proper construction and inspection, assembly, or use of its products established under applicable laws, all of which is the sole responsibility of the purchaser and those authorized for the installation.

Follow all local and federal safety laws and regulations. Verify that all equipment and personnel conform to any applicable jurisdiction regulations.

Work Area Safety Statement

To ensure the safety of all individuals in the work area, only authorized and trained persons shall install, maintain and use the Caldwell Heater.

Under no circumstances should unauthorized individuals be allowed to trespass or be present in the work area.

It shall be the duty of all operators to ensure that the work area is clean, organized and kept free of all debris and tools that might cause an accidental tripping or falling hazard.

Special care should be taken when working from unsafe heights. Common sense dictates that when conditions such as rain or wind prohibit the safe use of equipment, the installation be discontinued.

Chief Industries, Inc. strongly recommends that equipment meeting the current specifications be used, whether the individual operator is required by law to do so or not. Proper climbing equipment and a secured safety harness should be used at all times when performing operations work, installation or maintenance.

Field modifications without the authorization of the manufacturer may present unknown dangers to the operator and must be avoided.

Auxiliary Equipment Safety

You may decide to purchase and install "auxiliary equipment" made by other manufacturers. Chief Industries, Inc. has no control over the design and manufacture of this equipment. In view of this, at a minimum, we suggest you do the following:

1. Obtain, read and understand the instructions and safety cautions of the auxiliary equipment manufacturer. Be certain that all equipment is installed in agreement with those instructions.
2. Check with Chief Industries, Inc. to verify that your system is designed to support any additional loads supplied by the auxiliary equipment.
3. Obtain any applicable safety decals from the manufacturer and make certain they are displayed in a visible location.
4. Make certain that all electrical equipment is properly installed and grounded by a qualified electrician.
5. Check availability and operation of electrical lock out and emergency stop systems.
6. Be certain that all guards and shields are securely in place.
7. Store all operation / maintenance manuals in a safe place for future use.

Heater Safety

Before operating the unit, perform the following checks:

1. Verify the fan, heater and transition units are bolted securely together. Verify the screen guard is secured in place.

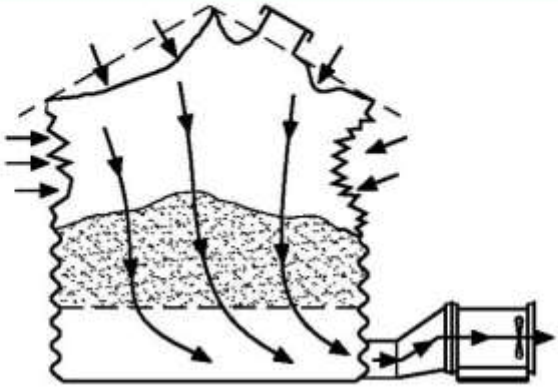
2. Verify the units are wired in compliance with the national electrical code, and the ground wire is of sufficient size to provide lightening protection.

3. Verify the gas supply is installed correctly according to instructions.

4. Provide sufficient bin exhaust vents or fans, and verify that they are open and operational before starting the drying system. These vents or fans are necessary to provide an exhaust path for moisture laden air (reducing condensation), and also to prevent pressurization of the bin above the grain mass and causing damaging loads on the bin and roof structure. Do not operate units when conditions are such that freezing of the vents could occur.

    a. Heed the following warning:

⚠ WARNING



TO PREVENT ROOF AND WALL DAMAGE OF STRUCTURE

1.) USE POSITIVE AERATION SYSTEM (PUSH SYSTEM)
2.) MAKE SURE ALL ROOF VENTS ARE SIZED PROPERLY, OPEN, AND UNOBSTRUCTED.
3.) IF USING ROOF EXHAUST FANS, WIRE ROOF AND SUPPLY FANS TO START SIMULTANEOUSLY OR MAKE SURE ROOF FANS ARE STARTED WHEN SUPPLY FANS ARE STARTED.
4.) DO NOT OPERATE YOUR AERATION SYSTEM WHEN CONDITIONS EXIST THAT MAY CAUSE ROOF VENT ICING.

(VENT ICING CAN OCCUR WHEN AMBIENT AIR TEMPERATURE IS BELOW 35° (2°C) AND AIR RELATIVE HUMIDITY IS 90% AND ABOVE. FOR ANY QUESTION AS TO POSSIBLE ICING CONDITIONS, SHUT DOWN THE SYSTEM AND CONTACT YOUR LOCAL WEATHER SERVICE.)

DETERMINE THE AIR FLOW FROM FAN PERFORMANCE CHARTS AT FREE AIR AND PROVIDE VENTS ACCORDING TO CHART (A).

CHART (A)	
BIN VENT	CFM
LOW PROF	2670
HGBV - 1.75	2670
BBV - 19	3000

CONSULT YOUR CALDWELL EQUIPMENT DEALER FOR AID IN SIZING POWER EXHAUST FANS AND / OR ROOF VENTS.

XX/XX 740969

Heater and Control Enclosure Components

The following outlines the accessories, general components and replacement part numbers for the Caldwell heater models.

Accessories:

1. A humidistat, thermostat, or thermostat-humidistat control is not included with the standard heater. These controls are to be ordered separately. A dual humidistat-thermostat kit can be ordered so that one control assembly can be used when two heater units are used on the same bin.

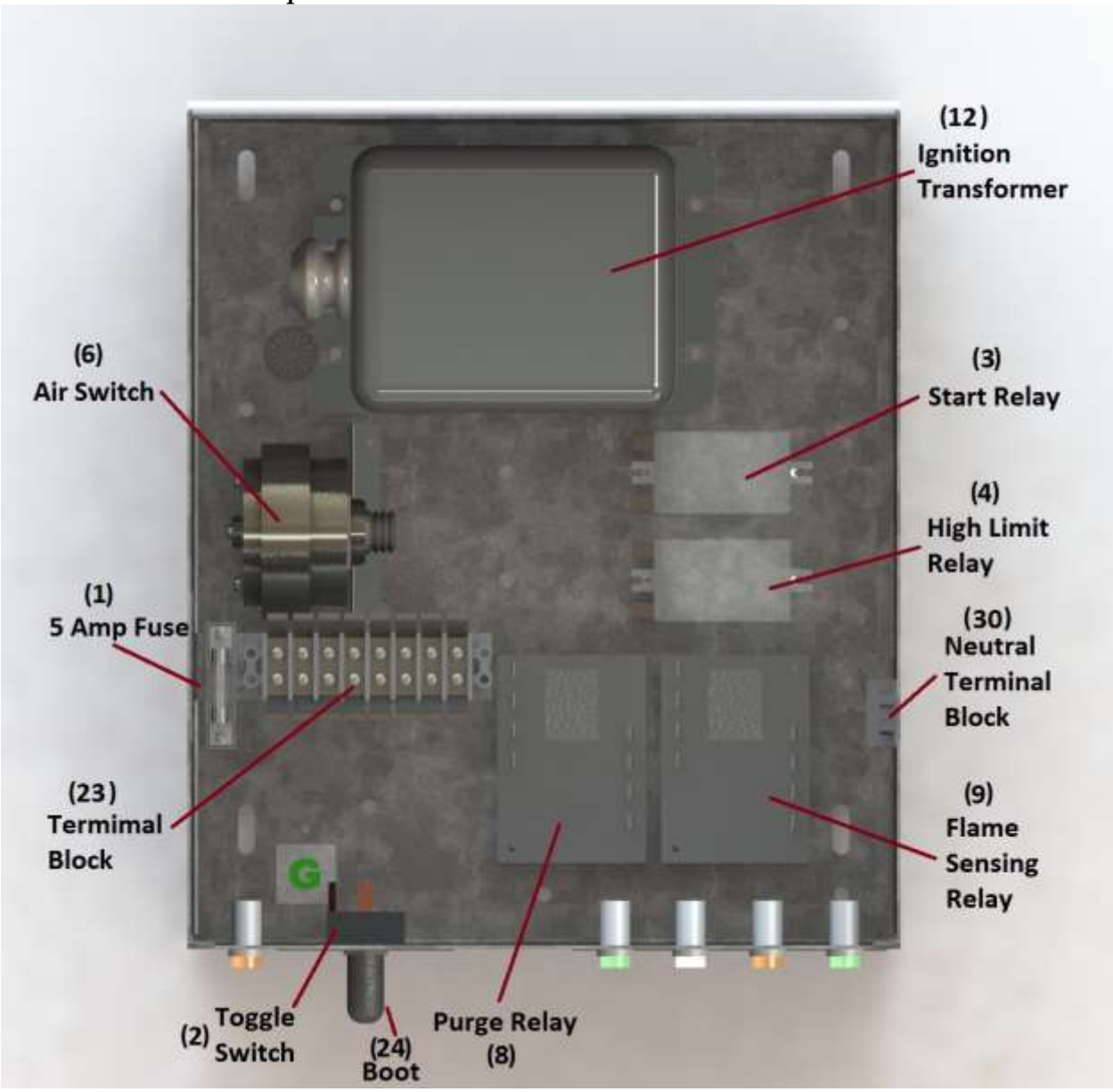
2. Caldwell requires using a fuel line strainer in the fuel line just before the fuel enters the heater plumbing. A line strainer is provided on all units. A line strainer can be obtained from Caldwell, or your gas company. **Caution:** Your warranty could be jeopardized if the heater should malfunction due to foreign material in the heater plumbing lines if the fuel supply line is not fitted with a line strainer.

3. When wiring a heater to a 460 or 575 volt fan, a step down transformer must be used to develop 115 volt, single phase, 60 cycle power (part #9717033).

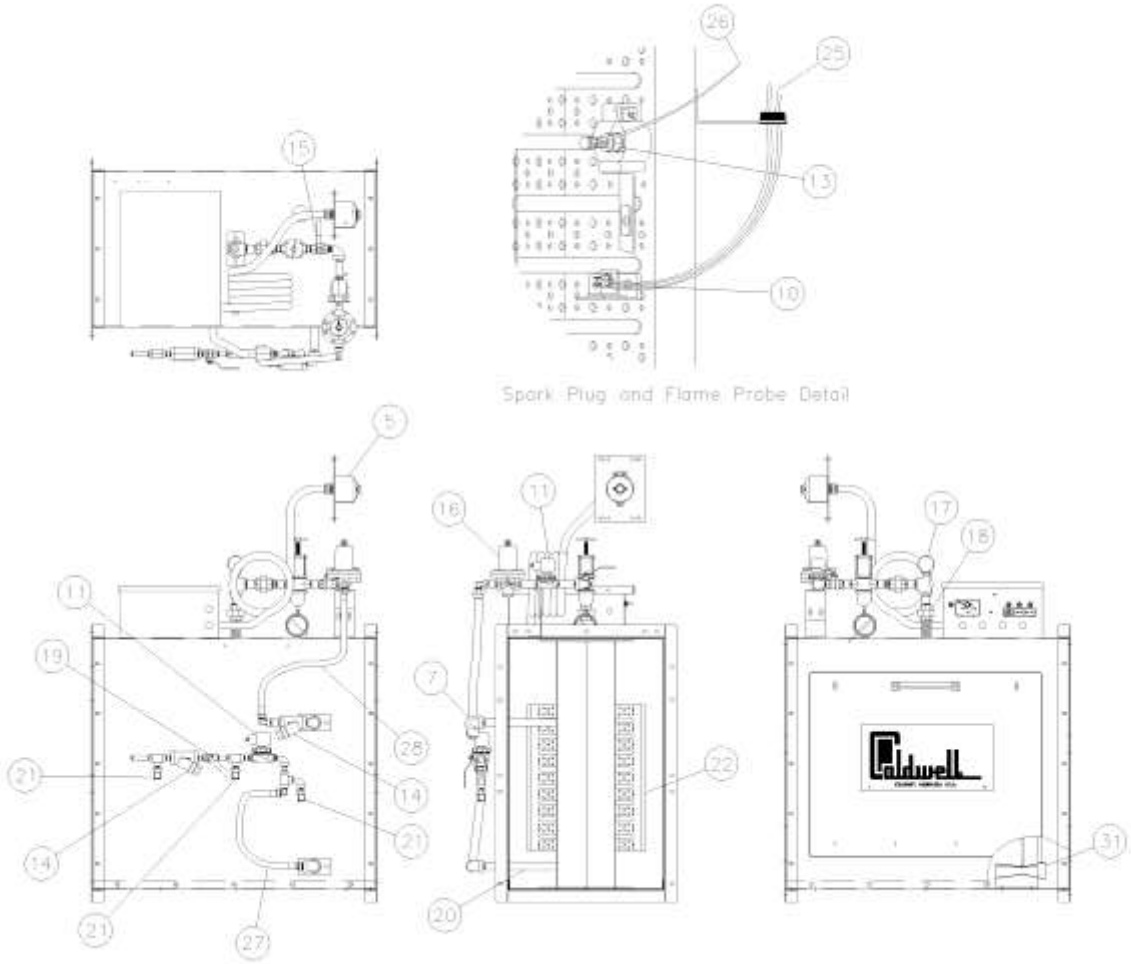
Explanation of Components:

Please note the location and general description of the primary components and their function.

Control Enclosure Components:



Heater Body Components:



The balloon callouts shown in the above illustration specify each component of the heater.

1. **5 Amp Fuse (#850412)** - The fuse protects the heater control circuit from excessive current draw.

2. **Toggle Switch (#710707)** - The toggle switch is the heater "On" and "Off" and "Momentary Start" switch.

3. **Start Relay (#756692)** – A start relay is utilized to prove that the flame probe is functioning properly with every trial for ignition. If the flame probe is functioning properly the relay allows the purge to energize. If the flame probe is not functioning properly the start relay prevents the initiation of the ignition process.

4. **High Limit Relay (#756692)** – The high limit relay is activated by the high limit. The slave relay shuts off the spark and fuel to the burner and maintains the off condition until the operator

determines the reason for the high limit activation. The slave relay is reset by turning the heater toggle switch to the off position.

5. **High Limit (#776443)** - The high limit control, located in the bin plenum, is a manual resetting temperature limiting control, used to protect the heater, not the bin plenum, from excessive heat. The high limit control activates the slave relay to shut off the heater if the plenum temperature reaches 230° F (110° C). **Note**: The high limit is not an operating control; the operator must utilize an operating control to set the firing rate for the desired drying plenum temperature.

6. **Air Switch (#785691)** - The air switch is a control that senses the flow of air from the fan to the heater. If, for any reason, the air flow is stopped, the air switch will shut off the heater. The air switch will keep the heater shut off until air flow from the fan is re-established. If the air switch cycles off from a lack of air, turn the heater toggle switch off before restarting the fan.

7. **Vapor Temperature Limit (#157200)** - The vapor temperature limit is an automatic resetting temperature limiting control used to protect the solenoid valve and regulator from being damaged due to excessive gas temperature coming from the vaporizer. Also, the vapor temperature limit protects the vaporizer from re-cracking the propane and causing an oil film to deposit on the burner. The vapor temperature limit is set to shut off the heater if the gas from the vaporizer reaches a temperature of 160°F (71°C). The control will allow the heater to reignite after the vaporizer cools. The vapor temperature limit is only on LPGE heaters.

8. **Purge Delay with 30 sec Time Delay (#719914)** - Purge delay is a time delay relay used to delay the energizing of the ignition transformer and solenoid valves for 30 seconds after the heater is turned on to allow for the removal of any raw gas from the heater before ignition is tried. The purge delay calls for a 30-second delay before ignition, regardless which control is sued to turn the heater on.

9. **Flame Sensing Relay with 30 sec Time Delay (#719914)** - The flame sensing relay has a 30 second delay and is used to break the circuit to the solenoid valves and ignition transformer if the flame probe does not establish the presence of the flame at the burner. The operator will have to manually reset the flame sensing relay by moving the power switch to off, before retrying for ignition.

10. **Flame Probe (#749812)** - The flame probe is a switch that is sensitive to heat, and is used to establish the presence or absence of flame at the burner. The flame probe is used with the flame sensing relay, as the flame safeguard circuit of the heater. The switch is opened on temperature rise.

11. **Solenoid Valves** - Solenoid valves are shut-off valves that are electrically operated. The valves are opened automatically when energized, and are closed automatically when de-energized.

12. **Ignition Transformer (#851790)** - The ignition transformer is a transformer used to create the 6,000 secondary volts necessary for spark at the spark plug.

13. **Spark Plug (#851402)** - The spark plug is used to ignite the fuel at the burner. The spark plug will spark while the ignition transformer is energized.

14. **Fuel Line Strainer** - The fuel line strainer is used to remove foreign particles from the fuel before the fuel enters the heater plumbing. If these particles are not removed, possible operating difficulties could occur.

15. **Vapor Valve** - The vapor valve is used for preliminary adjustment of the firing rate by opening and closing the valve to generate the proper plenum temperature. Once the proper firing rate is established, the regulator needs to be adjusted to the firing rate that is required.

16. **Regulator** - The regulator is used to regulate the firing rate of the heater. The regulator is not used to regulate the fuel from the fuel sources. A separate regulator should be used for regulating the fuel at the fuel source.

17. **Pressure Gauge** - The pressure gauge is used to indicate the amount of fuel pressure at the orifice. The pressure is used as a tool to set the firing rate.

18. **Orifice** - The orifice is an opening at the end of the heater plumbing that develops a restriction to gas flow, which allows the pressure gauge to develop a pressure reading, so that the firing rate of the heater can be field set.

19. **Liquid Shut-Off Valve (#714949)** - The liquid shut off valve is used as a manual shut off valve and is used to stop fuel from entering the heater. The liquid shut off valve has only two positions: open or closed. The liquid shut off valve is only on LPGE heaters.

20. **Vaporizer (#9752584)** - The vaporizer is used on LPGE heaters only, and is used to convert the liquid propane gas to propane vapor gas by using the heat supplied by the burner.

21. **Hydrostatic Pressure Relief Valve (#716878)** - The hydrostatic pressure relief valve is used to protect the heater plumbing components from excessive fuel pressure by relieving the excessive fuel pressure from gas trapped between shut off valves to the atmosphere. If a hydrostatic pressure relief valve opens, replace the relief valve.

22. **Burner** - The burner is a component in the heater where the fuel and air are mixed and then burned.

23. **Terminal Block 8 POLE (#749614)** - The terminal block is used as a junction block for connecting the lead wires of the various electrical parts.

24. **Toggle Switch Protective Boot (#712034)** - The toggle switch boot is used to eliminate water entering the heater controls through the toggle switch.

25. **Flame Probe Wire** - The flame probe wire is used to connect the flame probe to the control box.

26. **Spark Plug Wire** - The spark plug wire is used to connect the spark plug to the ignition transformer.

27. **Liquid Propane Hose (#715276)** - The liquid propane hose is used to connect the liquid plumbing line to the inlet of the vaporizer.

28. **Vapor Propane Hose (#155820)** - The vapor propane hose is used to connect the vaporizer to the vapor propane line.

29. **Burner High Limit Wire (#9701961)** - Wiring that connects the burner high limit and burner exhaust limit to the control box.

30. **Neutral Terminal Block 3 POLE (#850255)** - This terminal block is used as a junction block to establish a common neutral for connection of the neutral leads.

31. **Venturi Weldment (#9415661)** - The venturi weldment creates a high and low pressure area in the airflow, which aids the air switch in measuring air velocity.

32. **Humidistat Control (#9850982)** - The humidistat control is an electrical operating control that is wired into the heater to cycle the heater "On" and "Off" with respect to the relative humidity of the drying air. The humidistat control is typically set at about 50% - 60% relative humidity of the drying air. When the relative humidity is higher than the humidistat setting, the heater is cycled "On" and is left on until the relative humidity is below the humidistat setting. If the relative humidity of the drying air is less than the humidistat setting, the heater is cycled "Off" until such time that the relative humidity would become greater than the setting of the humidistat. The humidistat control is for low temperature drying.

33. **Thermostat Control (#9851014)** - The thermostat control is an electrical operating control that is wired into the heater to cycle the heater "On" and "Off" with respect to the temperature of the drying air. The thermostat is set at a desired temperature, and if the drying air temperature is higher than the thermostat setting, the heater is cycled "Off." If the drying air temperature is less than the thermostat setting, the heater is cycled "On," and is left on until such time that the drying air temperature is above the thermostat setting.

34. **Humidistat-Thermostat Control (#9870974)** - The humidistat-thermostat control is an electrical operating control that is wired into the heater to cycle the heater "On" and "Off" with respect to both the drying air relative humidity and temperature. The humidistat-thermostat control will cycle the heater on if either the drying air relative humidity is too high, or the drying air temperature is too low with respect to the humidity setting or temperature setting of the control. **NOTE:** The optional external plenum controls do not function in the same manner as a thermostat in a residential house. When the bin plenum controls reach the set point the heater is then shut off. In the off mode the bin's plenum temperature will drop below the set point of the control due to the rapid air change in the plenum from the fan. The controls do not sense the instantaneous change in air temperature but take time to reach the plenum control setting before controlling the heater operation. **NOTE:** The firing rate must be set by the operator to verify excessive temperature is not present in the plenum.

35. **Modulating Valve** - The modulating valve is a non-electrical operating control. The modulating valve is placed in the heater plumbing, and controls the amount of fuel burned by the heater depending upon the temperature of the drying air. If the temperature of the drying air is lower than the temperature setting of the modulating valve, the modulating valve opens up and more fuel is burned to raise the drying air temperature. If the drying air temperature is higher than the temperature setting, the modulating valve restricts the amount of fuel to the heater. The modulating valve has an interchangeable by-pass orifice to maintain continuous low heat operation regardless of modulating valve setting. The orifice is interchangeable for establishing lower or higher by-pass flow through the modulating valve, depending on conditions.

Replacement Parts Common to All Models:

ITEM #	PART DESCRIPTION	PART NUMBER
1	5 Amp Fuse	850412
2	Toggle Switch	710707
3	Slave Relay	756692
4	High Limit	776443
5	Air Switch	785691
6	Vapor Temperature Limit (LPGE units only)	157200
7	Purge Relay (30 sec. time delay)	719914
8	Flame Sensing Relay (30 sec. time delay)	719914
9	Flame Probe	749812
11	Ignition Transformer	851790
12	Spark Plug	851402
16	Pressure Gage LP	851543
16	Pressure Gage NG	715011
22	Terminal Block (8 POLE)	749614
23	Toggle Switch Boot	712034
26	Liquid Propane Hose	715276
27	Vapor Propane Hose	155820
29	Neutral Terminal Block (3 POLE)	850255
31	Venturi	9415661
32	Nylon Humidistat Control (Not Shown)	9850982
33	Thermostat Control (Not Shown)	9851014
34	Humidistat-Thermostat Control (Not Shown)	9850974
35	Modulating Valve Kit (Propane) (Not Shown)	9701862
35	Modulating Valve Kit (Nat. Gas) (Not Shown)	9767954

Replacement Parts for Specific Models:

		CH1015T-NGE	CH1015T-VPGE	CH1015T-LPGE	CH1015T-LPGEM
ITEM #	PART DESCRIPTION	PART #	PART #	PART #	PART #
10	Vapor Solenoid Valve	789263	789255	789255	189255
10	Liquid Solenoid Valve			753863	753863
13	Vapor Fuel Line Strainer	851626	851626	851626	851626
13	Liquid Fuel Line Strainer			851634	851634
14	Vapor Valve	714931	714931	714931	714923
15	Regulator	753905	715003	715003	715003
17	Orifice	9720516	9422253	9422253	9422253
18	Liquid Valve			714949	914949
19	Vaporizer			9752584	9752584
20	Hydrostatic Pressure Relief Valve			716878	716878
21	Burner	9784793	9784793	9784793	9784793
24	Flame Probe Wire	9730515	9730515	9730515	9730515
25	Spark Plug Wire	9701995	9701995	9701995	9701995

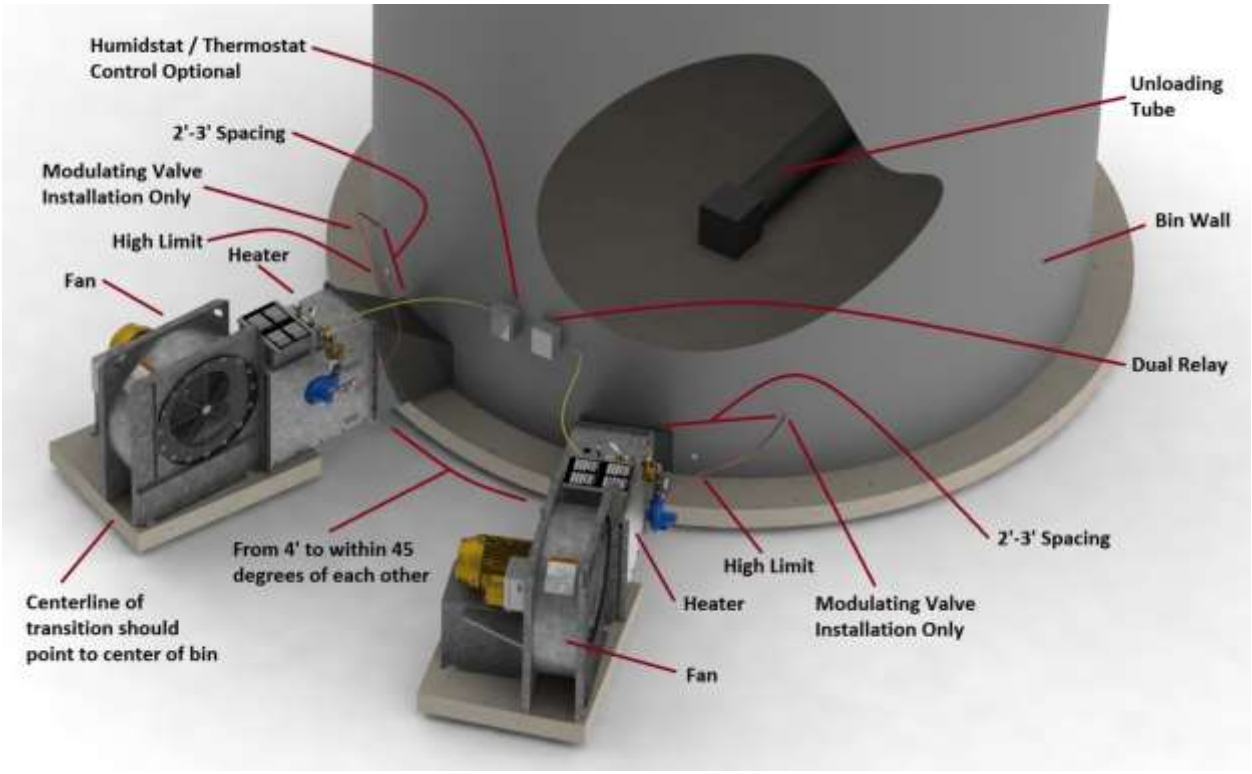
		CH2025T-NGE	CH2025T-VPGE	CH2025T-LPGE	CH2025T-LPGEM
ITEM #	PART DESCRIPTION	PART #	PART #	PART #	PART #
10	Vapor Solenoid Valve	789263	789263	789263	789263
10	Liquid Solenoid Valve			753863	753863
13	Vapor Fuel Line Strainer	851626	851626	851626	851626
13	Liquid Fuel Line Strainer			851634	851634
14	Vapor Valve	714931	714931	714931	714931
15	Regulator	775502	715003	715003	715003
17	Orifice	9719328	9714881	9714881	9714881
18	Liquid Valve			714949	914949
19	Vaporizer			9752584	9752584
20	Hydrostatic Pressure Relief Valve			716878	716878
21	Burner	9787840	9787840	9787840	9787840
24	Flame Probe Wire	9730531	9730531	9730531	9730531
25	Spark Plug Wire	9701995	9701995	9701995	9701995

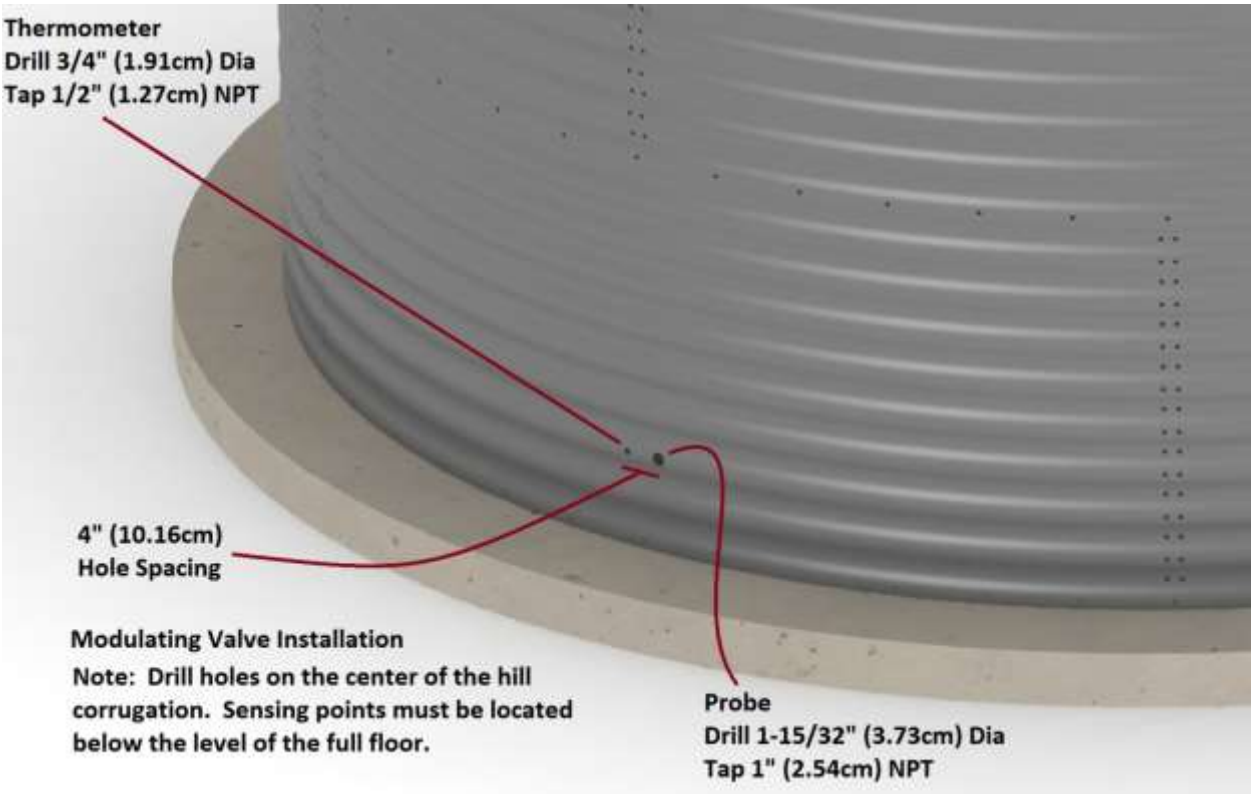
Installation Requirements

The following illustration describes the components necessary for a typical installation. The drying unit (fan, heater, and transition) should be located such that the heated air can enter the bin plenum chamber uniformly. Verify all the components needed for the drying system are present. The fan and heater should be located opposite the unloading tube for best air distribution.

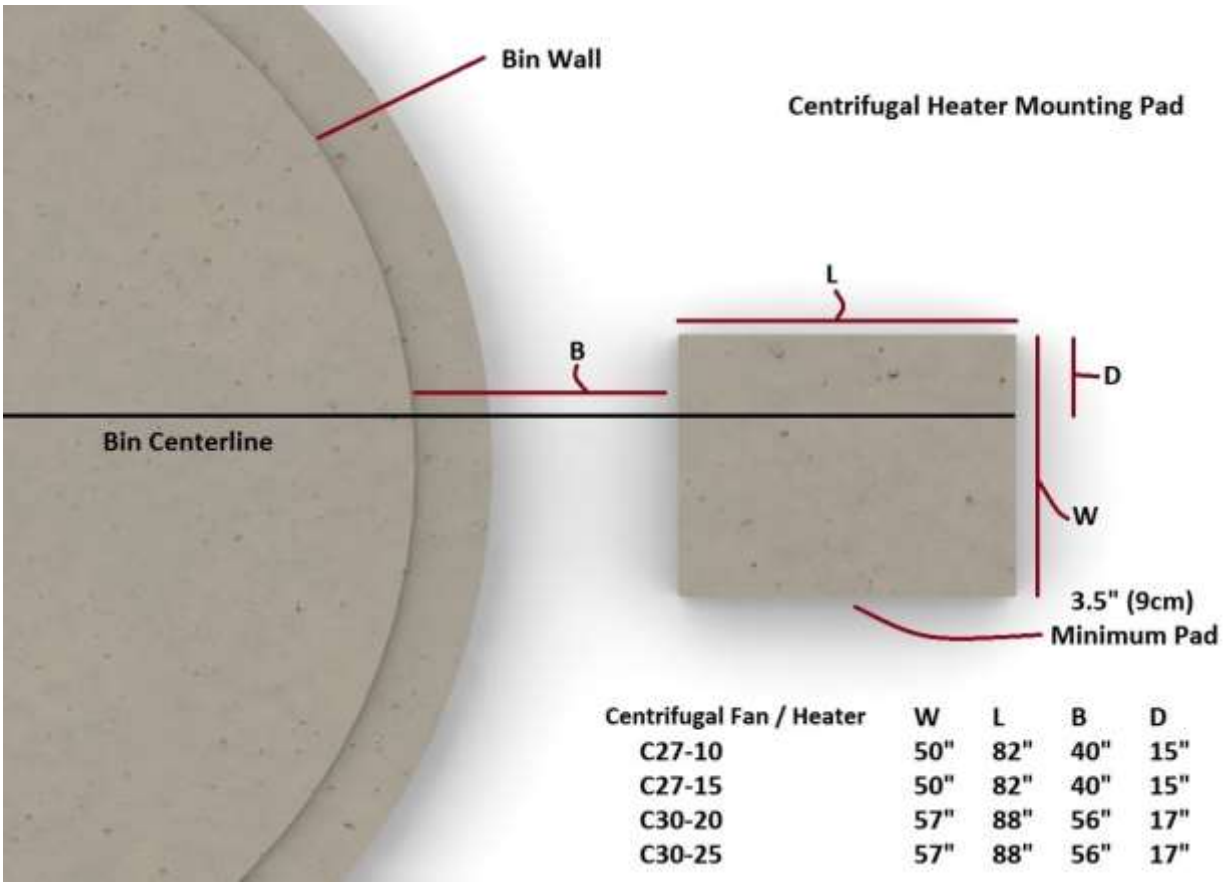
Heater Location and Foundation

The following illustration shows a typical installation of 2 drying units and optional plenum controls. If two drying units are used on the same bin, locate them 4' (1.21m) to within 45° of each other and centered opposite the unloading tube. Locate any humidistat or thermostat control between the two heater units, making sure control senses heat from both units (order kit #9735035).





For proper operation of heater, the fan and heater are to be mounted on a level pad. The pad should be the same height as the concrete floor. The size of the pad should be as indicated in the following illustration.



Centrifugal Fan / Heater	W	L	B	D
C27-10	50"	82"	40"	15"
C27-15	50"	82"	40"	15"
C30-20	57"	88"	56"	17"
C30-25	57"	88"	56"	17"

Before installing heater please verify the following:

1. That the spark plug is gapped at 1/8" (.32cm). If not, gap to 1/8" (.32cm).
2. That the flame probe and spark plug wires are attached.
3. That all bolts, including carriage bolts and screws are tight.
4. The heater is installed on the air discharge end of the fan. Check air flow decals on the fan and heater to verify heater is oriented properly. Connect the heater to the transition with bolts provided in the fan bolt bag. The installation should appear as illustrated previously.

Gas Supply Installation

Refer to the dryer rating plate to locate the minimum gas supply pressure for obtaining the maximum gas capacity for which this dryer is specified.

The gas piping installer is to locate a manual emergency shutoff valve in an appropriate location that allows access to this valve in case of a fire, explosion or other emergency at the heater.

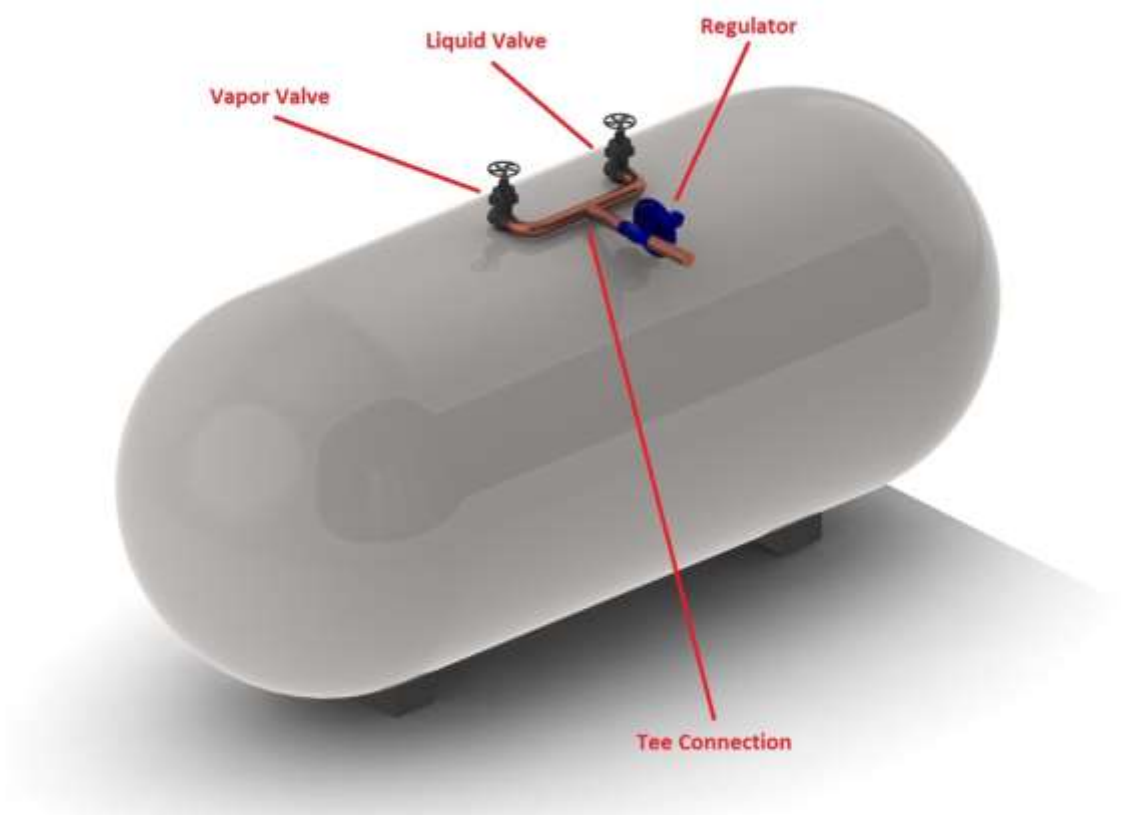
Propane Gas

For a typical propane tank installation a 1000 gallon tank is recommended as the minimum size to avoid frequent refilling. (Raising the air temperature 100°F (38°C) on an airflow rate of 10,000 CFM (283m³/min) would require approximately 300 gallons of liquid propane per day.) Also the larger tank will aid in the vaporization of the liquid propane.

Note: Never use an anhydrous ammonia tank as your LP gas tank. Contaminants in the tank can be harmful to the heater, and safety devices may not meet liquid propane storage codes.

The supply tank should be placed at least 10' (3.05m) from the heater. Because some areas may require a greater distance, please consult your local authorities.

The supply tank should be equipped with a liquid valve and vapor valve. The inlet of the liquid valve should be located 12" (31cm) from the tank bottom to avoid impurities getting into the gas line and heater.



The liquid valve and vapor valve on the propane tank should be connected as illustrated. This allows the operator to run the LPGE and LPGEM units on vapor or liquid propane.

A minimum 60 psig (414kPa) pressure regulator is recommended, located as shown. The regulator provides uniform flow, and reduces the pressure on the gas line from the regulator to the heater for added safety. The regulator is required on vapor and liquid propane installations. Verify that the supply tank has a relief valve present and that it is properly sized and located.

Natural Gas

The natural gas service should be able to provide a minimum of 5 psig (34kPa) when the heater is operating. Check with your gas supplier to verify that the supply pressure has the pressure potential to deliver natural gas for the length of the service line.

A line strainer must be located at the heater (order part #714709).

The natural gas service should be regulated. Contact your gas supplier. A regulator can be obtained from Caldwell (order part #753905).

Fuel Line Installation

The suggested tubing size to be used from the supply to the heater is 5/8" (1.59cm) O.D. type K copper tubing or 1/2" (1.27cm) black schedule 80 steel pipe. If copper tubing is used, make a loop in the tubing within 3' (0.9m) of the heater to absorb shock. If 1/2" (1.27cm) steel pipe is used, run the plumbing to within about 3' (0.9m) of the heater, and use three feet of 3/8" (.95cm) minimum I.D. high pressure flexible hose, (CGA approved for propane). Be careful not to turn or twist the heater plumbing parts because the proper operation of these can be affected or leaks in joints can be developed. Verify all foreign material is out of the gas line before connecting the line to the heater.

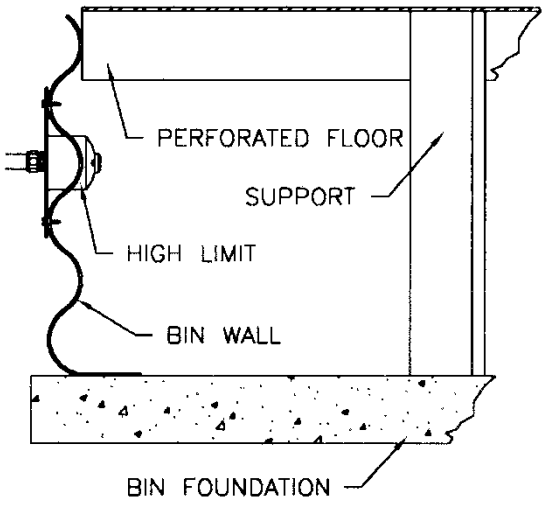
If your natural gas supply pressure is not adequate to maintain 10 psig (69kPa) at the heater, use a one inch or larger service line and verify that 5 psig (34kPa) natural gas pressure is available when the heater is operating. Install a line strainer between the natural gas heater and the service line.

Check all connections for leaks with a soap test. Open the supply valve at the source and use a liquid detergent and brush all fittings and joints. If bubbles are generated at the fitting, gas is escaping from the joint. With the installation of the service line, inspect all parts that are added, and the heater plumbing parts affected by the installation. Tighten the components that are not sealing and replace if cracked or defective.

Note: Do not use galvanized pipe fittings.

High Limit Installation

The High Limit control is connected by conduit to the control enclosure of the heater. The High Limit will need to be installed into the bin plenum as shown in the following illustration. Install the high limit on the right hand side of the transition, 2' - 3' (.60m - .91m) from the transition, approximately midway up in plenum space under the drying floor. Drill a 4.0" (10.16cm) diameter hole centered on a valley of the bin corrugation. Next place the limit control in the 4.0" (10.16cm) hole and match drill (4) 7/32" (.55cm) diameter mounting holes located on the corrugation hill. Field seal around the high limit and fasten using (4) 1/4" (.64cm) sheet metal screws located in the bolt bag to secure the High Limit to the bin wall.



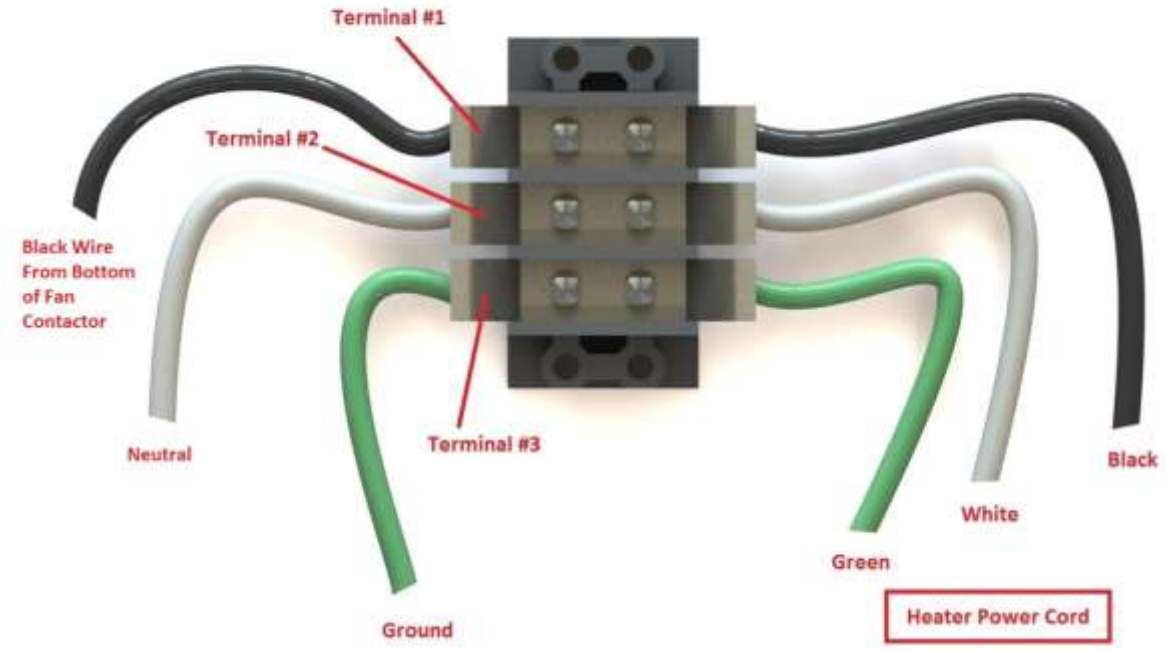
Fan Electrical Installation

Connect the fan unit to the electric power source following the recommended wiring procedure indicated in the fan manual. The electrical disconnect switch for the fan shall be sized with adequate ampacity for the fan rating and installed in accordance with the Canadian Electrical Code Part 1 (CSA Standard C22.1) and any local requirements.

Heater Electrical Installation

Note: The heater is electrically interlocked with the fan electrical service.

The heater operates on 115 volt, single phase, 60 cycle power. For fans wired for 230 volt, verify that the fan is wired with a neutral wire to the middle terminal of the fan terminal block (#2), as well as a ground wire linked to the bottom terminal of the fan terminal block (#3) as shown. The heater power cord is wired into the fan controls by connecting the black wire to the terminal (#1), the white wire to terminal (#2), and the green wire to terminal (#3) of the fan terminal block, as shown. With the heater wired into the fan circuitry, the fan must be operating before power is available to the heater.



For fans wired for 460 or 575 volt, three phase power and 230 volt, three phase power, a step down transformer must be used to convert the 460 or 575 volt system and 230 volt system to 115 volt, single phase, 60 cycle power for the heater.

When installing a thermostat, humidistat, or thermostat-humidistat control, the control power cord is wired into terminals #6 and #7 of the heater terminal block. Remove the jumper wire linking terminals #6 and #7, and connect one lead of the control power cord to terminal #6 and the other lead to terminal #7. The control leads can be interchanged.

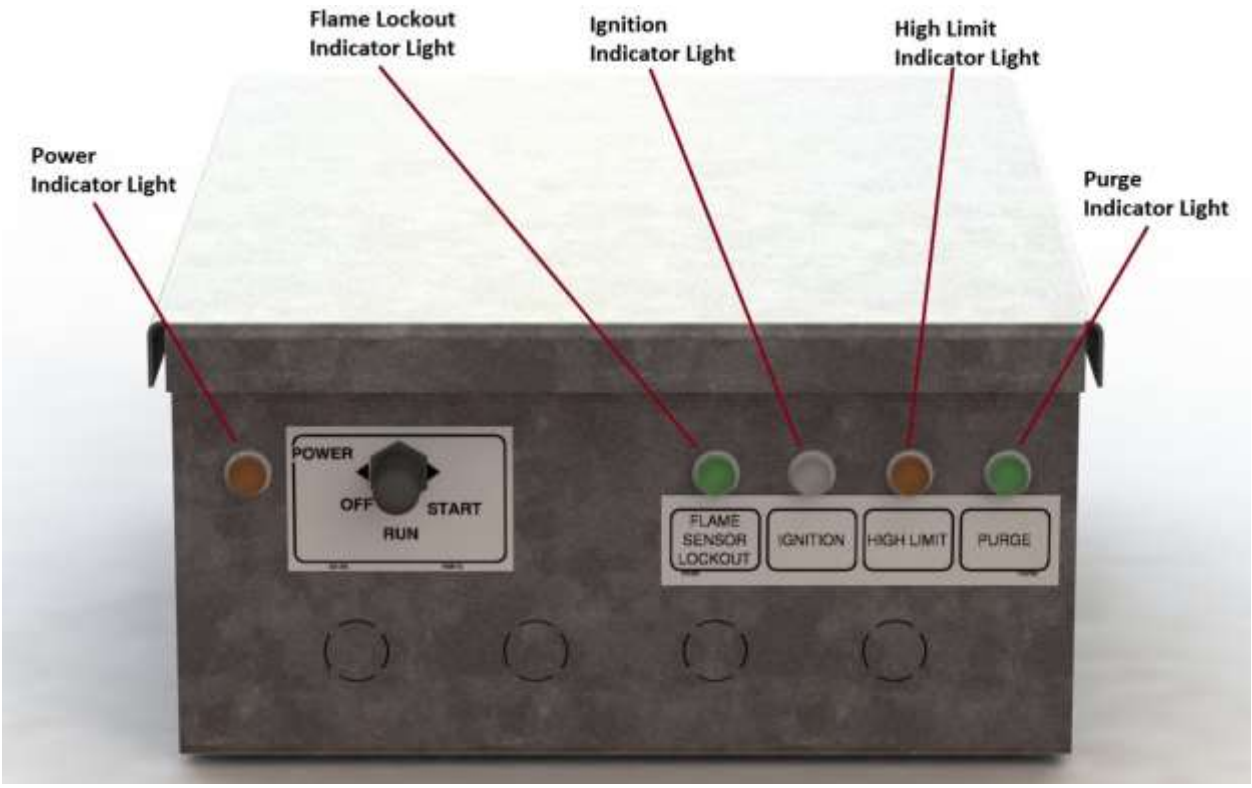
Installation of External Plenum Controls

For the proper installation of a thermostat, humidistat, or thermostat-humidistat control to the bin, the installation of a dual humidistat-thermostat kit, or the installation of a vaporizer or a modulating valve to the heater, refer to the installation instruction provided with each accessory.

Operating Instructions

Heater Control:

Information on the operating characteristics of the Centrifugal heater with a flame sensing system is outlined in the following illustration. The flame sensing relay is reset by de-energizing the heater circuit after a loss of flame condition.



The operating characteristics of the flame sensing circuit are outlined as follows:

1. The flame probe is checked for proper functionality every time the heater is started. The heater toggle switch is pushed to the "START" position. If the flame probe is in good condition, the purge light is illuminated. If the flame probe is not good, the flame probe will require replacement.

2. Once the flame probe is checked, the remaining internal and external heater sensors have power available. If all sensors call for heater operation, after a 30 second time frame to complete the purge cycle, the transformers and solenoids are energized, and the ignition light is illuminated.

3. If no flame is at the burner or the flame probe is not positioned to monitor the flame, the flame sensing relay will de-energize the solenoids and transformer after approximately 30 seconds. The flame lock-out light will be illuminated. The condition that resulted in the loss of flame at the flame probe needs to be addressed. The flame sensing relay is reset by switching the heater power switch to "OFF".

4. The heater then can be restarted by repeating the operation steps.

Start-Up Procedure:

Note: The heater is designed to operate at various firing rates. The operator must adjust the firing rate for correct operation based upon the conditions present.

Refer to the dryer rating plate to locate the minimum gas supply pressure for obtaining the maximum gas capacity for which this dryer is specified.

1. Verify all roof vents are open and unobstructed. **Note:** if freezing of roof vents could occur, do not operate the system.
2. Verify all controls are installed correctly. Refer to the ratings plate for determining the minimum gas supply pressure to achieve the maximum gas capacity for which the heater is specified.
3. Turn fan on by placing fan switch in an "On" position.
4. Open supply valve at the regulator.
    a. It is preferable to start liquid propane units on vapor fuel. (After warm up, open liquid valve on the supply tank approximately 1 turn, and close vapor valve.)
5. Open liquid valve (on LPGE Heaters only).
6. Open vapor valve.
7. Turn heater on by placing toggle switch to "Momentary Start" then "On" position.
8. Open regulator at heater slowly to 2 psig (14kPa) fuel pressure for low temperature start.
9. Set plenum external controls for desired heater operation. (See adjustment section of this manual for more information.)
10. Wait at least 40 seconds for ignition to occur. The heater has a 30-second pre-purge before ignition.
11. Perform a gas leak check during start up to verify the gas tightness of the gas train components and piping under normal operating conditions.
12. If burner fails to ignite in 40 seconds, close regulator and vapor valve and turn off the heater by placing toggle switch to the "Off" position. (Refer to service section of this manual for trouble shooting of heater.)
13. If the high limit shuts the burner off, the high limit indicator light will be illuminated. Once the high limit has cooled to a lower temperature, the high limit is reset by turning the heater switch off and then back on. The repeated shutting off of the burner by the burner high limit is caused by excessive static pressure, lack of air flow or a firing rate set too high. Reduce the static pressure or air blockage before re-firing unit. If needed adjust the firing rate.

Drying Temperature Recommendations:

To determine the appropriate drying temperature, the crop to be dried and the drying system used must be established. When this information is known, refer to the following table for the recommended maximum plenum temperatures.

In using the recommended drying temperatures please be aware of the following information:

1. The rate of drying is increased with increased temperature, however susceptibility to grain damage also increases.

2. Wet grain will remain relatively cool due to moisture evaporation from the kernel, however dry grain will warm to the drying temperature.
3. The drying front moves from the base of the bin upward. When operated as a batch system and when a stirring machine does not reach the floor, significant over drying can occur at the base of the bin.
4. When drying grain and focusing on kernel quality, use as low a plenum temperature as possible. **Note: Do not automatically set the plenum temperature at the maximum recommendation**.
5. When the grain is nearly dry, reduce the plenum temperature to complete the drying. This will reduce the quantity of cracked grain generated and reduce the fire hazard.
6. When drying sunflowers, exercise caution because sunflowers are very flammable. Do not exceed the temperature recommendations. Also, be aware that the chaff from sunflowers is very flammable. Good housekeeping in the plenum chamber and around the bin is essential.

Recommended Drying Temperatures of Non-Seed Crops

Crop	In Bin Continuous Drying	Stir Drying	In Bin Batch Drying
Corn	160°F (71°C)	140°F (60°C)	120°F (49°C)
Grain Sorghum	160°F (71°C)	140°F (60°C)	120°F (49°C)
Wheat	140°F (60°C)	120°F (49°C)	110°F (43°C)
Rice	105°F (40°C)	100°F (38°C)	90°F (32°C)
Oats	140°F (60°C)	120°F (49°C)	110°F (43°C)
Sunflowers	110°F (43°C)	110°F (43°C)	100°F (38°C)
Soybeans	120°F (49°C)	120°F (49°C)	110°F (43°C)
Pinto Beans	100°F (38°C)	100°F (38°C)	100°F (38°C)

- **Note: Temperature recommendations are based on non-seed crops (to be marketed commercially). For seed crops, do not exceed 110˚F (43˚C), except for pinto beans do not exceed 100˚F (38˚C).**
- **For other crops contact your extension service or Chief for drying temperature recommendations.**

Adjustments:

The following adjustments will have to be made, depending upon the kind of heater and plenum external controls being used. These adjustments cannot be made at the factory due to the differences in bin setups, drying methods, and weather climates. These adjustments should be checked at least twice a day or every 6 hours of operation to verify that the heater is functioning properly, and that the desired results are being achieved. In using the recommended drying temperatures keep the following considerations in mind:

Vaporizer Adjustment

The vaporizer is used on LPGE units and is located in the flame established by the burner. The vaporizer uses heat from the burner to convert the liquid propane at the vaporizer entrance to vapor propane. The burner requires vapor propane for proper operation.

The vaporizer outlet is connected to the vapor plumbing line by a vapor propane hose. The temperature of the vapor plumbing line is sensed by a vapor limit thermostat, which will cycle the heater off if the temperature exceeds 160°F (71°C). The proper location of the vaporizer will establish a vapor plumbing line temperature of about 110°F (43°C). At this temperature, the vapor plumbing line should be warm to touch. If the temperature of the vapor plumbing line is too low, move the vaporizer into the flame by loosening the square headed setscrew holding the vaporizer in place, adjusting the vaporizer location and re-tightening the setscrew. If the temperature of the vapor plumbing line is too high, the vaporizer should be moved out of the flame with the procedure indicated above.

Regulator Adjustment

The regulator should be set at the firing rate required. This can be done by first setting the heater to the desired firing rate with the vapor valve, then reopening the vapor valve and adjusting the regulator by turning the adjusting screw until the pressure gauge shows the desired pressure at the desired firing rate.

When setting the heater at the desired firing rate, the operator must take into account the heater size, the static pressure the fan is working against, the ambient temperature, orifice size, and fuel used and the type of plenum control. Refer to operation instructions that are supplied with the humidistat, thermostat, or modulating valve. The Firing Rate Tables of this manual are set up to help the operator select the desired firing rate.

Humidistat Control Adjustment (Heater Operation)

Set the humidistat control at the desired setting (50% - 60% relative humidity is recommended). To obtain even drying, adjust the firing rate of the heater unit so that the humidistat maintains a constant humidity of the drying air. The heater should be set at a firing rate of approximately 2 psig (14kPa) for propane, or 1 psig (7kPa) for natural gas, and then be adjusted to maintain correct operation of the heater. The heater firing rate must be checked as humidity conditions change.

Thermostat Control Adjustment (Heater Operation)

Set the thermostat control to the desired temperature setting. Initially, set the firing rate of the heater at 2 psig (14kPa) pressure for propane, or 1 psig (7kPa) pressure for natural gas. To obtain even drying, adjust the firing rate of the heater unit so that the thermostat calls for heat 90% of the time. The heater firing rate must be checked as temperature conditions change.

Warning: The plenum thermostat is used as a drying thermostat, not as a plenum high limit.

Humidistat - Thermostat Control Adjustment

1. Humidistat Control Only

Set the thermostat at the lower temperature limit. This is the temperature wanted for heater operation, whether the humidistat is calling for heat or not, 40°F-50°F (4.4°C-10°C) is recommended. Set the humidistat and heater according to the humidistat instructions previously given.

2. Thermostat Control Only

Set the humidistat at 100% relative humidity. Then adjust the thermostat and heater controls according to the thermostat instructions given.

3. Humidistat - Thermostat Combination

Set the humidistat and thermostat at the desired operating conditions. Then adjust the firing rate of the heater according to the humidistat and thermostat instructions.

Modulating Valve Adjustment (Heater Operation)

The modulating valve is used to maintain a constant plenum temperature by allowing more gas to flow to the burner if the plenum temperature is lower than desired, or by restricting the gas flow if the temperature is higher than desired.

To set the modulating valve, use the following procedures:

1. Determine what plenum temperature is desired.
2. Using the vapor valve, set the operating pressure at 8 psig (55kPa) for propane, or 3 psig (21kPa) for natural gas.
3. Adjust the "T" Handle of the valve until the bin thermometer maintains the desired plenum temperature. The handle is turned in, (clockwise) to get a higher temperature, or out (counter-clockwise) to get a lower temperature.
4. Set the regulator 2 psig (14kPa) higher than the modulating valve operating condition, by turning the modulating valve handle in (clockwise) 2 revolutions, adjusting the regulator to the desired pressure, and then resetting the modulating valve to the desired plenum temperature

Shut Down Procedures

If the heater is to be shut off for a prolonged period, carry out the following steps:

1. Close the fuel valve at tank.
2. Allow the fuel to be burned out of the fuel line.
3. After the flame burns out, close vapor valve, regulator valve and liquid valve.
4. Turn off heater, placing toggle switch to "Off" position.
5. Allow fan to run for 2 minutes in order to cool off heater. Next shut the fan off. Finally shut off the power at the fan service disconnect.
6. The thermostat or humidistat external plenum controls should be removed and stored in a clean, dry place.

Firing Rate Guideline Tables

The following tables are to be used as a guide for setting the firing rate of the heater. The values are an estimate - the actual values may vary, depending upon the bin setup and weather conditions. Once the predicted firing rate is obtained, a bin thermometer should be used to determine the actual plenum temperature, and then the firing rate should be adjusted to obtain the desired plenum temperature. Use the following procedures in conjunction with the "Drying Temperature Recommendations", in determining the firing rate needed for your application:

1. Determine the ambient temperature at which the heater will be operating (e.g. the outside air temperature).
2. Find the difference of the desired drying temperature and the ambient temperature. This value is the temperature rise desired.
3. Use a static pressure gauge to determine the static pressure at which the fan and heater are operating.
4. Refer to the following tables which list the size of your heater, the gas used, and the temperature rise desired. Locate the required firing rate for the operating static pressure.
5. If the ambient temperature is 50°F (10°C), then the firing rate can directly be read for your heater, gas used, and plenum temperature for 50°F (10°C) ambient air.

Note: As conditions vary, the firing rate should be adjusted to obtain the desired plenum temperature.

Approximate firing rates for CH1015T heater with C27-10 Centrifugal fan operated on vapor propane with 7/32" (5.55mm) diameter orifice:

FIRING RATE PSIG	STATIC PRESSURE (INCHES OF WATER COLUMN)							
	1.0		2.0		3.0		4.0	
	TEMP. RISE (^{o}F)	PLENUM TEMP. FOR 50^{o}F AMBIENT AIR (^{o}F)	TEMP. RISE (^{o}F)	PLENUM TEMP. FOR 50^{o}F AMBIENT AIR (^{o}F)	TEMP. RISE (^{o}F)	PLENUM TEMP. FOR 50^{o}F AMBIENT AIR (^{o}F)	TEMP. RISE (^{o}F)	PLENUM TEMP. FOR 50^{o}F AMBIENT AIR (^{o}F)
3.0	79	129	84	134	90	140	98	148
4.0	91	141	97	147	104	154	113	163
5.0	101	151	108	158	116	166	126	176
6.0	112	162	119	169	128	178	139	189
7.0	126	176	134	184	144	194	156	206
8.0	138	188	147	197	158	208	171	221
9.0	148	198	157	207	167	217	181	231
10.0	156	206	166	216	178	228	193	243
11.0	164	214	174	224	187	237	203	253
12.0	171	221	182	232	195	245	211	261

Approximate firing rates for CH1015T heater with C27-10 Centrifugal fan operated on natural gas with 3/8" (9.52mm) diameter orifice:

FIRING RATE PSIG	STATIC PRESSURE (INCHES OF WATER COLUMN)							
	1.0		2.0		3.0		4.0	
	TEMP. RISE (^{o}F)	PLENUM TEMP. FOR 50^{o}F AMBIENT AIR (^{o}F)	TEMP. RISE (^{o}F)	PLENUM TEMP. FOR 50^{o}F AMBIENT AIR (^{o}F)	TEMP. RISE (^{o}F)	PLENUM TEMP. FOR 50^{o}F AMBIENT AIR (^{o}F)	TEMP. RISE (^{o}F)	PLENUM TEMP. FOR 50^{o}F AMBIENT AIR (^{o}F)
1.0	73	123	78	128	83	133	90	140
1.5	90	140	96	146	103	153	112	152
2.0	104	154	111	161	119	169	129	179
2.5	116	166	124	174	133	183	144	194
3.0	128	178	136	186	146	196	158	208
3.5	139	189	148	198	159	209	172	222
4.0	150	200	160	210	172	222	186	236

Approximate firing rates for CH1015T heater with C27-15 Centrifugal fan operated on propane with 7/32" (5.55mm) diameter orifice:

FIRING RATE PSIG	STATIC PRESSURE (INCHES OF WATER COLUMN)							
	1.0		2.0		3.0		4.0	
	TEMP. RISE (^{o}F)	PLENUM TEMP. FOR 50^{o}F AMBIENT AIR (^{o}F)	TEMP. RISE (^{o}F)	PLENUM TEMP. FOR 50^{o}F AMBIENT AIR (^{o}F)	TEMP. RISE (^{o}F)	PLENUM TEMP. FOR 50^{o}F AMBIENT AIR (^{o}F)	TEMP. RISE (^{o}F)	PLENUM TEMP. FOR 50^{o}F AMBIENT AIR (^{o}F)
3.0	64	114	68	118	74	124	80	130
4.0	73	123	78	128	85	135	92	142
5.0	81	131	86	136	94	144	102	152
6.0	90	140	96	146	105	155	115	165
7.0	101	151	108	158	118	168	129	179
8.0	111	161	118	168	129	179	141	191
9.0	119	169	127	177	139	189	152	202
10.0	126	176	134	184	146	196	159	209
11.0	132	182	141	191	154	204	168	218
12.0	138	188	147	197	160	210	175	225

Approximate firing rates for CH1015T heater with C27-15 Centrifugal fan operated on natural gas with 3/8” (9.52mm) diameter orifice:

FIRING RATE PSIG	STATIC PRESSURE (INCHES OF WATER COLUMN)							
	1.0		2.0		3.0		4.0	
	TEMP. RISE (^{o}F)	PLENUM TEMP. FOR 50^{o}F AMBIENT AIR (^{o}F)	TEMP. RISE (^{o}F)	PLENUM TEMP. FOR 50^{o}F AMBIENT AIR (^{o}F)	TEMP. RISE (^{o}F)	PLENUM TEMP. FOR 50^{o}F AMBIENT AIR (^{o}F)	TEMP. RISE (^{o}F)	PLENUM TEMP. FOR 50^{o}F AMBIENT AIR (^{o}F)
1.0	59	109	63	113	68	118	74	124
1.5	72	122	77	127	83	133	91	141
2.0	84	134	89	139	96	146	105	155
2.5	93	143	99	149	107	157	117	167
3.0	103	153	110	160	118	168	129	179
3.5	112	162	119	169	128	178	140	190
4.0	121	171	129	179	139	189	152	202

Approximate firing rates for CH2025T heater with C30-20 Centrifugal fan operated on propane with 1/4" (6.35mm) diameter orifice:

FIRING RATE PSIG	STATIC PRESSURE (INCHES OF WATER COLUMN)							
	1.0		2.0		3.0		4.0	
	TEMP. RISE (°F)	PLENUM TEMP. FOR 50°F AMBIENT AIR (°F)	TEMP. RISE (°F)	PLENUM TEMP. FOR 50°F AMBIENT AIR (°F)	TEMP. RISE (°F)	PLENUM TEMP. FOR 50°F AMBIENT AIR (°F)	TEMP. RISE (°F)	PLENUM TEMP. FOR 50°F AMBIENT AIR (°F)
3.0	44	94	46	96	49	99	53	103
4.0	60	110	63	113	67	117	72	122
5.0	75	125	79	129	84	134	90	140
6.0	90	140	95	145	100	150	107	157
7.0	100	150	105	155	111	161	119	169
8.0	108	158	114	164	120	170	129	179
9.0	116	166	122	172	129	179	138	188
10.0	123	173	129	179	136	186	146	196
11.0	129	179	136	186	144	194	155	205
12.0	135	185	142	192	150	200	161	211

Approximate firing rates for CH2025T heater with C30-20 Centrifugal fan operated on natural gas with 7/16” (11.11mm) diameter orifice:

FIRING RATE PSIG	STATIC PRESSURE (INCHES OF WATER COLUMN)							
	1.0		2.0		3.0		4.0	
	TEMP. RISE (°F)	PLENUM TEMP. FOR 50°F AMBIENT AIR (°F)	TEMP. RISE (°F)	PLENUM TEMP. FOR 50°F AMBIENT AIR (°F)	TEMP. RISE (°F)	PLENUM TEMP. FOR 50°F AMBIENT AIR (°F)	TEMP. RISE (°F)	PLENUM TEMP. FOR 50°F AMBIENT AIR (°F)
1.0	37	87	39	89	41	91	44	94
1.5	46	96	48	98	51	101	55	105
2.0	53	103	56	106	59	109	63	113
2.5	71	121	75	125	79	129	85	135
3.0	83	133	87	137	92	142	99	149
3.5	90	140	95	145	100	150	107	157
4.0	110	160	116	166	122	162	131	181

Approximate firing rates for CH2025T heater with C30-25 Centrifugal fan operated on propane with 1/4" (6.35mm) diameter orifice:

FIRING RATE PSIG	STATIC PRESSURE (INCHES OF WATER COLUMN)							
	1.0		2.0		3.0		4.0	
	TEMP. RISE (°F)	PLENUM TEMP. FOR 50°F AMBIENT AIR (°F)	TEMP. RISE (°F)	PLENUM TEMP. FOR 50°F AMBIENT AIR (°F)	TEMP. RISE (°F)	PLENUM TEMP. FOR 50°F AMBIENT AIR (°F)	TEMP. RISE (°F)	PLENUM TEMP. FOR 50°F AMBIENT AIR (°F)
3.0	37	87	39	89	41	91	44	94
4.0	51	101	53	103	56	106	59	109
5.0	64	114	67	127	70	120	74	124
6.0	77	127	81	131	84	134	88	138
7.0	85	135	89	139	93	143	98	148
8.0	92	142	97	147	100	150	106	156
9.0	99	149	103	153	108	158	114	164
10.0	105	155	109	159	114	164	120	170
11.0	110	160	115	165	121	171	128	178
12.0	115	165	120	170	126	176	133	183

Approximate firing rates for CH2025T heater with C30-25 Centrifugal fan operated on natural gas with 7/16” (11.11mm) diameter orifice:

FIRING RATE PSIG	STATIC PRESSURE (INCHES OF WATER COLUMN)							
	1.0		2.0		3.0		4.0	
	TEMP. RISE (°F)	PLENUM TEMP. FOR 50°F AMBIENT AIR (°F)	TEMP. RISE (°F)	PLENUM TEMP. FOR 50°F AMBIENT AIR (°F)	TEMP. RISE (°F)	PLENUM TEMP. FOR 50°F AMBIENT AIR (°F)	TEMP. RISE (°F)	PLENUM TEMP. FOR 50°F AMBIENT AIR (°F)
1.0	32	82	33	83	35	85	37	87
1.5	39	89	41	91	43	93	46	96
2.0	45	95	48	98	49	99	52	102
2.5	60	110	64	114	66	116	70	120
3.0	71	121	74	124	77	127	82	132
3.5	77	127	81	131	84	134	88	138
4.0	94	144	98	148	102	152	108	158

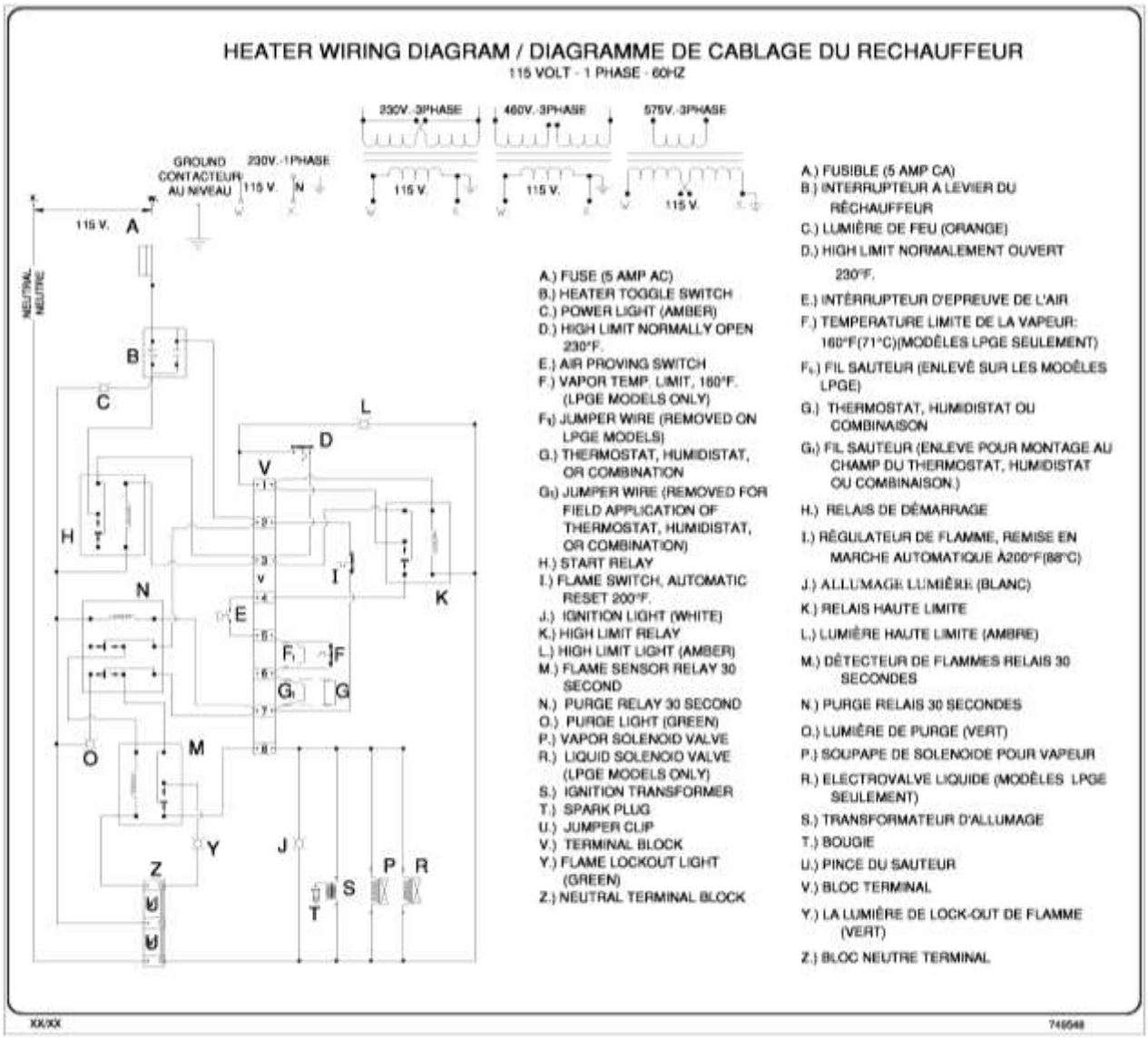
Heater Maintenance

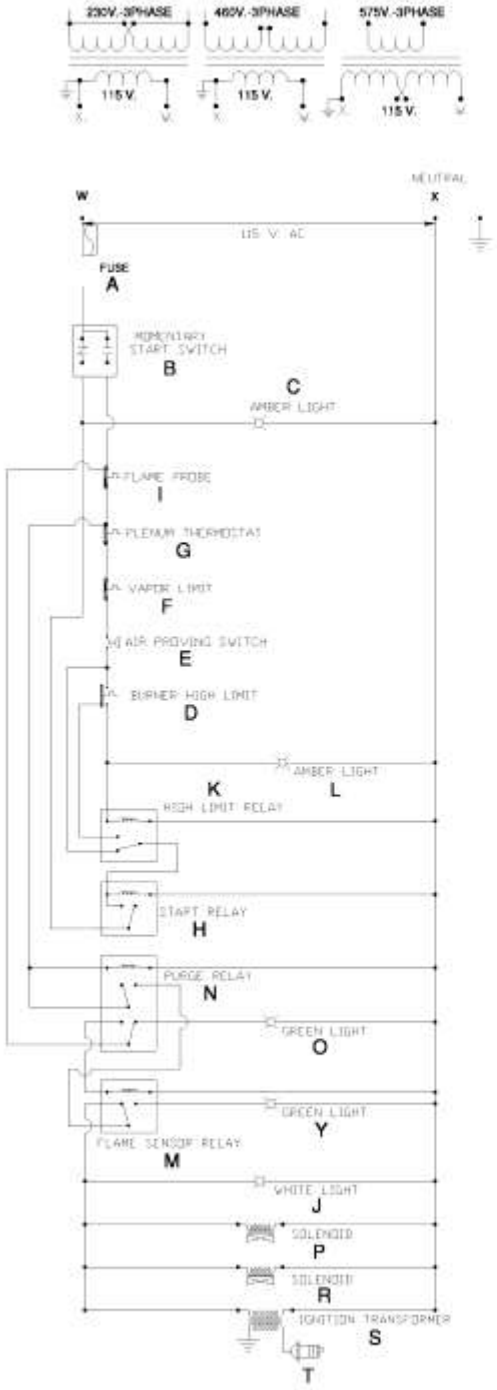
The following procedures should be followed and maintenance performed before starting the unit at the beginning of every season, and also during operation:

1. The fuel line strainers should be taken out and cleaned. A plugged screen will restrict the gas flow to the unit. On liquid propane units, liquid and vapor line strainers both should be checked. Warranty is void if the strainer or screen is removed, and not reinstalled after cleaning.
2. The burner should be checked for obstructions and debris. To check, use a piece of wire or drill bit that will fit the holes in the burner. To clean the inside of the burner, remove from the heater and tap lightly around the burner. Then pour the foreign material out of the inlet.
3. The air switch inlet screen should be cleaned. This screen keeps debris from entering the air switch; however, during operation the screen can become clogged or dirty.
4. Check all plumbing joints for leaks using the "soap test." The gas tightness of the gas train should be checked at least on an annual basis. (See previous installation instructions).
5. Check all wires to verify they are not bare or causing a short. Pests can destroy insulation on wires, including the spark plug, flame probe, burner limit wires if protective measures to control rodents are not implemented.
6. Examine and gap spark plug. Through wear, the spark plug can go out of adjustment. Verify during operation every two days. The gap of the plug should be 1/8" (.32cm).
7. The flame probe needs to be checked to be sure that it has not been burnt off due to lack of proper adjustment in and out of the flame. The flame probe can also become damaged. Verify every two days during operation and replace or adjust as needed. (See adjustment section).
8. Check all wire connections to be sure they are tight.
9. All external plenum controls (nylon humidistat or thermostat combination) should be inspected, cleaned, and checked every three days during operation.
10. Caldwell recommends that external plenum controls be removed and stored in a clean, dry place when not in use.
11. Check adjustment of the vaporizer twice daily, or as changing weather conditions demand. (See heater adjustment section).

Heater Wiring Diagram

Note: When used with a 575 volt, 460 volt, or 230 volt fan, a step down transformer must be used to develop 115 volt, 1 phase, 60hz power.





A.) FUSE (5 AMP AC)
B.) HEATER TOGGLE SWITCH
C.) POWER LIGHT (AMBER)
D.) HIGH LIMIT NORMALLY OPEN 230°F.
E.) AIR PROVING SWITCH
F.) VAPOR TEMP. LIMIT, 160°F. (LPGE MODELS ONLY)
F_1.) JUMPER WIRE (REMOVED ON LPGE MODELS)
G.) THERMOSTAT, HUMIDISTAT, OR COMBINATION
G_1) JUMPER WIRE (REMOVED FOR FIELD APPLICATION OF THERMOSTAT, HUMIDISTAT, OR COMBINATION)
H.) START RELAY
I.) FLAME SWITCH, AUTOMATIC RESET 200°F.
J.) IGNITION LIGHT (WHITE)
K.) HIGH LIMIT RELAY
L.) HIGH LIMIT LIGHT (AMBER)
M.) FLAME SENSOR RELAY 30 SECOND
N.) PURGE RELAY 30 SECOND
O.) PURGE LIGHT (GREEN)
P.) VAPOR SOLENOID VALVE
R.) LIQUID SOLENOID VALVE (LPGE MODELS ONLY)
S.) IGNITION TRANSFORMER
T.) SPARK PLUG
Y.) FLAME LOCKOUT LIGHT (GREEN)

A.) FUSIBLE (5 AMP CA)
B.) INTERRUPTEUR A LEVIER DU RÈCHAUFFEUR
C.) LUMIÈRE DE FEU (ORANGE)
D.) HIGH LIMIT NORMALEMENT OUVERT 230°F.
E.) INTÈRRUPTEUR D'EPREUVE DE L'AIR
F.) TEMPERATURE LIMITE DE LA VAPEUR: 160°F(71°C)(MODÈLES LPGE SEULEMENT)
F_1.) FIL SAUTEUR (ENLEVÉ SUR LES MODÈLES LPGE)
G.) THERMOSTAT, HUMIDISTAT OU COMBINAISON
G_1) FIL SAUTEUR (ENLEVE POUR MONTAGE AU CHAMP DU THERMOSTAT, HUMIDISTAT OU COMBINAISON.)
H.) RELAIS DE DÊMARRAGE
I.) RÈGULATEUR DE FLAMME, REMISE EN MARCHE AUTOMATIQUE À200°F(88°C)
J.) ALLUMAGE LUMIÈRE (BLANC)
K.) RELAIS HAUTE LIMITE
L.) LUMIÈRE HAUTE LIMITE (AMBRE)
M.) DÊTECTEUR DE FLAMMES RELAIS 30 SECONDES
N.) PURGE RELAIS 30 SECONDES
O.) LUMIÈRE DE PURGE (VERT)
P.) SOUPAPE DE SOLENOIDE POUR VAPEUR
R.) ELECTROVALVE LIQUIDE (MODÈLES LPGE SEULEMENT)
S.) TRANSFORMATEUR D'ALLUMAGE
T.) BOUGIE
Y.) LA LUMIÈRE DE LOCK-OUT DE FLAMME (VERT)

Sequential Switching Actions:

1. Toggle switch (B) is moved to the "momentary start" position. With all safety devices in a "closed" electrical condition the start relay (H) is engaged.
2. The purge relay (N) results in a 30 second time delay before ignition will proceed.
3. With completion of the purge, the flame sensor relay (M) monitors the flame probe (I). The flame sensor relay (M) locks out the fuel supply and ignition transformer (S) upon the lack of flame. The flame sensor relay (M) is reset by manually moving the toggle switch (B) to the off position.

Servicing the Heater:

The following will help you find any problems that may occur in the heater unit and includes tips for repair. For servicing of electrical systems, open the control box cover. Inside the cover you will find a wiring schematic to help you service the unit. In the checks shown below, locate the symptoms you are experiencing with your unit and follow the list of corresponding possible causes and remedies:

Note: Unless otherwise indicated, checks are made with the power off using a voltmeter on resistance setting.

Generic Sequential Operations Check:

1. Lack of power going to the unit (check made with power on).
    a. Take a voltmeter or continuity tester, put one lead to ground and the other on the top terminal of terminal block in fan control box. Power lead is the black wire on the top terminal (#1) on the terminal block. When the fan is operating, it should indicate 115 volts on the voltmeter or the light should come on using a continuity tester.
2. Improper Neutral.
    a. Verify neutral wire is connected to the terminal block in the fan control box. Neutral to be provided from disconnect to fan control box with the power supply.
3. Fuse may be blown.
    a. Visually check fuse. If dark in color, replace.
    b. Check fuse and holder. Put one lead on each side of the fuse on the fuse holder screws. Meter should show continuity through fuse.
4. Check for power at toggle switch in heater (check made with power on).
    a. Put one lead of voltmeter to toggle switch where power cord is connected and the other lead to ground. If there is not any power, check cord and fuse for damage.
5. Flame probe may be in an open condition. **Note:** The heater control is wired to check the continuity of the Flame Probe each time the heater is started. If the Flame Probe is in an open condition, the Flame Probe will prevent heater operation. Verify all wires are connected properly.
    a. Use a voltmeter and check for continuity across the flame probe. If no continuity is present and the flame probe has cooled down, replace the flame probe. Check the wires to the flame probe. If they are damaged replace the flame probe wire.
6. Thermostat or Humidistat control may be open.
    a. Use a voltmeter and check continuity across the terminal block where the 2 leads of the control are connected (terminals 6 and 7).
    b. If no continuity is present, check the control setting to call for heater operation. Check for damaged wires to the control. If either wire is damaged replace the wire. Replace entire thermostat or humidistat.
7. The vapor limit switch may be defective (LPGE units only)

   a. Use voltmeter and check continuity between terminals 5 and 6 on terminal block. If there is no continuity, replace switch. (Verify that the vapor limit switch has had sufficient time to cool and automatically reset).
8. Air switch may be defective.
   a. With the fan running, check continuity across the air switch. If no continuity is present and the fan is delivering air, the problem is in the air switch or in the venturi.
   b. Verify the screen on the venturi is not plugged. If the fan is working against 4" static pressure or lower, the heater should operate.
9. High limit may be closed.
   a. Use voltmeter to check for continuity between the two leads going to high limit channel. (Terminal #1 on the terminal block and #3 on the start relay.)
   b. If there is no continuity, remove the sensor from the bin. Check the switch individually by putting leads of voltmeter on the two screws that have wires attached. The switch should not show continuity. Replace switch if defective. If switches are functional, the limit wire is defective. Replace damaged wire.
10. Flame sensing relay is not completing the circuit.
   a. Turn off switch to de-energize the circuit. Check the continuity of the contacts of the relay. Check for continuity in the normally closed set of contacts (2 and 4, also 5 and 7). A lack of continuity indicates a defective relay. Replace the relay.
   b. Supply power (115V and neutral) to the coil (terminals 1 and 8). Check power at the normally open set of contacts (2 and 3, also 6 and 7). After power has been supplied to the relay for 30 seconds, power should be present at the terminals. If not, replace the relay.
11. Purge delay may be defective.
   a. Turn off switch to de-energize the circuit. Check the continuity at the contacts of the relay. Check for continuity in the normally closed set of contacts (2 and 4, also 5 and 7). A lack of continuity indicates a defective relay. Replace the relay.
   b. Supply power (115v and neutral) to the coil (terminals 1 and 8). Check power at the normally open set of contacts (2 and 3, also 6 and 7). After power has been supplied to the relay for 30 seconds power should be present at the terminals. If not replace the relay.
12. Check all wires and connectors to verify they are functional and installed correctly.
   a. See wiring schematic for correct installation.

Condition Specific Faults:

1. Symptom: No ignition, Lack of ignition spark, Gas is present.
   a. Transformer is defective (power on).
      i. Take the cap holding the spark plug wire off and remove the spark plug wire from the transformer. With the transformer energized, ground an insulated

screwdriver and arc to the transformer post where spark plug wire was connected. **Caution**: Do not touch the screwdriver shaft.

ii. If no arc is present or is less than 1/8" (.31cm) replace transformer.

b. Spark plug wire is defective (power on).

i. Take wire off spark plug and arc to heater. **Caution**: Do not touch the mounting terminal of the spark plug wire. If no arc is present or is less than 1/8" (.31cm) replace wire.

c. Spark plug is defective

i. Check gap of plug. Verify gap is 1/8" (.31cm).

ii. If transformer and spark plug wire are functional replace the spark plug.

2. Symptom: No ignition, Lack of gas with spark present. **Note**: The check to verify gas is present should be made after all the electrical component checks are made, and the electrical controls are confirmed to be functioning properly. **Note**: that the purge delay develops a 30 second delay for the solenoids to open.

a. Lack of gas to the heater.

i. Check tank to see if ample pressure is available to start unit. Unit requires 35 psig (241kPa) of propane pressure and 5 psig (34kPa) of natural gas available at the unit for startup.

ii. Check to see if the tank, regulator, or line going to the unit is blocked.

b. Check to see if the solenoids are functioning.

i. (Power On) Put your hand on the top of the solenoid and turn the heater toggle switch on and allow 30 seconds for the purge. If you feel a click at the top of the solenoid, the coil is functional and the solenoid is working electrically. If there is no click, the coil is defective and should be replaced.

ii. (Power Off) Check solenoid to see if screen is plugged or the diaphragm is defective. Unscrew the top of the brass fixture and locate the screen and diaphragm inside. Be sure to reassemble properly. Reversing any parts in the solenoid will cause the solenoid not to function properly. Keep all foreign material out of the solenoid.

c. Obstruction in the gas line.

i. Install pressure gauges at available locations in the plumbing line to determine where a fuel restriction could exist.

d. If gas is present at the pressure gage but unit lacks gas for ignition.

i. Check orifice size, and be sure it is clean. (See Firing Rate Tables.)

ii. Check burner. See that holes are not plugged. See that the tubing isn't plugged by debris.

3. Symptom: Flame sensing relay locks ignition out.

a. If ignition is not present.

i. Refer to the steps outlined previously in: "Condition Specific Faults/No ignition, Lack of gas with spark present" and "Condition specific Faults/No ignition, Lack of ignition spark, Gas present"

b. If ignition is present.
   i. Check position of the flame probe for proper adjustment.
   ii. Defective flame probe. When flame is present, the flame probe contacts should be in an "open" position. If contacts are "closed", replace the flame probe.
   iii. Check flame probe wire and replace if defective. Check wire for bare spots and shorts to ground. Flame probe should not show continuity from either wire to ground. Check the two wires in the flame probe wire assembly to see if they are shorting across in the assembly. With the wires removed from the flame probe, there should be no continuity.

c. Defective flame sensing relay (power on).
   i. With the switch off, shut off gas supply at heater plumbing with ball valve. Push the switch to the start position and release. Remember that there is a 30 second purge delay. After the 30 second purge delay, the flame sensing relay should have power to the coil for an additional 30 seconds. After 30 seconds elapses the circuit collapses and the flame lockout light turns on. If the coil does not activate the contacts within 30 seconds, or the light does not illuminate afterwards, replace the flame sensing relay.

4. Symptom: High limit is activated.
   a. Fan limit may be obstructed. Keep the fan screen clean of all foreign material.
   b. Fan motor may be failing. Check the motor to verify that it is obtaining full speed.
   c. Verify that static pressure is not excessive with a static pressure gage. Verify that roof vents are open and are sufficient in size and quantity. Check the aeration floor for plugged holes. Verify the grain depth, moisture content and fines in the grain. If any of these conditions are high the grain level should be lowered.
   d. Firing rate may be too high for the application. Reduce the firing rate.
5. Symptom: Heater cycles without any external plenum controls in place (power on).
   a. Static pressure is too high, causing the high limit to cycle the unit.
      i. Remove vapor temperature limit from the vapor plumbing line. If unit continues to cycle, check the following:
         1. The vent area in the bin roof is insufficient. Verify that roof vents are open and are sufficient in size and quantity. Check the aeration floor for plugged holes. Verify the grain depth, moisture content and fines in the grain. If any of these conditions are high the grain level should be lowered.
         2. The firing rate is too high for the application. Reduce the firing rate.
   b. The vaporizer is too hot.

i. Remove vapor temperature limit from plumbing line. If cycling stops, adjust vaporizer out of the flame.

6. Symptom: Not enough heat.
    a. Orifice is too small or dirty.
        i. Check the firing rate table for the proper size orifice for your unit and application.
        ii. Remove orifice and check for obstructions then reinstall the orifice.
    b. Insufficient gas pressure.
        i. Refer to the installation section for proper gas supply.
    c. Vaporizer is not hot enough.
        i. Vapor plumbing will be cold to the touch. Refer to the adjustment section.
7. Symptom: External plenum control not functioning.
    a. Check wiring schematic and be sure the control is wired to the heater properly.
    b. Make a visual check of the external plenum control cord for cuts or shorted wires.
    c. Check the external plenum control setting. Adjust the control for the desired settings, referencing the adjustment section.

STANDARD LIMITED WARRANTY

Caldwell Aeration Products

1. **Definitions**. The following terms, when they appear in the body of this Standard Limited Warranty for Caldwell Aeration Products in initial capital letters shall have the meaning set forth below:
   A. Accepted Purchase Order shall mean the Purchase Order identified below.
   B. Chief shall mean Chief Agri/Industrial, a division of Chief Industries, Inc.
   C. Original Owner shall mean the original owner identified below.
   D. Product shall mean the Agri/Industrial Equipment as described in the Accepted Purchase Order.
   E. Reseller shall mean the authorized Chief Agri/Industrial Equipment dealer identified below.

2. **Limited Product Warranty**. Upon and subject to the terms and conditions set forth below, Chief hereby warrants to the Reseller, and, if different, the Original Owner as follows:
   A. All new Products delivered to the Reseller or the Original Owner by Chief pursuant to the Accepted Purchase Order will, when delivered, conform to the specifications set forth in the Accepted Purchase Order;
   B. All new Products delivered pursuant to the Accepted Purchase Order will, in normal use and service, be free from defects in materials or workmanship; and
   C. Upon delivery, Chief will convey good and marketable title to the Products, free and clear of any liens or encumbrances except for, where applicable, a purchase money security interest in favor of Chief.

3. **Duration of Warranty and Notice Requirements**. Subject to the **Exceptions, Exclusions and Limitations** set forth below, the warranties set forth in Section 2 above shall apply to all covered non-conforming conditions that are discovered within the first twenty-four (24) months following delivery of the Product to the carrier designated by the Reseller and/or the Original Owner at Chief's manufacturing facility in Kearney, Nebraska (the "Warranty Period") and are reported to the Chief as provided in Section 4 below within thirty (30) days following discovery (a "Notice Period").

4. **Notice Procedure**. In order to make a valid warranty claim, the Reseller and/or the Original Owner must provide Chief with a written notice of any nonconforming condition discovered during the Warranty Period within the applicable Notice Period specified in Section 3 above. Said notice must be in writing; be addressed to Chief Industries, Inc., Agri/Industrial Division, Customer Service Department, P.O. Box 848, Kearney, NE 68848; and contain the following information: (a) the Customer's name and address; (b) the Reseller's name and address; (c) the make and model of the Product in question; (d) the current location of the Product; (e) a brief description of the problem with respect to which warranty coverage is claimed; and (f) the date on which the Product was purchased.

5. **Exceptions and Exclusions**. Anything herein to the contrary notwithstanding, the warranties set forth in Section 2 above do ***not*** cover any of the following, each of which are hereby expressly excluded:
   - A. Defects that are not discovered during the applicable Warranty Period;
   - B. Defects that are not reported to the Chief Agri/Industrial Division Customer Service Department in conformity with the notice procedure set forth in Section 4 above within the applicable Notice Period specified in Section 3;
   - C. Any used or pre-owned Products;
   - D. Any Chief manufactured parts that are not furnished as a part of the Accepted Purchase Order;
   - E. Any fixtures, equipment, materials, supplies, accessories, parts or components that have been furnished by Chief but are manufactured by a third party;
   - F. Any Products which have been removed from the location at which they were originally installed;
   - G. Any defect, loss, damage, cost or expense incurred by the Reseller or the Original Owner to the extent the same arise out of, relate to or result, in whole or in part, from any one or more of the following:
     - (i) Usual and customary deterioration, wear or tear resulting from normal use, service and exposure;
     - (ii) Theft, vandalism, accident, war, insurrection, fire or other casualty;
     - (iii) Any damage, shortages or missing parts which result during shipping or are otherwise caused by the Reseller, the Original Owner and/or any third party;
     - (iv) Exposure to marine environments, including frequent or sustained salt or fresh water spray;
     - (v) Exposure to corrosive, chemical, ash, smoke, fumes, or the like generated or released either within or outside of the structure on which the Product is installed, regardless of whether or not such facilities are owned or operated by the Reseller, the Original Owner or an unrelated third party;
     - (vi) Exposure to or contact with animals, animal waste and/or decomposition;
     - (vii) The effect or influence the Product may have on surrounding structures, including, without limitation, any loss, damage or expense caused by drifting snow;
     - (viii) Any Product or portion thereof that has been altered, modified or repaired by the Reseller, the Original Owner or any third party without Chief's prior written consent;
     - (ix) Any Product or portion thereof that has been attached to any adjacent structure without Chief's prior written approval;
     - (x) Any Product to which any fixtures, equipment, accessories, materials, parts or components which were not provided as a part of the original Accepted Purchase Order have been attached without Chief's prior written approval;
     - (xi) The failure on the part of the Reseller, the Original Owner or its or their third party contractors to satisfy the requirements of all applicable statutes, laws, ordinances rules, regulations and codes, (including zoning laws and/or building codes);
     - (xii) The use of the Product for any purpose other than the purpose for which it was designed; and/or

(xiii) The failure of the Reseller, the Original Owner and/or any third party to:
(a) properly handle, transport and/or store the Product or any component part thereof;
(b) properly select and prepare a site that is adequate for the installation and/or operation of the Product or any component part thereof;
(c) properly design and construct a foundation that is adequate for the installation and/or operation of the Product or any component part thereof;
(d) properly set up, erect, construct or install the Product and/or any component part thereof; and/or
(e) properly operate, use, service and/or maintain the Product and each component part thereof.

6. **Resolution of Warranty Claims**. In the event any nonconforming condition is discovered within the Warranty Period and Chief is notified of a warranty claim as required by Section 4 prior to the end of the applicable Notice Period set forth in Section 3 above, Chief shall, with the full cooperation of the Reseller and the Original Owner, immediately undertake an investigation of such claim. To the extent Chief shall determine, in its reasonable discretion, that the warranty claim is covered by the foregoing Limited Product Warranty, the following shall apply:

A. Warranty Claims With Respect to Covered Non-Conforming Conditions Discovered Within the First Three Hundred Sixty Five (365) Days and Reported to Chief Within Thirty (30) Days of Discovery. In the case of a warranty claim which relates to a covered non-conforming condition that is discovered during the first three hundred sixty five (365) days of the Warranty Period and is reported to Chief as required by Section 4 within thirty (30) days of discovery as required by Section 3, Chief will, as Chief's sole and exclusive obligation to the Reseller and the Original Owner, and as their sole and exclusive remedy, work in cooperation with the Reseller and the Original Owner to correct such non-conforming condition, and in connection therewith, Chief will ship any required replacement parts to the "ship to address" set forth in the Accepted Purchase Order FOB Chief's facilities in Kearney, Nebraska, and will either provide the labor or reimburse the Reseller or the Original Owner, as may be appropriate in the circumstances, for any out of pocket expense the Original Owner may reasonably and necessarily incur for the labor that is required to correct such non-conforming condition, provided that if work is to be performed by the Reseller or a third party contractor, Chief may require at least two competitive bids to perform the labor required to repair or correct the defect and reserves the right to reject all bids and obtain additional bids. Upon acceptance of a bid by Chief, Chief will authorize the necessary repairs.

B. All Other Warranty Claims. Except as is otherwise provided in subsection 6A above, in the case of all other warranty claims which relate to covered non-conforming conditions that are discovered during the Warranty Period and are reported to Chief as required by Section 4 within thirty (30) days following discovery, Chief will, as Chief's sole and exclusive obligation to the Reseller and the Original Owner, and as the Reseller's and the Original Owner's sole and exclusive remedy, ship any required replacement parts to the Original Owner at the "ship to address" specified in the Accepted Purchase Order FOB

Chief's facilities in Kearney, Nebraska; and **in such event, Chief shall have no responsibility or liability to either the Reseller or the Original Owner for the cost of any labor required to repair or correct the defect**.

7. **Warranty Not Transferable**. This Warranty applies only to the Reseller and the Original Owner and is **not transferable**. As such, this Warranty does **not** cover any Product that is sold or otherwise transferred to any third party following its delivery to the Original Owner.

8. **Limitation on Warranties, Liabilities and Damages**. The Reseller and the Original Owner expressly agree that the allocation of the risk, liability, loss, damage, cost and expense arising from any Product that does not conform to the limited warranty given in Section 2 above are fair and reasonable and acknowledge that such allocation was expressly negotiated by the parties and was reflected in the Purchase Price of the Product. Accordingly the Reseller and the Original Owner expressly agree as follows:

A. **Disclaimer of Implied Warranties. EXCEPT AS IS OTHERWISE EXPRESSLY SET FORTH HEREIN, CHIEF MAKES NO OTHER REPRESENTATIONS OR WARRANTIES OF ANY KIND WHATSOEVER, WHETHER EXPRESS OR IMPLIED, BY OPERATION OF LAW, COURSE OF DEALING OR OTHERWISE WITH RESPECT TO THE PRODUCT, ANY COMPONENT PART THEREOF OR ANY OTHER GOODS OR SERVICES THAT CHIEF MANUFACTURES, FABRICATES, PRODUCES, SELLS OR PROVIDES TO THE DEALER OR THE ORIGINAL OWNER PURSUANT TO THE TERMS OF ANY ACCEPTED PURCHASE ORDER, INCLUDING WITHOUT LIMITATION ANY REPRESENTATION OR WARRANTY WITH RESPECT TO DESIGN, CONDITION, MERCHANTABILITY OR FITNESS OF THE PRODUCT OR ANY OTHER GOODS OR SERVICES FOR ANY PARTICULAR PURPOSE OR USE.**

B. Limitation on Liability. **EXCEPT AS IS OTHERWISE EXPRESSLY SET FORTH IN SECTION 6 ABOVE, CHIEF'S LIABILITY TO THE DEALER AND/OR THE ORIGINAL OWNER WITH RESPECT TO ANY DEFECTS IN ANY PRODUCTS OR FOR ANY OTHER GOODS OR SERVICES WHICH DO NOT CONFORM TO THE WARRANTIES SET FORTH ABOVE SHALL NOT, IN ANY EVENT, EXCEED THE ACTUAL COST OF SUCH NON-CONFORMING PRODUCT, GOODS OR SERVICES AS DETERMINED PURSUANT TO THE ACCEPTED PURCHASE ORDER; AND**

C. Limitation on the Nature of Damages. **EXCEPT AS EXPRESSLY PROVIDED IN SECTION 6 ABOVE, CHIEF SHALL NOT, UNDER ANY CIRCUMSTANCES, BE LIABLE TO THE DEALER, THE ORIGINAL OWNER OR ANY THIRD PARTY FOR ATTORNEY FEES COURT COSTS OR ANY OTHER SPECIAL, INDIRECT, INCIDENTAL, CONSEQUENTIAL, LIQUIDATED OR PUNITIVE DAMAGES OF ANY NAME, NATURE OR DESCRIPTION AS A RESULT OF THE FAILURE OF ANY PRODUCT OR ANY OTHER GOODS OR SERVICES PURCHASED BY THE DEALER OR THE ORIGINAL OWNER FROM CHIEF PURSUANT**

TO THE ACCEPTED PURCHASE ORDER TO CONFORM TO THE LIMITED WARRANTIES SET FORTH IN SECTION 2 ABOVE.

8. **Applicable Law**. This Limited Product Warranty has been issued, accepted and entered into by the Reseller, the Original Owner and Chief in the State of Nebraska and shall be governed by, and construed in accordance with, the internal laws of the State of Nebraska. Any legal action or proceeding with respect to any goods or services furnished to the Original Owner by Chief in connection herewith, or any document related hereto shall be brought only in the district courts of Nebraska, or the United States District Court for the District of Nebraska, and, by execution and delivery of this Limited Product Warranty, the undersigned Original Owner hereby accept for themselves and with respect to their property, generally and unconditionally, the jurisdiction of the aforesaid courts. Further, the undersigned Original Owner hereby irrevocably waives any objection, including, without limitation, any *forum non conveniens*, which it may now or hereafter have to the bringing of such action or proceeding in such respective jurisdictions.

ACKNOWLEDGMENT OF RECEIPT

By its signature hereto, the undersigned Reseller represents and warrants to Chief that the Reseller has provided a true, correct and complete copy of this Standard Limited Warranty to the Original Owner at the time the product was purchased.

Reseller Name and Address: _____
_____
_____

Original Owner Name and Address: _____
_____
_____

Accepted Purchase Order No. _____

Original Jobsite Address: _____
_____
_____

RESELLER:

By: _____
Date

Print name and title

4821-6088-7329, v. 1

NATURAL GAS
CH1015T-NGE/NGEM
CH2025T-NGE/NGEM

LIQUID PROPANE
CH1015T-LPGE / LPGEM
CH2025T-LPGE / LPGEM

VAPOR PROPANE
CH1015T-VPGE
CH2025T-VPGE

Should you have any questions concerning assembly instructions, parts or drawings, please feel free to contact us at any of the following.

4400 East 39th Street • PO Box 848
Kearney, NE 68847
Phone 800.359.7600

For more information about Chief Industries, Inc. and additional products or services visit our website
www.agri.chiefind.com