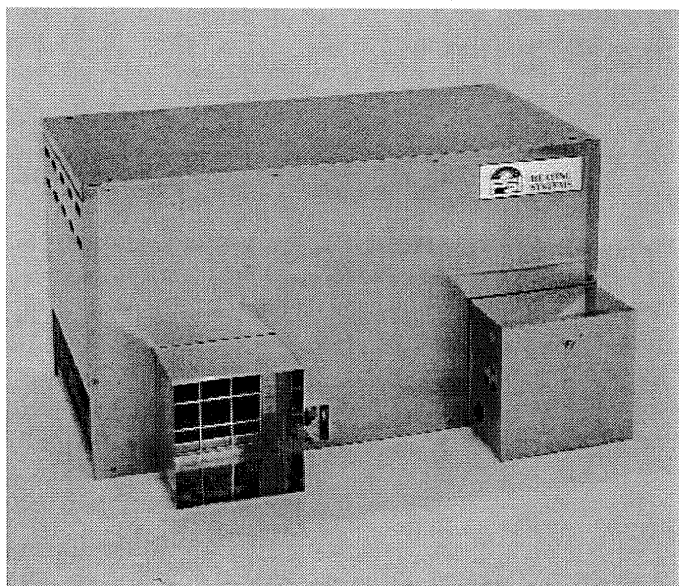




Owner's Manual and Instructions

Agricultural Animal Confinement Building Heaters



SERIES	IGNITION TYPE	OUTPUT (BTUH)
1450	Pilot	40,000
		60,000
		150,000
		225,000

Available in either L.P. Vapor Withdrawal or Natural Gas Configurations.



Congratulations!

You have purchased the finest agricultural building heater available.

Your new PSI heater incorporates the benefits from the most experienced manufacturer of heating products using state-of-the-art technology.

We, at PSI, **thank you** for your confidence in our products and welcome any suggestions or comments you may have.....call us, at 800-562-2966.



W6636 East Avenue North, Onalaska, WI USA ■ (608) 781-8500 ■ (800) 562-2966 ■ Fax: (608) 783-6115 ■ Mail@PSIHeaters.com

F150-80764-C

ATTENTION ALL USERS

Agricultural Confinement Building Heaters

Agricultural confinement building heaters are intended only for installation in farm buildings used for the confinement of poultry and livestock and which are not used as human workplaces for periods in excess of 4 hours per day. This type of heater is not intended for use in other types of buildings including those used for human dwelling, grain storage or grain handling or where gasoline or other liquids having flammable vapors are stored or used.

This heater has been tested and evaluated by ITS/Warnock Hersey in accordance with:

- ANSI/IAS U.S. LC 2 -1996, ANSI/IAS LC 2A-1998 Direct Gas Fired Circulating Heaters for Agricultural Animal Confinement Buildings.
- WP-GPN-003 and is listed and approved for Canadian installations as an agricultural confinement building heater.
- CAN 1-2.20 and is listed and approved for Canadian installations as a gas-fired brooder.
- CAN 1-2.21 Gas Fired Appliances for Outdoor Installation.
- CAN/CGA 2.17 Gas Fired Appliances for use at high altitudes.
- NEC 547 National Electric Code-Agricultural Buildings manual.

Agricultural Building Heaters

Agricultural building heaters are intended only for installation in farm buildings excluding those used for human dwelling, grain storage or grain handling, or where gasoline or other liquids having flammable vapors are stored or used.

This heater has been tested and evaluated by ITS/Warnock Hersey in accordance with GPN-003 and is listed and approved for Canadian installations as an agricultural building heater.

Refer to the ventilation requirements for agricultural building heaters in this manual

If you are considering using this product for any application other than its intended use, then please contact your fuel gas supplier or PSI at 800-562-2966.



GENERAL HAZARD WARNING

- Failure to comply with the precautions and instructions provided with this heater, can result in:
 - Death
 - Serious bodily injury or burns
 - Property damage or loss from fire or explosion
 - Asphyxiation due to lack of adequate air supply or carbon monoxide poisoning
 - Electrical shock
- Read this Owner's Manual before installing or using this heater.
- Only properly-trained service people should repair or install this heater.
- Save this Owner's Manual for future use and reference.
- Owner's Manuals and replacement labels are available at no charge. For assistance, contact PSI at 800-562-2966.



WARNING

- Proper gas supply pressure must be provided to the inlet of the heater.
- Refer to the heater's dataplate for proper gas supply pressure.
- Gas pressure in excess of the maximum inlet pressure specified at the heater inlet can cause fires or explosions.
- Fires or explosions can lead to serious injury, death, building damage or loss of livestock.
- Gas pressure below the minimum inlet pressure specified at the heater inlet may cause improper combustion.
- Improper combustion can lead to asphyxiation or carbon monoxide poisoning and therefore serious injury or death to humans and livestock.



WARNING

Fire and Explosion Hazard

- Not for home or recreational vehicle use.
- Installation of this heater in a home or recreational vehicle may result in a fire or explosion.
- Fire or explosions can cause property damage or loss of life.

CONSIGNES DE SECURITE

Il est interdit d'utiliser des liquides inflammables ou dégageant des vapeurs inflammables, à proximité de tout appareil fonctionnant au gaz.



WARNING

Fire and Explosion Hazard

- Keep solid combustibles a safe distance away from the heater.
- Solid combustibles include wood or paper products, feathers, straw, and dust.
- Do not use the heater in spaces which contain or may contain volatile or airborne combustibles.
- Volatile or airborne combustibles include gasoline, solvents, paint thinner, dust particles or unknown chemicals.
- Failure to follow these instructions may result in a fire or explosion.
- Fire or explosions can lead to property damage, personal injury or loss of life.

CONSIGNES DE SECURITE

Si vous sentez une odeur de gaz:

- Ouvrez les fenêtres.
- Ne touchez pas aux interrupteurs électriques.
- Éteignez toute flamme nue.
- Contactez immédiatement votre compagnie de gaz.

FOR YOUR SAFETY

Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

FOR YOUR SAFETY

If you smell gas:

- Open windows.
- Don't touch electrical switches.
- Extinguish any open flame.
- Immediately call your gas supplier.



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General Information

This Owner's Manual includes all options and accessories commonly used on this heater. However, depending on the configuration purchased, some options and accessories may not be included.

When calling for technical service assistance, or for other specific information, always have model number and serial number available. This information is contained on the dataplate. The dataplate is located on the exterior of the case assembly on the blower outlet side of the heater.

This manual will instruct you in the operation and care of your unit. Have your qualified installer review this manual with you so that you fully understand the heater and how it functions.

The gas supply line installation, installation of the heater, and repair and servicing of the heater requires continuing expert training and knowledge of gas heaters and should not be attempted by anyone who is not so qualified. See page 6 for definition of the necessary qualifications.

Contact your local PSI distributor or PSI for assistance, or if you have any questions about the use of the equipment or its application.

PSI has a policy of continuous product improvement. It reserves the right to change specifications and design without notice.

Heater Specifications

		Models							
SPECIFICATIONS		40		60		150		225	
		L.P. Gas	Natural Gas	L.P. Gas	Natural Gas	L.P. Gas	Natural Gas	L.P. Gas	Natural Gas
Maximum Input per Hour (BTUH)		40,000		60,000		150,000		225,000	
Minimum Input per Hour (BTUH)		22,000		32,000	30,000	90,000	96,000	150,000	
Ventilation Air Required to Support Combustion (CFM)		200		250		625		900	
Fuel Consumption Per Hour	MAX.	1.85 lbs.	40 cu. ft.	2.77 lbs.	60 cu. ft.	6.94 lbs.	150 cu. ft.	10.42 lbs.	225 cu. ft.
	MIN.	.92 lbs.	22 cu. ft.	1.48 lbs.	30 cu. ft.	4.16 lbs.	96 cu. ft.	6.94 lbs.	150 cu. ft.
Inlet Gas Supply Pressure Acceptable at the Inlet of the Heater for Purpose of Input Adjustment (in.W.C.)		MAX.		13.5 in. W.C.					
		MIN.		LP. Gas - 11.0 Natural Gas - 7.0					
Burner Manifold Pressure		LP. Gas - 11.0 Natural Gas - 7.0							
		Ball Bearing							
Motor Characteristics		1/10 H.P. 1550 RPM				1/4 H.P. 1100 RPM		1/3 H.P. 1100 RPM	
Electrical Supply (Volts/Hz/Phase)		115/60/1							
Amp Draw	STARTING	2.2				6.0		10.0	
	CONTINUOUS OPERATION	1.0				2.2		3.7	
Dimensions L x W x H (inches)		29 x 12 ½ x 11 ¼				38 ½ x 18 ½ x 16 ½		36 ½ x 20 x 18 ¼	
Minimum Safe Distances From Nearest Combustible Materials	TOP	1 ft. (.3 m)							
	SIDES	1 ft. (.3 m)							
	BACK	1 ft. (.3 m)							
	BLOWER OUTLET	10 ft. (3 m)							
	GAS SUPPLY	L.P. Gas Supply – 6 ft. (1.83 m) Natural Gas Supply – N/A							
Net Weight (lbs.)		48				95		105	
Shipping Weight (lbs.)		56				105		120	

Safety Precautions



WARNING

Asphyxiation Hazard

- Do not use this heater for heating human living quarters.
- Do not use in unventilated areas.
- The flow of combustion and ventilation air must not be obstructed.
- Proper ventilation air must be provided to support the combustion air requirements of the heater being used.
- Refer to the specification section of the heater's Owner's Manual, heater dataplate, or contact PSI to determine combustion air ventilation requirements of the heater.
- Lack of proper ventilation air will lead to improper combustion.
- Improper combustion can lead to carbon monoxide poisoning in humans leading to serious injury or death. Symptoms of carbon monoxide poisoning can include headaches, dizziness and difficulty in breathing.
- Symptoms of improper combustion affecting livestock can be disease, lower feed conversion, or death.

FUEL GAS ODOR

LP gas and natural gas have man-made odorants added specifically for detection of fuel gas leaks.

If a gas leak occurs, you should be able to smell the fuel gas.

THAT'S YOUR SIGNAL TO GO INTO IMMEDIATE ACTION!

- Do not take any action that could ignite the fuel gas. Do not operate any electrical switches. Do not pull any power supply or extension cords. Do not light matches or any other source of flame. Do not use your telephone.
- Get everyone out of the building and away from the area immediately.
- Close all propane (LP) gas tank or cylinder fuel supply valves, or the main fuel supply valve located at the meter if you use natural gas.
- Propane (LP) gas is heavier than air and may settle in low areas. When you have reason to suspect a propane leak, keep out of all low areas.
- Natural gas is lighter than air and can collect around rafters or ceilings.
- Use your neighbor's phone and call your fuel gas supplier and your fire department. Do not re-enter the building or area.
- Stay out of the building and away from the area until declared safe by the firefighters and your fuel gas supplier.
- **FINALLY**, let the fuel gas service person and the firefighters check for escaped gas. Have them air out the building and area before you return. Properly trained service people must repair the leak, check for further leakages, and then relight the appliance for you.

ODOR FADING -- NO ODOR DETECTED

- Some people cannot smell well. Some people cannot smell the odor of the man-made chemical added to propane (LP) or natural gas. You must determine if you can smell the odorant in these fuel gases.
- Learn to recognize the odor of propane (LP) gas and natural gas. Local propane (LP) gas dealers and your local natural gas supplier (utility) will be more than happy to give you a scratch and sniff pamphlet. Use it to become familiar with the fuel gas odor.
- Smoking can decrease your ability to smell. Being around an odor for a period of time can affect your sensitivity to that particular odor. Odors present in animal confinement buildings can mask fuel gas odor.
- The odorant in propane (LP) gas and natural gas is colorless and the intensity of its odor can fade under some circumstances.
- If there is an underground leak, the movement of gas through the soil can filter the odorant.
- Propane (LP) gas odor may differ in intensity at different levels. Since propane (LP) gas is heavier than air, there may be more odor at lower levels.
- **Always be sensitive to the slightest gas odor.** If you continue to detect any gas odor, no matter how small, treat it as a serious leak. Immediately go into action as discussed previously.

ATTENTION -- CRITICAL POINTS TO REMEMBER!

- Propane (LP) gas and natural gas have a distinctive odor. Learn to recognize these odors. (Reference Fuel Gas Odor and Odor Fading sections above.)
- If you have not been properly trained in repair and service of propane (LP) gas and natural gas fueled heaters, then do not attempt to light heater, perform service or repairs, or make any adjustments to the heater on propane (LP) gas or natural gas fuel system.
- Even if you are not properly trained in the service and repair of the heater, ALWAYS be consciously aware of the odors of propane (LP) gas and natural gas.
- A periodic sniff test around the heater or at the heater's joints; i.e. hose, connections, etc., is a good safety practice under any conditions. If you smell even a small amount of gas, CONTACT YOUR FUEL GAS SUPPLIER IMMEDIATELY. DO NOT WAIT!

Safety Precautions

1. Do not attempt to install, repair, or service this heater or the gas supply line unless you have continuing expert training and knowledge of gas heaters.

Qualifications for service and installation of this equipment are as follows:

- a. To be a qualified gas heater service person, you must have sufficient training and experience to handle all aspects of gas-fired heater installation, service and repair. This includes the task of installation, troubleshooting, replacement of defective parts and testing of the heater. You must be able to place the heater into a continuing safe and normal operating condition. You must completely familiarize yourself with each model heater by reading and complying with the safety instructions, labels, Owner's Manual, etc., that is provided with each heater.
 - b. To be a qualified gas installation person, you must have sufficient training and experience to handle all aspects of installing, repairing and altering gas lines, including selecting and installing the proper equipment, and selecting proper pipe and tank size to be used. This must be done in accordance with all local, state and national codes as well as the manufacturer's requirements.
2. All installations and applications of PSI heaters must meet all relevant local, state and national codes. Included are L.P. gas, natural gas, electrical, and safety codes. Your local fuel gas supplier, a local licensed electrician, the local fire department or similar government agencies, or your insurance agent can help you determine code requirements.
 - a. For U.S.A. installations and applications:
 - ANSI/NFPA 58, latest edition, Standard for Storage and Handling of Liquefied Petroleum Gas and/or
 - ANSI Z223.1/NFPA 54, National Fuel Gas Code
 - ANSI/NFPA 70, National Electrical Code.
 - b. For Canadian Installations and Applications:
 - CAN1-B149.1 or CAN1-B149.2 Installation Codes
 - CSA C22.1 Part 1 Standard Canadian Electrical Code. CSA C22.2 No. 3, Electrical Features of Fuel-Burning Equipment.
 3. Do not move, handle, or service heater while in operation or connected to a power or fuel supply.
 4. This heater may be installed in areas subject to washdown. This heater may only be washed on the external case assembly—see Cleaning Instructions. Do not wash the interior of the heater. Use only compressed air, soft brush or dry cloth to clean the interior of the heater and its components. After external washdown, do not operate this heater until it is completely dry. In any event, do not operate the heater for at least one hour after external washdown.
 5. For safety, this heater is equipped with manual reset high-limit switches and an air flow switch. Never operate this heater with any safety device that has been bypassed. Do not operate this heater unless all of these features are fully functioning.
 6. Do not operate the heater with its door open or panel removed.
 7. Do not locate fuel gas containers or fuel supply hoses within 20 ft. of the blower outlet of the heater.
 8. Do not block air intakes or discharge outlets of the heater. Doing so may cause improper combustion or damage to heater components leading to property damage or animal loss.
 9. The hose assembly (if provided) shall be visually inspected on an annual basis. If it is evident there is excessive abrasion or wear, or if the hose is cut, it must be replaced prior to the heater being put into operation. The hose assembly shall be protected from animals, building materials, and contact with hot surfaces during use. The hose assembly shall be that specified by the manufacturer. See parts list.
 10. Check for gas leaks and proper function upon heater installation, before building repopulation or when relocating.
 11. This heater should be inspected for proper operation by a qualified service person before building repopulation and at least annually.
 12. Always turn off the gas supply to the heater if the heater is not going to be used in the heating of livestock.
 13. This heater is equipped with a three-prong (grounding) plug for your protection against shock hazard and must be plugged directly into a properly grounded three-prong receptacle. Failure to use a properly grounded receptacle can result in electrical shock, personal injury, or death.
 14. In a hanging type installation, rigid pipe or copper tubing coupled directly to the heater may cause gas leaks during movement, and therefore must not be used. Use only gas hose assemblies that are rated and approved for LP-gas and natural gas in a hanging type of installation.
 15. Installations not using the gas hose supplied with this appliance must connect dimensionally using American National Standard Wrought Steel and Wrought Iron Pipe B36/10-1970. (Aluminum piping or tubing shall not be used.) Copper tubing when used for conveying natural gas, shall be internally tinned or equivalently treated to resist sulphur.

Installation Instructions

GENERAL



WARNING

Fire or Explosion Hazard.

Can cause property damage, severe injury or death.

- Disconnect power supply before wiring to prevent electrical shock or equipment damage.
- To avoid dangerous accumulation of fuel gas, turn off gas supply at the appliance service valve before starting installation, and perform gas leak test after completion of installation.
- Do not force the gas control knob. Use only your hand to turn the gas control knob. Never use any tools. If the knob will not operate by hand, the control should be replaced by a qualified service technician. Force or attempted repair may result in fire or explosion.

1. Read all safety precautions and follow PSI recommendations when installing this heater. If during the installation or relocating of heater, you suspect that a part is damaged or defective, call a qualified service agency for repair or replacement.
2. Make sure the heater is properly positioned before use and is hung level. Observe and obey all minimum safe distances of the heater to the nearest combustible materials. Minimum safe distances are given on the heater nameplate and on page 4 of this manual.
3. The heater must have the proper gas regulator installed for the application. A regulator must be connected to the gas supply so that gas pressure at the inlet to the gas valve is regulated within the range specified on the dataplate at all times. Contact your gas supplier, or PSI if you have any questions.
4. The heater's gas regulator (with pressure relief valve) should be installed outside of building. Any regulators inside the buildings must be properly vented to the outside. Local, state and national codes always apply to regulator installation. Natural gas regulators with vent limiting device may be mounted indoors without venting to outdoors.
5. All gas pressure regulators must be installed in strict accordance with the manufacturer's safety instructions. These instructions accompany each regulator.
6. Insure that all accessories that ship within the heater have been removed from inside of heater and installed. This pertains to air diverters, hose, regulator, etc.
7. Make certain that a sediment trap is installed at the gas valve inlet to prevent foreign materials (pipe compound, pipe chips and scale) from entering the gas valve. Debris blown into the gas valve may cause that valve to malfunction resulting in a serious gas leak that could result in a possible fire or explosion causing loss of products, building or even life. A

properly installed sediment trap will keep foreign materials from entering the gas valve and protect the safe functioning of that important safety component.

8. Any heater connected to a piping system must have an accessible, approved manual shut off valve installed within 6 ft. of the heater it serves.
9. Check all connections for gas leaks using approved gas leak detectors. Gas leak testing is performed as follows:
 - Check all pipe connections, hose connections, fittings and adapters upstream of the gas control with approved gas leak detectors.
 - In the event a gas leak is detected, check the components involved for cleanliness and proper application of pipe compound before further tightening.
 - Furthermore tighten the gas connections as necessary to stop the leak.
 - After all connections are checked and any leaks are stopped, turn on the main burner.
 - Stand clear while the main burner ignites to prevent injury caused from hidden leaks that could cause flashback.
 - With the main burner in operation, check all connections, hose connections, fittings and joints as well as the gas control valve inlet and outlet connections with approved gas leak detectors.
 - If a leak is detected, check the components involved for cleanliness in the thread areas and proper application of pipe compound before further tightening.
 - Tighten the gas connection as necessary to stop the leak.
 - If necessary, replace the parts or components involved if the leak cannot be stopped.
 - Ensure all gas leaks have been identified and repaired before proceeding.



WARNING

Fire and Explosion Hazard

- Do not use open flame (matches, torches, candles, etc.) in checking for gas leaks.
- Use only approved leak detectors.
- Failure to follow this warning can lead to fires or explosions.
- Fires or explosions can lead to property damage, personal injury or loss of life.

10. A qualified service agency must check for proper operating gas pressure upon installation of the heater.
11. Light according to instructions on the heater or within owner's manual.
12. It is extremely important to use the proper size and type of gas supply line to assure proper functioning of the heater. Contact your fuel gas supplier for proper line sizing and installation.
13. This heater can be configured for use with either L.P. vapor withdrawal or natural gas. Consult the dataplate, located on the blower outlet side of the case assembly, for the gas configuration of the specific heater. Do not use the heater in an L.P. gas liquid withdrawal system or application. If you are in doubt, contact PSI.
14. Eventually, like all electrical/mechanical devices, the thermostat can fail. Thermostat failure may result in either an underheating or overheating condition which may damage critical products and/or cause animal injury or death. Critical products and/or animals should be protected by a separate back-up control system that limits high and low temperatures and also activates appropriate alarms.
15. Take time to understand how to operate and maintain the heater by using this Owner's Manual. Make sure you know how to shut off the gas supply to the building and also to the individual heater. Contact your fuel gas supplier if you have any questions.
16. Any defects found in performing any of the service or maintenance procedures must be eliminated and defective parts replaced immediately. The heater must be retested by properly qualified service personnel before placing the heater back into use.
17. Do not exceed the input rating stamped on the dataplate of the heater. Do not exceed the burner manifold pressure stated on the dataplate. Do not use an orifice size different than specified for the specific input rating of this heater, fuel type configuration and altitude.

VENTILATION

1. Ventilation must be provided as indicated in the Heater Specification table of this manual or on the data plate of the heater.
2. Ventilation Requirements:
 - a. Canadian Installations, Agricultural Confinement Building Heater, Gas-Fired Brooder.
 - A ventilation system shall be provided in accordance with national, provincial, local codes of CAN/CGA-B149 if local code requirements do not exist.
 - CAN/CGA-B149 requires the building have ventilation of not less than 3 cfm per 1,000 BTUH input of the heater. Ventilation must be provided as indicated in the Heater Specification table of this manual or on the data plate of the heater.
 - b. Canadian Installations, Agricultural Building Heater.
 - A ventilation system shall be provided in accordance with national, provincial, local codes or CAN/CGA-B149 if local code requirements do not exist.
- Installation requires the building have ventilation of not less than 3 cfm per 1,000 BTUH input of the heater. Ventilation must be provided as indicated in the Heater Specification table of this manual or on the data plate of the heater.
- Mechanical ventilation shall be interlocked with the heater to prevent heater operation unless the ventilation air flow is proven by an air flow proving device.
- Air for combustion shall be supplied from outdoors. The size of the opening shall be in accordance with Table 5.2.2A of CAN/CGA-B149.
- The opening (or duct termination if ducted) shall be within 1 foot (300 mm) above, and within 2 feet (600 mm) horizontally from the burner level of the heater.
- An opening to the outdoors shall be located in accordance with local code requirements, or CAN/CGA-B149 if local code requirements do not exist.

AIR DIVERTER INSTALLATION INSTRUCTIONS

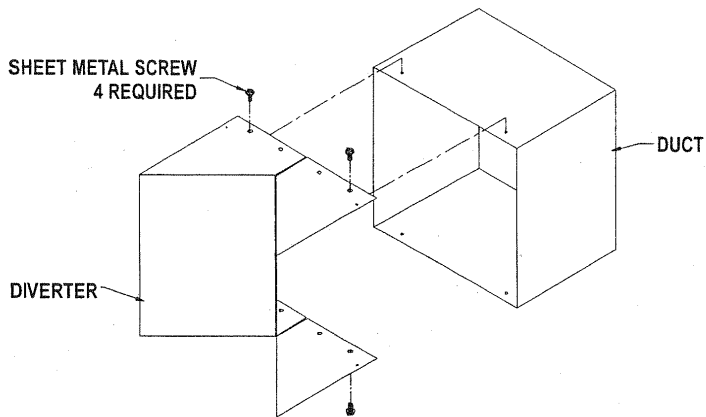
(Appearance of the outlet on heater may vary from model to model.)

1. Optional air diverters can be installed in the heater outlet to provide two 45 degree paths to the heated air as it exits the heater. Installation options include installing the diverters in such a way as to broadly distribute the air in two 45 degree paths or to focus the air flow in one 45 degree direction.
 - a. **40,000, 60,000, and 225,000 BTUH Heaters**
Mount the air diverter to the outlet duct of the heater by lining up the screw holes in the diverter with the holes in the duct. Secure in place with the screws included with the air diverter.
 - b. **150,000 BTUH Heaters**
Insert the tabs of air diverters between sheet metal case front and blower outlet. Loosen the blower outlet screws if necessary.

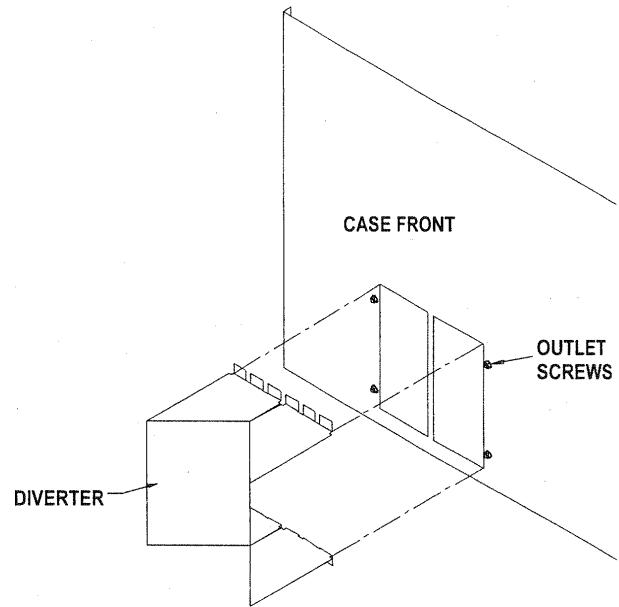
(Continued on page 9)

FIG. 1

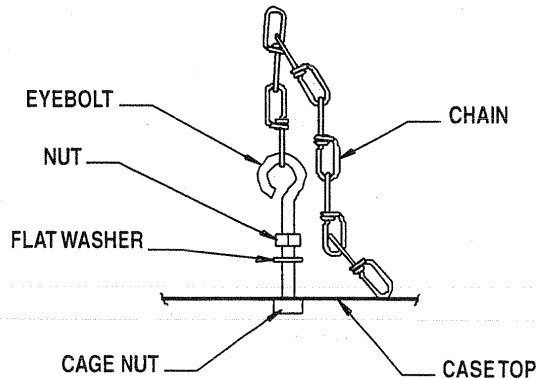
a. 40,000, 60,000, and 225,000 BTUH Heaters

**Alternate Air Diverter Installations**

b. 150,000 BTUH Heaters

**HANGING INSTRUCTIONS**

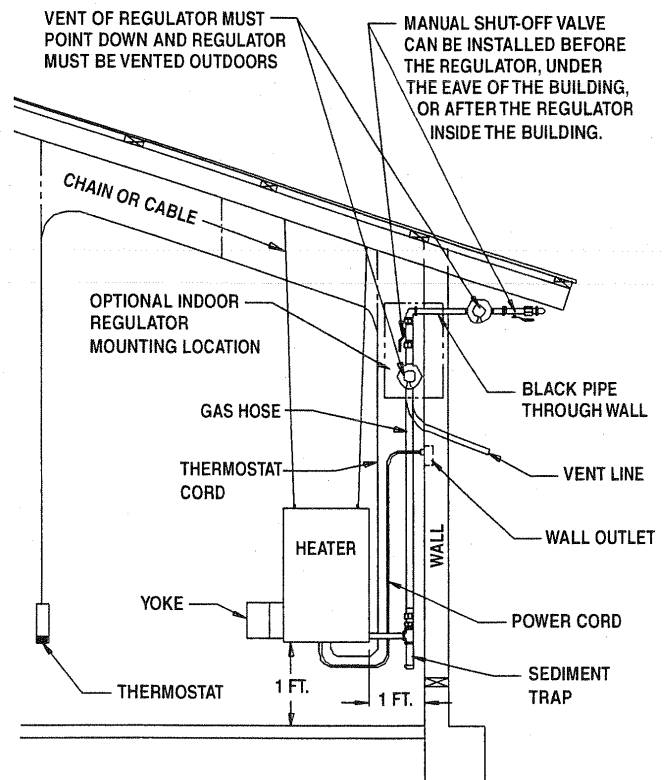
1. Assemble according to the illustration below and tighten all eyebolts securely.

FIG. 2

2. Be sure heater is securely fastened and is hanging level. (Check crosswise and lengthwise.)
4. See Fig. 3 for **typical** indoor installation. In any animal confinement building, consideration must be given to making sure the heater is located away from the livestock so that livestock cannot knock the heater, tear it loose from its mounting, or damage the heater or its gas supply line in any way. Make sure you observe and obey minimum clearance distances to combustible materials as stated in the specification section of this owner's manual and on the heater dataplate.

FIG. 3

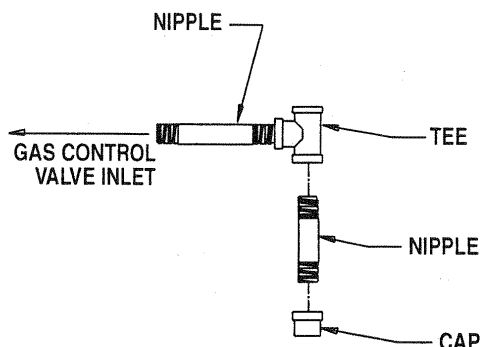
NOTE: REGULATORS SHOULD ALWAYS BE MOUNTED OUTDOORS. IF CIRCUMSTANCES FORCE INSTALLING THE REGULATOR INDOORS, THE REGULATOR'S VENT MUST BE VENTED OUTDOORS USING VENT LINE NO SMALLER THAN VENT OPENING.



SEDIMENT TRAP ASSEMBLY

Assemble the nipple and cap to the tee and nipple at the inlet of the gas control valve, and tighten securely. The sediment trap assembly must always be mounted in a vertical position. Make sure pipe thread compound that is resistant to both L.P. and natural gas is used in making all connections. **Check all connections for gas leaks using approved gas leak detectors.**

FIG. 4



THERMOSTAT INSTALLATION

WARNING Electrical Shock Hazard

- Disconnect the electrical supply before connecting the thermostat to the heater.
- Failure to follow this warning can result in electrical shock, leading to personal injury or death.

1. To Connect the Series Tap Plug Thermostat Kit:

- a. Connect the power cord of the heater to the female side of the plug on the end of the thermostat cord.

- b. Plug the male side of the series tap plug on the thermostat cord into a three-wire (grounded) electrical outlet within the building.

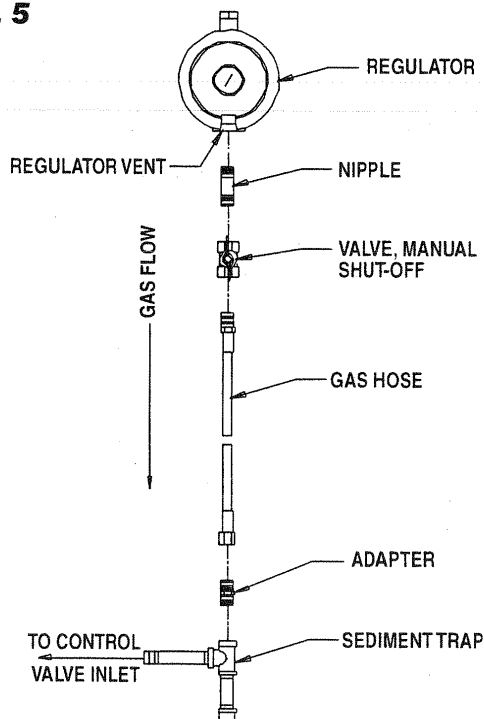
2. To Connect the Direct Wired Thermostat Kit to the Control Box on the Heater:

- a. The installation and wiring of a thermostat must be done by an electrician or someone properly qualified.
- b. The thermostat may use 18 gauge, 3 wire (with ground) cord to handle the voltage being supplied to the thermostat.
- c. The heater must be tested for proper operation after the thermostat has been connected.

MANUAL SHUT-OFF VALVE, HOSE AND REGULATOR ASSEMBLY

1. Always use approved pipe thread compound suitable for use with L.P. or natural gas on the threaded connections.
2. Assemble the components together according to the figure. This view is to show general assembly of the components only.
3. Tighten all connections securely.
4. **Check all connections for gas leaks using approved gas leak detectors.**

FIG. 5



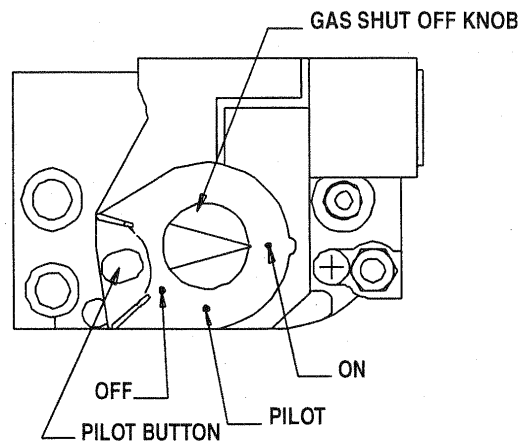
Start-Up Instructions

Follow steps 1 - 6 on initial start-up after heater installation by a qualified gas heater service person. For normal start-up, simply turn thermostat above room temperature. The heater will start.

1. Open all manual fuel supply valves and check for gas leaks using approved leak detectors.
2. Open the cover of the gas control valve enclosure.
3. The gas control valve incorporates a manual gas shut off feature. Position the indicator on the shut off knob to PILOT. Fully depress the red pilot button located on the control valve while applying flame to the pilot light. Keep the button depressed for about 30 seconds to allow the thermocouple to warm up so the pilot stays lit after you release the pilot button.
4. Once the pilot stays lit, position the knob to ON. Close and latch the the cover of the enclosure.

5. Connect the electrical cord to an approved electrical outlet.
6. Set the thermostat to a point above room temperature. The heater will light. Turn the thermostat to desired setting.

FIG. 6



ATTENTION

On new installations it may take a short period of time for the gas to purge out any air in the pilot line before the pilot stays lit.

Shut-Down Instructions

If the heater is to be shut down for cleaning, maintenance or repair, follow steps 1 - 5. Otherwise, simply turn thermostat to "off" or "no heat" for standard shut down.

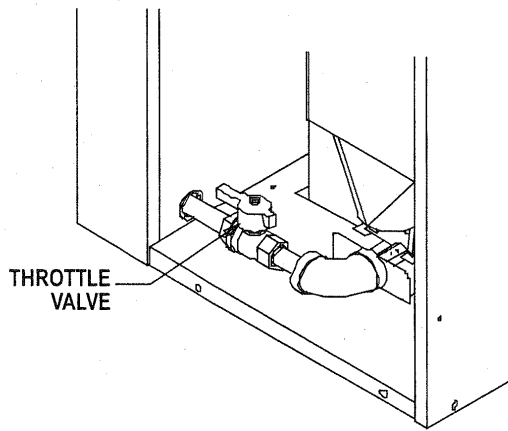
1. Close all manual fuel supply valves.
2. With the heater lit, allow heater to burn off excess fuel in gas supply hose.

3. Position the knob on the control valve to the OFF position.
4. Turn thermostat to OFF or NO HEAT position.
5. Disconnect the heater from the electrical supply.

Variable Heat Output

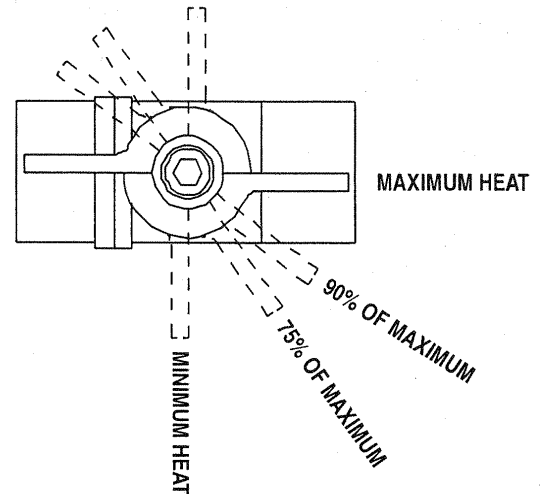
1. All models of propane (LP) gas or natural gas heaters have a throttle valve for varying heat output located between the gas control valve and gas manifold assemblies. **THIS IS NOT A MANUAL GAS SHUT OFF VALVE.**
2. The throttle valve can be adjusted to deliver either minimum heat or maximum heat. When the throttle valve handle is parallel to the gas flow, the valve is completely open to deliver maximum heat output. (Refer to Fig. 7)

FIG. 7



The throttle valve may be adjusted to minimum heat output by turning the handle 90° to gas flow or any position between maximum and minimum settings. (Refer to Fig. 8)

FIG. 8



Cleaning Instructions



WARNING Fire, Burn, and Explosion Hazard

- This heater contains electrical and mechanical components in the gas management, safety and airflow systems.
- Such components may become inoperative or fail due to dust, dirt, wear, aging, or the corrosive atmosphere of an animal confinement building.
- Periodic cleaning and inspection as well as proper maintenance are essential to avoid serious injury or property damage.

1. Before cleaning, shut off all gas supply valves and disconnect the electrical supply.
2. The heater should have dirt or dust removed periodically:
 - a. After each flock or between building re-population, give the heater a general cleaning using compressed air or a soft brush on its interior and exterior. At this time, dust off the motor case to prevent the motor from over-heating and shutting the heater down.
 - b. At least once a year, give the heater a thorough cleaning. At this time, remove the fan and motor assembly and brush or blow off the fan wheel, giving attention to the individual fan blades. Make sure the burner air inlet venturi ports and the "throat" of the casting are free of dust accumulation and the area between the heat chamber top and inside case is also free of dust.
 - c. When washing with water, observe and obey the Warning within these Cleaning Instructions. This same Warning is also supplied on the heater.



WARNING

This heater may be washed only on the external case assembly provided:

- A. The heater is disconnected from the electrical supply.
- B. All access panels are securely closed.
- C. Water spray nozzle shall not discharge within 6 ft. of the heater.
- D. The water pressure does not exceed 45 PSIG for 10 seconds on each side of heater.
- E. The heater is not reconnected to electrical supply for a minimum of 1 hour or until the heater is thoroughly dry.

Improper cleaning of the heater can cause severe personal injury or property damage due to water and/or cleaning solution:

1. In electrical components, connections and wires causing electrical shock or component failure.
2. On gas control components causing corrosion which can result in gas leaks and fire or explosion from the leak.

Clean internal components of the heater with a soft, dry brush or cloth, or compressed air.

Maintenance Instructions

1. Have your gas supplier check all gas piping annually for leaks or restrictions in gas lines. Also, at this time have your gas supplier clean out the sediment trap of any debris that may have accumulated.
2. The appliance area shall be kept clear and free from combustible materials, gasoline, and other flammable vapors and liquids.
3. Regulators can wear out and function improperly. Have your gas supplier check the date codes on all regulators installed and check delivery pressures to the appliance to make sure that the regulator is reliable.
4. Regulators must be periodically inspected to make sure the regulator vents are not blocked. Debris, insects, insect nests, snow, or ice on a regulator can block vents and cause excess pressure at the appliance.

Service Instructions

GENERAL



WARNING **Burn Hazard**

- Heater surfaces are hot for a period of time after the heater has been shut down.
- Allow the heater to cool before performing service, maintenance, or cleaning.
- Failure to follow this warning will result in burns causing injury.



WARNING **Fire and Explosion Hazard**

- Do not disassemble or attempt to repair any heater components or gas train components.
- All component parts must be replaced if defects are found.
- Failure to follow this warning will result in fire or explosions, causing property damage, injury, or death.

1. Close the fuel supply valve to the heater and disconnect the electrical supply before servicing unless necessary for your service procedure.
2. Clean the heater's orifices with compressed air or a soft, dry rag. Do not use files, drills, broaches, etc. to clean the orifice hole. Doing so will enlarge the hole, causing combustion or ignition problems. Replace the orifice if it cannot be cleaned properly.
3. The high limit switches, air proving switch, and thermostat can be tested by using a jumper to bypass the component:
 - Reconnect the electrical supply and open fuel supply valves.
 - If the heater lights, the component is defective and must be replaced.
 - Do not leave the jumper on or operate the heater if the part is defective. Replace the part immediately.
 - An alternate method for checking the components is to perform a continuity check..
4. Open the respective access panel for servicing of burner, gas control, or fan related components.
5. Disconnect the appropriate electrical leads for the component being serviced.
6. For reassembly, reverse the respective service procedure. Ensure gas connections are tightened securely.
7. After servicing, start the heater to ensure proper operation and check for gas leaks.

MOTOR AND FAN WHEEL ASSEMBLY

1. Remove the screws securing the motor mounting plate to the fan housing.
2. Pull the fan and motor assembly from the housing.
3. Loosen the square head set screw(s) on the fan wheel with a wrench.
4. Pull the fan wheel from the motor shaft. Use a wheel puller if necessary.
5. Remove the four (4) nuts securing the motor to the mounting plate.

NOTES: a. Fan wheel to motor mount plate spacing must be adjusted to proper clearance before tightening the fan wheel to the motor shaft.

- b. Ensure that set screw(s) are on the "flats" of motor shaft when tightening.

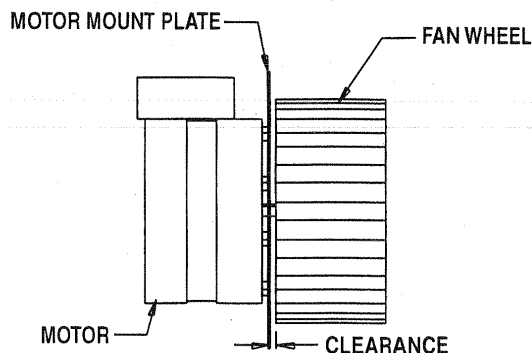
Heat Output (BTUH)

40,000/60,000/150,000
225,000

Clearance

3/8 in.
1/8 in.

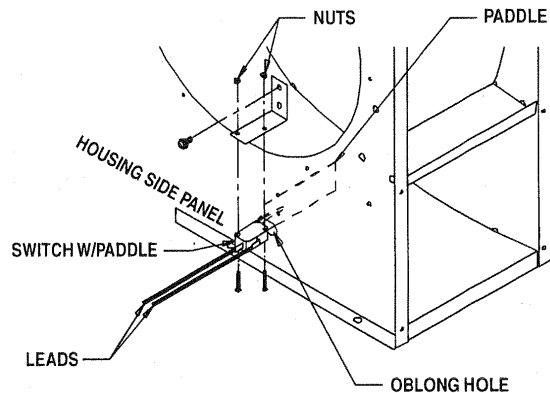
FIG. 9



AIR PROVING SWITCH WITH PADDLE

1. Remove the two (2) sheet metal screws holding the switch with bracket to blower housing.
2. Turn the switch assembly 90° so the paddle on the switch arm can be pulled through the oblong hole on side of fan housing.
3. The replacement switch will be pre-assembled to its mounting bracket.

FIG. 10



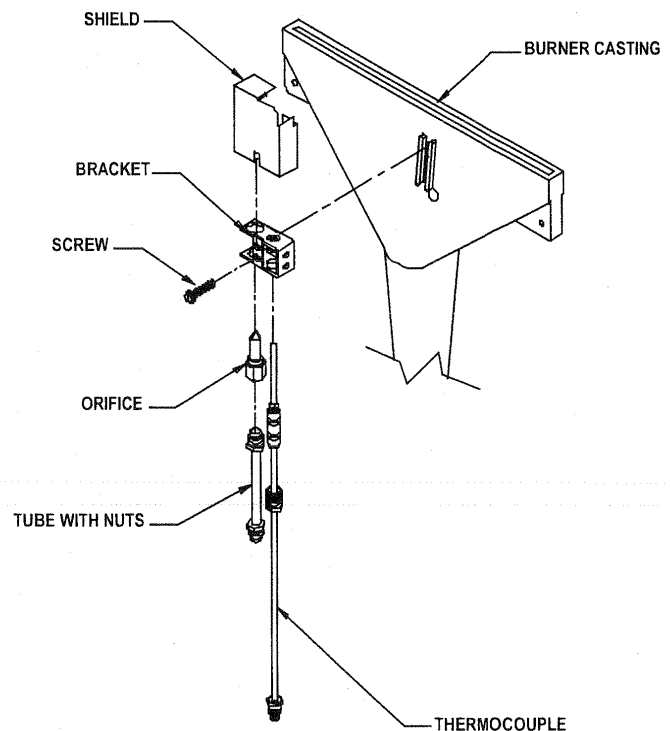
IMPORTANT

Do not bend the switch arm when installing the replacement switch. Bending the switch arm may create ignition problems later.

PILOT LIGHT ASSEMBLY

1. Remove the pilot assembly mounting screw.
2. Pull up on the pilot shield, exposing the pilot bracket, pilot orifice, and thermocouple.
3. Clean the pilot assembly.
4. Remove the pilot orifice from its bracket. Hold the orifice up to light. If plugged, blow out with air, or replace.

FIG. 11

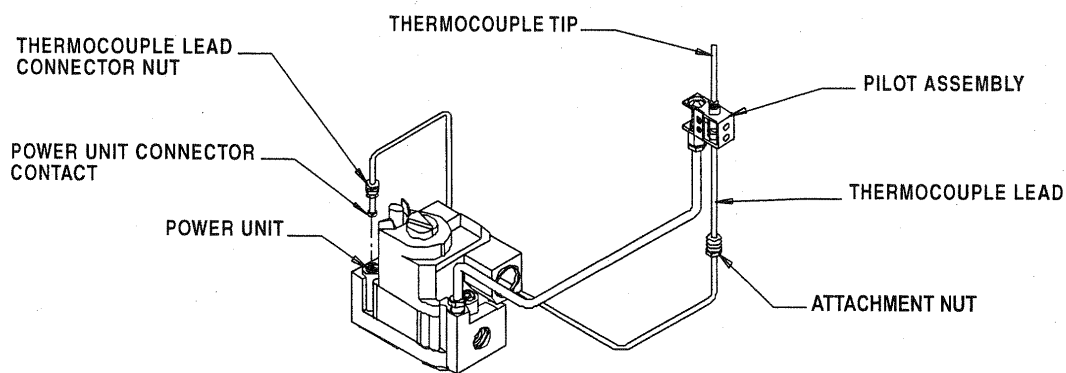


1. Remove the pilot screw and pilot shield.
2. Loosen the thermocouple attachment nut at the pilot bracket, and the thermocouple connector nut at the gas control valve. Remove thermocouple.

IMPORTANT

- The thermocouple is an important safety device which works directly with the pilot safety control valve. It should only be replaced with the PSI part number referenced in the parts listing of this owner's manual.
- When threading the thermocouple's connector nut back into the gas control valve, thread the nut in finger tight and snug it in place. DO NOT OVERTIGHTEN OR USE UNNECESSARY FORCE ON THE NUT WHEN TIGHTENING.

FIG. 12



GAS PRESSURE CHECKS



WARNING

Fire and Explosion Hazard

- Do not disassemble the gas control valve.
- Do not attempt to replace any components on the gas control valve.
- The gas control valve must be replaced if any physical damage occurs to the control valve assembly.
- Failure to follow this warning will result in fire or explosions, leading to injury or death to humans and livestock, and building damage.

ATTENTION

- The following explains a typical procedure to be followed in checking gas pressures.
- The gas pressures will vary depending upon model number and fuel type.
- Consult the dataplate on the heater or page 4 in this manual for specific pressures to be used in conjunction with this procedure.
- Gas pressure measured at the inlet to the gas valve is Inlet Pressure and gas pressure measured at the outlet of the gas valve is burner Manifold Pressure.

A. Preparation

1. Obtain two pressure gauges capable of reading up to 35 in. W.C.
2. Disconnect the heater from the electrical supply and close the fuel supply valve to the heater inlet.
3. Open the control box.
4. Brush or blow off any dust and dirt on or in the vicinity of the gas control valve.

B. Gauge Installation

1. Remove the inlet and outlet pressure tap plugs. See Fig. 13.
2. Securely connect a pressure gauge to each pressure tap port.
3. Open the fuel supply valves to the heater and reconnect the heater electrical supply.
4. Start the heater.

C. Reading Pressures

1. With the heater operating, the pressure gauges should read the pressures specified on the dataplate.
2. Do the readings at the inlet and outlet pressure gauges agree with that specified on the dataplate? If so, then no further checking or adjustment is required. Proceed to Section D.
3. If the inlet pressures do not agree with that specified on the dataplate, then the building system regulator controlling gas pressure to the heaters requires adjustment.
4. If the inlet pressures are correct and the burner manifold pressure does not agree with that specified on the dataplate, then the gas control valve's internal pressure regulator requires adjustment. See Fig. 14 for regulator location.

D. Completion

1. Once inlet and burner manifold pressures have been confirmed and/or properly set, close the fuel supply valve to the heater and allow the heater to burn off any gas remaining in the gas supply line.
2. Disconnect the heater from its electrical supply.
3. Remove the gauges.
4. Reinstall the pressure tap plugs and tighten securely.

FIG. 13

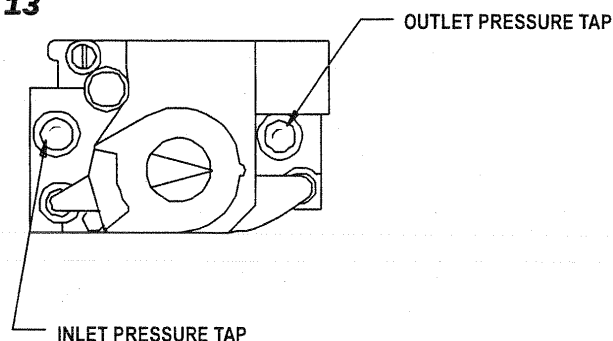
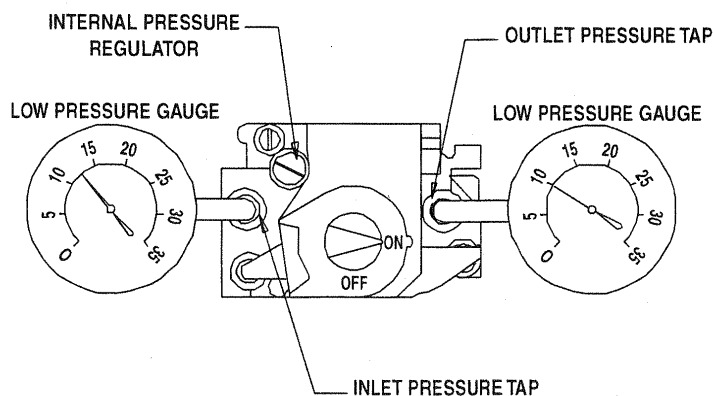


FIG. 14



TESTING THE MANUAL RESET HIGH LIMIT SWITCH



WARNING

Fire Hazard

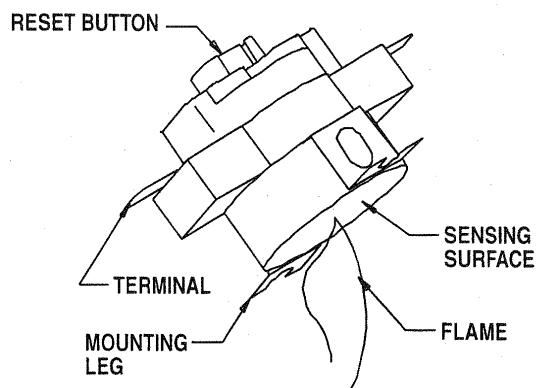
- Do not operate the appliance with the high limit switch bypassed.
- Operating the heater bypassed high limit switch may lead to overheating, possibly resulting in a fire, with subsequent damage to the heater, building damage, or loss of livestock.

This heater has two high limit switches. One is located near the heat chamber. The other is located at the fan end of the heater. The high limit switches should be tested a minimum of once per year when the heater is given a thorough cleaning.

1. The high limit switches have different temperature ratings. To eliminate confusion, remove and test only one high limit switch at a time.
2. Holding the switch by one of its mounting legs or electrical terminals, apply a small flame only to the sensing portion on the back of the switch. **Do not melt the plastic housing of the switch when conducting this test.**
3. Check for continuity across the switch terminals to verify contacts have opened.

5. Allow the switch cool down before firmly pressing the red reset button on the switch.
6. Check for continuity across the switch terminals to ensure contacts have closed.
7. Reinstall the switch.

FIG. 15

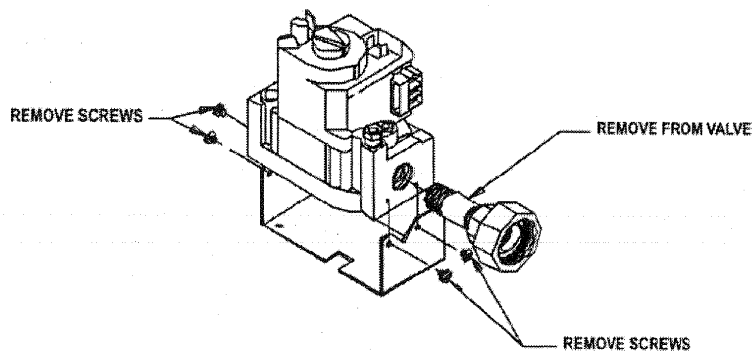
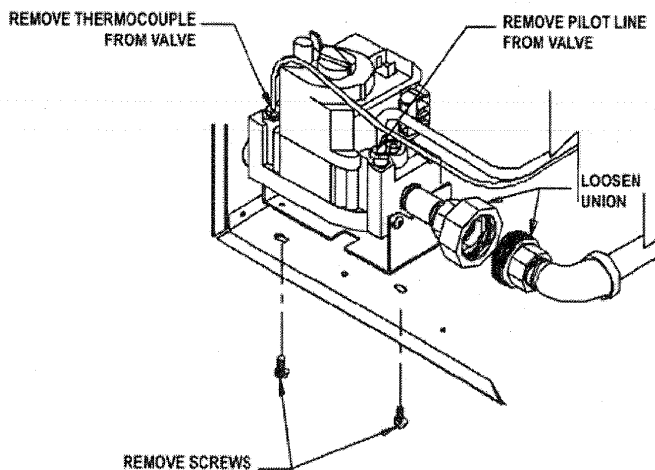


GAS CONTROL VALVE

1. Remove the hose and sediment trap from the heater.
2. Refer to Figs. 16a and 16b for disassembly.

FIG. 16b

FIG. 16a



Troubleshooting Guide

READ THIS ENTIRE SECTION BEFORE BEGINNING TO TROUBLESHOOT PROBLEMS.

The following troubleshooting guide provides systematic procedures for isolating equipment problems. This guide is intended for use by a QUALIFIED GAS HEATER SERVICE PERSON. **DO NOT ATTEMPT TO SERVICE THESE HEATERS UNLESS YOU HAVE BEEN PROPERLY TRAINED.**

TEST EQUIPMENT REQUIRED

The following pieces of test equipment will be required to troubleshoot this system with minimal time and effort.

- **Digital Multimeter** - for measuring AC and DC voltage and resistance.
- **Thermocouple Diagnostic Kit** - (PSI Part No. 08506) When used with a standard digital multimeter, this kit allows testing of the thermocouple and electromagnetic power unit strength of the pilot safety gas control valves.
- **Low Pressure Gauge** - for checking inlet and manifold pressures at the gas control valve against nameplate rating.



WARNING

Electrical Shock and Burn Hazard

- Troubleshooting this system may require operating the unit with line voltage present and gas on. Use extreme caution when working on the heater.
- Failure to follow this warning may result in property damage, personal injury or death.
- Make sure heater is properly installed and meets minimum clearances to nearest combustible materials. (Refer to dataplate on heater.)
- Check all wiring for loose connections and worn insulation.

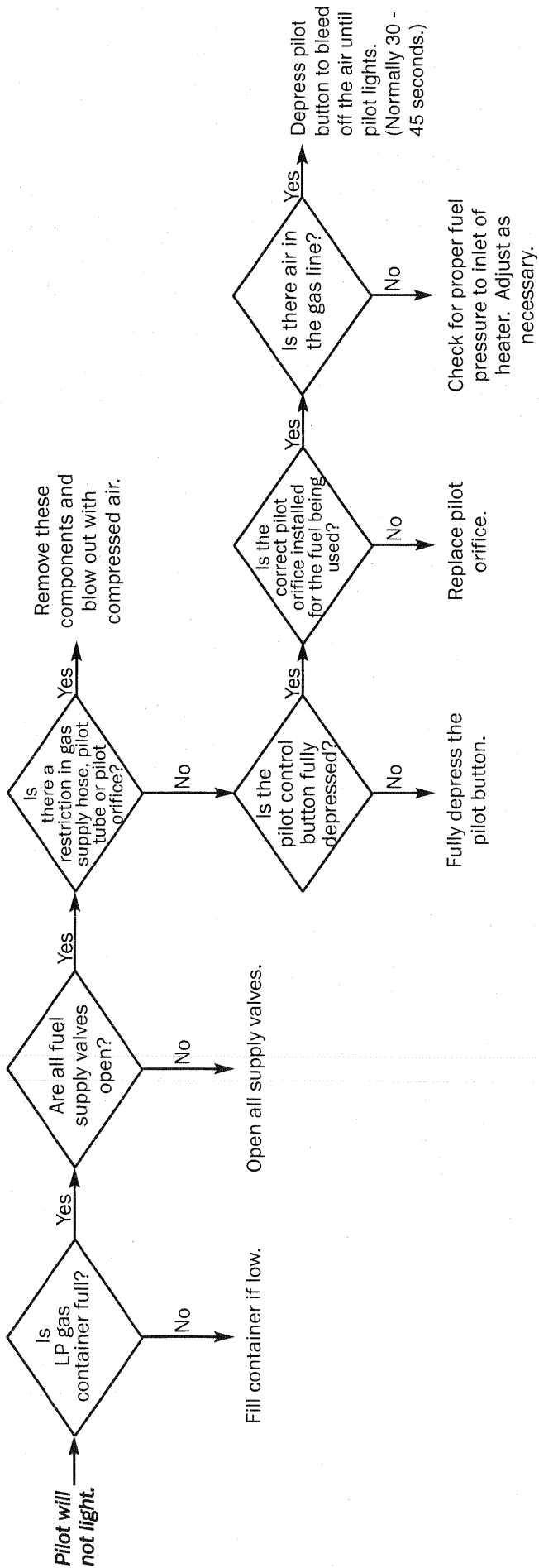
To effectively use these flow charts, you must first identify the problem. The problems are numbered sequentially, along with a brief explanation of each problem. Start at the "diamond" closest to the identified problem and proceed with each step, performing whatever tests are suggested. After each step or test, the guide will direct the service person to the next logical step based on the outcome of the previous check.

Components should be replaced only after each step has been completed and replacement is suggested in the flow chart.

The problems are listed below along with the page number on which you may find the flow chart for the specific problem.

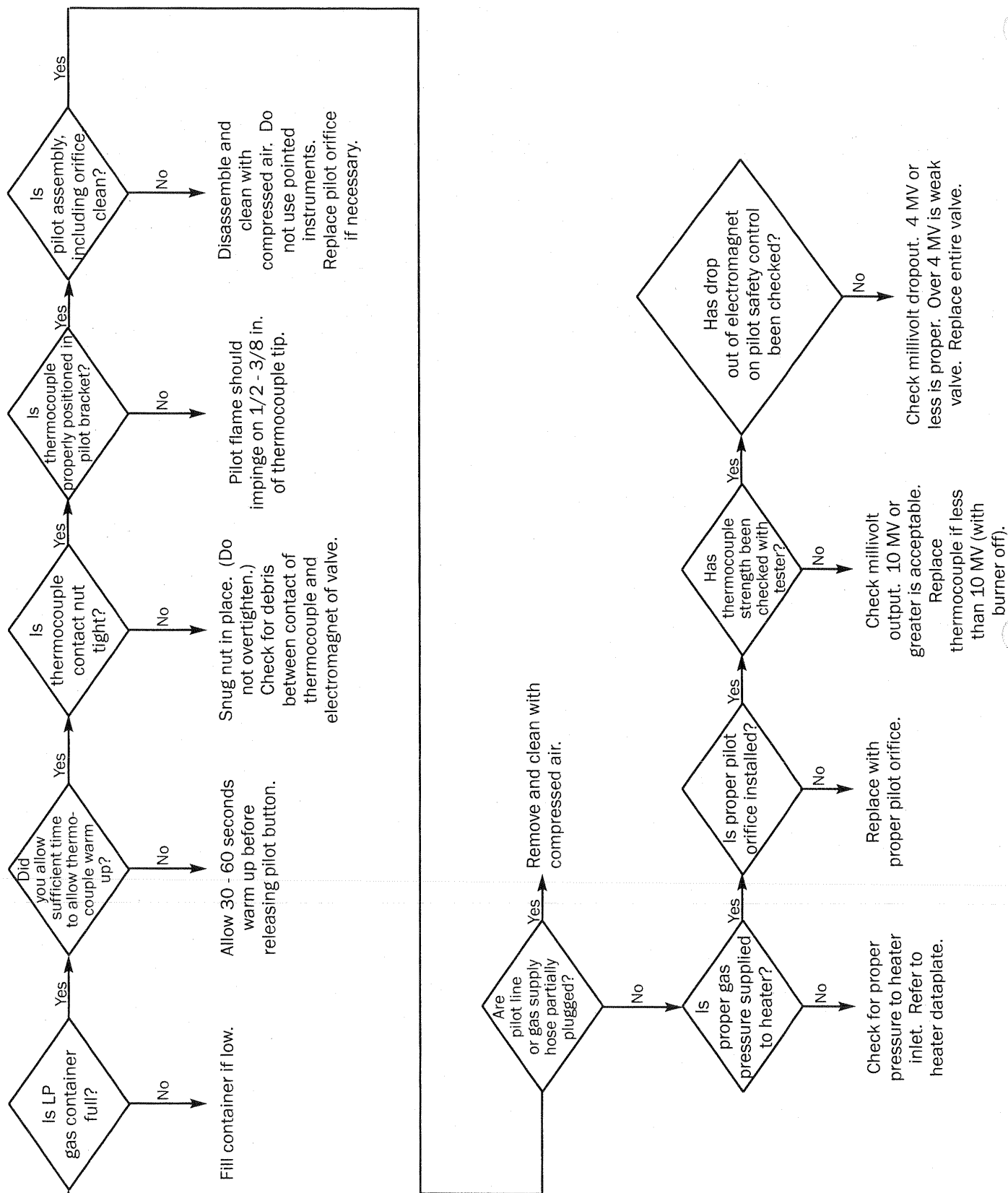
<u>Problem</u>	<u>Description</u>	<u>Page</u>
1	Pilot will not light	20
2	Pilot will not stay lit when pilot control button is released.	21
3	Motor runs. Burner does not light with pilot light lit	22
4	Motor does not run, heater does not light with pilot light lit	23
5	Main burner cycles on and off repetitively. Pilot stays lit	24
6	Pilot will not stay lit when main burner and blower are operating	24
7	High limit switch is open	25
8	Burner does not shut off	26
9	Flame "lifting" off of burner.	26
10	Burner flame drops out after 10 - 15 minutes of operation	26
11	Gas control valve "chatters"	27
12	Motor "hums"	27

Problem 1



Problem 2

Pilot will not stay lit when pilot control button is released.



Motor runs.

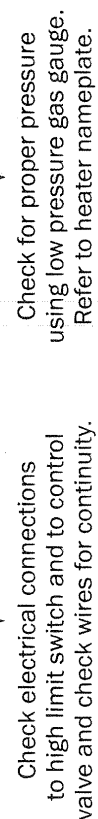
Motor runs.

Burner

does not

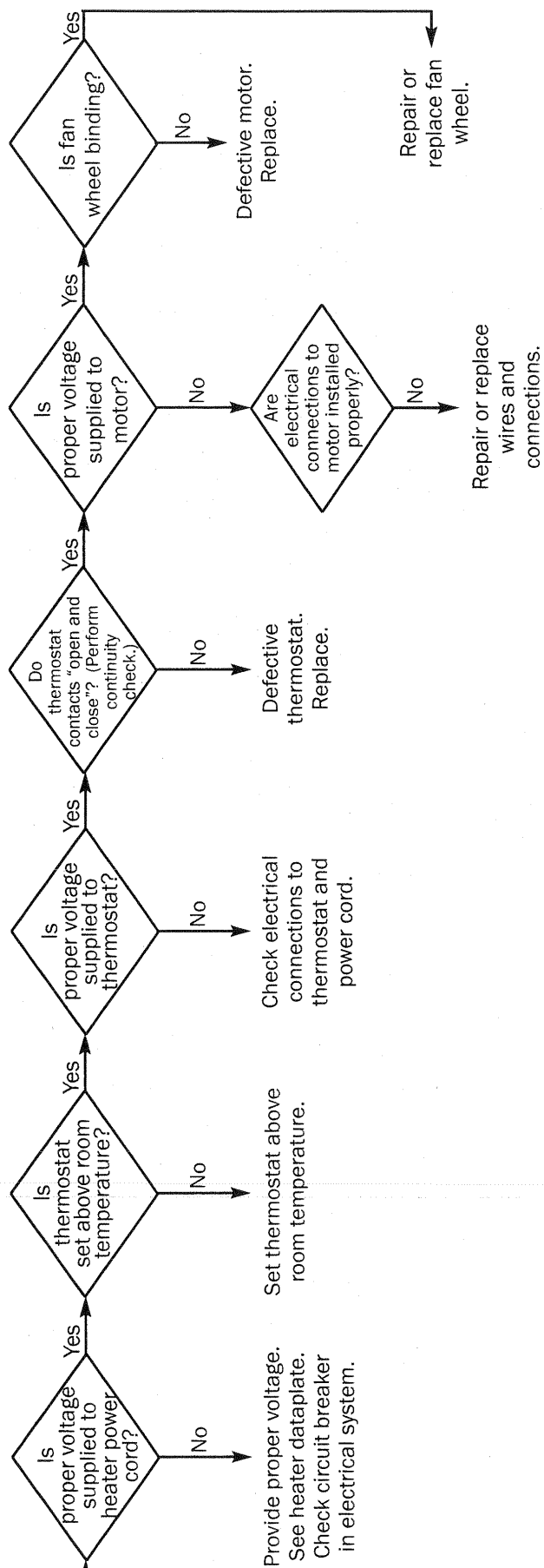
*light with
pilot light*

lit.



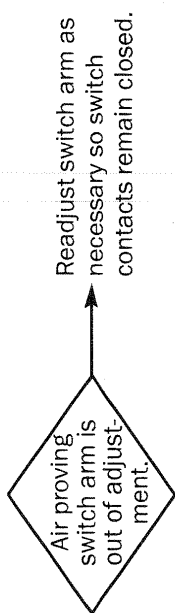
Problem 4

Motor does not run, heater does not light with pilot light lit.



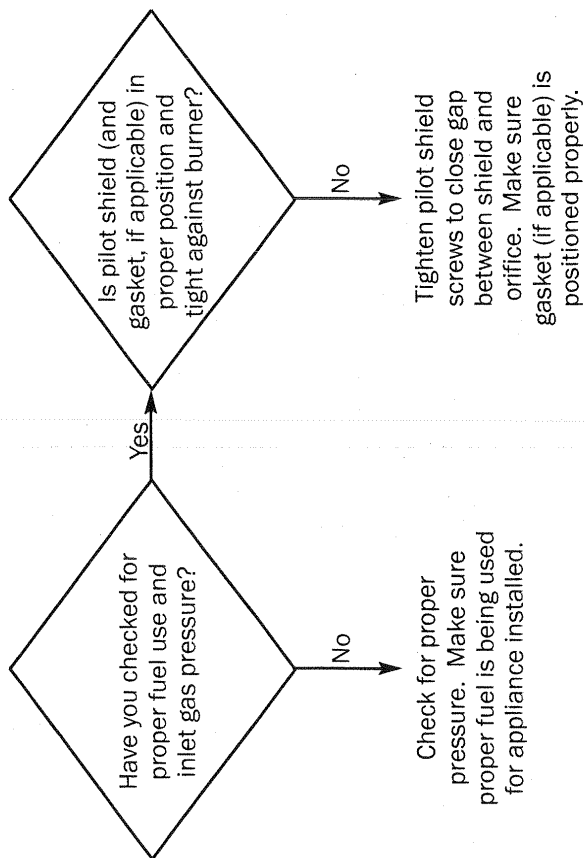
Problem 5

Main burner cycles on and off repetitively. Fan motor remains on, pilot stays lit.



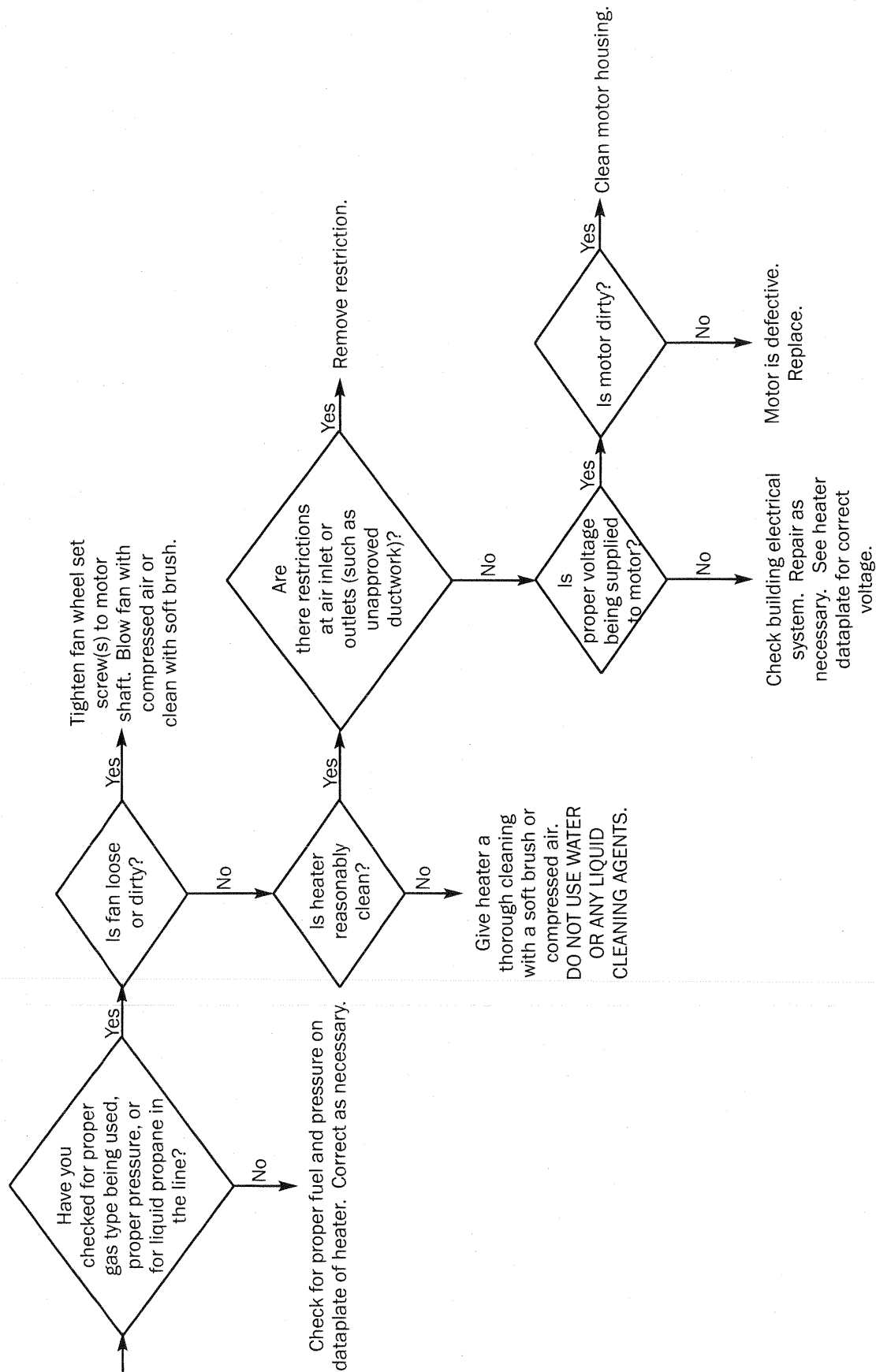
Problem 6

Pilot light will not stay lit when main burner and motor are operating.



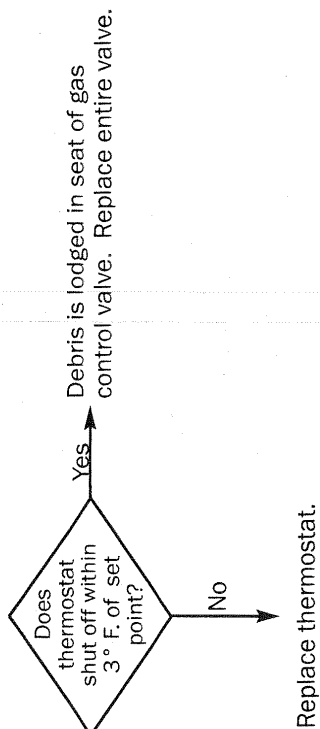
Problem 7

High limit switch is open.



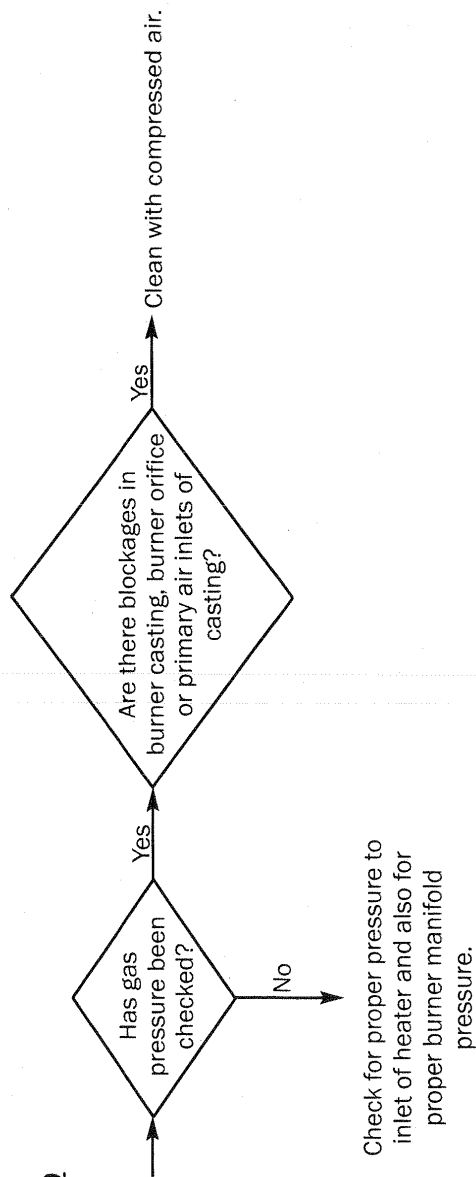
Problem 8

Burner does not shut off when temperature requirement is satisfied.



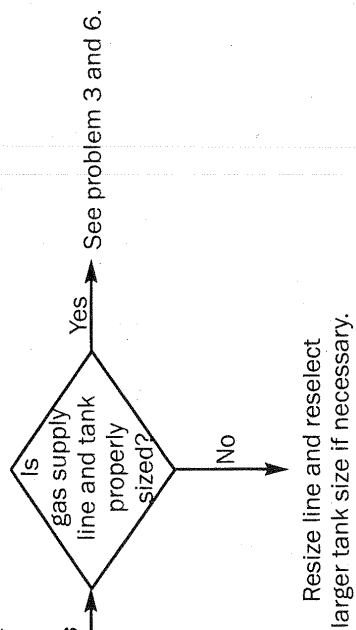
Problem 9

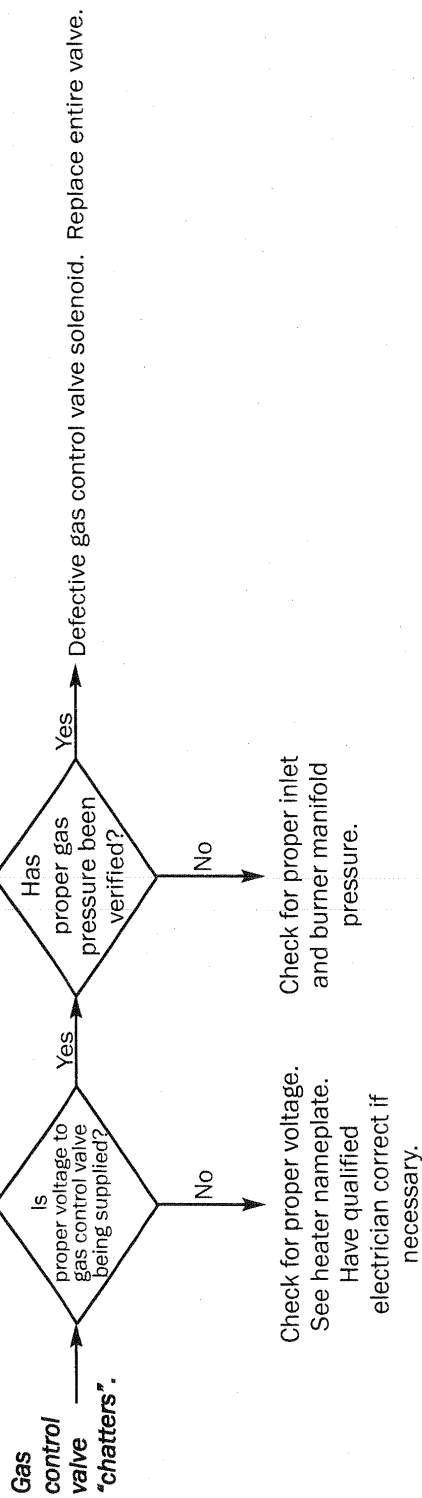
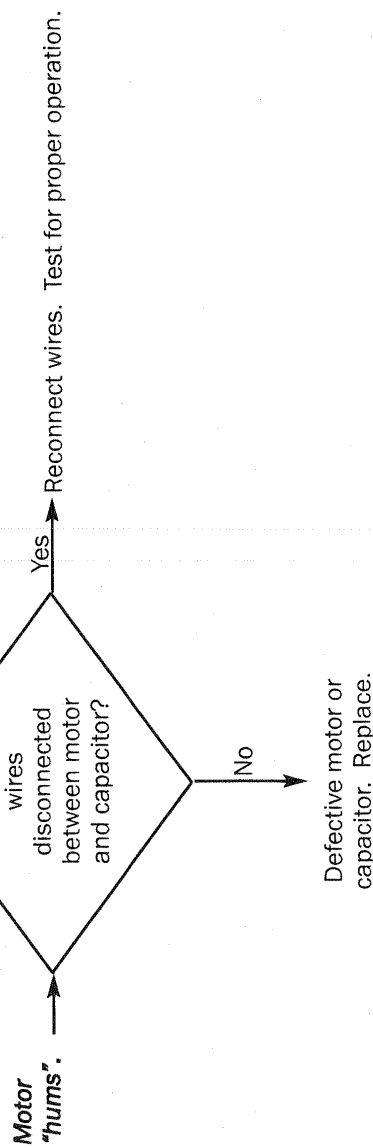
Flame "lifting" off of burner.



Problem 10

Burner flame drops out after 10 - 15 minutes of operation.



Problem 11**Problem 12**

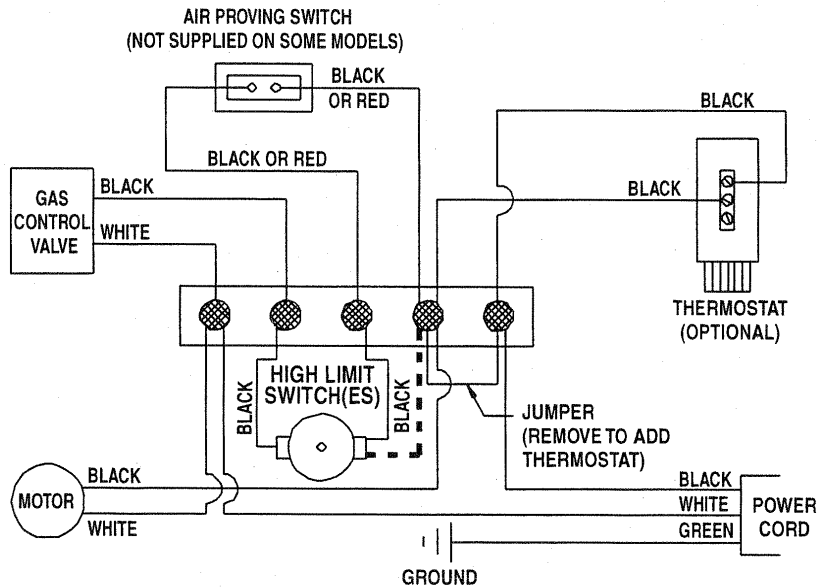
- (1) Some thermocouples use a retainer clip to secure the thermocouple into the pilot bracket. Make sure the thermocouple is pushed up completely into the hole so clip on thermocouple holds it securely within the bracket. Other thermocouples use a retainer nut to hold the thermocouple in place. Make sure the nut is securely tightened.
- (2) With any electrical problem, all wiring should be checked for good connections and proper voltage and repaired if a problem is found.
- (3) The high-limit switch will open or "trip" for a variety of reasons including high fuel pressure (see dataplate or owner's manual for proper pressures) or reduced air flow. Reduced air flow is normally due to intake air obstructions, low voltage or dirty fan wheels, etc.

Electrical Connection and Ladder Diagrams

CAUTION

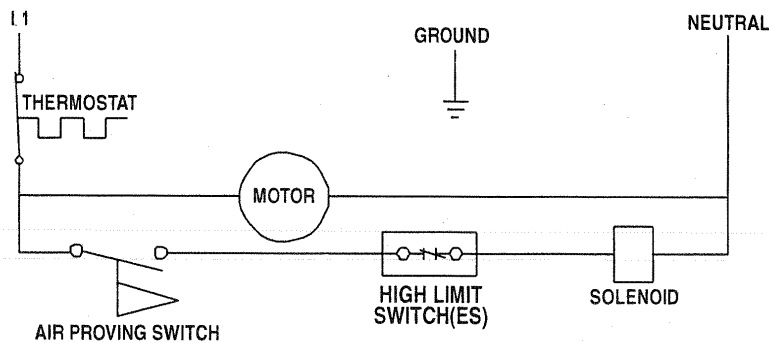
Always refer to the heater's electrical connection diagram when servicing to avoid wiring errors and heater malfunction. Check for proper operation after servicing.

WARNING: THIS HEATER MAY START AT ANY TIME



NOTE: IF AIR PROVING SWITCH IS NOT SUPPLIED, POWER IS SENT DIRECTLY TO HIGH LIMIT SWITCH. SEE "DASHED" LINE.

ELECTRICAL CONNECTION DIAGRAM



ELECTRICAL LADDER DIAGRAM

IF ANY OF THE ORIGINAL WIRE AS SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, IT MUST BE REPLACED WITH WIRING MATERIAL HAVING A TEMPERATURE RATING OF AT LEAST 302° F (150° C).

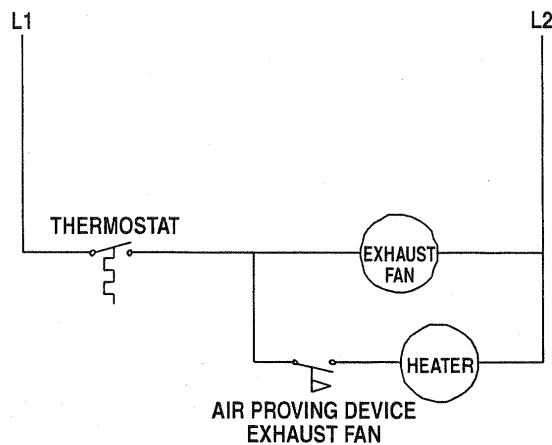
MECHANICAL VENTILATION INTERLOCK WIRING

For Canadian Installations

Agricultural Building Heaters:

Installation of the heater requires mechanical ventilation of not less than 3 CFM per 1,000 BTU input of the heater. The mechanical ventilation shall be interlocked with the heater to prevent operation of the heater unless the ventilation air flow is proven by an air flow proving device.

The exhaust fan CFM output must equal or exceed the ventilation air to support the combustion requirement stated in the Heater Specification table for the specific model being used.



Heater Component Function

Air Proving Switch

Safety device used to insure that the proper air flow is being achieved before the gas valve is opened.

Burner

Cast iron component used to channel gas and provide an area at which the fuel may ignite.

Burner Orifice

Brass metering device used to feed gas to burner at a specific rate.

Fan Housing

Chamber used for compressing air for efficient air movement.

Fan Wheel

Component used in conjunction with the motor and fan housing to pull the hot air from heater and blow it into room for heating (also known as a "squirrel cage").

Gas Hose

Flexible connector used to convey gas from supply line in building to heater.

Heat Chamber

Metal "fire box" within the appliance that provides an area where burner flame mixes with combustion air thereby providing heat.

High Limit Switch

Safety device wired into the control system which is used to break an electrical circuit to the gas control valve in event of overheat situation.

Motor

Electric device used to force preheated air through the heater and to circulate heat within a certain area. Converts electrical energy into mechanical energy.

Pilot Light Orifice

A metering device used to supply gas for the dual purpose of igniting the main burner and heating the thermocouple.

Pilot Safety Control Valve

A gas control valve which is held open by electrical power supplied by a pilot generator and which closes automatically to shut off the flow of gas to the main burner when the pilot flame is extinguished or becomes too small to light the main burner.

Pilot Shield

A formed sheet metal piece that fits around the pilot assembly to protect the the pilot flame against drafts.

Pilot Tube

Formed copper tube used to convey gas from the safety control valve to the pilot light orifice. The tube is internally "tinned" when natural gas is used to resist the effects of sulphur in the fuel.

Regulator

The heart of any gas supply installation. Used to deliver a working pressure to the appliance under varying conditions in tank pressure.

Thermocouple

A thermoelectric device that converts heat energy directly into electrical energy. Works in conjunction with the electromagnet in the gas control valve thereby providing gas supply for the pilot light.

Thermostat

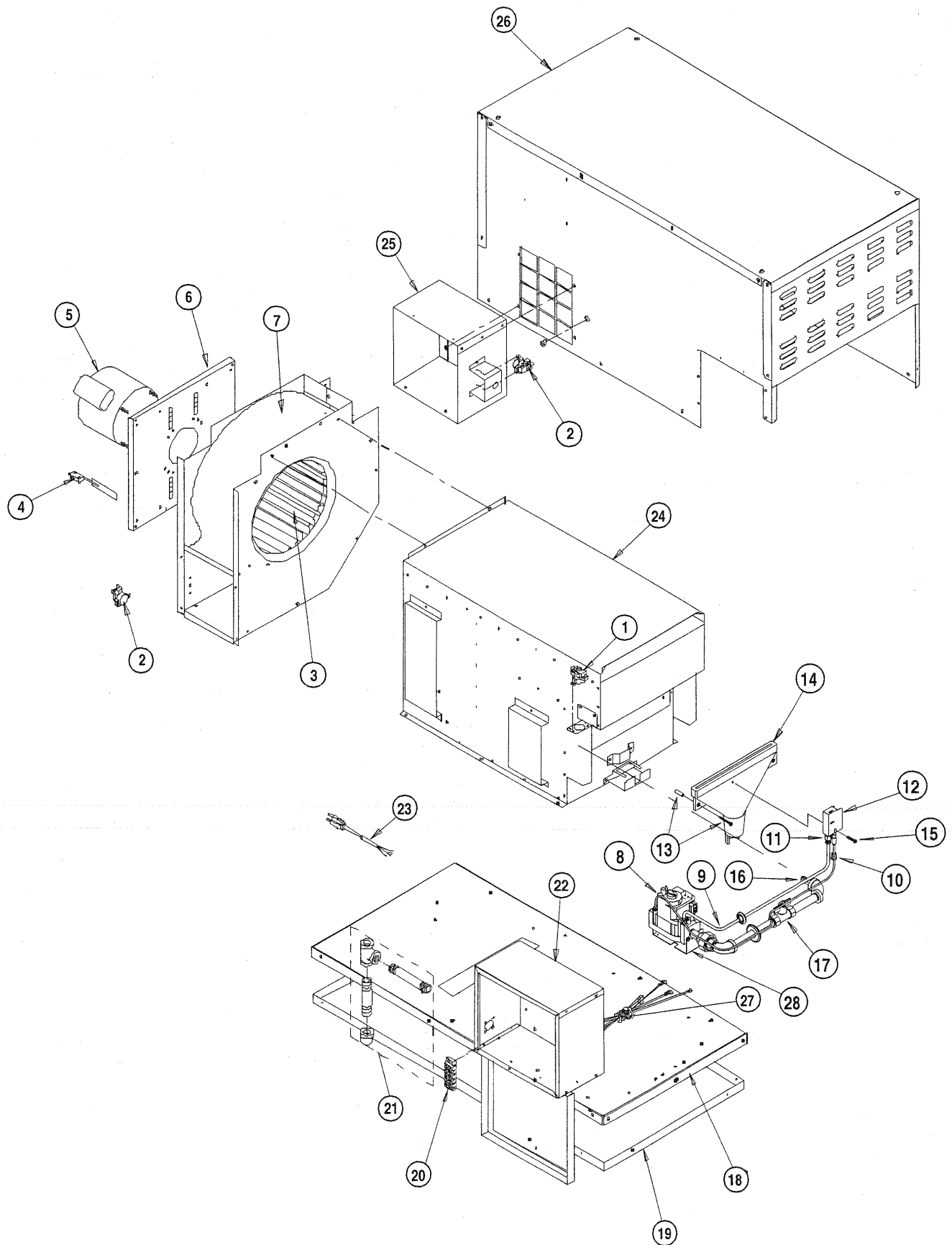
Electrical device used as an automatic "on/off" switch which will respond to changes in temperature in a certain area. Can be wired so contacts in the thermostat open or close on temperature increase or decrease.

Throttle Valve

Manually adjustable component used to increase or decrease the flow of gas to the burner. The throttle valve is located between the gas control valve and burner assembly.

Parts Identification

PARTS SCHEMATIC



PARTS LIST

Item	Description	Model			
		40	60	150	225
1	High Limit Switch, at Heat Chamber	05566		84144	
2	High Limit Switch, at Blower End		84144		
3	Fan wheel	02808		83053	02684
4	Air Proving Switch		80324		
5	Motor	81748		81749	81098
6	Motor Mount	80298		80294	
7	Housing, Fan Assembly				
	Stainless Steel	81740	81742	81744	81746
	Galvannealed Steel	81741	81743	81745	81747
8	Valve, Gas Control				
	Propane		81241		
	Natural Gas		81242		
9	Tube, Pilot	81997		81996	81995
10	Thermocouple	01036		01020	
11	Orifice, Pilot				
	LP Gas		07829		
	Natural Gas		06968		
12	Pilot Shield w/ Bracket and Orifice				
	Propane		81103		
	Natural Gas		81104		
13	Burner Mounting Hardware		81766		
14	Burner Casting	80218		80219	
15	Screw, Pilot		03420		
16	Orifice, Burner				
	LP Gas	81670	81017	81553	81062
	Natural Gas	81672	81018	81554	81149
17	Valve, Throttle				
	LP Gas	81671	81678	81555	81486
	Natural Gas	81673	81679	81694	20144
18	Base Top	81191		80653	80445
19	Base Bottom	81192		80883	80582
20	Terminal Strip		08253		
21	Sediment Trap Kit		81767		
22	Control Box Assembly, LP Gas				
	Stainless Steel	81998	82002		
	Galvanized Steel	81999	82003		
	Control Box Assembly, Natural Gas				
	Stainless Steel	82000	82004		
	Galvanized Steel	82001	82005		
	Control Box Assembly, LP Gas or Natural Gas				
	Stainless Steel			82006	
	Galvanized Steel			82007	
23	Power Cord		80679		
24	Heat Chamber Assembly				
	Stainless Steel	81729		81731	81733
	Galvanized Steel	81730		81732	81734
25	Duct Assembly				
	Stainless Steel	80285		81768	
	Galvanized Steel	80286		81769	
26	Case Assembly				
	Stainless Steel, LP Gas	82008		82010	82014
	Stainless Steel, Natural Gas	82008		82011	82015
	Galvanized Steel, LP Gas	82009		82012	82016
	Galvanized Steel, Natural Gas	82009		82013	82017
27	Wiring, Kit, Includes Harness	81737		81738	81739
28	Bracket, Gas Control Valve w/ Screws		82093		
29	Latch Kit, for Control Box (Not Illustrated)		80762		

NOTE 1: High Limit, Part No. 05566 is 350° F. High Limit Part Number 84144 is 200° F.

Warranty Policy

EQUIPMENT

PSI Heating Systems warrants that the component parts of its equipment are free from defects in material and workmanship, when properly installed, operated, and maintained in accordance with the Installation and Maintenance Instructions, safety guides and labels contained with each unit. If, **within 12 months from the date of purchase by the end user**, any component is found to be defective, PSI will at its option, repair or replace the defective part or equipment, with a new part or equipment, F.O.B., Onalaska, Wisconsin.

A warranty card on file at PSI will automatically qualify a unit and its component parts for warranty consideration. If a warranty card is not on file, a copy of the bill of sale will be required to establish warranty qualification. If neither is available, the warranty period will be 12 months from date of shipment from PSI.

PARTS

PSI Heating Systems warrants that replacement parts purchased from the company and used on the appropriate PSI equipment are free from defects both in material and workmanship for **12 months from the date of purchase by the end user**. Warranty is automatic if a component is found defective within 12 months of the date code marked on the part. If the defect occurs more than 12 months later than the date code but within 12 months from the date of purchase by the end user, a copy of a bill of sale will be required to establish warranty qualification.

The warranty set forth above is the exclusive warranty provided by PSI, and all other warranties, including any implied warranties or merchantability or fitness for a particular purpose, are expressly disclaimed. In the event any implied warranty is not hereby effectively disclaimed due to operation of law, such implied warranty is limited in

duration to the duration of the applicable warranty stated above. The remedies set forth above are the sole and exclusive remedies available hereunder. PSI will not be liable for any incidental or consequential damages directly or indirectly related to the sale, handling or use of the equipment, and in any event PSI's liability in connection with the equipment, including for claims based on negligence or strict liability, is limited to the purchase price.

Some regions do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you. Some regions do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Replacement Parts and Service

Contact your local PSI dealer for replacement parts and service or call PSI at 800-562-2966 for assistance. Be sure that you have your heater model number when calling.