TEMP-HEAT®

THP-400A, THP-500A and THP-550

Gas, Direct-Fired Process Heater

Installation and Service Manual

1-800-836-7432

Heating

Cooling

Dehumidifying

Ventilating

This manual is the property of the owner. Leave with the unit when set-up and start-up are complete.

For your safety, do not use this heater in a space where gasoline or other liquids having flammable vapors are stored or used.

RUPP INDUSTRIES, INC.

Warning

General Hazard Warning

Failure to comply with the precautions provided with this heater can result in death, serious bodily injury and property loss or damage from hazards of fire, explosion, burn, asphyxiation, carbon monoxide poisoning, and electrical shock.

Only persons who can understand and follow the instructions should use or service this heater.

If you need assistance or heater information such as an instructions manual, labels, etc., contact the manufacturer.

Warning

Fire, burn, inhalation and explosion hazard.

Keep solid combustibles, such as building materials, paper or cardboard, a safe distance away from the heater as recommended by the instructions.

Never use the heater in spaces which do or may contain volatile or airborne combustibles, or products such as gasoline, solvents, paint thinner, dust particles or unknown chemicals.

Warning **Not for home or recreational vehicle use.**

We cannot anticipate every use which may be made of our heaters. Check with your local fire safety authority if you have questions about applications.

Other standards govern the use of fuel gases and heat-producing products in specific applications. Your local authority can advise you about these.

Introduction

The following recommendations are not intended to supplement requirements of federal, state, or local codes having jurisdiction over the application and operation of this heater.

This instruction booklet contains the necessary information, instructions, and guidelines to achieve maximum efficiency and safety from the TEMP-HEAT process heater. Please read all instructions before attempting the set-up and operation of this heater.

The THP-Series Heaters are direct-fired, fresh-air heaters used to provide heat for buildings under Class B furnaces as defined by NFPA 86 standard for ovens and furnaces. The area of fresh air required for safe operation must be equal to the area of the unit's intake grill. THP-Series Heaters draw fresh outside air through the unit's intake and discharge tempered air controlled by a remote sensors. The heaters generate 85° F to 270° F discharge temperatures with models ranging from 300,000 BTU/hour to 4,500,000 BTU/hour operating on natural gas or propane vapor.

Most models are equipped with a remote temperature sensors and an adjustable automatic burner control. This combination prevents extreme temperature fluctuations that occur when ON/OFF burner controls are selected.

Rating Information

		For indoor or outdoor installation		
Unit Specifications		THP-400A	THP-500A	THP-550
CFM		2,500	3,000	3,000
BTU/Hour	minimum maximum	200,000 400,000	44,500 500,000	40,500 550,000
Inlet Pressure Natural Gas	minimum psig maximum psig	1/2 4*	1/4 4*	1/2 4*
Inlet Pressure Propane Gas	maximum psig	10	10	10
Electrical Requirements	voltage/hertz/phase/amps	115/60/1/20	115/60/1/20	115/60/1/20
Dimensions	l x w x h, in	50 x 26 x 48	58 x 28 x 53	56 x 29 x 40
Weight	lbs	450	565	500
Minimum distance from combustible materials	floor, in top, in sides, in discharge, ft	0 6 6 10	0 6 6 10	0 6 6 10
Ambient Conditions	minimum °F maximum °F	-40 120	-40 120	-40 120

*For inlet pressure over 4-psi natural gas, contact TEMP-AIR.

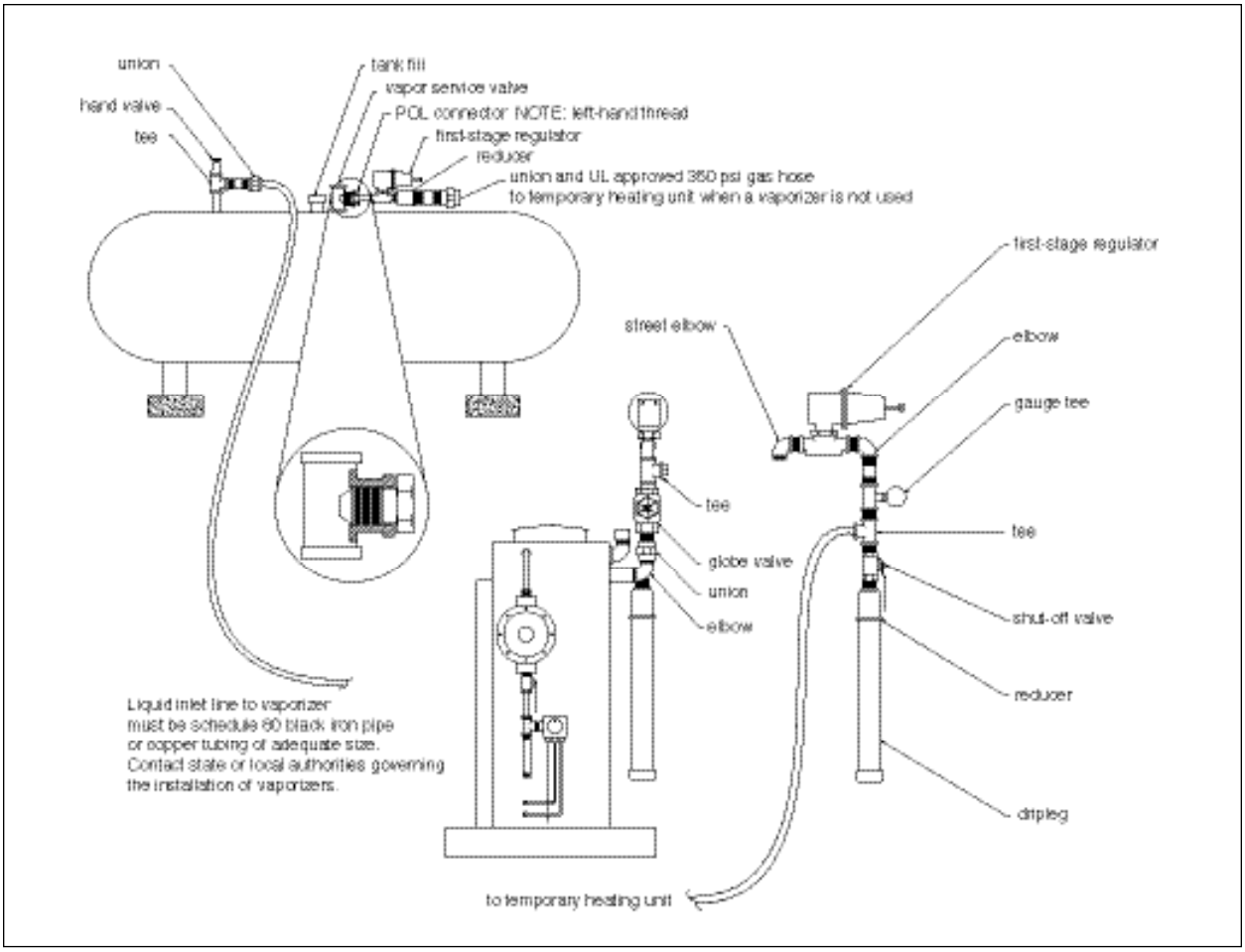
Control Functions

Airflow Switch	Verifies that proper airflow through unit is present before ignition can take place.
First-Stage Regulator	Reduces tank pressure to an intermediate pressure, and supplies inlet pressure to a second-stage regulator.
Flame-Safety Control	Senses flame and shuts down the heater in the event of flame failure.
High-Gas Pressure Switch	Measures manifold-gas pressure. If pressure is greater than setpoint, the switch closes the gas valves.
High-Temperature Limit	Opens electric circuit to flame-safety control and closes gas valves in the event of an overheating condition.
Low-Temperature Limit	Protects against the possibility of discharging freezing air into the building in the event the burner fails to ignite. Pre-set at 40° F, this control shuts the blower down if the temperature through the unit drops below this setpoint.
Manual Bypass Switch	Over-rides automatic shut-down of the blower during start-up if the temperature through the unit is below the 40° F setting of the Low-Temperature Limit control.
Manual Gas Valve	Manually shuts off fuel supply at heater. For short-term, shut-down only.
Modulating Control Valve	Regulates gas supply to the burner controlled by the remote thermostat.
Pilot Valve	Supplies fuel to the ignition pilot when starting unit.
Proof-of-Closure Switch	Monitors and proves that gas valve is totally closed in the normally closed position.
Second-Stage Regulator	Reduces the outlet pressure from first-stage levels to burner pressure.
Starter Interlock	Proves motor-starter is engaged in the normally closed position.
Thermostat	Automatically cycles the heater from low- to high-fire to maintain desired room temperature.

Fuel Supply System — Bulk-Tank System

- Installation must comply with all state and local codes or, in the absence of local codes, with the standard for the Storage and Handling of Liquified Petroleum Gases, ANSI/NFPA 58.
- Locate fuel tanks according to the minimum distances shown in the Rating Information Table on page 5.
- The vapor-supply fuel line from the tank or vaporizer must have a first-stage regulator located at the tank or vaporizer to reduce the tank pressure to the 10-psi needed to supply unit.
- A vaporizer may be necessary, especially on multiple-heater installations where adequate storage supply is not attainable or practicable.
- Vaporizers must be no closer than 10-ft from a container.
- Locate vaporizers at a minimum of 15-ft from fuel-transfer valves.

Each Storage Capacity above Ground	Minimum Distance from Building
one, 500-gal tank	10-ft
one or two, 1000-gal tanks	25-ft
2001-gal or more	50-ft



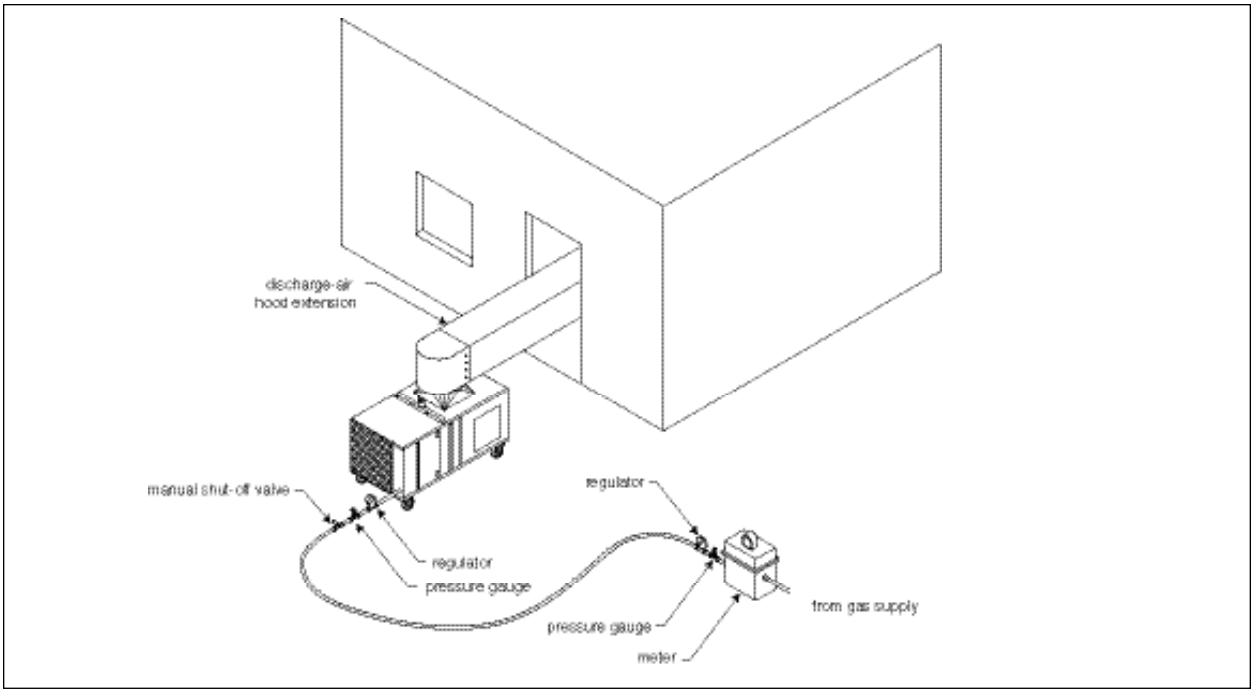
Typical Vaporizer Installation — Algas 40/40 Vaporizer

Natural Gas Installations

- See Rating Information Table on page 5 for proper inlet pressure.
- Use external regulator supplied on all installations over 4-psi.
- Gas meter and supply system must be able to supply the minimum supply pressures as specified in the Rating Information Table on page 5.
- Follow all federal, state, and local codes governing temporary-gas connections.
- Leak test all gas connections using a 1:3 solution of soap and water.

Set-Up

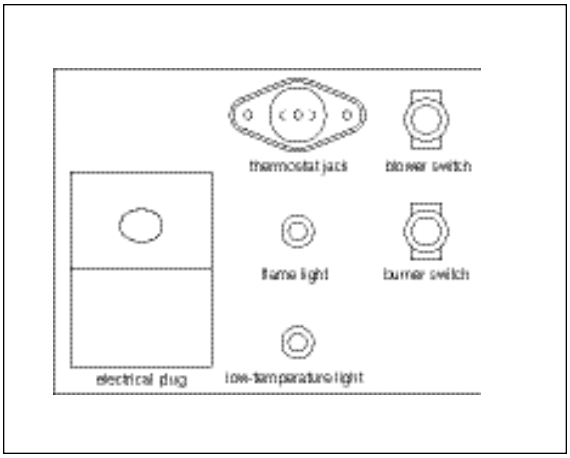
- Keep fresh-air intake and heated-air discharge clear of obstruction.
- Provide clearance to allow access to vestibule, blower, and motor compartments.
- Heater must be level and in compliance with minimum-clearance and minimum-distance requirements for combustible materials. See Rating Information Table on page 5.
- Position heater to draw 100% fresh, outside air through its intake grill.
- Do not use or operate the heater in the presence of combustible vapors or liquids.
- Maintain a maximum voltage differential of plus or minus 10% while unit is running.
- Do not move, handle, or service heater while hot, running, or connected to power supply.
- Check for gas leaks and proper functioning during installation, periodically, or when relocating.



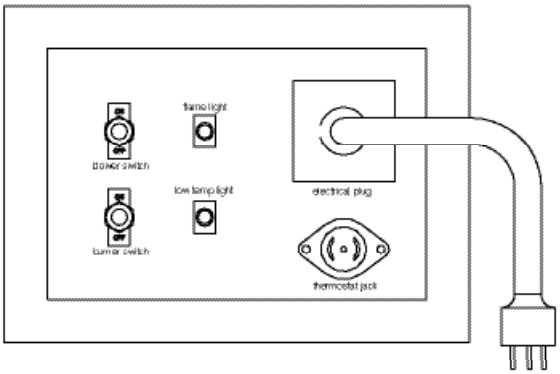
Typical Heater Installation

Preliminary Start-Up Steps

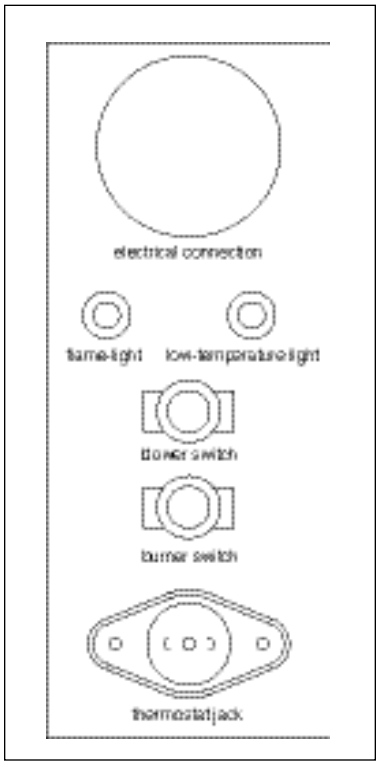
- Check for proper fuel-supply application, connections, and pressure.
- Check that external regulator has been installed on all natural-gas installations over 4-psi.
- External regulator must be installed on unit on all propane installations.
- Purge gas line of air, as necessary.
- Leak test all gas connections with a 1:3 solution of soap and water.
- Do not operate unit if leaks are present.
- Determine that unit is drawing 100% fresh outside air through its intake grill.
- Check for proper electrical connections and supply voltage.
- Check that the intake and discharge of unit are free from obstructions.
- Reset flame-safety control by pressing reset button on control.
- Reset motor overload.
- Check control settings:
  high-temperature limit switch: 270° F
  low-temperature limit switch: 40° F



THP-400A Switch Panel



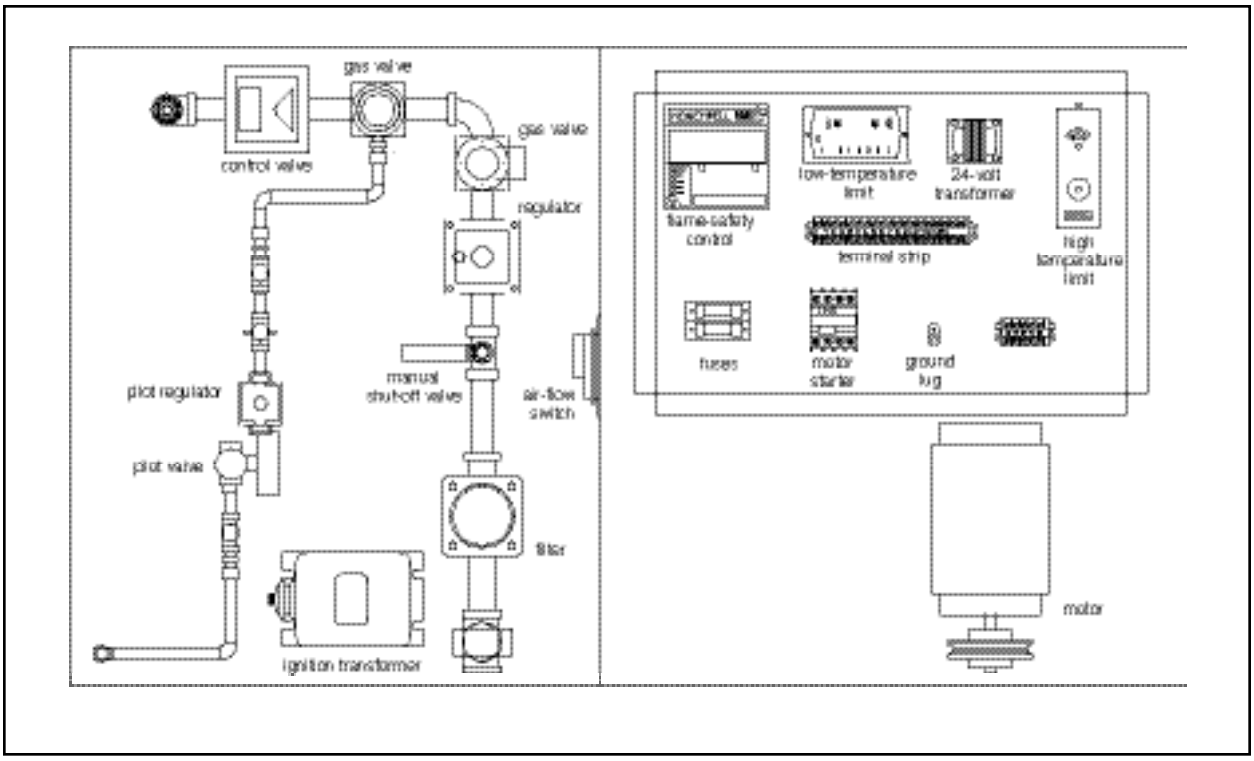
THP-500A Switch Panel



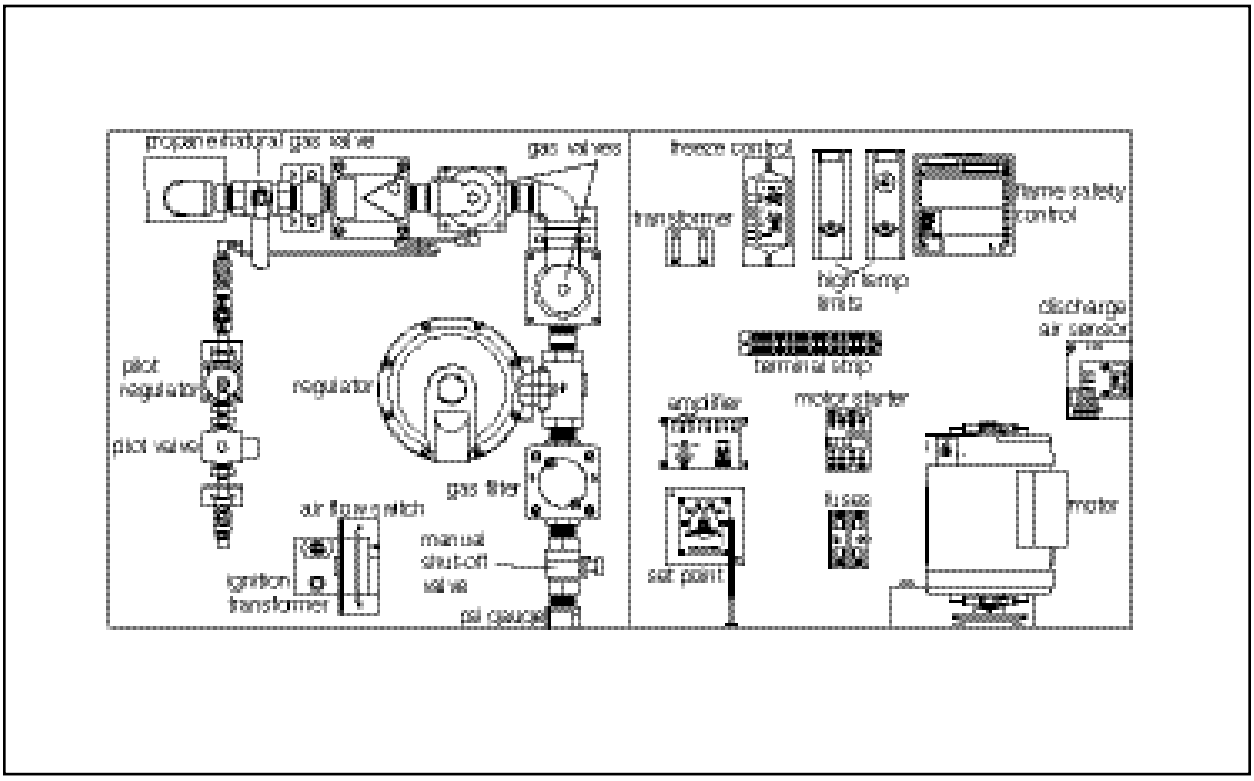
THP-550 Switch Panel

Note: Other switch panel layouts may be used depending on application.

Control Vestibule Layout

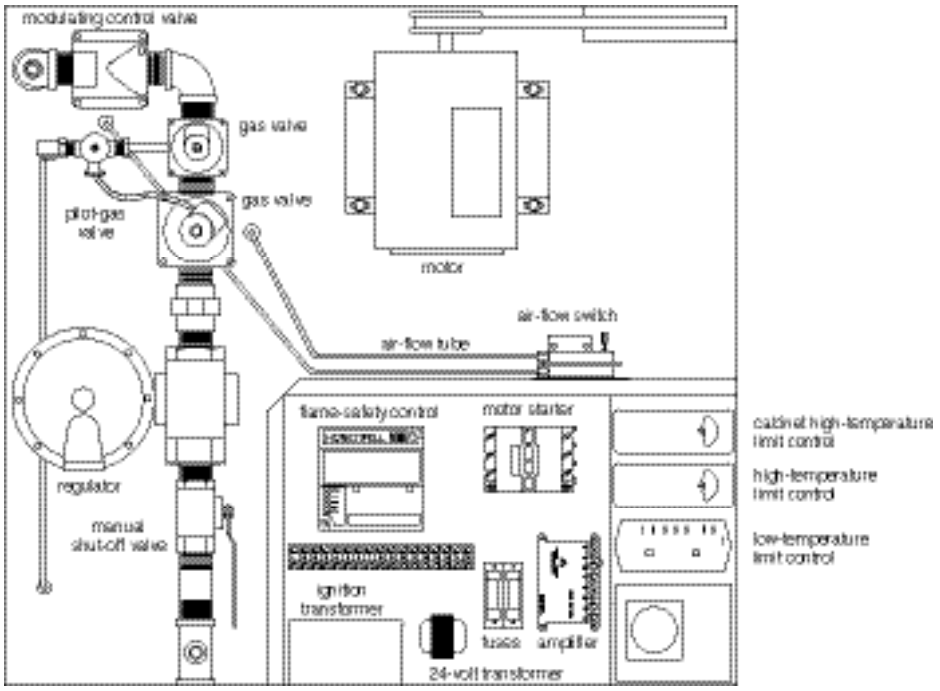


THP-400A Vestibule Layout



THP-500A Vestibule Layout

Control Vestibule Layout



THP-550 Vestibule Layout

Start-Up Steps

1. Connect power supply. See Rating Information Table on page 5 for electrical requirements.
2. Confirm heater is set up for fuel being supplied. See Rating Information Table on page 5 for proper gas-inlet pressures.
3. Open fuel-supply valve at tank slowly.
4. Open manual gas valve at heater.
5. Reset Flame-Safety control.
6. Check control settings
   high-temperature limit switch: 270° F
   low-temperature limit switch: 40° F
7. Turn blower and burner switches to the ON position.

   For units equipped with electronic low-temperature limit control:
   Allows unit to run for 3-min. If discharge-sensor bulb located in the discharge-air stream does not reach the 40° F minimum temperature, the unit shuts down, and the low-temperature bulb glows.

   To reset: turn blower and burner switches OFF. Reset the Flame-Safety Control and turn switches back to ON.

   Do not attempt to light the pilot manually.
8. Set discharge air temperature.
9. Set room air temperature.

Shut-Down Steps

Short-Term Shut Down

- Turn burner switch to OFF position.
- Wait 30-sec.
- Turn blower switch to OFF position.
- Look to see that flame is extinguished.

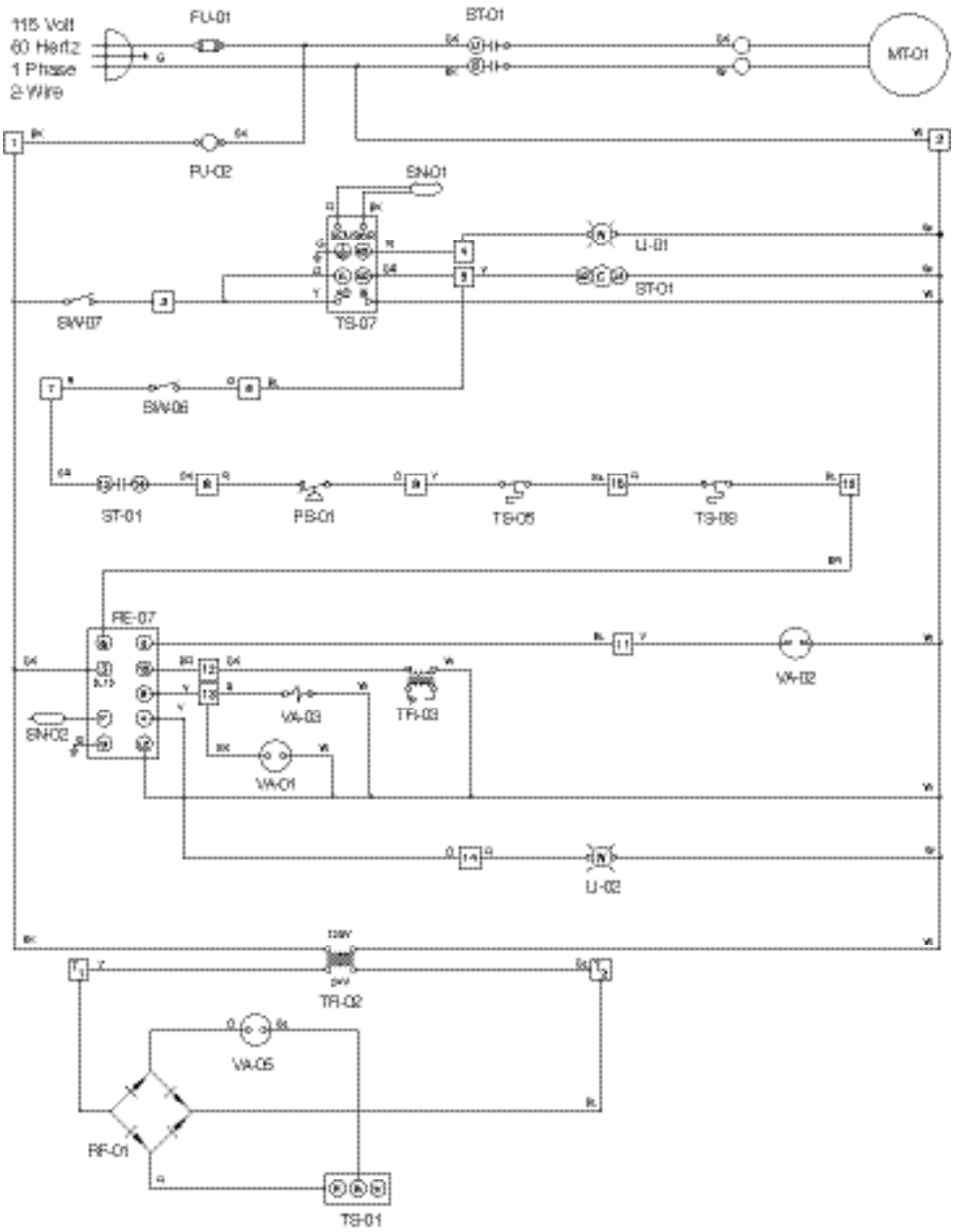
Extended Shut-down or Disconnection of Unit

- With unit running, close vapor-fuel supply valve at vaporizer. (Propane installation only.)

  Caution: Do not close liquid supply valve while vaporizer is ON. See vaporizer for proper operation of vaporizer. Contact your gas company for further information on safe handling of propane vaporizers.
- Allow heater to run until flame-safety light goes ON, indicating that all gas has been burned from gas lines.

  Caution: Check to see that pilot light on vaporizer is extinguished before disconnecting gas lines.
- Turn burner switch OFF.
- Continue running blower until no flame exists in the base of the burner.
- Turn the blower switch OFF.
- Turn power OFF at source and disconnect electrical lines.
- Disconnect propane-vapor line from heater.
- Contact gas company to disconnect vaporizer.

Wiring — *THP-400A*



ComponentIdentification					
FU-01	main fuse	SN-01	low-temperature sensor	TS-04	high-temperature limit switch
FU-02	control fuse	SN-02	flame rod	TS-07	low-temperature limit switch
LI-01	low-temperature light	ST-01	motor starter	TS-11	room-override thermostat
LI-02	burner-reset light	SW-06	burner switch	VA-01	main-gas valve
MT-01	supply-blower motor	SW-07	blower switch	VA-02	2nd main-gas valve
PS-01	air flow switch	TR-02	low-voltage transformer	VA-03	pilot-gas valve
RE-07	flame-safety relay	TR-03	ignition transformer	VA-05	modulating gas valve
RF-01	rectifier	TS-01	discharge-air sensor		

THP-400A Sequence of Operation

When the main safety switch, SW-01 is turned ON, power is supplied:

- to the line side of the motor starter, ST-01,
- to the primary side of the power transformer, TR-01, and
- from the secondary side of the power transformer to the FU-02 control fuse, located on the transformer.

F2 to 1 — Terminal 1 receives 120-V power from the FU-02 control fuse.

2 — Terminal 2 is neutral.

1 to 3 — Terminal 3 receives power from Terminal 1 through the blower switch, SW-07.

3 to 5 — Terminal 5 receives power from Terminal 3 through the low-temperature limit control, TS-07.

Note: The low-temperature limit control is a timed thermostat that allows the heater to run for 3-min. If the discharge sensor bulb, located in the discharge-air stream, does not meet the 40° F minimum temperature setting of the control, the unit shuts down, and the amber low-temperature alarm light, LI-01, glows.

To Reset: Turn blower switch OFF, wait 45 seconds, and turn back ON.

5 to 6 — Terminal 6 receives power from Terminal 5.

6 to 7 — Terminal 7 receives power through the burner switch, SW-06.

7 to 8 — Terminal 8 receives power from Terminal 7 through the supply-fan motor starter.

8 to 9 — With proper airflow through unit, Terminal 8 supplies power to Terminal 9 through the airflow switch, PS-01.

9 to 15 — Terminal 15 receives power from Terminal 9 through the high-temperature limit switch, TS-04.

15 to 10 — Terminal 10 receives power from Terminal 15 through the cabinet high-temperature switch, TS-08.

10 to (6) — Terminal 10 supplies power to Terminal 6 within the flame safety control, RE-07. Internal circuitry energizes Terminals 4, 8, 9, and 10 within the control.

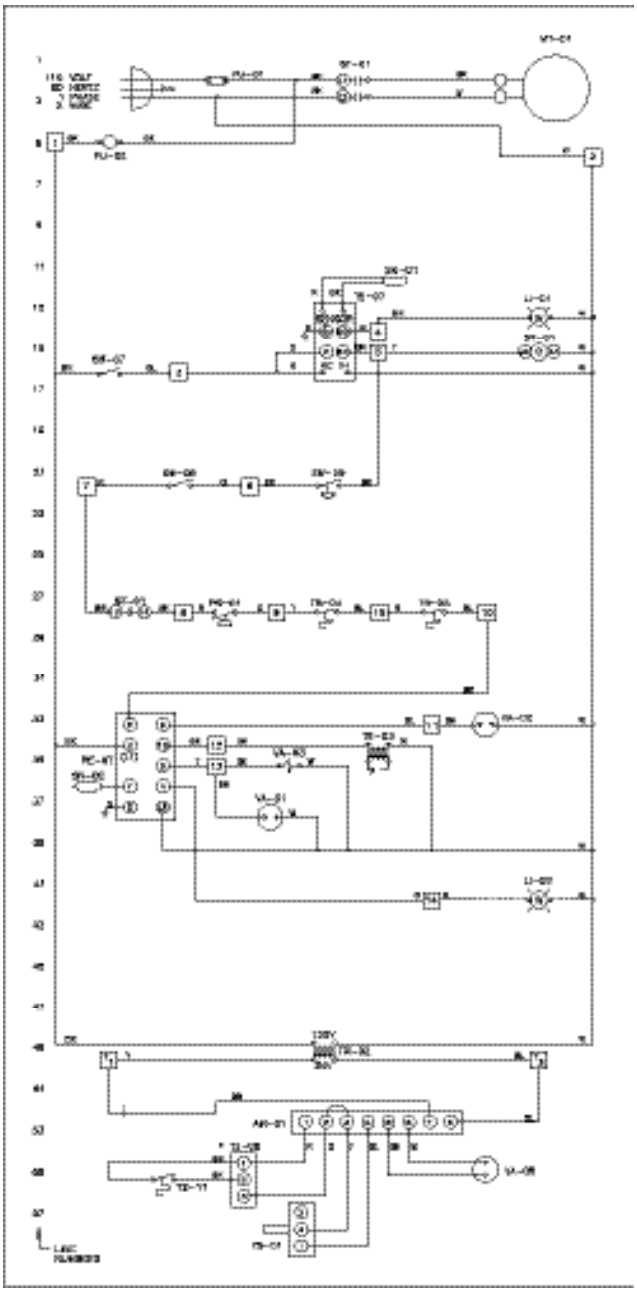
(8) to 13 — Terminal 8 of the flame safety control supplies power to Terminal 13, energizing the pilot-gas valve, VA-03, and the main-gas valve, VA-01.

Note: If pilot flame is not present, the flame safety control locks out, illuminates the red flame light, and the control must be reset.

(10) to 12 — Terminal 10 of the flame safety control supplies power to Terminal 12, energizing the ignition transformer, TR-03.

(9) to 11 — Terminal 9 of the flame safety control supplies power to Terminal 11, energizing the second-main gas valve, VA-02

Wiring — *THP-500A*



ComponentIdentification							
AM-01	amplifier	RE-07	flame safeguard relay	TR-02	low voltage transformer	TS-11	room override thermostat
FU-01	main fuse	SN-01	low temp sensor	TR-03	ignition transformer	VA-01	main gas valve
FU-02	control fuse	SN-02	flame rod	TS-01	discharge air sensor	VA-02	2nd main gas valve
LI-01	"low temp" fuse	ST-01	supply fan motor starter (28)	TS-04	high temp limit switch	VA-03	pilot gas valve
LI-02	"flame" light	SW-06	burner service switch	TS-05	2nd high temp limit switch	VA-04	modulating gas valve
MT-01	supply blower motor	SW-07	blower starting switch	TS-07	low temp stat/timer		
PS-01	low air flow switch	SW-09	unit tip over switch	TS-08	remote disch. temp. setpoint		

THP-500A Sequence of Operation

When the main safety switch, SW-01 is turned ON, power is supplied:

- to the line side of the motor starter, ST-01,
- to the primary side of the power transformer, TR-01, and
- from the secondary side of the power transformer to the FU-02 control fuse, located on the transformer.

F2 to 1 — Terminal 1 receives 120-V power from the FU-02 control fuse.

2 — Terminal 2 is neutral.

1 to 3 — Terminal 3 receives power from Terminal 1 through the blower switch, SW-07.

3 to 5 — Terminal 5 receives power from Terminal 3 through the low-temperature limit control, TS-07.

Note: The low-temperature limit control is a timed thermostat that allows the heater to run for 3-min. If the discharge sensor bulb, located in the discharge-air stream, does not meet the 40° F minimum temperature setting of the control, the unit shuts down, and the amber low-temperature alarm light, LI-01, glows.

To Reset: Turn blower switch OFF, wait 45 seconds, and turn back ON.

5 to 6 — Terminal 6 receives power from Terminal 5 through Tip Over Switch

6 to 7 — Terminal 7 receives power through the burner switch, SW-06.

7 to 8 — Terminal 8 receives power from Terminal 7 through the supply-fan motor starter.

8 to 9 — With proper airflow through unit, Terminal 8 supplies power to Terminal 9 through the airflow switch, PS-01.

9 to 15 — Terminal 15 receives power from Terminal 9 through the high-temperature limit switch, TS-04.

15 to 10 — Terminal 10 receives power from Terminal 15 through the cabinet high-temperature switch, TS-08.

10 to (6) — Terminal 10 supplies power to Terminal 6 within the flame safety control, RE-07. Internal circuitry energizes Terminals 4, 8, 9, and 10 within the control.

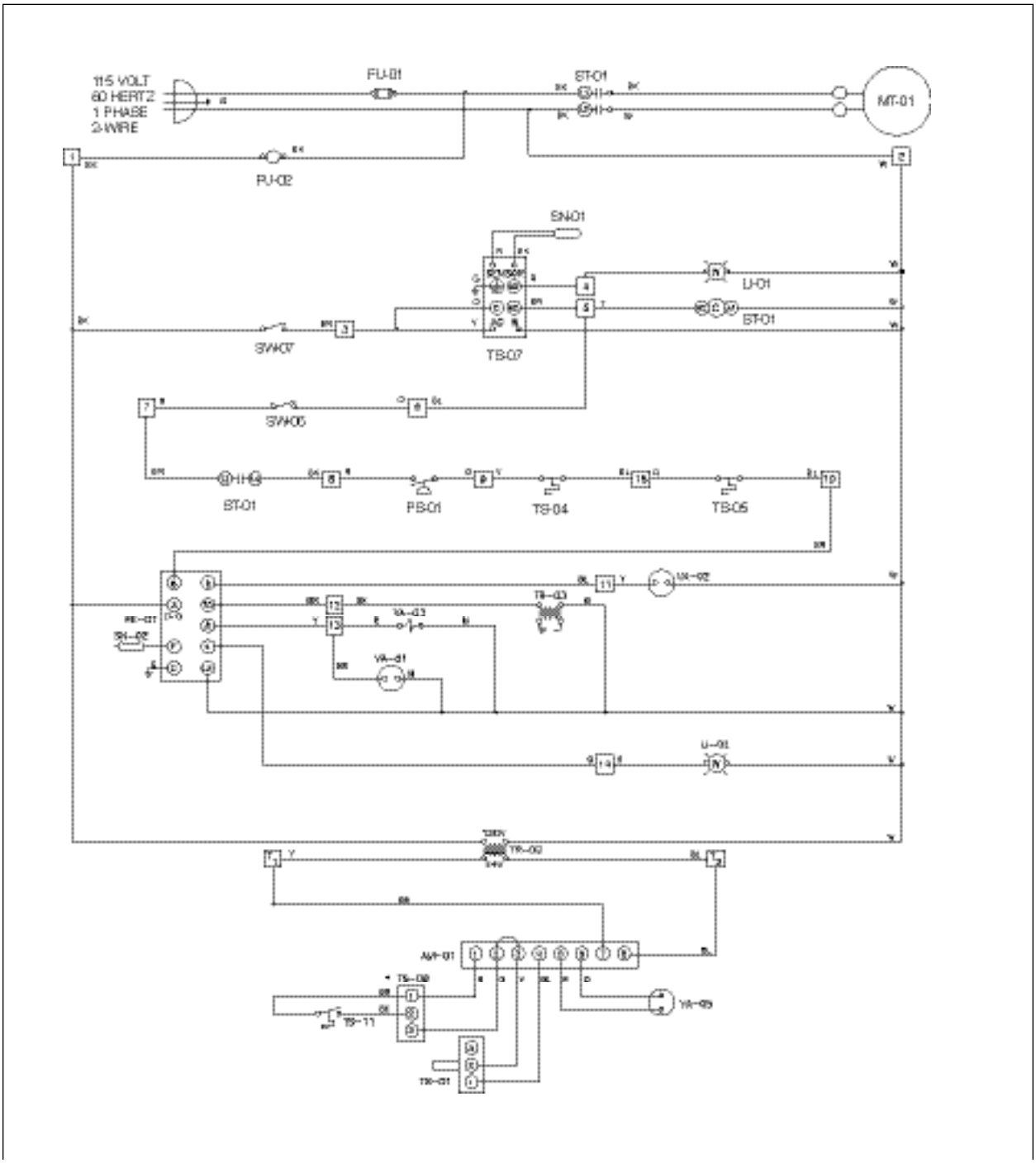
(8) to 13 — Terminal 8 of the flame safety control supplies power to Terminal 13, energizing the pilot-gas valve, VA-03, and the main-gas valve, VA-01.

Note: If pilot flame is not present, the flame safety control locks out, illuminates the red flame light, and the control must be reset.

(10) to 12 — Terminal 10 of the flame safety control supplies power to Terminal 12, energizing the ignition transformer, TR-03.

(9) to 11 — Terminal 9 of the flame safety control supplies power to Terminal 11, energizing the second-main gas valve, VA-02

Wiring—*THP-550*



ComponentIdentification					
AM-01	amplifier	SN-01	low-temperature sensor	TS-05	cabinet high-temperature limit
FU-01	main fuse	SN-02	flame rod	TS-07	low-temperature limit switch
FU-02	control fuse	ST-01	motor starter	TS-08	remote-discharge temperature
LI-01	low-temperature light	SW-06	burner switch	TS-11	room-override thermostat
LI-02	burner reset light	SW-07	blower switch	VA-01	main-gas valve
MT-01	supply-blower motor	TR-02	low-voltage transformer	VA-02	2nd main-gas valve
PS-01	air flow switch	TS-01	discharge-air sensor	VA-03	pilot-gas valve
RE-07	flame-safety relay	TS-04	high-temperature limit switch	VA-05	modulating gas valve

THP-550 Sequence of Operation

When the main safety switch, SW-01 is turned ON, power is supplied:

- to the line side of the motor starter, ST-01,
- to the primary side of the power transformer, TR-01, and
- from the secondary side of the power transformer to the FU-02 control fuse, located on the transformer.

F2 to 1 — Terminal 1 receives 120-V power from the FU-02 control fuse.

2 — Terminal 2 is neutral.

1 to 3 — Terminal 3 receives power from Terminal 1 through the blower switch, SW-07.

3 to 5 — Terminal 5 receives power from Terminal 3 through the low-temperature limit control, TS-07.

Note: The low-temperature limit control is a timed thermostat that allows the heater to run for 3-min. If the discharge sensor bulb, located in the discharge-air stream, does not meet the 40° F minimum temperature setting of the control, the unit shuts down, and the amber low-temperature alarm light, LI-01, glows.

To Reset: Turn blower switch OFF, wait 45-sec, and turn back ON.

6 to 7 — Terminal 7 receives power from Terminal 6 through the burner switch, SW-06.

7 to 8 — Terminal 8 receives power from Terminal 7 through the supply-fan motor starter.

8 to 9 — With proper airflow through unit, Terminal 9 supplies power to Terminal 8 through the airflow switch, PS-01.

9 to 15 — Terminal 15 receives power from Terminal 9 through the high-temperature limit switch, TS-04.

15 to 10 — Terminal 10 receives power from Terminal 15 through the cabinet high-temperature switch, TS-05.

10 to (6) — Terminal 10 supplies power to Terminal 6 within the flame safety control, RE-07. Internal circuitry energizes Terminals 4, 8, 9, and 10 within the control.

(8) to 13 — Terminal 8 of the flame safety control supplies power to Terminal 13, energizing the pilot-gas valve, VA-03, and the main-gas valve, VA-01.

Note: If pilot flame is not present, the flame safety control locks out, illuminates the red flame light, and the control must be reset.

(10) to 12 — Terminal 10 of the flame safety control supplies power to Terminal 12, energizing the ignition transformer, TR-03.

(9) to 11 — Terminal 9 of the flame safety control supplies power to Terminal 11, energizing the second-main gas valve, VA-02

Troubleshooting

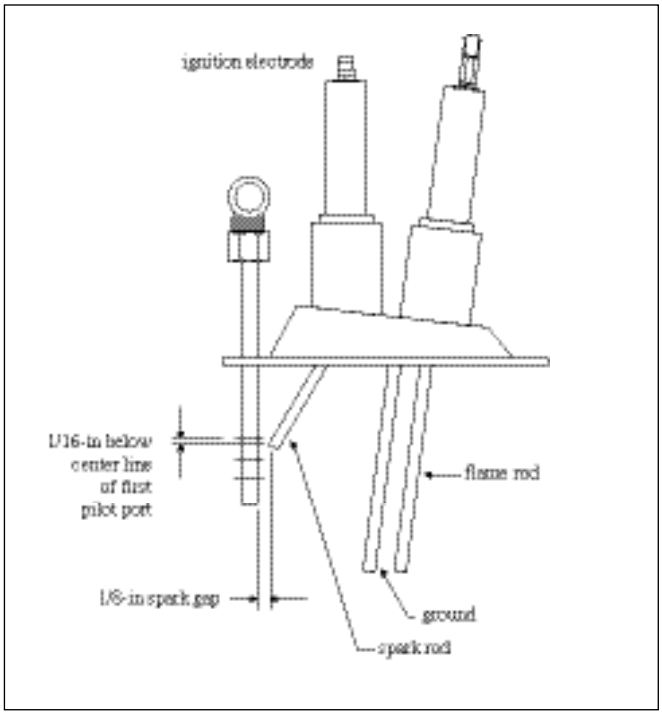
Problem	ProbableCause	Remedy
Blower does not operate	Inadequate or no voltage present	Check power supply to unit. 115-V must be available. Check Rating Information Table on page 5.
	Fuse loose or blown	Check control fuse, FU-02.
	Blower switch not in ON position	Turn ON.
	Blower switch defective	With switch in the ON position, check for 115-V at Terminal 3. Replace switch if voltage is not present.
	Low-temperature limit switch not at proper setting	Timer: 3-min Temperature: 40° F To Reset: Turn burner and blower switches OFF and then back ON.
	Defective low-temperature limit switch	Check wiring connections. Check for 115-V at Terminal 5. If no voltage is present, replace switch.
	Defective motor	Check wiring condition and connections from motor starter to motor. If motor is receiving proper voltage and wiring is in good condition, the motor is defective and must be replaced.
Blower runs, burner does not ignite	Burner switch not in ON position	Turn ON.
	Defective burner switch	With burner switch in the ON position, check voltage at Terminal 5. If 115-V are present at Terminal 5 and not at Terminal 6, the burner switch is defective.
	Insufficient airflow	Check unit's intake and discharge for obstructions. Inspect fan blade and motor for proper operation. Adjust airflow control according to the instructions on page 19. Remove airflow tubing and inspect for obstructions. Reconnect tubing. If voltage is present at Terminal 7 but not at Terminal 8, replace the airflow switch.
	High-temperature limit switch out of adjustment	Press reset button on switch. If unit continues to shut down, the unit is either overfired, or the limit switch is defective. Contact *TEMP-HEAT*.
	Adjustable high-temperature limit switch not at proper setting	Set at 240° F. If unit continues to shut down, the unit is either overfired or the limit switch is defective. Contact *TEMP-HEAT*.

Problem	ProbableCause	Remedy
Blower runs, burner does not ignite	Flame safety control lockout	Press reset button on the control. If resetting does not correct problem, the flame safety control must be replaced.
	Gas valve defective	Check wiring connections and condition to and from gas valves. If wiring is in good condition and voltage is present, the valves may need replacement.
	Fuel supply	Confirm gas supply to unit. See Rating Information Table on page 5 for inlet gas supply pressures. Bleed air from gas hose.
	Ignition spark rod improperly gapped	Maintain 1/8-in gap as shown on page 19. Replace spark rod as needed.
Burner ignites, does not stay lit	Spark rod defective	Turn blower and burner switches OFF. Check spark-rod gap and condition. Carefully inspect porcelain insulator for cracks or moisture. Replace if necessary.
	Insufficient air flow	Check unit's intake and discharge for obstructions. Inspect fan blade and motor for proper operation. Adjust airflow control according to the instructions on page 19. Remove airflow tubing and inspect for obstructions. Reconnect tubing. If voltage is present at Terminal 7 but not at Terminal 8, replace the airflow switch.
Blower runs, burner ignites, but unit does not deliver high fire	Fuel supply	Confirm gas supply to unit. See Rating Information Table on page 5 for inlet gas supply pressure.
	Remote thermostat	Plug remote thermostat securely into thermostat jack on heater. Set at a temperature higher than the indoor-air temperature.

Control Adjustments

Ignition

1. Clean and dry electrodes.
2. Check porcelain insulators for cracks or moisture. Replace if necessary.
3. Adjust as shown.
4. Secure ignition leads.
5. Replace spark electrode if defective.



Ignition Assembly

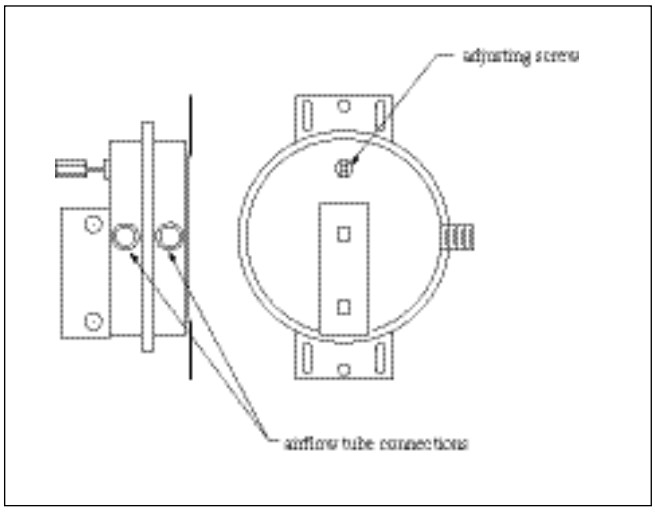
Air-Flow Control

Setting control

1. Turn ON/OFF switch to ON.
2. With unit operating at high-fire, turn adjusting screw clockwise until burner goes OFF.
3. Turn adjusting screw counter-clockwise 1/2 turn at a time until burner re-ignites.

To check setting

1. Set remote thermostat on highest setting.
2. Observe that when operating on high-fire, the switch does not break contact.



Airflow Control

TEMP-HEAT®

Boston, MA	800-666-8133	fax 508-624-0036
Chicago, IL	800-283-2843	fax 847-931-7704
Cleveland, OH	800-443-3301	fax 330-721-7742
Columbus, OH	800-444-3481	fax 614-471-1933
Denver, CO	800-577-7053	fax 303-783-8579
Detroit, MI	800-678-1488	fax 248-526-9527
Kansas City, MO	800-430-0523	fax 816-471-7774
Minneapolis, MN	800-836-7432	fax 952-707-5104
Newark, DE	800-656-6000	fax 302-369-8022
Salt Lake City, UT	801-328-1013	fax 801-328-3616
St. Louis, MO	314-381-7688	fax 314-381-7688
Watertown, WI	800-558-9209	fax 920-261-4523

RUPP Industries manufactures, sells and rents commercial, industrial and construction equipment. Our employees — our most valuable asset, are dedicated to finding innovative solutions that fulfill our customers' product and service requirements.

RUPP INDUSTRIES, INC.

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