

INSTALLATION, OPERATION & MAINTENANCE MANUAL

FOR

CATCO CATALYTIC HEATERS



CATCO
CATALYTIC HEATER COMPANY
www.catcoUSA.com



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.

CATALYTIC HEATER OPERATION AND MAINTENANCE

Your CATCO catalytic heater has been manufactured to exacting standards to produce safe, flameless heat. Every CATCO heater is factory tested to ensure proper performance; each unit is brought up to operating temperature and tested for leaks and consistent heat output. Proper installation and maintenance will guarantee years of trouble-free service. All CATCO catalytic heaters are warranted against defects in material or workmanship for a period of one year from the date of purchase.

HOW THEY WORK

Catalytic heaters utilize a catalyst bed to convert natural gas or LPG into heat, carbon dioxide and water vapor. A clean, dry source of fuel is important in keeping the catalyst bed in service and operating efficiently. Catalytic combustion will not begin until the catalyst bed has been preheated to approximately 250°F. This is accomplished safely by connecting a power source matching the heater specifications to the electrical connections on the heater. After a short period of time, fuel gas is introduced to the heater and autocombustion begins. Once the catalytic reaction is fully established, electrical power is disconnected. The catalyst is neither consumed or destroyed in the catalytic combustion process and, as long as clean fuel and air are supplied to the heater, the process can continue indefinitely.

INSTALLATION

All installations should comply with local building codes. In the absence of local codes, installations should comply with the *National Fuel Gas Code (ANSI Z223.1/NFPA)* or the *Natural Gas and Propane Installation Code (CSA B149.1)*.

For best results, heaters should be mounted with the face in a vertical position. If the face of the heater is to be tilted away from the vertical the angle should not exceed 45°. If it is absolutely necessary to mount the heater in a horizontal position, an angle of at least 10 degrees should be maintained in order to ensure that combustion by-products do not accumulate on the face of the heater and that a sufficient supply of air reaches the catalyst bed. It is essential that heaters be protected from rain, snow and wind by mounting them in a building or enclosure of some type. Care should be taken that the building or enclosure is vented to provide an adequate inflow of air to the heater.

If heaters are used to heat an appliance with rubber or fabric parts, care should be taken to direct the heat away from the components that are sensitive to heat. If more heat is needed on a particular object, high temperature flat black paint will increase its heat absorption characteristics significantly.

Buildings, Garages and Airplane Hangars

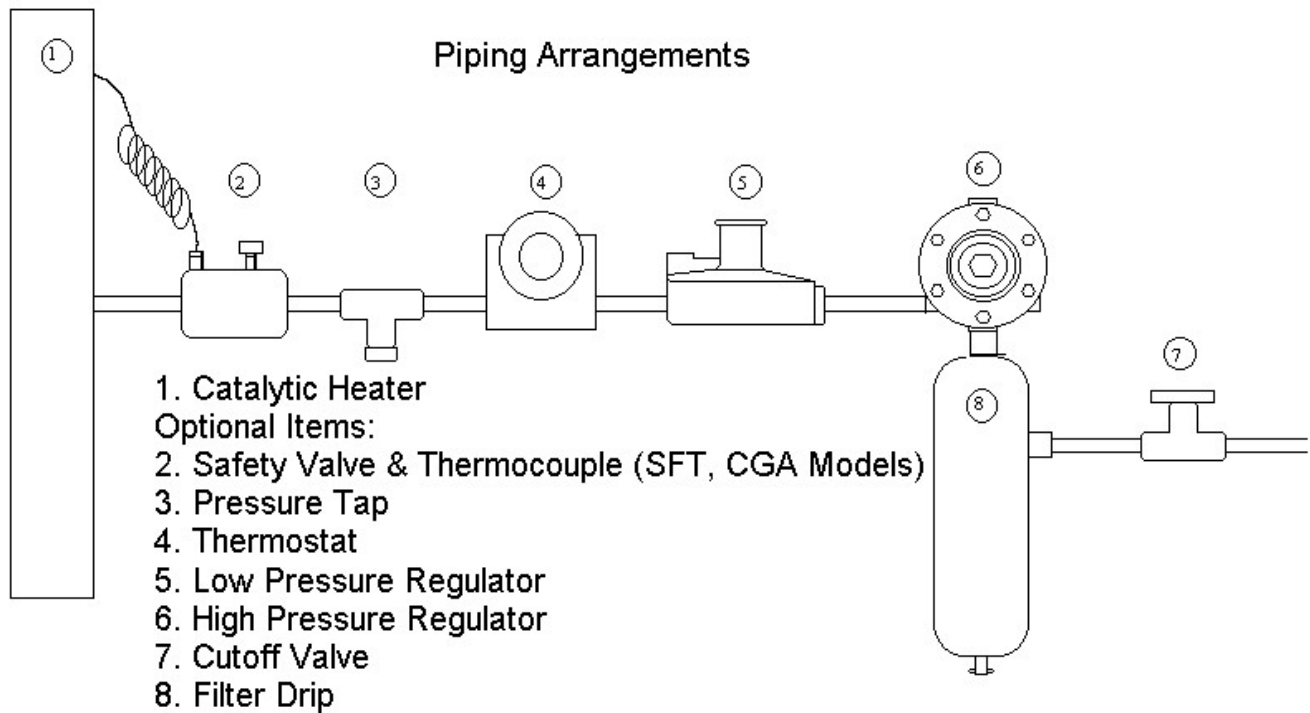
When installed in buildings and other enclosed workspaces, heaters should be installed with a minimum clearance as marked on the heater. Overhead heaters should be installed so that the minimum clearances marked on the heater will be maintained from vehicles parked below the heater. (CSA rated heaters).

In locations used for the storage of combustible materials, signs must be posted to specify the maximum permissible stacking height to maintain the required clearances from the heater to the combustibles. Signs must be posted either adjacent to the heater thermostat or in another conspicuous location.

Piping

The gas supply should be connected as shown in Figure 1 below. Note that some of the components shown in the diagram are optional and may not be applicable to your heater. A filter drip is strongly recommended when using natural gas fuel to prevent liquids and other foreign matter from clogging the regulators or passing into the heater. A tee with a 1/8" tapped hole should be installed on the output side of the low pressure regulator for troubleshooting purposes.

Figure 1



The standard input pressure to CATCO catalytic heaters is 4.5 inches of water column (11" WC for LP heaters). Higher pressures may result in leaks or damage to the catalyst and lower pressures will prevent the heater from operating at optimum efficiency. Maximum and minimum input pressures (inches water column) to the heater are:

Natural Gas: Maximum – 6.5" Minimum – 2"
Propane: Maximum – 15.5" Minimum – 5.5"

Important Note: Catalytic heaters burn a precise amount of gas, depending on the size of the heater. The catalyst used will only convert a certain amount of gas and CATCO heaters are carefully designed to prevent too much gas from flowing through the heater. Changing the orifice in a heater or enlarging the existing one will not increase the amount of heat output and may result in a hazardous gas leak. Any modification of the heater may result in a hazard to personnel or property and will void any warranty.

Thermostats

Thermostats are available as an option for controlling CATCO catalytic heaters. They must be pre-set at the factory for specific sizes of catalytic heater and will regulate the amount of gas flowing to the heater. They should be mounted downstream from the low pressure regulator. (Figure 1) When the thermostat set point is reached, the valve closes, allowing only a minimum amount of gas to flow to the heater. In the closed position, manifold pressure should be 2.2 – 2.6 inches water column (wc) for natural gas fuel and 5.5-6.0 inches wc for lpg fuel.

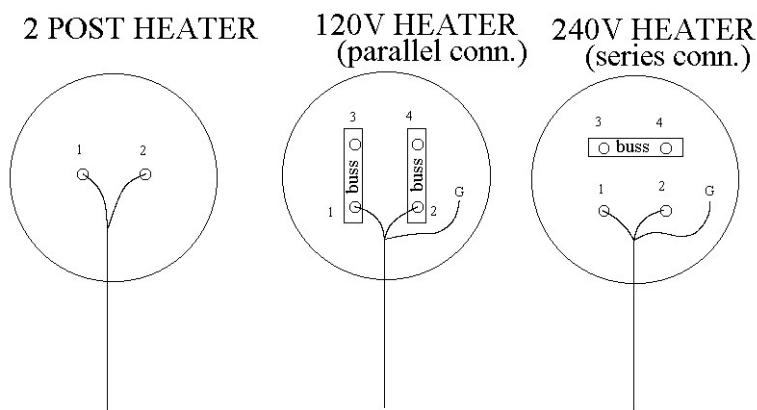
The sensing device on the thermostats supplied by CATCO consists of a hydraulic bulb connected to the thermostat by a capillary. **Both the bulb and capillary are fragile and care should be used in handling.** The bulb should be attached to the part of the valve or control that is most sensitive to excessive heat.

Electrical Connections

The heater's electrical starting system may consist of one or two 12, 120 or 240 volt heating elements; heaters 6000 btu and under utilize a single element and have two terminals while larger heaters utilize two elements and have four terminals. Voltage information may be found on the label on the back of the catalytic heater, along with the amperage required to properly start the heater. Electrical connections are shown in Figure 2 below. Note that four terminal arrangements have buss bars connecting the posts. 120 volt heaters have two buss bars connecting the two internal heating elements in parallel. 240 volt heaters have one buss bar connecting the two internal elements in series.

If an external electrical source is utilized, the heater, when installed, must be electrically grounded in accordance with the *National Electrical Code (ANSI/NFPA 70 or current Canadian Electrical Code (CSA C22.1)*.

Figure 2



STARTING INSTRUCTIONS

Standard Heaters (no safety valve or thermocouple)

1. With gas valve "off", energize electrical preheating element. **IMPORTANT:** If jumper cables are used, connect to heater **first** to avoid hazards from sparking.
2. Wait 10-15 minutes (Colder weather may affect how fast the catalyst bed heats up.)
3. Turn on the gas supply valve and wait five minutes or until catalytic reaction begins, indicated by a rapid rise in the heater face temperature.
4. Disconnect the electrical supply. If jumpers are used, disconnect at **power source first**.

Heaters with Safety Valve and Thermocouple

1. Turn on gas valve and energize electrical preheating element. **IMPORTANT:** If jumper cables are used, connect to heater **first** to avoid hazards from sparking.
2. Wait 10-15 minutes (Colder weather may affect how fast the catalyst bed heats up.)
3. Depress the button on the safety valve and release. The button will return to the extended position, but there will be a significant reduction in spring tension.
4. Wait five minutes or until catalytic reaction begins, indicated by a rapid rise in the heater face temperature.
5. Disconnect electrical supply. If jumpers are used, disconnect at **power source first**.
6. If heater does not continue to operate, reconnect electrical supply and repeat steps 2-5.

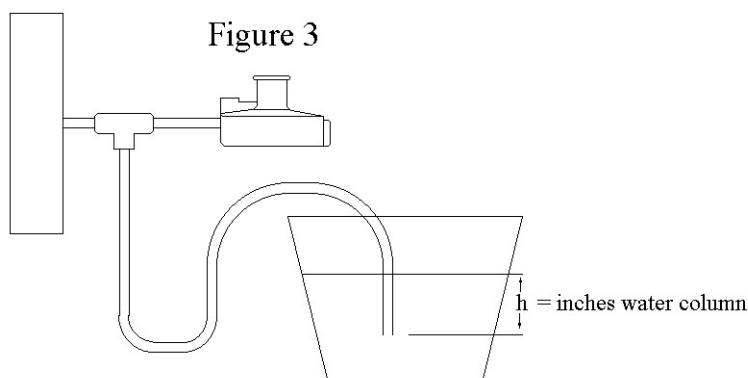
MAINTENANCE

CATCO catalytic heaters contain no moving parts and maintenance is minimal. The face of the heater should be protected from water and other contaminants. If an area is being cleaned with high pressure water spray or air pressure, care must be taken to protect any heaters in the area, as the catalyst may be damaged or destroyed. When the heater is not in use, it should be stored in a clean, dry area. Heaters should be wrapped in plastic or other protective material when not in service to protect them from excessive contaminants and rodent or insect damage.

TROUBLE SHOOTING

Once catalytic combustion has begun, it should continue without interruption as long as adequate supplies of fuel and air are available. If a heater will not start or quits operating:

1. Check the electrical wiring and connections if heater will not start. Connections should be tight and the wiring should be of sufficient capacity to carry the amperage required to start the heater. If a battery is used as the power supply, it should be fully charged.
2. Check the gas supply pressure downstream of the low pressure regulator by tapping into the pressure tee. Pressure should be 4 1/2 inches of water column for natural gas heaters and 11 inches water column for heaters fueled by LPG. If a manometer is not available, a simple field expedient can be used (Figure 3).



1. Submerge hose in water until bubbles cease.
2. The depth of the hose indicates output pressure

3. Check the orifice for obstructions.
4. Check for saturation of the catalyst pad- if it is saturated with water, gas may not be able to reach the catalyst. One evidence of water saturation is rust colored discoloration along the edges of the heater. If the heater is saturated with water, it can often be dried out in a conventional oven by placing it face up at 250-275 degrees for 1-2 hours. Small amounts oil or other hydrocarbons normally will not harm the catalyst; however, if the pad is saturated with oil, the heater will have to be remanufactured or replaced.
5. Operation of the safety valve and thermocouple can be bypassed by **temporarily** securing the button in the open (down) position and starting the heater as a standard heater. If the heater is in a classified area the heater should be removed from the area and tested in a safe area. The thermocouple output can be tested by unscrewing it's electrical connection from the safety valve and attaching a millivolt tester to the end. After 20 minutes of preheating, the thermocouple should generate 10-15 millivolts.
6. Check electrical heating elements for continuity. A lack of continuity indicates a damaged or defective heating element and the heater will have to be replaced or returned to the factory for remanufacture.
7. If none of the above checks isolate the problem, contact your local CATCO representative for more information, or contact the factory directly.

REMANUFACTURING AND REPAIR SERVICES

CATCO remanufactures all major brands of catalytic heaters. All heaters are disassembled, cleaned, and reassembled with new catalyst and components. Heaters are thoroughly tested for heat output and leaks. A standard flat price covers the cost of remanufacturing. When downtime is critical, **CATCO** branded heaters may be available for immediate exchange. Contact your local representative for complete information about remanufactured heaters.

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EXPANDED TROUBLE SHOOTING GUIDE

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If the Catalytic Heater Will Not Start:

Gas Supply

1. If this is a new installation make certain that the fuel gas lines are aggressively and completely purged of air, liquid, and debris. Because of the small volume flowing through the heater, it can take a very long time to purge the lines with the heater gas train connected.
2. Verify gas pressure to the heater. Natural gas fueled heaters should receive 4 ½ inches of water column pressure. LPG fueled heaters should receive 11 inches of water column pressure. It is important that this pressure be verified with a gauge or manometer. Check the pressure with gas flowing through the heater, not dead-headed. If the heater is equipped with a shutoff valve the button should be pressed fully in when verifying pressure. The best place to check the pressure of the heater is as close to the heater input as possible. Never rely on pressure reading more than approximately one foot away from the heater input as there can be significant line pressure drop at these extremely low pressures.
3. Verify that the heater orifice is not obstructed. The orifice is located inside of the ¼ npt nipple on the back of the heater.
4. Read the heater label to verify that the proper fuel is being used (Natural Gas or LPG)

Electrical Supply

1. From the heater label, verify that you are using the proper starting voltage.
2. Verify that the voltage is as required. Check the voltage at the heater with power flowing through the heating element (under load).
3. Make sure that electrical power is applied per instructions in the manual and on the label. Once the heater is pre-heated and gas is sent into the heater, the electrical power should be continued per instructions so as to allow the heater enough time to be fully operating.

Other Issues

1. If you observe steam or vapor emitted from the heater or from a vent in an enclosure, this is an indication that the pad material inside the heater is wet (water or other substance). The heater will not function properly. If the liquid is something that will evaporate and leave no residue, the heater might eventually dry itself enough to be functional. If contaminated by a non-flammable substance that will not leave a residue in the heater pad material, it is possible to "bake" the heater in an oven at about 250 °F for several hours to evaporate the liquid.
2. If the face of the heater shows significant discoloration, this indicates that the heater may be contaminated, preventing the free flow of gas to the catalyst pad at the face of the heater.
3. There must be an adequate source of combustion air for the heater to function.

If the Catalytic Heater Seems to Start but Does Not Continue Operating:

First, insure that the heater is actually operating and that the heat created is not from the heating element. There are several ways to verify this. First, if the heater is enclosed (such as in a Freeze Buster Instrument Gas Heater), you should be able to feel the hot and damp exhaust gas (CO₂ and water vapor) flowing out of the vent. Second, once the electrical power is disconnected, the heater back will cool off if the heater is not operating. Finally, if the face of the heater can be accessed, it is quite apparent when the heater is functioning because of the substantial radiant heat emitted from the face of the heater.

1. As detailed above, verify the gas supply and pressure.
2. As detailed above, verify that the heater does not show signs of contamination. The best way to observe this is to check the face of the heater. If it is discolored, this can indicate that there is contamination that is preventing the even flow of gas to the catalyst at the heater face. This can reduce performance of the heater to the point that it will not sustain the catalyst reaction.
3. Verify that the orifice is not partially obstructed.
4. The heater must not be installed in such a way as to eliminate adequate combustion air. (a) Insure that any vents or holes above or below the heater are not blocked and that that the heater has adequate "intake air flow" and "exhaust ventilation". (b) Insure that the vertical angle of the heater does not exceed 45°.
5. If the heater is equipped with a thermocouple and shutoff valve, a failure of one of these components can cause the heater to shut down. Operation of the shutoff valve and thermocouple can be bypassed by **temporarily** securing the button in the open (down) position and starting the heater. If the heater will operate for an extended time in this way, this indicates that the thermocouple and/or shutoff valve is not functioning properly.



INFORMATION SHEET

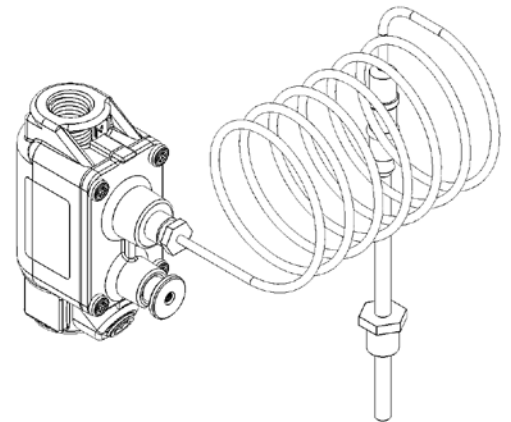
THERMOCOUPLE AND LOW TEMPERATURE SHUTOFF VALVE

How do the valve and thermocouple work?

Catalytic heaters require 3 things to work: Fuel, oxygen and a 250° catalyst. The thermocouple senses the temperature of the catalyst and holds the valve in the open position as long as the catalyst maintains a temperature of 250° F. If the thermocouple senses that the catalyst has dropped below that temperature, the valve will close and the heater will not operate until it is manually restarted with the electric heating element.

What's the **downside** of adding the valve and thermocouple to catalytic heaters?

The downside to adding the valve and thermocouple has to do with the reliability of the heater. Catalytic heaters are typically considered very durable and simple products. When more components are added to the product, more places for potential failures are added as well. The vast majority of the time when a customer is having trouble with a catalytic heater, the problem is the valve and thermocouple.



What's the **benefit** of adding the valve and thermocouple to catalytic heaters?

From a safety standpoint, the valve and thermocouple eliminate the risk of venting natural gas through the face of the heater. The important thing to consider in different applications is how much gas is going to be potentially vented. This is easy to determine based on the BTU ratings of the heaters. The BTU rating for the heaters is on the label on the back of the heater. See table 1 for common enclosures and potential gas venting. It's important to understand the risk that is being mitigated. The question to ask is whether or not that potential amount of vented gas is a concern worth the added expense and time of adding the valve and thermocouple.

Table 1

Potential venting prevented by adding low temperature shutoff valve

Enclosure Part Number	Heater Size	Number of Heaters	Potential Venting
70-015P1	3000 BTU	1	3 SCFH
70-015P2	3000 BTU	2	6 SCFH
70-050P1	2667 BTU	1	2.6 SCFH
70-050P2	2667 BTU	2	5.2 SCFH
70-067P1	6000 BTU	1	6 SCFH
STD2600SS1	2667 BTU	1	2.6 SCFH

THERMOSTAT INSTALLATION INSTRUCTIONS

- The thermostat is installed in the fuel gas train upstream of the heater and downstream from the low pressure regulator. **The maximum input pressure to the thermostat is ½ psi.**
- When deciding where to locate the sensor bulb, ask yourself, “Where is it that I want to sense the temperature?” The bulb should not be directly in front of the catalytic heater, but should be in a location to sense the temperature in the building. The bulb should be in a location similar to a thermostat for a central heating or cooling system.
- Tie straps or clips may be used to mount the bulb to the wall, but the bulb is fragile and will not operate if crushed.

THERMOSTAT OPERATION

- The red dot is the pointer to the dial numbers with 1 equal to the lowest temperature and 10 equal to the highest temperature.
- Turn the dial clockwise to increase the temperature set point; turn the dial counter-clockwise to decrease the temperature set point.
- When the set point is reached, the thermostat valve closes off the primary fuel gas supply. A 50% gas supply flows through a bypass orifice to the heater to sustain the catalytic reaction.



Part Number	40-030	40-006
BTU Range	Less than 24,000 BTU/hr	24,000 BTU/hr and greater
Connection	3/8" NPT	1/2" NPT
Temperature Range	60 – 250°F	50-200°F
Capillary Length	60"	84"