

INSTALLATION AND OWNER'S GUIDE



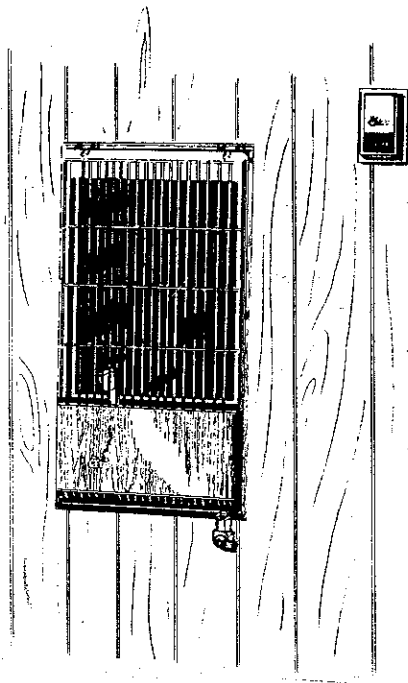
12 VOLT POWER VENTED CATALYTIC HEATER

Models 3P12 and 6P12 for LP GAS only

EFFECTIVE DATE: 6/19/85

INSTALLER MUST LEAVE INSTRUCTIONS WITH THE OWNER AFTER INSTALLATION

IMPORTANT: Installer must have owner fill out and mail warranty card attached to the heater.



THIS IS A HEATING APPLIANCE. ANY SAFETY SCREEN OR GUARD REMOVED FOR SERVICE-ING MUST BE REPLACED PRIOR TO OPERATING THE APPLIANCE.

ANY ALTERATION OF THE ORIGINAL DESIGN, INSTALLED OTHER THAN AS SHOWN IN THESE INSTRUCTIONS OR USE WITH A TYPE OF GAS NOT SHOWN ON THE RATING PLATE IS THE RESPONSIBILITY OF THE PERSON AND COMPANY MAKING THE CHANGE.

Due to high temperatures, the appliance should be located out of traffic and away from furniture and draperies.

Children and adults should be alerted to the hazard of high surface temperature and should be kept away to avoid burns or clothing ignition.

Young children should be carefully supervised when they are in the same room with the appliance.

Do not place clothing or other flammable material on or near appliance.

INSTALLATION AND REPAIR SHOULD BE DONE BY A QUALIFIED SERVICE PERSON. The appliance should be inspected before use and at least annually by a professional service person. More frequent cleaning may be required due to excessive lint from carpeting, bedding material, etc. It is imperative that control compartments, burners, and circulating air passageways of the appliance be kept clean.

FOR YOUR SAFETY

If you smell gas:

1. Open windows.
2. Don't touch electrical switches.
3. Extinguish any open flame.
4. Immediately call your gas supplier.

FOR YOUR SAFETY

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

INSTALLATION INSTRUCTIONS

IMPORTANT

READ ALL INSTRUCTIONS CAREFULLY AND COMPLETELY BEFORE STARTING YOUR INSTALLATION. ALL WARRANTIES ARE VOID IF THE CAT IS INSTALLED OTHER THAN AS RECOMMENDED BY THERMAL SYSTEMS, INC.

GENERAL

Congratulations — you have purchased the safest, most efficient, easiest to operate, and simplest to install vented gas space heater. You have made a wise decision and, properly installed, The Cat will provide you with years of comfortable, dry, radiant heat. As with most products, proper installation maximizes the benefits you will derive from The Cat. For instance: **IT IS MANDATORY FOR SAFETY AND PROPER INSTALLATION THAT THE CAT BE INSTALLED ONLY IN A VERTICAL OR UPRIGHT POSITION.** Always follow industry approved guidelines for installing propane systems. Use only industry approved materials within the system. An example is the use of approved storage lockers and locker locations for propane tanks.

You can either surface mount or recess mount your new Cat heater. For quickest heating results you should choose an unobstructed wall or bulkhead where the sunlike radiant heat is directed towards the area to be heated, although any unobstructed vertical surface will generally be satisfactory.

Remember, radiant heat can be aimed like light and this form of energy will first heat people and objects which will then heat room air. Aiming The Cat at windows or poorly insulated exterior walls will result in unnecessary heat loss.

In marine installations, choose a location for the heater away from ports, hatches and above sloshing bilge water. A space suitable for electronic equipment would be the best choice.

In boats or R.V.'s, the flue terminal must exit the side or roof. The back or transom should not be used because of engine exhaust re-entering the living space. The flue terminal supplied is only suitable for side walls. The drain loop and slope shown can be arranged in a variety of ways, but always so that water will drain out and not accumulate.

A. SURFACE MOUNTING

See appropriate figures for clearances to combustible surfaces. Make sure that the location allows sufficient space for installing your gas supply and exhaust hose. (see figs. 4, 8 and 9)

DUE TO HIGH TEMPERATURE, THE UNIT SHOULD BE LOCATED OUT OF TRAFFIC, AND AWAY FROM FURNITURE AND DRAPES.

ATTENTION: ALL FLUE PIPE MUST BE 1½" SCHEDULE 40 WASTE AND DRAIN PIPE. See figs. 4, 7, 8 and 9.

Step 1 — Remove the guard by depressing it from under each upper retaining clip. Carefully tilt the guard back and lift away from the lower retaining clips. Care must be used so as not to damage the reset switch assembly.

Step 2 — Hold the heater on the wall surface where it is to be installed and with a pencil mark the location of the two upper keyway slots. Make sure that you have allowed enough space for the gas line, exhaust flue, and temperature clearances (fig. 1, 2 and 3). Check for obstructions before drilling.

Step 3 — Center punch the two keyway marks (fig. 1) and drill appropriate holes and screw in the two No. 8 x ¾" screws to within ¼" of the wall surface.

Step 4 — Hang The Cat on the upper mounting screws on the keyway slots provided. Mark and drill the single lower mounting hole to the left of the blower and start the No. 8 x ¾" screw. Tighten all three screws.

B. FLUSH MOUNTING

See figs. 3, 7 and 9 for installation clearances to combustible construction.

DUE TO HIGH TEMPERATURE, THE UNIT SHOULD BE LOCATED OUT OF TRAFFIC AND AWAY FROM FURNITURE AND DRAPES.

Step 1 — Same as Step A-1.

Step 2 — Hold the wire guard on the wall where the heater is to be installed. With a pencil or tape, mark the approximate perimeter. Make sure that you have allowed enough space for the connections and temperature clearances. Remove the guard and mark the exact cutout location per fig. 2. Check for obstructions before cutting.

Step 3 — Using a fine cutting saber saw blade, cut carefully on the lines.

Step 4 — Insert The Cat bottom first at a slight angle. Before inserting the remaining portion, depress the aluminum exhaust extension sufficiently to clear the opening. Using No. 8 x $\frac{3}{4}$ " screws through the holes in the flange, secure the heater in place.

C. EXTERIOR EXHAUST TERMINAL

This terminal is designed to be installed only on sidewalls. Never install it on the roof. The terminal can be located higher or lower than the heater. Form a "drain loop" to allow moisture to drain out. See figs 7, 8 and 9.

Step 1 — Insert the exterior wall fitting and position so the exhaust terminal will be level. Mark the six hole centers, remove the fitting and drill appropriate holes for the No. 8 x $1\frac{1}{2}$ " screws.

Step 3 — Use a good silicone sealant or zinc caulk tape between the wall and the exhaust terminal and secure the terminal and vent cover in place.

AFTER THE INITIAL FLUE RISE SHOWN IN FIGS. 7, 8 and 9 PROVIDE A CONSTANT DOWNWARD SLOPE TO THE FLUE TERMINAL. Sloping sidewalls require a filler block to level the exhaust terminal.

D. EXHAUST FLUE — WARNING: SINCE THE FLUE GASES ARE UNDER SLIGHT POSITIVE PRESSURE, IT IS IMPORTANT THAT ALL VENT JOINTS BE PROPERLY SEALED TO PREVENT LEAKAGE OF CARBON DIOXIDE, AND OTHER COMBUSTION BY-PRODUCTS.

Along with sufficient lengths of $1\frac{1}{2}$ " Schedule 40 plumbing pipe you will need two waste connectors; one to connect to the $1\frac{1}{2}$ " O.D. aluminum outlet tube of the heater and one to connect to the $1\frac{1}{2}$ "

O.D. flue terminal. The terminal provided is only for use on sidewalls. In addition you will need a combination of 45° and 90° elbows to complete the installation shown in figs. 7, 8 and 9. If you choose to make a roof installation per fig. 4, use a vent cap that will offer positive ventilation and prevent water from entering the flue pipe. Total flue length should not exceed 12 feet.

Minimize undue strains on the appliance or flue terminal by loosely connecting and aligning the entire system before tightening or gluing. Use cement suitable for the pipe and connectors. The completed assembly must be supported every two feet.

E. GAS CONNECTIONS

Use approved gas line tubing with a $\frac{3}{8}$ " 45° flare fitting connected to a propane cylinder fitted with a standard low pressure regulator set at 11" W.C. Use industry approved tube connections, securely tightened.

After the system is complete, all gas connections should be checked for possible leaks. With the gas tank supply valve turned on, paint soapy water on each joint; bubbles will indicate a poor connection. *Do Not Test with a Match!* Turn tank supply valve off when completing the installation.

Warning: Complete all electrical wiring before making final power connection.

F. THERMOSTAT AND RESET BUTTON

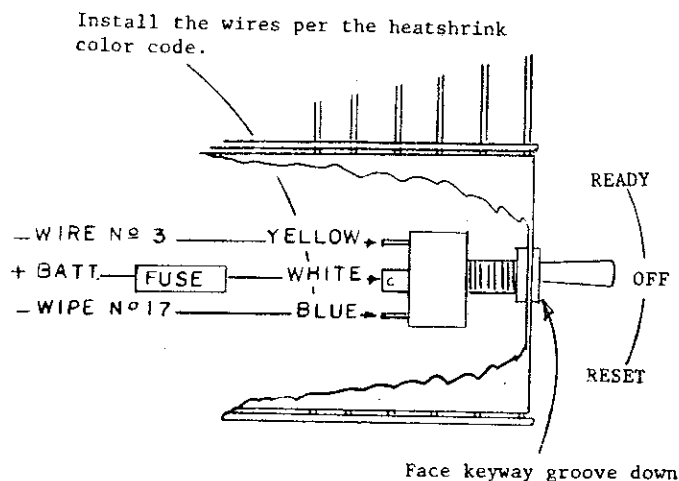
The ideal location is within 5 feet above the floor and within 3 feet to either side of the heater, or you can install the thermostat as close as is practical above the heater. Leave enough room to remove the wire guard.

Step 1 — Mate the cable connector with the 10' thermostat wire to the two-connector plug from the heater.

Step 2 — Route the thermostat wire through the $\frac{5}{8}$ " rubber grommet to the thermostat location and fasten securely to prevent shorts.

Step 3 — Make the wiring connections to the back of the thermostat.

Step 4 - Before replacing the chrome guard, install the Power ON/OFF and RESET Switch as shown.



WARNING: Check the wall thermostat wires for present or potential shorts caused by metal edges, kinks, staples, etc. If the thermostat wires are grounded the heater will run continuously and will not shut off by opening the thermostat contacts.

G. 12 VOLT DC CONNECTION

This appliance is designed for connection to a 12 volt DC automotive or marine battery. Make sure the battery is adequately charged. The gas valve will not open if the voltage drops below 10.5 volts measured at the heater **while in the ignition cycle**. In addition the gas valve will not open if marginal voltage does not provide sufficient blower speed to actuate the proof of vent switch. Adequate wiring will eliminate nuisance lock-outs.

WARNING: Connect the red positive power supply lead directly to the positive (+) terminal of a 12 volt battery or the "Fused positive (+) battery terminal" of a converter. If using existing power wires, insure that the wires are connected to the battery or converter as described.

Measure the best wire route to The Cat and select the correct wire size (see below). One red for positive and one black for negative would be easiest for correct polarity tracing.

- 10 ft from source - No. 16 stranded wire
- 20 ft from source - No. 14 stranded wire
- 30 ft from source - No. 12 stranded wire
- 45 ft from source - No. 10 stranded wire

The heater should have its own circuit.

The appliance, when installed, must be electrically grounded in accordance with local codes or, in the absence of local codes, with the National Electrical Code, ANSI NFPA No. 70-1981.

IF THE GUARD IS REMOVED FOR INSTALLATION OR SERVICING, IT MUST BE REPLACED PRIOR TO OPERATING THE HEATER.

DO NOT USE 110V AC PLUGS OR RECEPTACLES FOR POWER CONNECTIONS.

H. INSTALLER OPERATING PROCEDURES

IF THE GUARD IS REMOVED FOR INSTALLATION OR SERVICING, IT MUST BE REPLACED PRIOR TO OPERATING THE HEATER.

Step 1 — Turn off the fuel supply to unit. Turn on the wall thermostat and allow the heater to run until "timed out" by the circuit board clock. While waiting, (nominal time 2-3½ minutes), alternately block and open the blower outlet. The gas solenoid will "click" on and off. Then with the back of your hand feel the lower 2" of the burner for a slight temperature rise from the ignition wire. Wait for five (5) minutes before proceeding to Step 2.

Step 2 — Turn on the fuel supply. Depress the reset switch.

Step 3 — Turn on The Cat by setting your thermostat at least 5° above room temperature. This call for heat will engage the ignition wire, operate all safety circuits, engage the blower motor and then open the gas valve. When room temperature reaches the thermostat setting, The Cat will shut off automatically. It will start again when the room temperature drops at least 2° below the thermostat setting, or after the 3-5 minute "cooling cycle".

After following the above procedures, should The Cat fail to start or not continue to operate, check the following trouble shooting steps:

- a. Is all wiring properly connected?
- b. Is the reset switch activated? (push and release reset switch)
- c. Is the fuel supply valve turned on?
- d. Is the fuel tank empty?
- e. Is there air in your fuel line? (repeat the starting cycle several times)
- f. Is your battery properly charged?

- g. Is your exhaust flue free of blockages?
- h. Are your fuses operational?
- i. Did you read the SAFETY SHUT-OFF SYSTEM?
(see I. below).

I. SAFETY SHUT-OFF SYSTEM

The Cat utilizes an electronic safety system which will automatically shut off the heater, or will not allow it to start or operate when the following conditions exist. The unfavorable condition must be corrected and in most cases the circuit must be manually reactivated by depressing the RESET SWITCH, located on the right side of the heater, before The Cat can again be operational.

Heater will become inoperative when:

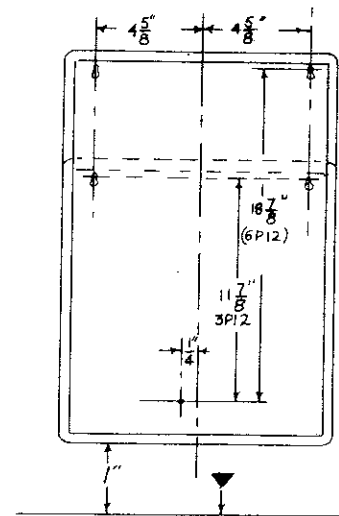
- a. Attempting to start The Cat with the fuel tank in a closed position.
- b. Attempting to start The Cat with the fuel supply tank empty.
- c. Running out of fuel while The Cat is operating.
- d. Attempting to start The Cat with air in the fuel supply line (after switching or filling tanks).
- e. Attempting to start The Cat when the battery is failing or run-down (voltage at the heater must be at least 10 volts during the starting cycle).
- f. The exhaust hose becomes blocked or crimped or when the outside vent has been blocked.
- g. The fuses fail either at the heater or at the electrical supply panel.
- h. The thermostat or power supply wires have become disconnected or shorted.

J. CAUTION

DO NOT ATTEMPT TO REPAIR OR REPLACE ANY PARTS OR COMPONENTS OTHER THAN THE FUSE WITHOUT DIRECTIONS OR INSTRUCTIONS FROM TSI OR TSI'S AUTHORIZED REPRESENTATIVE(S). ALL WARRANTIES ARE VOID IF REPAIRS OR REPLACEMENTS ARE MADE OR ATTEMPTED BY UNAUTHORIZED PERSONNEL.

CAUTION: DO NOT PLACE ANY ARTICLES SUCH AS FURNITURE, DRAPERIES, CLOTHING, ETC. WITHIN 18" DIRECTLY IN FRONT OF THE HEATER WHILE THE CAT IS IN USE.

REQUIRED INLET GAS SUPPLY PRESSURE IS 11.0" W.C. FOR SAFE AND EFFICIENT OPERATION.



SURFACE MOUNTING HOLE LOCATIONS

FIG. 1

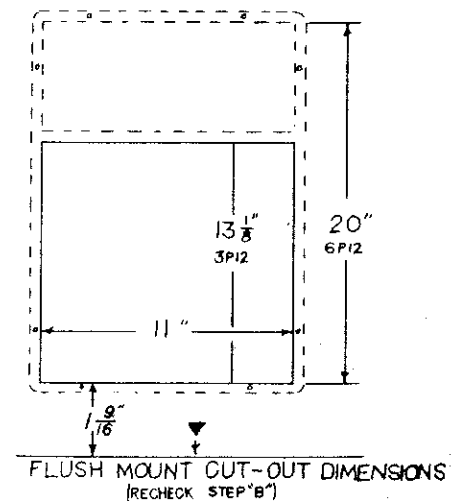


FIG. 2

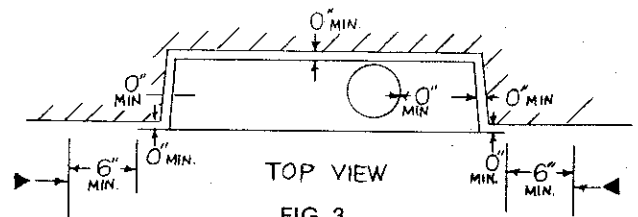


FIG. 3

////// OR ▲ = COMBUSTIBLE MATERIALS

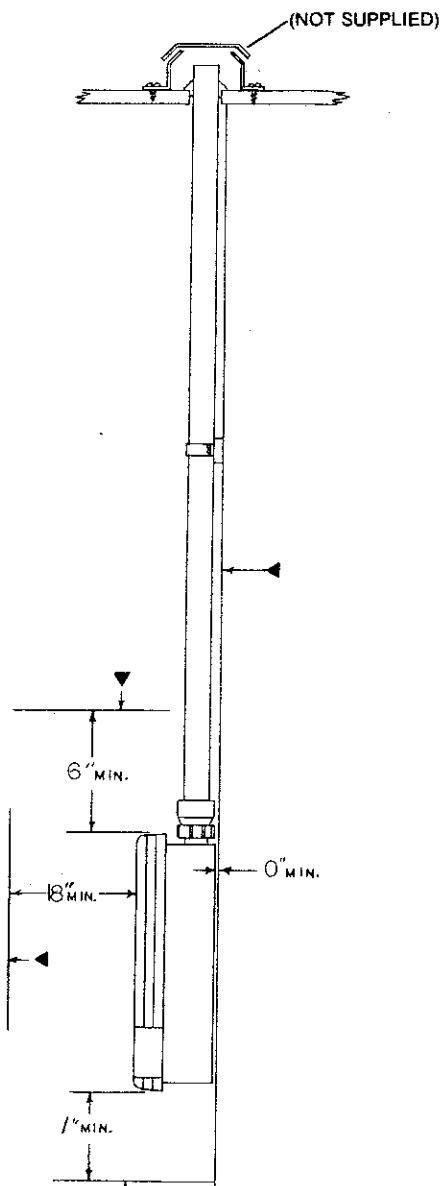
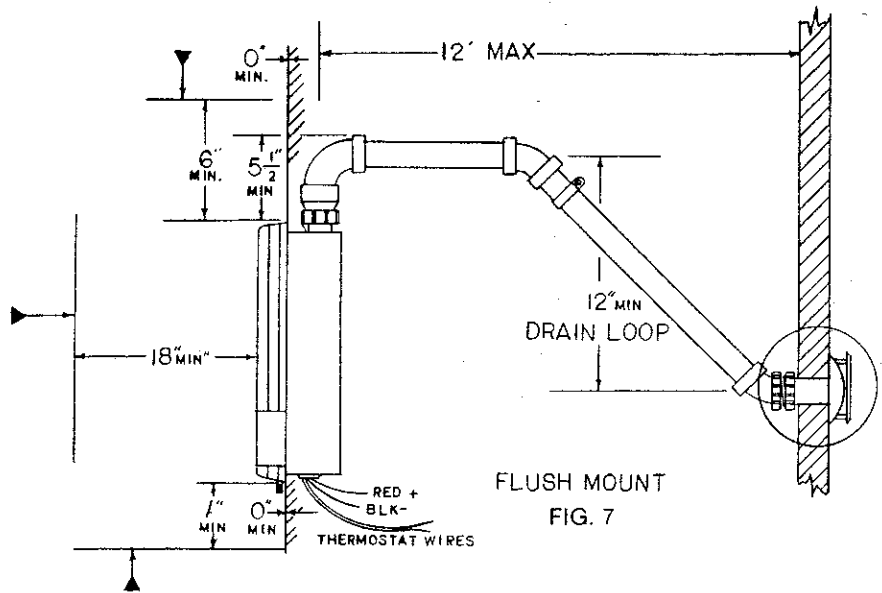
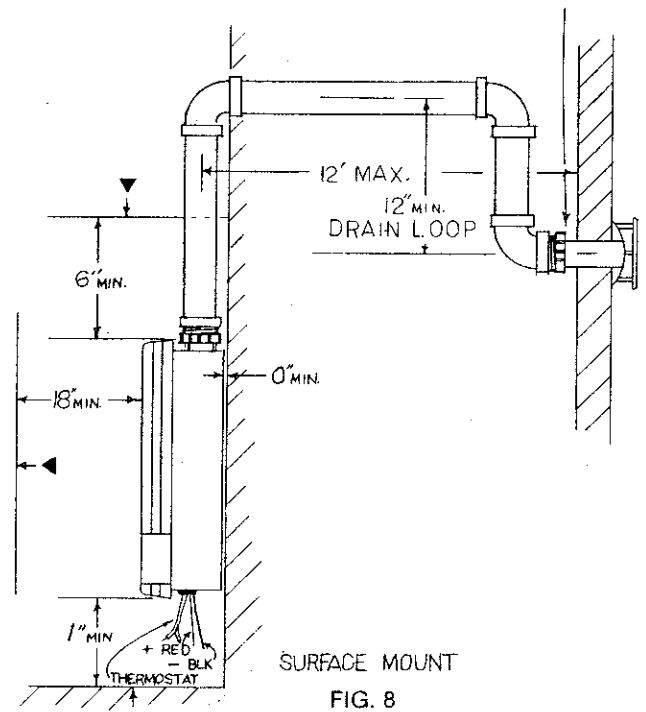


FIG. 4



FLUSH MOUNT
FIG. 7



SURFACE MOUNT
FIG. 8

▲ OR //// = COMBUSTIBLE MATERIAL

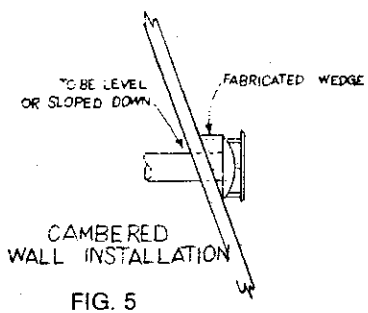


FIG. 5

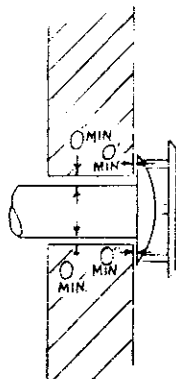


FIG. 6

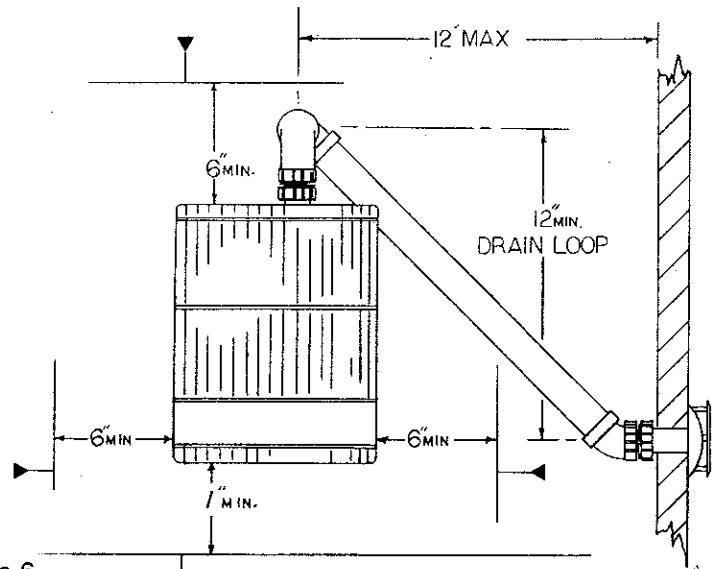
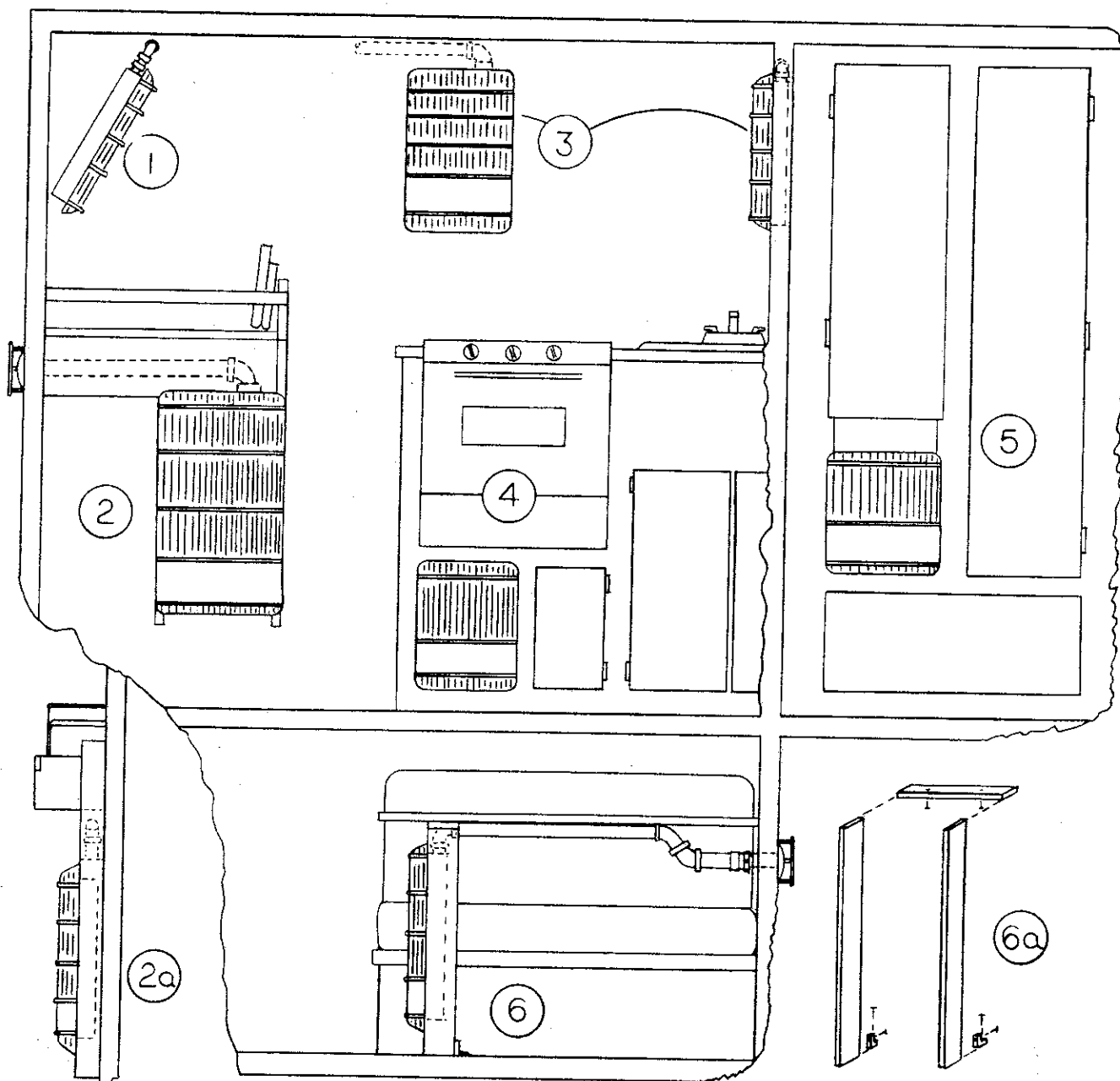


FIG. 9



TYPICAL "CAT" INSTALLATION SUGGESTIONS

1. Heater can be installed near the ceiling with a forward angle of up to 20° which will direct the radiant heat downward into a wide area.
2. A surface mount can be accomplished quickly. Trim molding around the heater and flue pipe can be added later. 2a shows a side view of a simple frame with optional bookshelf.
3. Standard flush mount installation into bulkhead or wall.
4. Flush mount installation into cabinet.
5. Flush mount installation using lower portion of a closet door. Use cut-off portion of door for a new door sill.
6. Under table installation. A simple frame from $\frac{3}{4}$ " x $2\frac{1}{2}$ " stock and two angle brackets shown in 6a will quickly anchor the CAT in a safe, out of the way place. The gas line and wiring can be routed behind and along side of the heater, then parallel with the flue pipe before branching to the nearest gas and electric sources and thermostat location.

OPERATING INSTRUCTIONS

A. SEQUENCE OF NORMAL OPERATION

1. When the wall thermostat calls for heat the control module, ignition wire and vent blower are energized.
2. After the vent sensor detects sufficient moving air from the blower the gas valve circuit is energized. The open valve allows gas to fill the burner and move toward the hot wire for ignition.
3. Catalytic combustion will slowly be observed and within 210 seconds the combustion sensor will detect combustion and turn off the pre-heat wire and the lock-out timers. The heating cycle will continue until the thermostat is satisfied.

If the burner does not ignite or if the combustion sensor does not de-energize the lock-out timers within 210 seconds, the unit will lock-out. Push the reset switch for a second trial for ignition. If, after a second or third try, the burner fails to ignite, go to shut-down (see Section C) and determine the cause.

B. OPERATING PROCEDURES

(Follow this sequence)

1. Turn the wall thermostat to "off" or the lowest position. Turn on the power supply. WAIT FIVE MINUTES.
2. Turn manual gas valve on.
3. Turn on the heater's on-off switch and activate the reset switch. See F-4, page 4 for switch positions.
4. Push the thermostat on-off switch to "on". Set the thermostat to the desired temperature. It will start automatically and when the desired temperature has been reached the heater will shut off automatically.
5. Should the heater fail to start or not continue to operate, proceed as follows:
 - a. Check to see if the 12 volt circuit to the heater is turned on.
 - b. Check to make sure the gas supply is turned on.
 - c. Push the reset switch located on the bottom panel of the heater.

- d. Check to make sure that the exhaust blower is operational.
- e. Check to make sure that the flue pipe or outside flue terminal is not blocked.
- f. Check the heater's fuse. **FIRST UNPLUG OR DISCONNECT THE 12 VOLT POWER SUPPLY.** Remove the inline fuse and replace, if necessary, with an identical 4 amp fuse.

ALL OF THE ABOVE CONDITIONS CAN BE EASILY CHECKED AND CORRECTED. SHOULD CONDITIONS OTHER THAN THE ABOVE CAUSE THE HEATER TO FAIL TO START OR OPERATE, CONSULT YOUR DEALER OR THERMAL SYSTEMS, INC.

C. SHUT DOWN INSTRUCTIONS

- 1) The safety controls draw a modest .03 Amps of standby current. To avoid battery drain when the heater will not be used for several weeks or more, turn the power switch to the "off" position. In addition, turn off or close the manual gas valve(s).

SERVICE HINTS, DIAGNOSIS, CORRECTIVE ACTION

A. Complaint: Unit will not operate.

1. Thermostat Off - Place on-off switch in the "on" position. Check the contacts. The wire(s) could be off of the terminals or the in-line connector at the heater could be corroded or misaligned.
2. Heater Power Switch Off - Make sure that the heater's on-off power switch is in the "on" position.
3. Lock-Out Controls - The heater could be in the "fault" position. Push the reset switch.
4. Electrical Polarity - the red wire must be connected to the positive battery lead. See Section F.
5. Check the heater's +12v inline fuse after disconnecting the heater circuit at the main fuse or breaker. If it is necessary to replace the heater fuse, use **only** a 4 amp fuse of identical size.

B. Complaint: Units runs, but no heat.

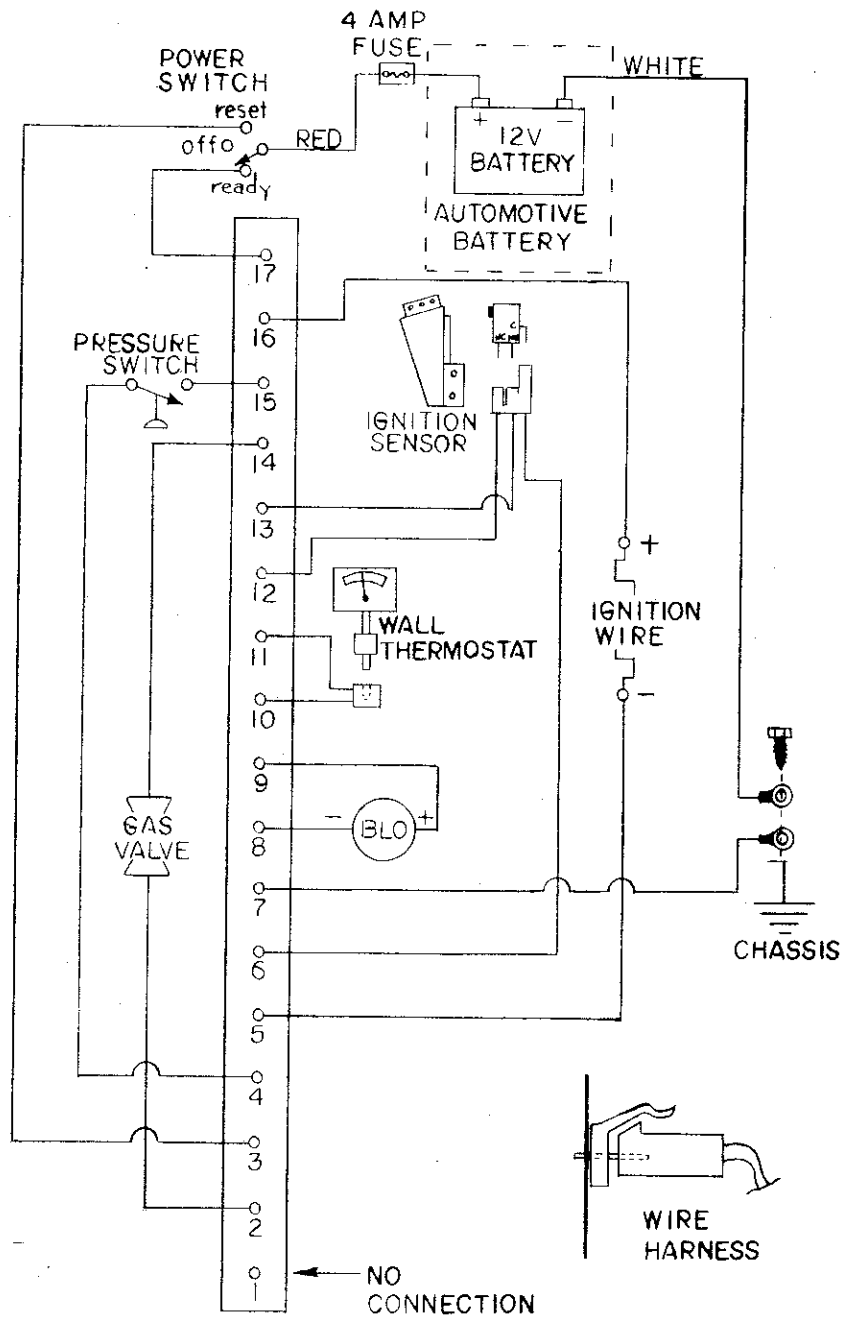
1. Gas Supply — The manual gas valve must be completely on (handle parallel to the gas line). Check the supply line and fittings for leaks.
2. Electrical Power - If the voltage at the heater power leads, measured during the ignition cycle, falls below 10.5 volts, the gas valve will not open. Charge battery, check for loose or corroded connections. Check the heater's fuse and the branch circuit fuse.
3. Ignition Pre-Heat Failure - Turn the gas supply off, remove the wire guard and turn the heater on. With the back of your hand close to the lower 1/3 of the burner, you should feel a slight rise in temperature from the ignition pre-heat wire. If not, turn off the power and check for proper connection of the two ignition lead wires on the left side of the burner.
4. Inadequate Flue Discharge (See Section C, Installation). An obstruction or foreign material in the flue pipe may cause inadequate venting and must be cleared out for the gas valve to open and close properly. Alternately close and open the thermostat contacts. You should hear the gas valve open and close. If not, remove the roof stack vent cover and check for proper clearance between the flue pipe and the vent cover. (See figs. 3,4,7 & 8). Make sure that all flue elbows are of the extra long turn type and do not exceed 450° in total.
5. Inadequate Combustion and Ventilation Air - Since the hourly requirements are considerably below the normal leak rate of the tightest construction, this is not expected to cause the gas valve to chatter or close. If opening a window or outside door does not solve the problem, recheck (2) and (4) for marginal conditions.

C. Complaint: Excessive noise.

1. Chattering Gas Valve - inadequate flue discharge (see B-4 above).
2. Blower Noise - a "buzz saw" or "rattling" noise could be debris in the blower housing. Turn the power off, remove the four screws holding the motor assembly plate on the blower case. The motor/blower assembly can be removed for inspection.

D. CARE OF THE HEATER

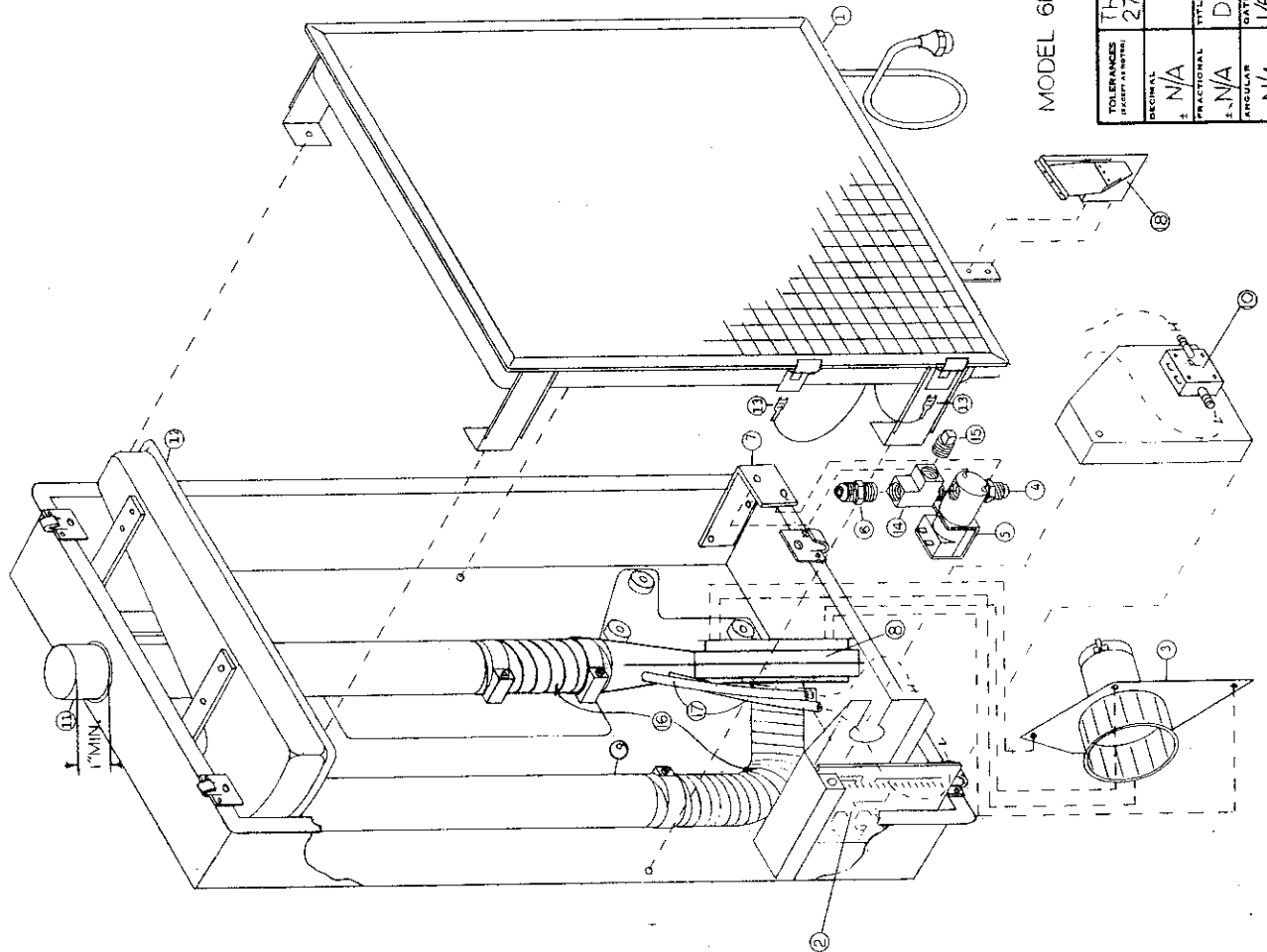
1. The case may be cleaned with a damp cloth. Abrasives must not be used. The chrome plated grill may be cleaned with a dry cloth.
2. Occasionally run a vacuum cleaner over the outer grill to remove possible dust collection. CAUTION: Do not bring the vacuum cleaner in direct contact with the catalytic pad.
3. If the heater is not to be used for a prolonged period of time, perform the following procedures:
 - a) Set the thermostat in the "OFF" position.
 - b) If a separate gas shut-off valve is used in that gas line supplying the heater, make sure that it is turned off.
4. After the heater has not been used for a prolonged time, perform the following procedures before operating:
 - a) Run a vacuum cleaner over the outer grill to remove possible dust collection. Do Not Vacuum the Burner Surface!
 - b) Depress Reset Switch.
 - c) Follow standard operating procedures and check "Safety Shut-Off" conditions.
5. Under no circumstances allow the heater to become wet. This will cause damage to the catalytic pad, ignition wire, and circuit board.



DC-9 WIRE DIAGRAM

FIG. 1

DATE	TOLERANCES (EXCEPT AS NOTED)	P/N	SCALE	DRAWN BY	THERMAL SYSTEMS INC MOTTMAN INDUSTRIAL PARK 2757 29TH ST. S.W. TUMWATER, WA. 98502 U.S.A. (206) 352-0539 TELEX: TSI TUMW 32-1012
2-13-85	DECIMAL ± N/A	N/A	N/A	APPROVED BY	
DRAWING NUMBER	FRACTIONAL ± N/A	TITLE DC 9 WIRE DIAGRAM (SPDT POWER SWITCH)			
253-B	ANGULAR ± N/A				



MODEL 6PI2, 3PI2

TOLERANCES UNLESS OTHERWISE SPECIFIED		THERMAL SYSTEMS INC 206 - 352 - 0589 2757 29th AVE SE TUMWATER WA 98502	
DECIMAL	1 N/A	DATE	1/6/81
FRACTIONAL	1 N/A	TITLE	DC CONSTRUCTION FIGURE
ANGULAR	1 N/A	DRAWING NUMBER	67
DESIGNED BY		APPROVED BY	
DRAWN BY		CHECKED BY	
DATE		REVISION	
1/6/81		7/15/82	

MADE IN U.S.A.

HOW TO ORDER PARTS

Before ordering parts you will need to obtain the Model No. and Serial No. from the Name Plate on the bottom mounting lip. Then determine the Index No. and the Description of each part from the following list and illustration. Be sure to give all this information.

Heater Model No. _____

Serial No. _____

Index No. & Description _____

Index No.	Description
1.	Burner Assembly (install with 4 #8 x 1/4" sheet metal screws)
2.	Circuit Board - Slides into junction box with wire harness (not shown) connected. Make sure that the harness plug engages the ramp correctly and the harness grommet is slid into the key way hole.
3.	Blower and Motor Assembly (install with 4 #6 x 3/16" sheet metal screws)
4.	Gas Inlet 3/8" Flare x 1/8" NPT or 1/4" Flare x 1/8" NPT
5.	Gas Valve Assembly (install with 2 8-32 x 1/4" machine screws)
6.	Gas Metering Orifice — 3P12 - Color Code Red 6P12 - Color Code Green 3N12 - Color Code Yellow (transparent) 6N12 - Color Code Brown
7.	Gas Valve Bracket
8.	Blower Housing
9.	Exhaust Inlet Pipe
10.	Pressure Differential Switch and Junction Box Cover - Connect to pressure taps (17) as shown
11.	Flue
12.	Plenum Assembly
13.	Ignition Wire Leads
14.	Pressure Test Tee
15.	Pressure Test Plug
16.	Aluminum Flex Duct (1 1/2" I.D.)
17.	Pressure Differential Taps
18.	Combustion Sensor