

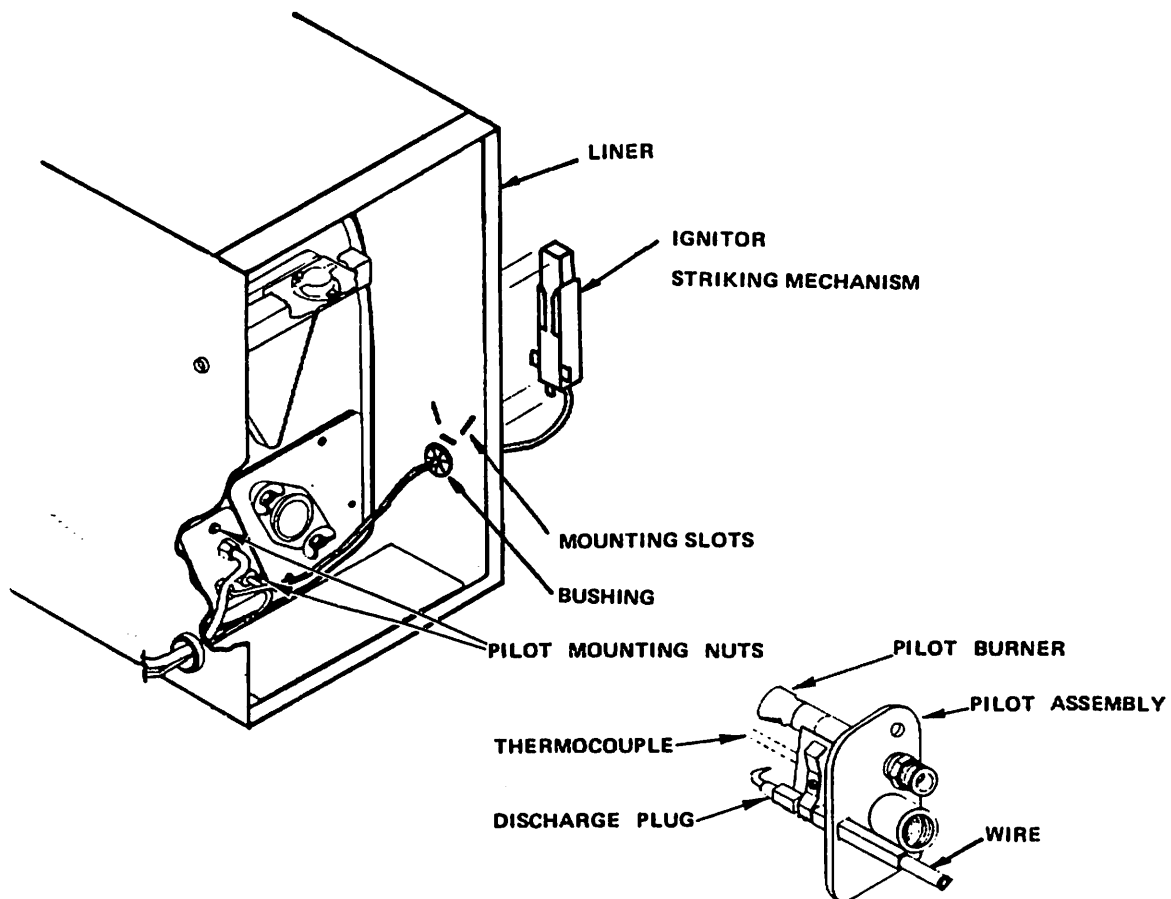
# DUO-THERM

# 1

## PIEZO SPARK IGNITION KIT PART NO. 3-16941

THIS KIT INSTALLED ON YOUR HEATER ELIMINATES THE NEED FOR MATCHES.  
SIMPLE TO INSTALL & EASY TO USE. PROVISIONS FOR INSTALLATION ARE PROVIDED.

NOTE: CERTAIN MODELS ALREADY HAVE THE PIEZO  
IGNITOR INSTALLED. CHECK YOUR UNIT BEFORE  
ORDERING THIS KIT. THIS KIT WILL NOT FIT ON UNITS  
WITH ELECTRONIC IGNITION (WITHOUT PILOT BURNER).



TO ORDER PIEZO IGNITION KIT, REFER TO YOUR DIRECTORY OF AUTHORIZED  
SERVICE CENTERS FOR A LISTING IN YOUR AREA.

# DUO-THERM

## OWNERS MANUAL FOR 66100 SERIES FURNACES



### Gas-Fired Fan Type Direct Vent Wall Furnaces For Recreational Vehicles

### Pilot Models

#### FOR YOUR SAFETY

##### IF YOU SMELL GAS:

1. OPEN WINDOWS
2. DON'T TOUCH ELECTRICAL SWITCHES
3. EXTINGUISH ANY OPEN FLAME
4. VACATE PREMISES UNTIL VENTILATION IS COMPLETE AND GAS SOURCE IS FOUND AND CORRECTED.
5. IMMEDIATELY CALL YOUR SUPPLIER

#### FOR YOUR SAFETY

CLOTHING OR OTHER FLAMMABLE MATERIAL SHOULD NOT BE PLACED ON OR NEAR THE APPLIANCE.

DO NOT STORE OR USE GASOLINE OR OTHER FLAMMABLE VAPORS AND LIQUIDS IN THE VICINITY OF THIS OR ANY OTHER APPLIANCE.

CHILDREN AND ADULTS SHOULD BE ALERTED TO THE HAZARDS OF HIGH SURFACE TEMPERATURES AND SHOULD STAY AWAY TO AVOID BURNS OR CLOTHING IGNITION.

YOUNG CHILDREN SHOULD BE CAREFULLY SUPERVISED WHEN THEY ARE IN THE SAME ROOM AS THE APPLIANCE.

IF THE FRONT GRILLE IS REMOVED FOR SERVICING IT MUST BE REPLACED PRIOR TO OPERATING THE APPLIANCE.

#### WARNING

THIS UNIT MUST BE SERVICED ONLY BY AN AUTHORIZED SERVICEMAN. MODIFICATION OF THE APPLIANCE CAN BE EXTREMELY HAZARDOUS AND COULD LEAD TO SERIOUS INJURY OR DEATH.

FUEL BURNING APPLIANCES GENERATE TOXIC FLUE PRODUCTS. MODIFICATION OR IMPROPER MAINTENANCE CAN CAUSE CARBON MONOXIDE IN DEADLY AMOUNTS. TO PREVENT THIS, MAINTAIN APPLIANCE IN SAFE OPERATING CONDITION.

- DO NOT** BLOCK OR MODIFY ANY COMBUSTION AIR OR FLUE GAS PASSAGEWAYS.
- DO NOT** ADD ANY DEVICES OR ACCESSORIES TO THIS APPLIANCE EXCEPT THOSE SPECIFICALLY AUTHORIZED BY DUO-THERM.
- ALWAYS** CONSULT YOUR AUTHORIZED SERVICEMAN FOR ANY PROBLEMS OR QUESTIONS YOU MAY HAVE PERTAINING TO THIS APPLIANCE.
- ALWAYS** INSPECT THE APPLIANCE BEFORE STARTING A NEW HEATING SEASON, PAYING SPECIAL ATTENTION TO COMBUSTION AIR, FLUE GAS PASSAGEWAYS AND FUEL LINES.

**■ IMPORTANT INSTRUCTIONS ■  
MUST STAY WITH UNIT  
OWNER - READ CAREFULLY**

KEEP FOR FUTURE REFERENCE.

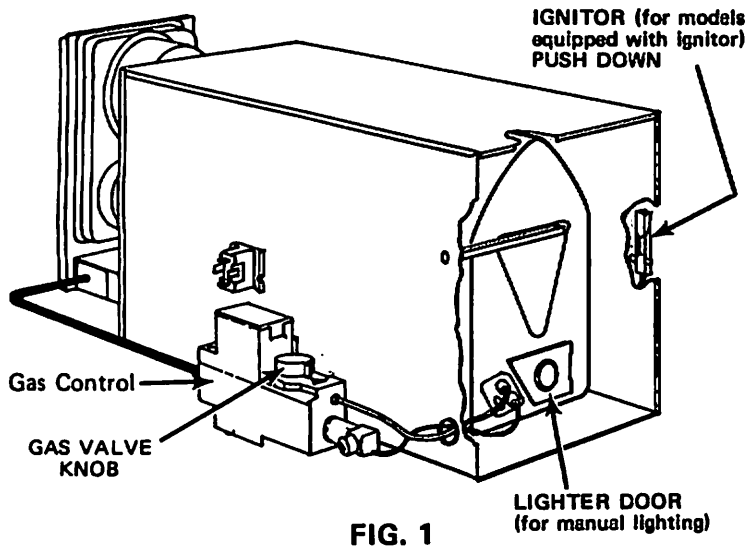
MANUFACTURED BY THE DOMETIC CORPORATION FOR:  
SUBURBAN MANUFACTURING COMPANY  
P.O. Box 399  
Dayton, TN 37321

FOR WARRANTY / SERVICE ASSISTANCE CALL:  
(615) 775-2131

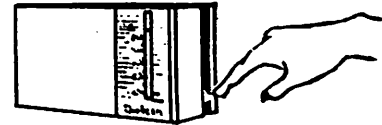
3102342.007

# 1. OPERATIONAL CHECKOUT

**IMPORTANT:** Failure to follow these lighting instructions exactly may result in damage to the unit.

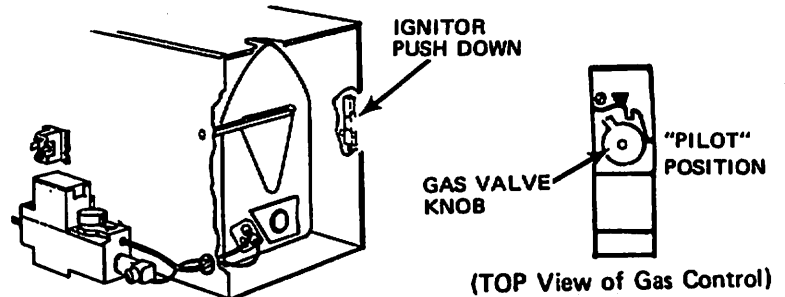
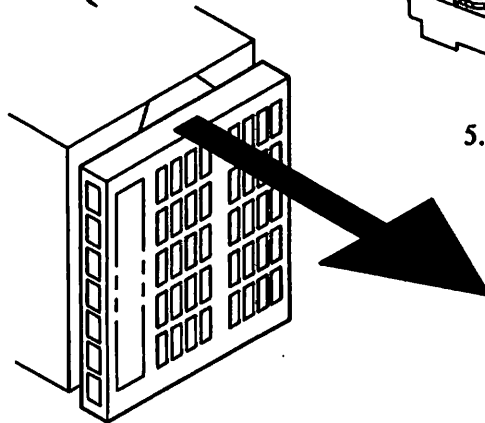
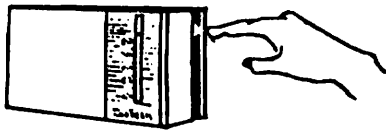


3. Reset thermostat to lowest setting. (Blower will stop after a short time.)

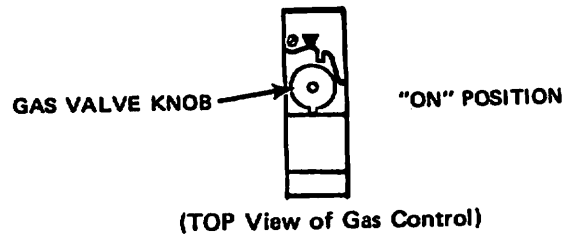


4. Turn gas valve knob to "PILOT" position. Depress knob and light pilot with match or by depressing igniter on models provided with piezo igniter. Several strokes may be required before gas will ignite. On the initial lighting the pilot may not light immediately due to air in the gas line. If such is the case, it may be necessary to hold the gas valve knob "IN" for a minute or more before the pilot lights. When the pilot continues to burn, hold the knob in for approximately 30 seconds or until the pilot remains lighted when the knob is released. **IF THE PILOT GOES OUT**, repeat Steps 1 through 4, allowing longer time before releasing the gas valve knob.

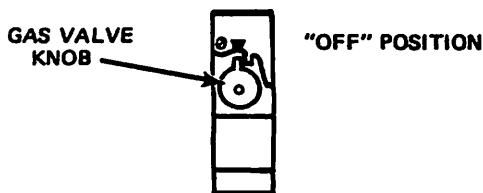
1. Set thermostat to highest setting. (Blower will start and purge any unburned gases from the heat exchanger.) Remove furnace front panel by pulling straight out.



5. Turn gas valve knob to full "ON" position. Correct operation of the unit depends on this valve being in the full "ON" position. Never attempt to operate the unit with valve partially closed.



2. Turn gas valve knob to "OFF" position. **WAIT FIVE (5) MINUTES.**



6. Replace furnace front panel.
7. Set thermostat at desired temperature. Furnace will now operate automatically.

**FOR COMPLETE SHUTDOWN, DEPRESS GAS VALVE KNOB AND TURN TO "OFF". SET THERMOSTAT TO "OFF" SETTING.**

## 2. SEQUENCE OF NORMAL OPERATION

1. When the thermostat calls for heat, a delay of 15 to 30 seconds will occur before the fan motor is energized.
2. As the fan motor reaches approximately 75 percent of its normal r.p.m. (within 1 to 2 seconds) the combustion air switch, in response to the air flow, will engage, allowing current flow to the gas valve.
3. The gas valve will open and allow gas to the main burner. The pilot light then will ignite the main burner.
4. When the thermostat is satisfied or turned back, the gas valve will close and the flame on the main burner will go out. The blower will continue to run for a short period of time and will then shut off. The purpose of this is to remove most of the remaining gases and heat from the heat exchanger.

## 3. PIEZOELECTRIC IGNITION SYSTEM

This "spark pump" igniter is available as optional equipment on all pilot models to facilitate more convenient lighting.

Depressing the "ignition button" creates a spark. In the event the unit does not readily light with the igniter, it is possible the igniter tip may need repositioning. Align the igniter tip with the pilot gas flow.

On initial lighting, air in the gas line may require several pumps of the "igniter button" for ignition.

The igniter does not prevent lighting the pilot with a match if necessary.

## 4. TIME DELAY FAN RELAY

This relay controls the sequence of the blower operation. When the bimetal disc of the relay is heated internally to the operating temperature, the switch closes. This completes the circuit to the motor. The blower will continue to run as long as the relay is hot even though the thermostat is satisfied and the main burner is off. When the relay sensor cools, after the thermostat is satisfied, the switch opens and the blower shuts off. See the figure below for terminal orientation.

## 5. LIMIT SWITCH

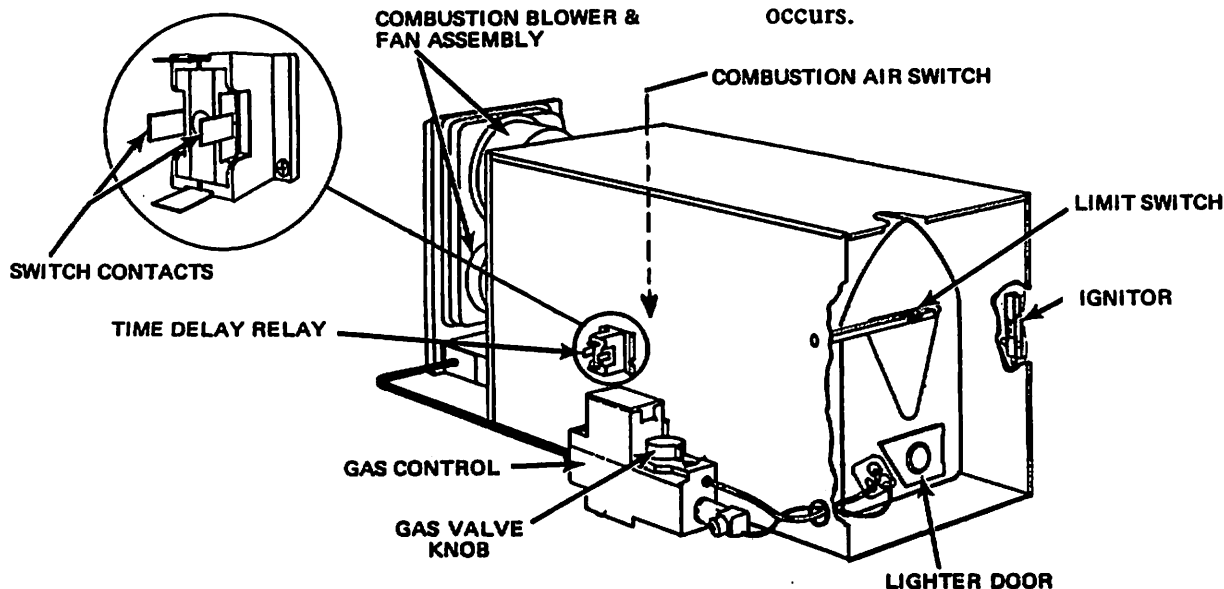
The purpose of the limit control is to turn off the gas to the main burner if for any reason the furnace becomes abnormally hot. If the circulating air is blocked, even partially, the limit control will function and cause the main burner to cycle. If cycling of the limit control occurs, the circulating air passage should be thoroughly cleaned.

If the limit control is damaged, it can not be repaired. It must be replaced with a new one. **CAUTION: NEVER SHORT ACROSS OR BYPASS THE LIMIT CONTROL EVEN FOR ONLY TEMPORARY OPERATION.**

## 6. AIR SWITCH

The combustion air switch has two purposes:

1. It is an "air prover". It operates in response to the flow of air generated by the fan. Hence, if for any reason the air from the fan is not sufficient, the switch will not operate. One cause of insufficient air is a slow motor caused by low voltage.
2. The switch allows time for the blower to pull in a sufficient amount of air to support combustion before it engages. Once it engages, the gas valve opens, gas flows to the main burner and ignition occurs.



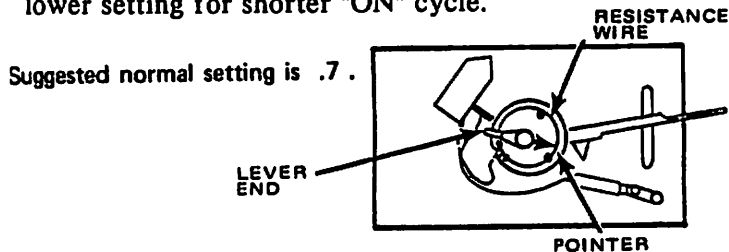
## 7. BLOWER ASSEMBLY

One motor is used to drive both the combustion air wheel and the circulating air fan blade. Although one motor drives both, the wheel and fan blade are separate. The combustion air blower is sealed so as to allow no passage of air between it and the circulating room air fan. The combustion air blower draws air from the outside atmosphere, discharges it into the combustion chamber, and forces the combustion products out the exhaust tube. The circulating room air fan blade pulls return air in and forces it across the heat chamber discharging it into the area to be heated.

## 8. THERMOSTAT ADJUSTMENT

This unit is equipped with an adjustable thermostat. Improper setting of the heat anticipator can cause either abnormally short or long heating cycles resulting in discomfort.

Cycle system to determine if cycling rate is satisfactory. If adjustment is necessary, move pointer to a higher setting for longer "ON" cycle and to a lower setting for shorter "ON" cycle.



## 9. MAINTENANCE & CLEANING

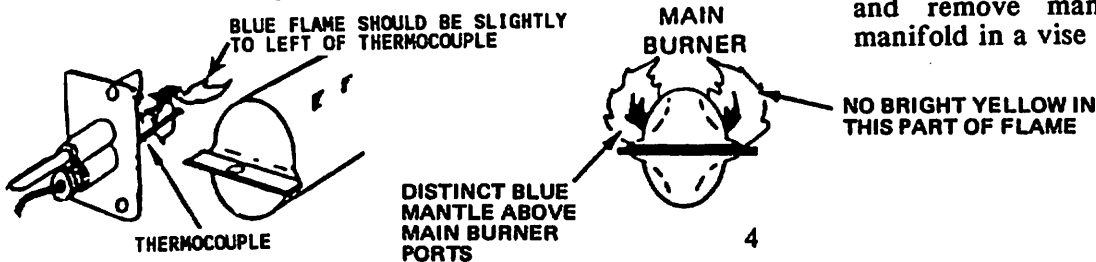
**NOTE:** For continued satisfactory performance of this unit, it is necessary for the control compartment to be kept clean. It is also important that the appliance area be clear and free of combustible materials, vapors and liquids.

If the main burner has been allowed to operate with a high yellow flame, a soot formation may be deposited inside the combustion chamber. The carbon deposit may be of such quantity that cleaning will be necessary. A vacuum cleaner is ideal to clean out any carbon deposit in the combustion chamber.

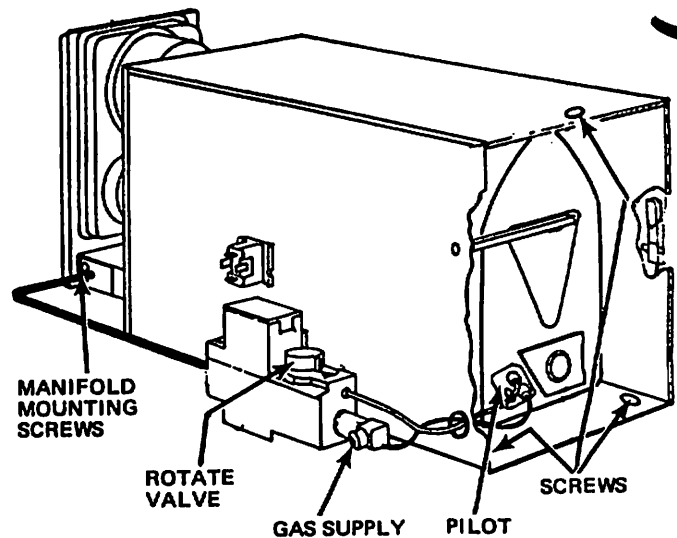
Routine inspection, maintenance and cleaning of burner, pilot flame, venting system and gas connections is recommended at least on a yearly basis.

This unit is equipped with a sealed motor and requires no oiling.

The main burner and pilot burner should be examined periodically to be sure that a distinct blue mantle is visible and that bright yellow tips are not evident. See "FURNACE ASSEMBLY REMOVED" illustration at the top of this page.



## FURNACE ASSEMBLY REMOVED



## 10. TO REMOVE FURNACE FOR SERVICE

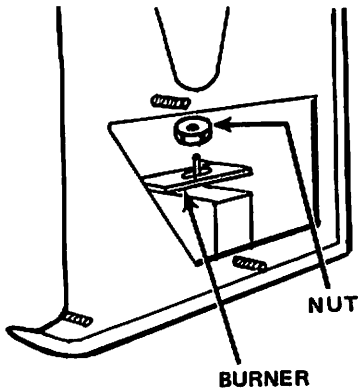
1. Remove the furnace front panel by pulling straight out.
2. Disconnect wiring.
3. Disconnect gas supply. (Be sure gas supply to the unit is turned off).
4. Remove screws securing furnace to cabinet.
5. Remove the vent cap screws (outside) and remove vent assembly.
6. Pull furnace forward and remove.

## 11. TO REMOVE BURNER & GAS VALVE

1. Remove nuts holding front close-off plate and remove plate.
2. Remove nut holding burner in place.
3. Raise burner off mounting pin and remove.
4. Burner orifice may now be serviced with long extension and 1/2" socket.
5. To replace gas valve disconnect pilot line and thermocouple, remove manifold mounting screws and remove manifold from furnace. Place manifold in a vise to remove gas valve.

## TO REPLACE BURNER

1. Center orifice end of burner over orifice, slide other end over burner mounting pin.
2. Reassemble nut over burner mounting stud until it is firmly against burner.
3. Replace close-off plate and secure with nuts.



## **12. SERVICE HINTS, DIAGNOSIS & CORRECTIVE MEASURES**

INSTALLATION 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.

### **A. COMPLAINT - NO HEAT**

1. Check electrical supply to make sure that 12 volt DC is available at unit. Battery must be charged. If battery is low, there may be sufficient power to run the blower but not enough to run the blower at full speed. If blower does not run at its prescribed speed, the combustion air switch cannot engage and gas will not flow to the main burner. Be sure the connections to the voltage lines are tight.
2. Manually rotate fan to make sure motor is free to turn.
3. Check for blown fuse in 12 volt circuit to furnace.

### **SHORT CIRCUIT CHECKOUT**

4. If fuses are blown, a short is indicated and should be checked.
  - a. Turn off all appliances including furnace.
  - b. Install an ammeter on the positive (+) lead of the battery. Amperage reading should be 0. If an amperage reading is noted, a short exists in the vehicle electrical system.
  - c. Disconnect the red (+) DC lead at the furnace. If the amperage continues, the short is exterior to the furnace. If the amperage reading ceases,

6 the furnace electrical system is shorted or miswired (see Section E - COMPLAINT - AMPERAGE DRAW THROUGH FURNACE WITH THERMOSTAT "OFF") and should be checked.

5. **GAS SUPPLY:** Be sure manual gas valve is in the OPEN position.
6. **PILOT:** Check to be sure pilot is lit (pilot outage discussed in "B" category).
7. **THERMOSTAT OFF:** Check to be sure thermostat is properly wired and is calling for heat.
8. **MALFUNCTIONING COMBUSTION AIR SWITCH:** Be sure the combustion air switch is moving far enough to close its contacts. If the switch is not closing, clean any dust or dirt from the actuator pin. Other reasons for switch not operating are:
  - a. **Insufficient fan speed** (slow motor due to low charged battery, faulty motor or line and dust accumulation restricting return air to furnace). Check wiring in accordance with unit's wiring diagram to assure that the proper polarity of the 12 volt DC power supply is observed. On certain models this polarity must be observed so the motor will run the proper direction of rotation to insure correct air delivery.
  - b. **Faulty Combustion Air Switch:** Replace switch if valve does not open when switch is engaged. Switch should also be replaced if battery is fully charged and with the fan motor running at top speed the switch fails to engage within 3 to 4 seconds.

**NOTE:** To service switch, heating assembly must be pulled out.

9. **GAS CONTROL VALVE:** With test light check valve terminals. If voltage is present, but valve is not opening (when combustion air switch engages), replace control valve.
10. **FAN NOT OPERATING:** Check for burned-out motor or loose wiring terminals.
11. **DEFECTIVE FAN RELAY:** Relay may be at fault if motor fails to start when thermostat calls for heat. This can be suspected if the thermostat is raised and the motor fails to operate within 60 seconds.

### **B. COMPLAINT - PILOT OUTAGE**

Troubleshooting for pilot outage problems on this model is greatly simplified if it can be determined at what time the pilot goes out during the heating cycle. Outage which occurs during one part of the cycle usually has a different cause than outage which occurs during another part of the cycle.

1. **"OFF" CYCLE: Main burner and blower not operating.**

- a. The unit has a sealed combustion chamber with an air intake and exhaust subject to the same atmospheric pressure. Therefore, the pressure within the chamber is equalized and air is steady. Regardless of the wind or draft condition, the pilot will not be blown out as long as the chamber is sealed properly. If, however, a leak is evident anywhere in the sealed combustion system, it would disrupt the pressurized chamber and an air movement would commence. As a result, the pilot could possibly go out.

The following points should be checked carefully for air leakage:

- 1) Combustion air pipe and exhaust pipe connections. These pipes must project into the furnace at least 1-1/4" and the connection should be snug. The maximum distance that these pipes may project into the furnace is 3-3/4". If the pipes are too long the combustion air inlet will be restricted and the flame will suffocate.  
If the vents are not correct, replace with a longer or shorter vent, as required.
- 2) It is very important that all gaskets in the sealed combustion system be tight. Gaskets which become damaged during service of the unit must be replaced.

- b. **PILOT ADJUSTMENT:** Pilot should be adjusted to where the pilot flame just envelopes the thermocouple tip. This is best accomplished by using a millivolt meter. Pilot should be adjusted to obtain a minimum millivolt reading of 10 millivolts. Unlike most heating equipment, too large a pilot flame in this unit will cause pilot outage. A limited amount of air is circulating through the heat chamber during the "OFF" cycle and if the pilot is too large, this air will not be sufficient to support combustion and the pilot will suffocate.

This problem will be amplified when the unit is operated at elevations over 4500 feet above sea level. At these higher altitudes it is imperative that the pilot flame is adjusted properly to insure proper operation.

The pilot adjustment screw is located under a screw cap next to the gas control knob. On some controls the adjustment screw must be turned in (clockwise) several revolutions before the pilot flame starts getting smaller. **BE SURE TO REINSTALL THE SCREW CAP** after adjusting pilot.

- c. **GAS PRESSURE:** Check gas manometer. Correct operating pressure for the system is 11" water column. Low gas pressure will cause the pilot flame to become smaller, creating a low millivolt output from the thermocouple;

high gas pressure will cause a larger pilot flame, requiring more combustion air, which could cause pilot to suffocate.

**NOTE:** If gas pressure is checked at the cooktop or range, be sure that there is no pressure regulator present or an incorrect reading will be obtained.

- d. **LEAKING GAS CONTROL:** If gas leaks through the gas control during the "OFF" cycle, it will burn, using up the oxygen in the chamber and causing the pilot to go out. Observe the main burner through the lighter door to be sure that the burner cuts off completely on the "OFF" cycle. If any flame is present on the burners, it indicates that a small amount of gas is leaking through. If there is any leakage, replace the gas control.

2. **BLOWER OPERATION CYCLE - MAIN BURNER ON**

- a. **NO COMBUSTION AIR:** If main burner flame is floating off of burner and rolling in chamber, it indicates lack of incoming air. Check vent pipe installation as outlined in Section 1. "OFF" CYCLE. Also, check for any restriction in combustion air inlet and exhaust sections of unit. Check to be sure small combustion blower wheel is tight on motor shaft, and motor is rotating in proper direction.

- b. **GAS PRESSURE DROP:** If pilot flame diminishes or goes out when the main burner comes on, it indicates a pressure drop in the gas supply to the gas control. Check for a defective (or undersized) tank regulator, or any restriction in the gas supply lines (kinked tubing, excessive pipe compound in fittings, etc.)

- c. **NO BLOWER AFTER-CYCLE:** The blower relay is a time-delay device designed to operate the blower for 30 to 45 seconds after the thermostat has opened and the main burner has shut down. If the blower shuts off at the same time as the burner, combustion fumes will be left in the chamber and pilot suffocation may occur. Check for incorrect wire connections at the furnace. Thermostat wire and 12 volt connections must be exactly as shown on the wiring diagram.

- d. **MAIN BURNER INCORRECTLY INSTALLED:** The main burner must be installed with the openings on top. If openings are on the bottom, burner will not operate properly. Remove burner and install correctly.

### 3. BLOWER OPERATION CYCLE - MAIN BURNER OFF

**LOW MILLIVOLT OUTPUT:** Caused by incorrect pilot flame or weak thermocouple. Pilot flame should be directed at the thermocouple, or slightly to left, (as viewed through lighter door). If flame is not correct it may be drawn away from thermocouple during blower operation and millivolt output will drop.

If pilot flame is too small it may indicate low gas pressure or clogged pilot orifice. Pilot orifice may be removed and cleaned with compressed air. Do not use any metal instrument (such as a pin) to clean, as the orifice opening may be damaged.

Check gas pressure at the pilot tube, (or at another appliance that does not have a pressure regulator) to determine tank regulator setting. Adjust regulator if necessary to obtain correct pressure.

Minimum inlet gas supply pressure (For purpose of input adjustment) 11" W.C.  
Maximum inlet gas supply pressure 13" W.C.

If pilot flame is correct, check millivolt output of thermocouple. If less than 10 millivolts, replace thermocouple.

### C. COMPLAINT - EXCESSIVE NOISE

1. Motor or blade out of balance. Replace motor or blade.
2. Motor hum. Replace motor.

### D. COMPLAINT - ERRATIC FAN OPERATION

A loose terminal or a defective relay may cause the motor to cycle off while the thermostat is calling for heat; an outage will occur because the blower is not purging the system of combustion products.

### COMPLAINT - AMPERAGE DRAW THROUGH FURNACE WITH THERMOSTAT "OFF"

1. Incorrect wiring at the terminal block. If 12 volt and thermostat wires are not connected properly at the furnace, a continuous circuit can be created through the heater of the fan relay. If this condition exists the blower will start as soon as the thermostat closes and will shut off when the thermostat opens, instead of having a delayed action. In some cases this will also burn out the heat anticipator in the thermostat.

Refer to the wiring diagram for correct connections.

2. Internal short to ground in gas control or motor. Disconnect all wiring to control or motor (disconnect ground screw on black motor lead from casing) and use an ohmmeter to check for shorts to ground. At no point should there be a reading between the electrical circuit of the motor or control and ground.

## 13. HIGH ALTITUDE DERATION

These units are certified by the Canadian Gas Association for operation without modification at altitudes up to 4500 feet only.

Operation at increased elevations require deration of 4% for each 1000 feet.

If the unit is not properly derated, the following conditions will exist:

1. Due to the lack of sufficient oxygen for proper combustion, carbon monoxide will be produced and exhausted through the vent. Entry of these fumes into the vehicle (due to improper installation of the vent or through another opening in the vehicle) could create a hazardous condition which could endanger the life of anyone exposed to these fumes for a prolonged period of time.
2. Due to incomplete combustion of LP gas at the burner, the actual heat output of the furnace will be considerably less than the rating of the unit. Fuel which is not burned will be wasted.

If the unit is properly derated, it will produce approximately the same amount of heat at higher elevations, but will do so with considerably less fuel.

The following chart lists recommended orifice sizes for various altitudes:

ALTITUDE IN FEET	66112 ORIFICE SIZE	66117 ORIFICE SIZE
0-4500	61	56
5000	64	57
6000	64	58
7000	65	58
8000	65	59
9000	65	59
10000	66	61
11000	67	61
12000	67	63

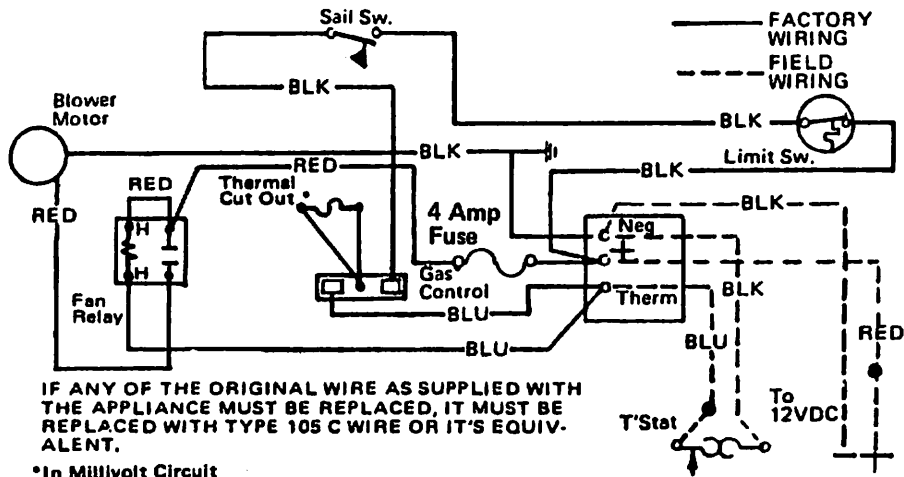
Also, check gas pressure when derating unit. First, check piping system pressure and adjust to 11" W.C. at tank regulator (NOTE: If this pressure check is made at cooktop or range, be sure that there is no pressure regulator present, or an incorrect reading will be obtained.) Then check manifold pressure at the pressure tap location on the outlet end of the gas control on the furnace. Adjust to 10.5" W.C. by rotating the adjustment screw (located under a screw cap, marked "Press Adj") on gas control.

Pilot flame must also be adjusted for high altitude operation. See previous section on "PILOT OUTAGE", Section 1.b. PILOT ADJUSTMENT.



19

**WIRING DIAGRAM**  
Pilot Models



**WIRING SCHEMATIC**  
Pilot Models

