DISTRIBUTION DATE: 02/05/97
REVISION: 1

TRANE THD

HORIZONTAL INDUCED DRAFT

MODEL NUMBER:	THD - A series
BTU SIZES:	60,000 - 80,000 - 100,000 - 120,000 BTU's

ACCESSIBILITY CLEARANCE

Forty-eight (48) inches between the front, twenty-four (24) inches between the back of the furnace and an adjacent wall or other appliances is required for servicing.

CLEARANCE FROM COMBUSTIBLE MATERIAL

Minimum clearances

Furnace top - 8"
Outlet air plenum - 6"
Return air plenum - 2"
Furnace front - Alcove extending 18" beyond front
Flue or vent connector - 6"
Furnace back - 6"
Floor - wood floor ok

COLD AIR RETURN AIR DUCTS

GARAGE

Approved. Must meet requirements in the Uniform Mechanical Code and the Good Practice Book.

GENERAL

HIGH ALTITUDE INSTALLATIONS	
Deration	At elevations above 2,000 feet, the furnace should be derated at the rate of four percent (4%) for each 1,000 feet above seal level.
Orifice	Change orifices
Regulator Pressure	Normal - 3.5" w.c. Minimum - 3.3" w.c. Maximum - 3.6" w.c. Small changes in gas pressure, only up to -0.2" w.c. to +0.1" w.c. may be made.
Pressure Switch	

MOBILE HOME

NOT approved.

VENTING MATERIAL AND REQUIREMENTS	
Vent Pipe	Type B-1 double wall vent
Vent Fittings	Type B-1 double wall. Single wall adapter at induced draft motor

The furnace is designed for use with U/L listed type "B-1" double wall vent.

VENT CLEARANCE FROM COMBUSTIBLE MATERIAL

1" Type "B-1" double wall vent

VENTING PROCEDURE

Vent according to GAMA vent tables - Category I appliance.

Vertical vent pipe shall extend at least six (6) feet above the highest connection to the point of termination.

MISCELLANEOUS INFORMATION/NOTES

GAS PIPING: DANGER - models designated as natural gas are to be used with natural gas only.

Spark Ignition Models — THS/THD-A

Honeywell Ignition System

On a call for heat from the thermostat, 24 volts is supplied through the vent limit switch, through the TCO, and through the limit side of the fan/limit switch to the ignition control module.

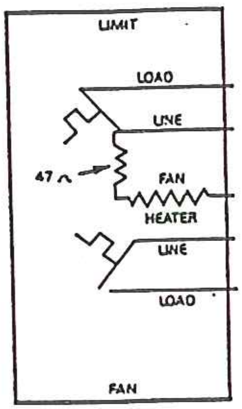


Figure 36

The fan/limit switch used in the horizontal furnaces is a little different than those in vertical furnaces. See Figure 36. This particular fan/limit includes a fixed value resistor and heating element wired in parallel with the limit switch. The purpose of the heater is to bias the bi-metal fan switch. This serves to bring the blower on before the heat exchanger temperature reaches the "fan on" set point of the fan switch. This is done because of the physical position of the limit in the furnace. Vertical furnaces have the fan/limit located above the burners. Since heat rises, natural convection carries the heat to the fan/limit switch. The switch is located horizontally from the burners in the horizontal furnaces. Natural heat flow would take too long to bring the fan on. An unnecessary amount of heat would be lost through the vent. So, by using a heater to bias the fan switch, the blower is brought on at the proper time.

The heater also affects the limit side bi-metal in the same manner, preventing overheating in the event of a loss of airflow.

Figure 37 shows a 47 ohm, one-half (1/2) watt resistor wired in series with the bias heater. The purpose of the resistor is to limit the amount of electrical current available to the bias heater. **It is important to note that this fan/limit is approved for use by the American Gas Association (AGA) only with a resistor of the ohm value installed at the factory.**

It is not recommended that the resistor be removed, by-passed, or replaced with one of a different value. Any of these will have an adverse effect on the fan/limit operation. Removing the resistor also removes the bias heater from the circuit. This will cause delayed "fan on" timing and results in overheat stress on the heat exchanger. Also, the blower will turn off sooner because

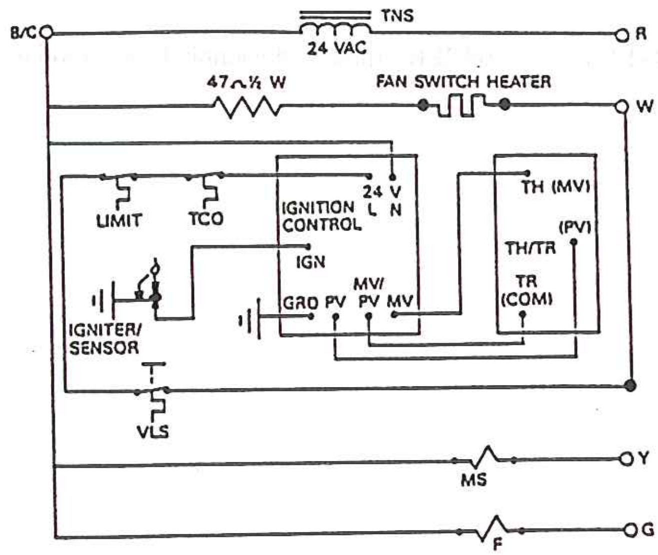


Figure 37

the fan switch bi-metal will cool down sooner. Useable heat would be wasted.

By-passing, or jumpering, the resistor allows more current to flow to the bias heater. This causes a greater heat output from the bias heater, bringing the blower on sooner. After the burners go out, the extra bias heat keeps the blower on a little longer. While this appears to increase efficiency, jumpering the resistor is discouraged for two reasons. First of all, the increased bias heat could possibly cause nuisance tripping of the limit switch. Secondly, at the beginning and end of the cycle, the air leaving the furnace may actually feel too cool to the occupants. If longer blower cycles are desired, adjustments can be made to the blower "cut-in/cut-out" set point.

In an emergency situation, if a defective resistor is found, the indoor blower could be placed into the continuous operation mode until the resistor can be replaced.

The ignition control module performs a quick "self-check" to ensure a safe start before energizing the pilot valve solenoid. What the control does is check for a "false" flame signal (short-to-ground) from the igniter/sensor. Refer to Figure 38. During this "self-

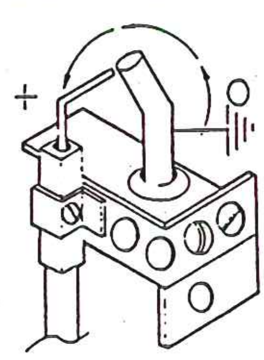
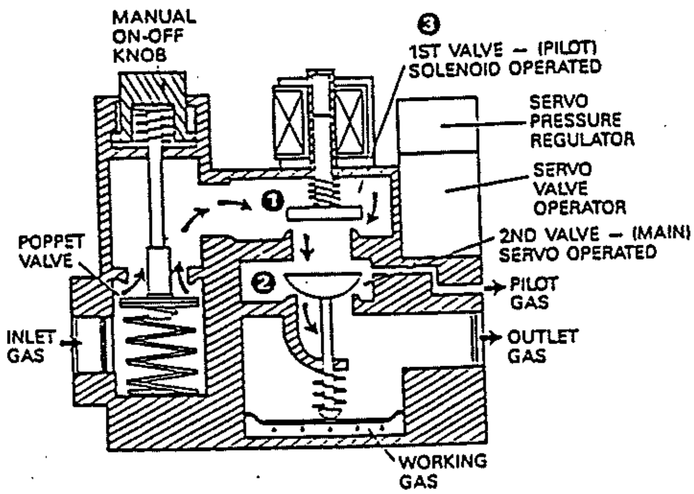


Figure 38

check", the ignition control puts a positive charge on the igniter/sensor. If the igniter is grounded, current will flow from ground to the igniter ("false" flame current). Gas flow must not be allowed in this situation.

Refer to Figures 39 and 40. If the ignition system checks out ok, the pilot valve coil ❸ is energized. The pilot valve ❶ opens, allowing gas to flow to the pilot burner and the main valve cavity ❷. The main valve is closed at this point.



HONEYWELL VR8440 AGV (Shown With Both Valves Open)

Figure 39

At the same time, the ignition control energizes the igniter/sensor causing a spark to jump from the igniter electrode, through the pilot gas stream, to the pilot burner hood. See Figure 40.

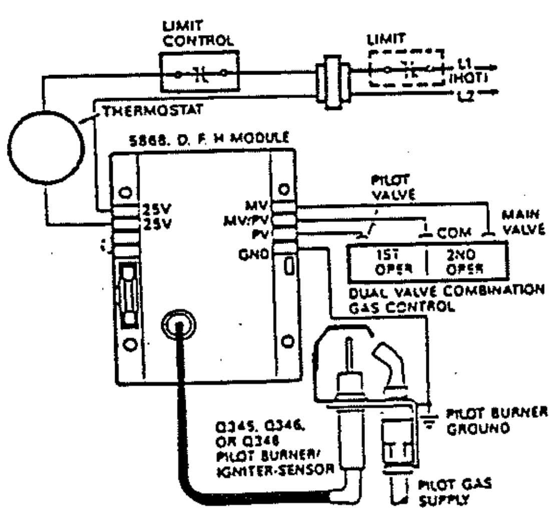
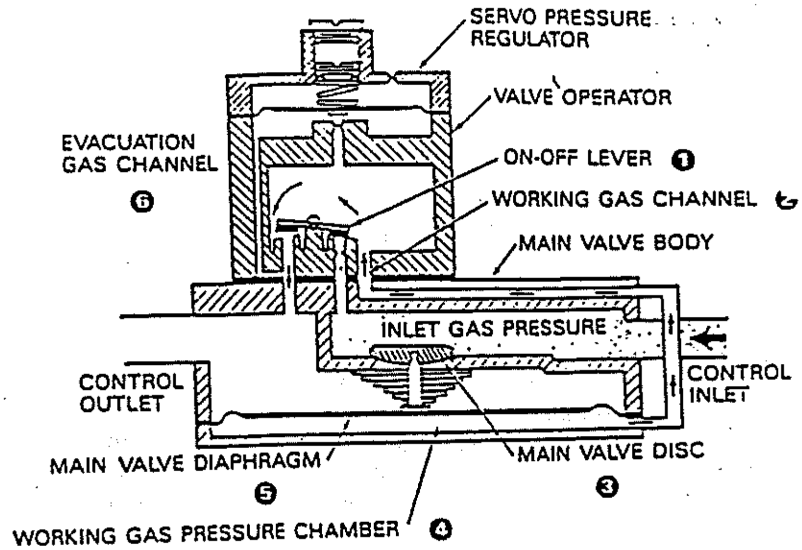


Figure 40

When a pilot flame is established, the igniter/sensor then verifies a pilot flame. This is done using the flame rectification principle described earlier in the text. After a pilot flame has been proven, the ignition control stops generating a spark. At the same time, power is supplied to the main valve servo operator. Gas flows to the main burners and is ignited by the pilot flame. See Figure 41.



BURNER OFF

Figure 41

The Honeywell VR8440 gas valve operates by the same principle as the White Rogers valve seen previously. Figures 41 and 42 are schematic diagrams which illustrate the theory of operation of the main valve which controls flow of gas to the burner, the on-off cycling function of the valve operator, and the servo pressure regulator method of maintaining the desired outlet pressure to the burner manifold. The basic theory is applicable to all models in the V800 family of combination gas controls.

Operation of the main valve assembly, Diaphragm ❺ and Disc ❸ is similar to a conventional diaphragm type valve. The valve opens and closes in response to admission or discharge of gas into the Pressure Chamber ❹ beneath the diaphragm. (Note that the gas performing this function is termed "working gas".)

In Figure 41, the working gas has been discharged, so there is no lifting force being exerted by the diaphragm on the valve disc assembly. The valve closing spring has firmly seated the valve disc, blocking flow of gas to the burner.

The function of the valve operator is to control the flow of working gas. It incorporates an ON-OFF lever ❶ which is electrically actuated by the temperature control circuit.

In Figure 41, the burner in the OFF position, note that the right-hand port is closed, blocking the flow of gas into the working gas channel ❷ from the control inlet. Also, the evacuation gas channel ❻ to the control outlet is open. This permits the escape of working gas from the pressure chamber ❹. With the loss of working gas pressure, the main valve is closed.

In Figure 42, the operator ON-OFF Lever ❶ is in the position it assumes when the valve operator is energized on a call for heat. The left-hand outlet port is closed, and the right-hand supply port is open, permitting flow of working gas into the main valve pressure chamber (4). As previously described, admission of working gas into this chamber moves the diaphragm upward. This lifts the valve disc to allow gas flow to the burner.

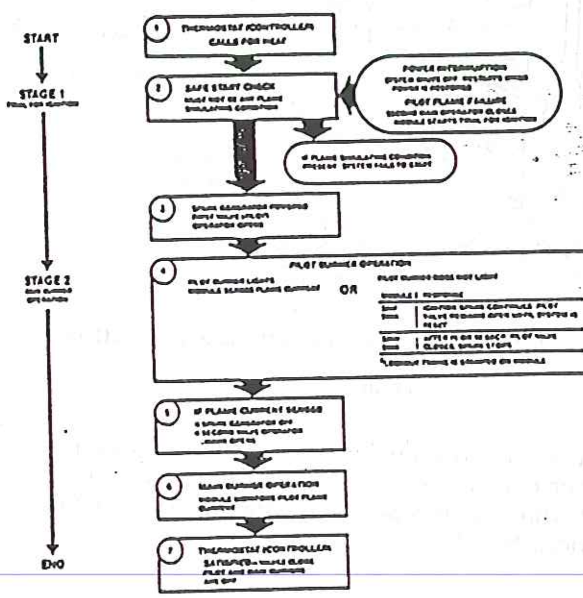
When the right-hand supply port in the valve operator opens upon a call for heat, a continuous flow of working gas also is established into the servo regulator pressure chamber (8), and through the evacuation gas channel (6) into the control outlet. It is through the evacuation channel that the servo regulator senses variation in outlet pressure. Any such variation in outlet pressure is instantly reflected back into the servo regulator pressure chamber (8) and repositions the regulator diaphragm (9). Movement of the diaphragm in turn alters the rate of flow of evacuation gas through the regulator valve (7), and causes the following corrective action:

If the outlet pressure begins to rise, the servo regulator valve (7) opens slightly to allow more working gas to discharge into evacuation gas channel (6). This decreases the pressure of the working gas in the main valve pressure chamber (4) and repositions main valve disc (3) downward, closer to its seat. This reduces the flow of main burner gas to correct the rise in outlet pressure.

If outlet pressure begins to fall, the servo regulator valve (7) closes slightly to reduce the discharge of working gas into evacuation gas channel (6). This increases the pressure of working gas in the main valve pressure chamber (4) and repositions main valve disc (3) upward, further away from its seat. The flow of main burner gas thus is increased to correct the fall in outlet pressure. The actual operation is so rapid that fluctuations in pressure are hardly noticeable.

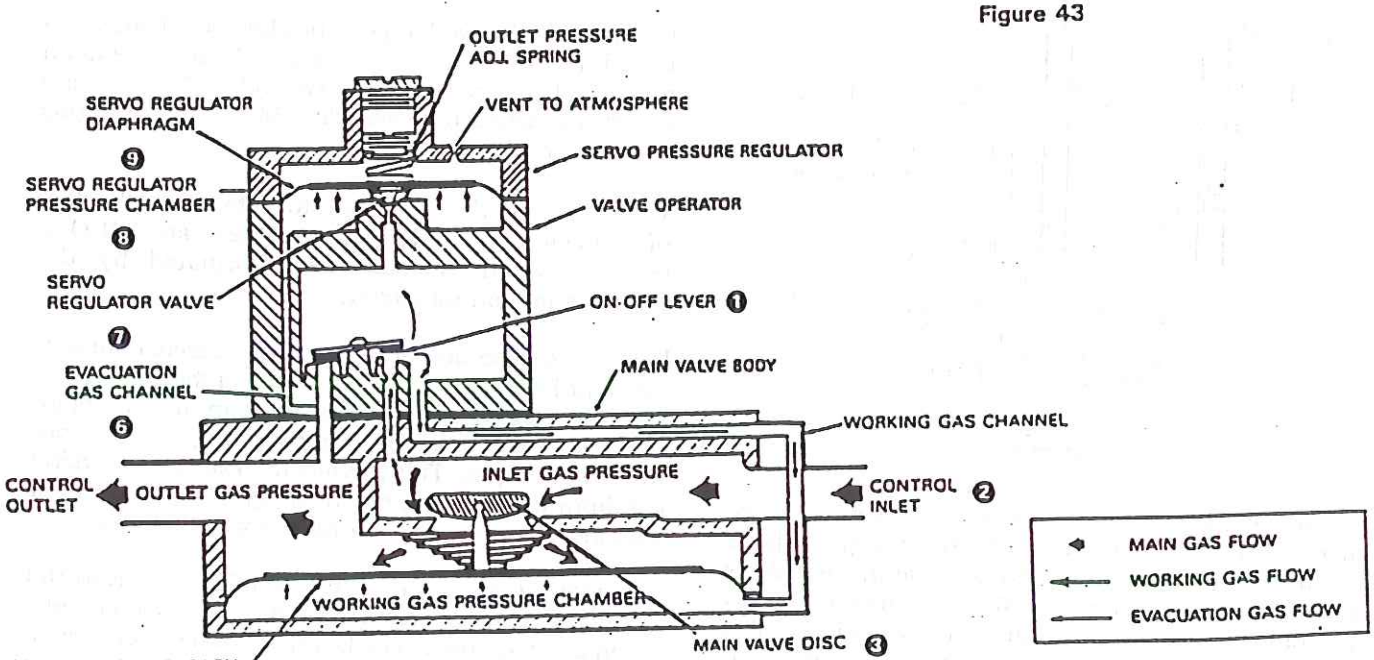
In the event of a loss of pilot flame during the heating cycle, the igniter/sensor would detect the loss of flame current. In this situation, the ignition control removes power from the main valve operator and also resumes spark generation. The Honeywell S86H ignition control is designed as a "one-try" module. If, after a 90 second trial for ignition period, a pilot flame is not re-established, the ignition system will go into safety "lockout" mode. In S86H models followed by a "3", (manufactured prior to June, 1987), spark generation continues after lockout (as long as there is a heating call from the thermostat.) Resetting the ignition control is done by interrupting control power to the ignition control for a period of one minute. This can be done simply by lowering the thermostat heating set point below the room temperature.

The flow chart in Figure 43 details the sequence of operation as previously described.



NORMAL SEQUENCE OF OPERATION

Figure 43



BURNER ON

Figure 42