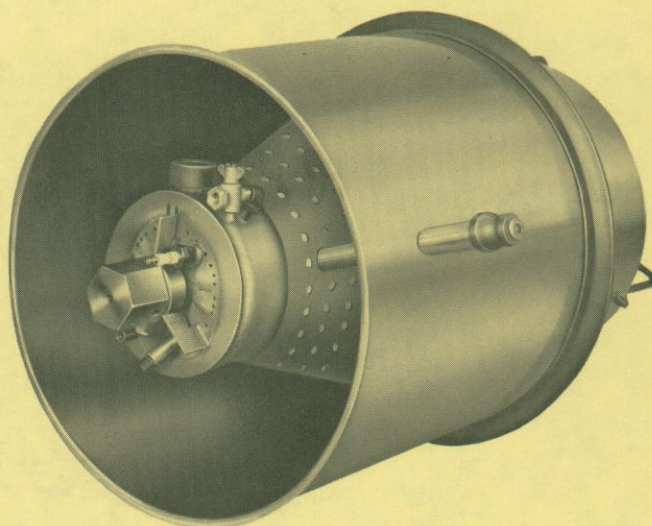
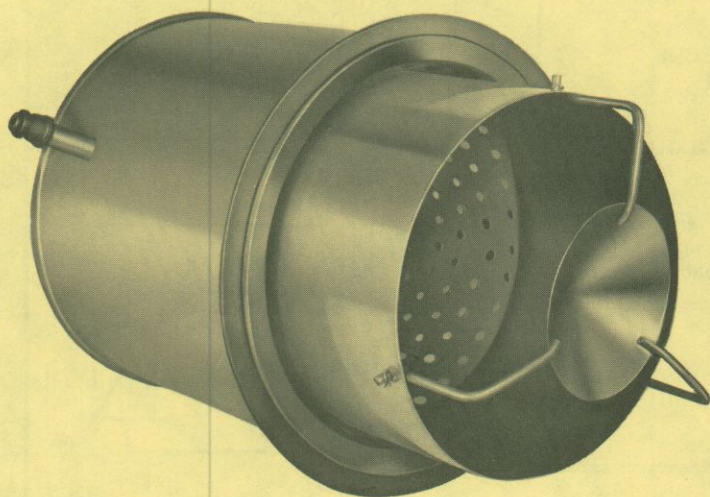


## ECLIPSE INFORMATION GUIDE

### 125WC - 250WC - 500WC

### WINGCONE BURNERS



#### WARNING

The burners covered in this guide are designed to mix air with fuel and burn the resultant mixture. All fuel burning devices are potentially capable of producing violent explosions and fires when improperly applied, installed, adjusted, controlled or maintained. This guide provides the information necessary for using these burners for their designed purpose. Do not deviate from any of the instructions in this guide without written consent from the engineering department at the Eclipse factory. Read this entire guide before attempting to light burner(s). If you do not understand any part of the information in this guide, contact your local Eclipse representative or the factory before proceeding further.

Protection from the elements must be provided from the time the Wingcone Burner leaves the Eclipse factory. Do not store outside. Rain, snow or extremes in temperature may damage the burner.

All maintenance and trouble shooting on Wingcone Burners should be performed by people with good mechanical aptitude and experience with combustion equipment.

#### APPLICATION

Eclipse Wingcone Burners are combination gas/oil burners designed primarily for mounting in air ducts where all of the air required for combustion is available from the air stream which flows through and by the burner.

These burners provide clean combustion throughout the entire operating range and 20 to 1 turndown on both gas and oil making them well suited for use in drying, curing, baking and other air heating processes which require clean, hot air, accurate temperature control and the versatility of dual fuel. Although the Wingcone burns cleanly, (tests indicate a smoke number of less than #1 Ringleman) U.S. Government rules prohibit the use of any oil burner on direct fired air makeup (comfort heating) systems.

#### FLAME MONITORING

Flame monitoring for Wingcone Burners must be provided by Ultra-Violet Scanner. Flame rod monitoring is not acceptable. Suitable scanner and relay must be provided by the customer. Eclipse can supply such equipment or recommend alternate sources (See 4.0)

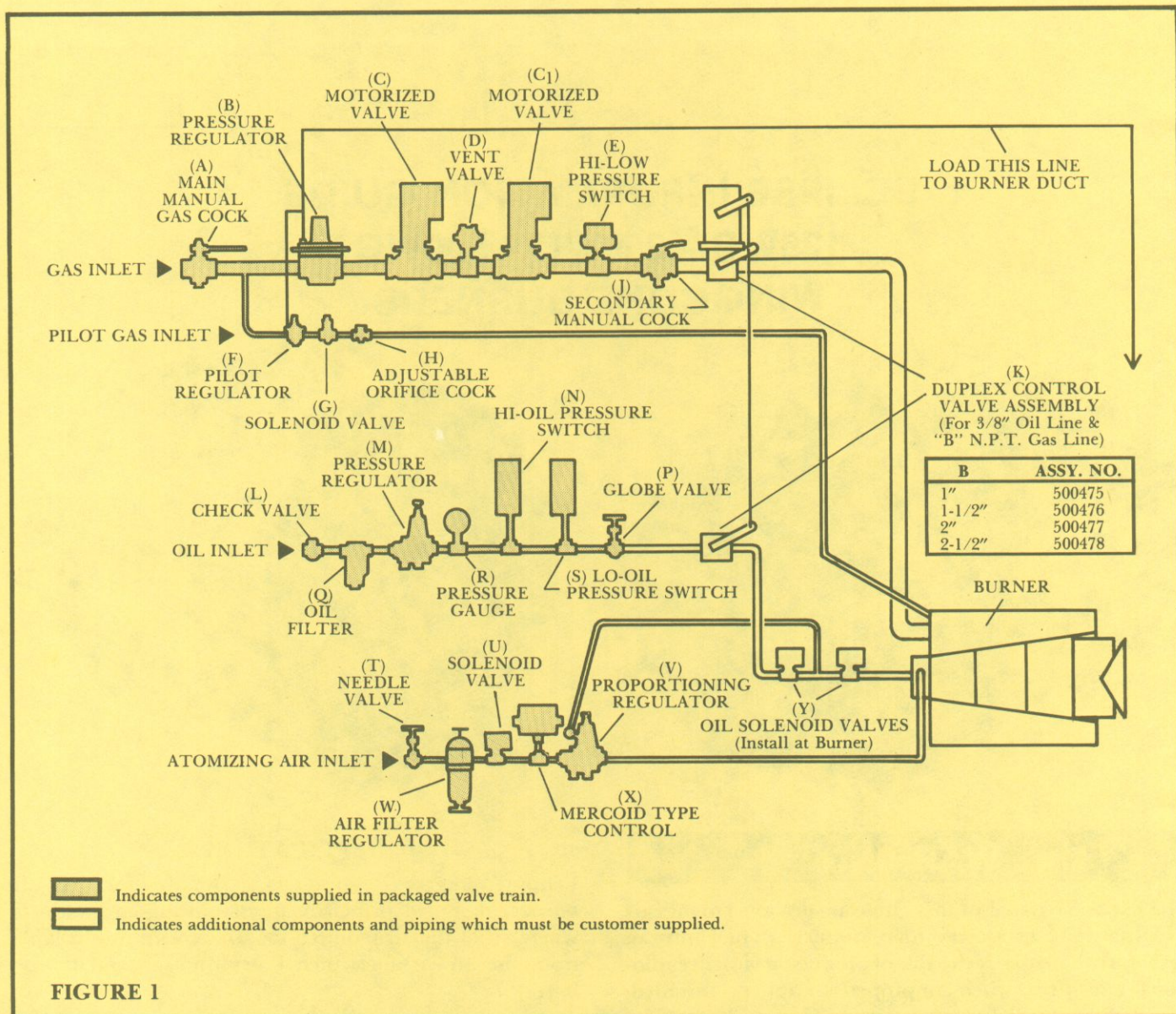


FIGURE 1

## FUEL AND ATOMIZING AIR SUPPLY

Eclipse offers "Packaged Valve Trains" for use with Wingcone burners. These valve trains are illustrated in Figure 1. The information contained in this guide is based on using these Packaged Valve Trains with the Wingcone Burner. When using these valve trains, it is the customer's responsibility to supply #2 or lighter fuel oil to the oil valve train at a steady minimum pressure of 80 psig. The fuel supply must be clean and it is the customer's responsibility to supply filtration means capable of removing particles larger than 40 microns (MPR) in the oil line. A 40 micron particle is one just visible to the average naked eye. The oil filter "Q" on the packaged valve train should be considered only as a final filter.

It is the customer's responsibility to supply compressed air to the atomizing air valve train at a minimum pressure of 70 psig. The atomizing air must be clean (40 micron maximum particle size) (MPR) and dry (Dew point 30° F. below minimum ambient). The customer is to supply adequate moisture dryer and filter in the atomizing air supply

piping. The filter and moisture separator "W" supplied on the packaged atomizing air valve train should be considered only as a final filter and separator.

## 1.0 INSTALLATION

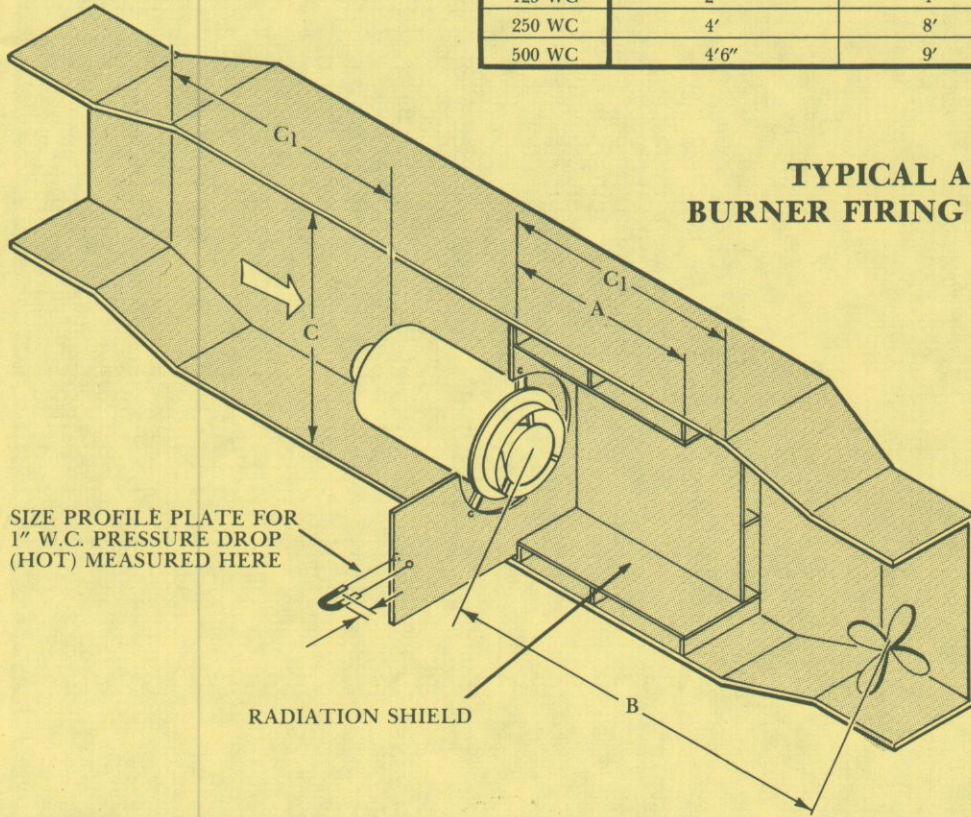
1.1 Wingcone Burners are furnished as standard with a rolled angle mounting ring welded at the discharge end of the outer burner shell. If specified at the time of order, the mounting ring can be welded at any location on the outer burner shell or the mounting ring can be continuously welded for sealed mounting or shipped loose for customer attachment at the installation site.

1.2 When the burner is mounted in a duct (See Figure 2), it should have a minimum of 6" clearance around the burner. When the burner is to be oil fired, radiator shields are recommended.

1.3 When the burner is mounted outside the duct, firing through a slot or opening in the duct wall, it is common practice to provide a gap around the burner to allow air to flow completely around the burner (See Figure 3). It is also

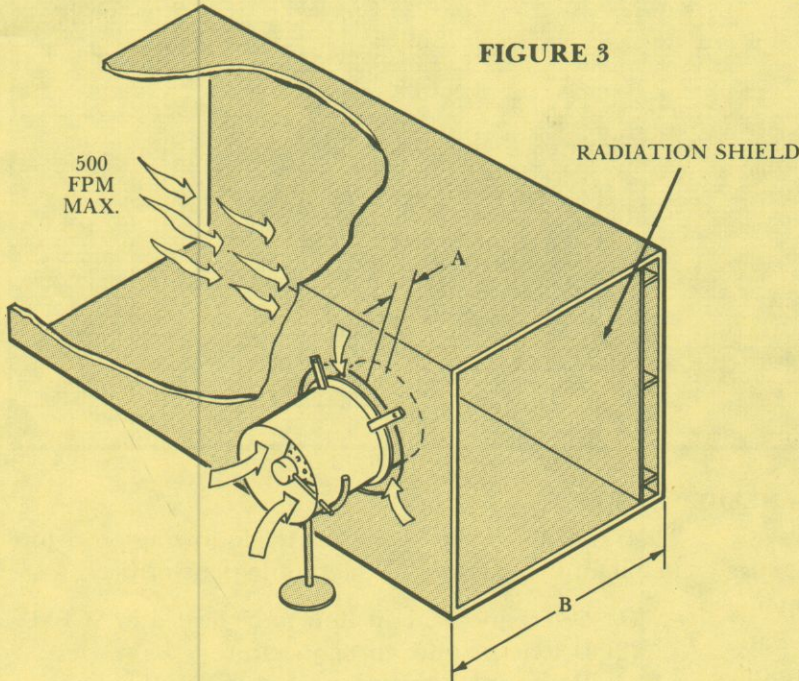
**FIGURE 2**

BURNER CAT. NO.	A	B	C	C <sub>1</sub>
	RADIATION SHIELD MIN. LENGTH	MIN. DISTANCE TO FAN	MINIMUM DUCT SIZE	MIN. DISTANCE TO DUCT TRANSITION
125 WC	2'	4'	2'6"	2'6"
250 WC	4'	8'	4'	4'
500 WC	4'6"	9'	4'6"	4'6"



**TYPICAL APPLICATION  
BURNER FIRING WITH AIRSTREAM**

**FIGURE 3**



**TYPICAL APPLICATION  
BURNER FIRING PERPENDICULAR  
TO AIRSTREAM**

BURNER CAT. NO.	A	B
	MIN. BURNER INSERTION DIST.	MIN. DISTANCE TO OPPOSITE WALL
125 WC	7-13/16"	30"
250 WC	7-15/16"	54"
500 WC	2-11/16"	60"

acceptable to seal the burner to the duct wall. Maximum air flow velocity should not exceed 500 FPM. Duct suction must be between .8" w.c. minimum and 1.5" w.c. maximum.

1.4 If the burner is to be mounted outside the duct, see Figure 3 for minimum insertion distance of the burner and minimum distance to opposite duct wall.

1.5 Regardless of where the burner is mounted, upstream air temperatures should not exceed 400° F. and temperature downstream should be limited to 1000° F.

1.6 If a duct transition is upstream or downstream of the burner, a straight section equal to one duct diameter should be allowed between the burner and transition section.

CHART 1



**2.0 COMBUSTION AIR SUPPLY**

**2.1** Air passing through the burner for combustion must contain 18% or more oxygen.

**2.2** Eclipse Wingcone Burners are designed to operate at a pressure drop of between .8" w.c. and 1.5" w.c. (Optimum operation is obtained at a 1.0" w.c. drop.)

**2.3** If the velocity in the duct is greater than 4900 FPM, the Wingcone Burner may not be used.

**2.4** If the velocity in the duct is between 3600 FPM and 4900 FPM, profiling is not necessary for proper burner operation.

**2.5** If the velocity in the duct is less than 3600 FPM, profiling will be necessary to achieve the proper drop across the burner.

**2.6** If profiling is necessary, use the following procedure to obtain the diameter of the profile plate orifice.

- (1) Determine total air flow to be heated in SCFM.
- (2) Determine inlet air temperature
- (3) Determine burner catalog number. This can be found on burner name plate.

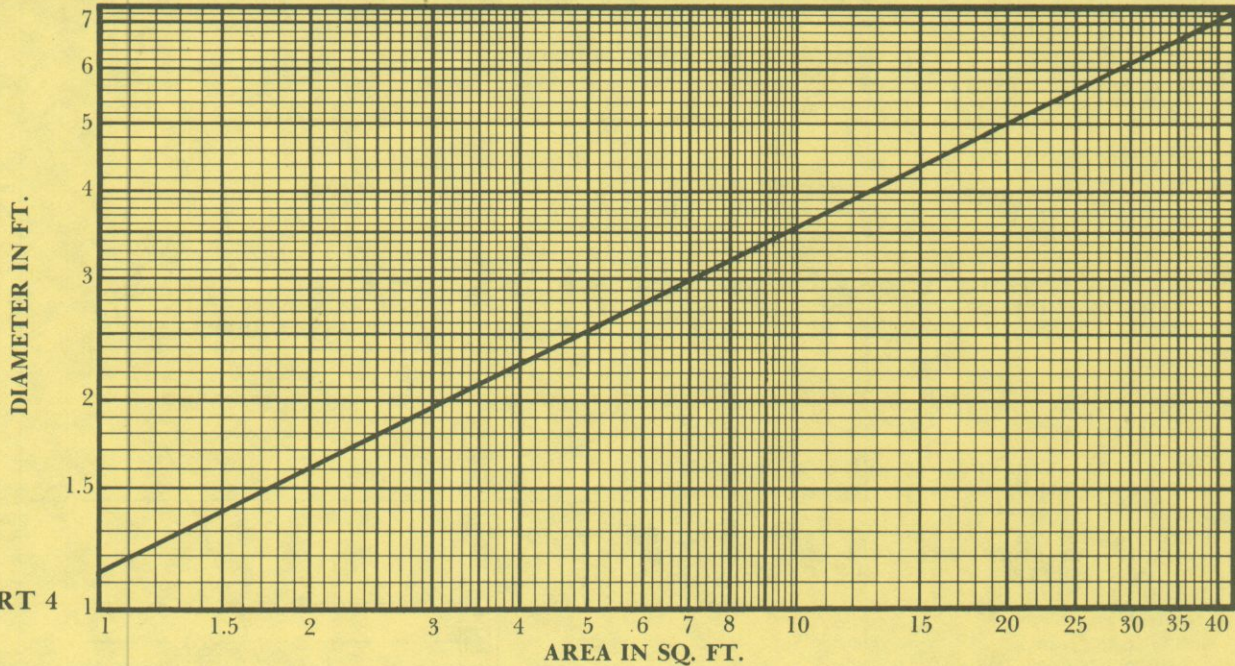
Enter Chart 1 on the left hand vertical axis at your required air flow to be heated in SCFM. Read right to intersection of curve. Read vertically down to bottom horizontal axis of chart to obtain area required in square feet. Multiply this number by the temperature correction factor obtained from Chart 2. Add the result to the blocking area figure that corresponds to your burner size. This number is obtained from Chart 3. The resulting number is the area of

**CHART 2**

TEMPERATURE CORRECTION FACTORS										
TEMP. °F.	32	50	60	100	150	200	250	300	350	400
CORR. FACTOR	.97	.99	1.00	1.04	1.08	1.13	1.17	1.21	1.25	1.29

**CHART 3**

BURNER CAT. NO.	BLOCKING AREA
125 WC	1.2
250 WC	1.9
500 WC	2.8



**CHART 4**

the profile plate orifice in square feet. To obtain the diameter of the profile plate orifice, enter Chart 4 on the bottom horizontal axis at the point that corresponds to the area in sq. ft. obtained in the above steps. Read vertically up to the intersection of the curve. Read left to the left hand vertical axis to obtain profile plate diameter in feet.

2.7 As an alternate method of determining the profile plate orifice diameter, use the following procedure.

- (1) Determine total air flow in SCFM to be heated.
- (2) Determine inlet air temperature.
- (3) Use formula to determine orifice diameter in ft.

$$D_o = 1.13 \sqrt{\left(\frac{\text{SCFM}}{2880}\right) \left(\frac{T_2}{520}\right)^{1/2} + A_e}$$

$A_e$  = Blocking area (from chart)

$T_2$  = 460 + inlet air temp. in °F.

$D_o$  = Orifice diameter in feet

BURNER SIZE	$A_e$
125 WC	1.2 ft. <sup>2</sup>
250 WC	1.9 ft. <sup>2</sup>
500 WC	2.8 ft. <sup>2</sup>

Example: 7000 SCFM total air flow to be heated  
 Inlet air temp. 100° F.  
 Required temp. rise, 300° F.

Input = .24 Btu/lb. °F x 300° F. x .075 lb./ft.<sup>3</sup> x 7000 ft.<sup>3</sup> x 60 min/hr.

Input = 2,268,000 Btu/hr.

Use 250 WC Burner

Profile: SCFM = 7000

$T_2$  = 460 + 100 = 560

$A_e$  = 1.9 (From chart)

$$D_o = 1.13 \sqrt{\left(\frac{7000}{2880}\right) \left(\frac{560}{520}\right)^{1/2} + 1.9}$$

$D_o = 2.38 \text{ ft. (2' 4-1/2")}$

2.8 Air passing through the burner must be free from foreign material which can plug the openings in the burner cone.

**3.0 FUEL AND ATOMIZING AIR PIPING**

3.1 All field piping and particularly the fuel oil and atomizing air supply pipes should be inspected during field assembly to ensure they are free from foreign material and pipe scale. Use of clean pipe will help ensure trouble free start up and operation.

3.2 Use of Teflon tape is not recommended for sealing threaded pipe connections to the burner assembly. Since commercial piping usually does require some type of sealant, Eclipse suggests the use of Loctite Teflon Pipe Sealant #9231 or equal. Sealant should be applied according to manufacturer's instructions.

3.3 Piping to the burner must be provided with suitable brackets and/or hangers. Flexible connections at the burner are preferred to minimize mechanical strain and possible damage to the burner assembly.

3.4 Piping disconnects installed close to the burner are convenient should servicing be required. Inlet pipe sizes at the burner are adequate for short piping runs. If longer piping runs are required, piping losses must be taken into account and pipes sized accordingly. Pipe size from the valve train to the burner should be at least the size of the burner inlets.

FIGURE 4

**BILL OF MATERIAL**

**Wingcone Burner Equipment**

- LGPS — LOW GAS PRESSURE SWITCH
- HGPS — HIGH GAS PRESSURE SWITCH
- LOPS — LOW OIL PRESSURE SWITCH
- HOPS — HIGH OIL PRESSURE SWITCH
- AAPS — ATOMIZING AIR PRESSURE SWITCH
- LFLS — LOW FIRE PROVING LIMIT SWITCH
- HFLS — HIGH FIRE PROVING LIMIT SWITCH
- PGV — PILOT GAS VALVE
- PIT — IGNITION TRANSFORMER (115/6000V.)
- VGW — VENT VALVE (N.O.)
- SGV — AUTOMATIC GAS SHUTOFF VALVE
- MGV — AUTOMATIC MAIN GAS VALVE
- MOV1 — MAIN OIL SHUTOFF VALVE
- MOV2 — MAIN OIL SHUTOFF VALVE
- AAV — ATOMIZING AIR VALVE
- UVS — ULTRA-VIOLET FLAME DETECTOR
- TCA — CONTROL MOTOR (ELECTRIC)  
(HONEYWELL SHOWN)

**Panel Equipment**

- F1 — FUSE
- 101FD-3 — P.C.I. FLAME SENTINEL SAFEGUARD  
(MANUAL OR AUTOMATIC OPERATION)
- CR1 — RELAY, LOW FIRE PROVING  
SW. HOLDING CIRCUIT.
- TR1 — TIMED RELAY (10 SEC.) INTERRUPTED  
PILOT AND LOW FIRE START

**External Equipment**

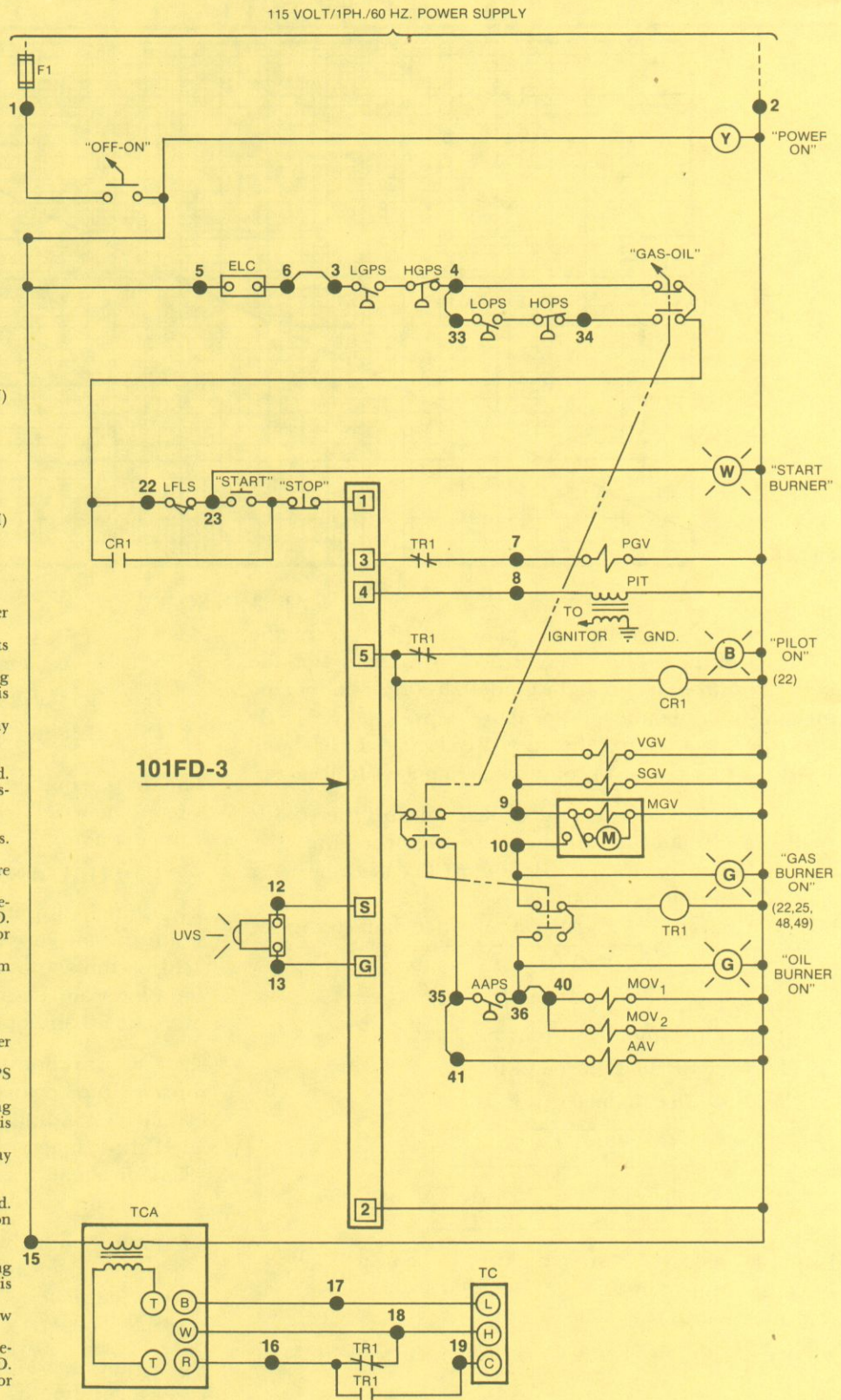
- ELC — EXTERNAL LIMITING CIRCUIT  
(EXAMPLE — HIGH TEMP. LIMIT SWITCH)
- TC — TEMPERATURE CONTROLLER  
(PARTLOW SHOWN)

**Gas Operation Sequence**

1. Fuel selector switch in "GAS" position.
2. "Power On" switch to the on position. Yellow "Power On" light is illuminated.
3. LGPS, HGPS, and ELC (air flow switches, etc.) limits are made.
4. Firing rate controller drives to low fire position making low fire proving switch. "Start Burner" light is illuminated.
5. Start button can be pushed powering the flame relay thru terminal 1.
6. Terminals 3 (PGV) and 4 (PIT) will be powered.
7. When pilot is proven terminal 5 becomes powered.
8. CR1 closes. (Release start button.)
9. Main motorized gas valves open. Vent valve closes. "Gas Burner On" light is illuminated.
10. TR1 timed relay (10 sec.) interrupted pilot and low fire start.
11. After 10 sec. delay, "TR1" N.C. contact opens to de-energize the pilot gas valve; and "TR1" N.C. and N.O. contacts reverse to release the "TCA" control motor from low fire start.
12. Burner is now on (flame proven) and operating from temperature controller.

**Oil Operation Sequence**

1. Fuel selector switch in "OIL" position.
2. "Power On" switch to the on position. Yellow "Power On" light is illuminated.
3. LOPS, HOPS, and ELC (air flow switches, etc.) LGPS and HGPS limits are made.
4. Firing rate controller drives to low fire position making low fire proving switch. "Start Burner" light is illuminated.
5. Start button can be pushed powering the flame relay thru terminal 1.
6. Terminals 3 (PGV) and 4 (PIT) will be powered.
7. When pilot is proven terminal 5 becomes powered.
8. CR1 closes. (Release start button.)
9. Atomizing air valve opens. AAPS closes powering MOV, and MOV2. "Oil Burner On" light is illuminated.
10. TR1 Timed Relay (10 sec.) interrupted pilot and low fire start.
11. After 10 sec. delay, "TR1" N.C. contact opens to de-energize the pilot gas valve, and "TR1" N.C. and N.O. contacts reverse to release the "TCA" control motor from low fire start.
12. Burner is now on (flame proven) and operating from temperature controller.



3.5 On a new installation, the gas piping requires purging to remove air. The oil pipe line should also be bled before startup to remove foreign materials found in a new piping system. Break union closest to the burner and bleed several gallons of oil into a bucket.

#### 4.0 COMBUSTION CONTROL PANEL

4.1 A combustion control panel is required for all Wingcone Burners. Figure 4 illustrates a minimum suggested control panel wiring diagram and operating sequence.

4.2 Eclipse Wingcone Burners are not supplied standard with flame monitoring equipment. Flame monitoring must be provided by Ultra-Violet Scanner. Flame rod monitoring is not acceptable. Suitable scanner and relay must be provided by the customer. Eclipse can supply such equipment or recommend alternate sources.

4.3 Do not attempt to operate this burner without adequate flame monitoring equipment. The owner/user and/or his insurance underwriter must assume responsibility for the acceptance, use, and proper maintenance of the limit controls and other safety devices as well as flame supervision provided in the control panel and the interfacing of all electrical equipment and sequencing of burner operation between the control panel and the burner.

#### 5.0 PILOT IGNITION

5.1 Before attempting initial lightoff, it is vital that the operator be familiar with the sequence of operations of the burner assembly. Do not open any fuel valve(s) or operate any ignition device until there is no question of how the burner system is to function.

5.2 Refer to any instructions included with the control panel and familiarize yourself with the sequence of operation that is under control of the panel.

5.3 Referring to Figure 1, verify that secondary manual gas cock "J" in the gas line and globe valve "P" in the oil

line are closed. Open main manual gas cock "A" and adjustable orifice pilot gas cock "H".

5.4 Begin ignition sequence on control panel. Check for spark if possible and opening of pilot solenoid valve "G".

5.5 Pilot has been adjusted at the factory for use with 1050 Btu/CF natural gas with 8" w.c. gas pressure at the adjustable orifice pilot gas cock supplied on the burner. Pilot gas flow should be the minimum required for reliable ignition. If it is necessary to readjust the pilot gas cock, see Figure 5. Remove orange plastic cap. This gives access to the adjusting screw. Turn the adjusting screw in for less gas or out for more gas. Replace cap.

5.6 If gas other than natural is used for the pilot, it will be necessary to readjust the pilot gas cock as in 5.5.

#### 6.0 MAIN FLAME IGNITION AND ADJUSTMENT — GAS

6.1 Set fuel selector switch in panel for gas. Once pilot is established, the main gas flow may be adjusted.

6.2 Make sure duplex control valve assembly "K" (Figure 1) is in the low fire position. Open secondary manual gas cock "J". (NOTE: Motorized gas valves C and C<sub>1</sub> should now be open.) Adjust duplex gas control valve for minimum stable gas flow. This is a good low fire setting.

6.3 Cause duplex control to drive to high fire. Duplex linkage must be adjusted so high fire gas pressure is as shown in Figure 6. Return to low fire and readjust linkage if necessary.

#### 7.0 MAIN FLAME IGNITION AND ADJUSTMENT — OIL

7.1 Set fuel selector switch in panel for oil. Once the pilot is established, the oil flow may be adjusted.

NOTE: Eclipse recommends the use of the gas pilot. In the event no gas is available for pilot operation, direct spark ignition can be utilized, but will not provide completely reliable lightoff.

7.2 Make sure duplex control valve assembly "K" (Figure 1) is in low fire position.

7.3 Solenoid valve "U" in atomizing air line must be open. (Under control of panel.) Open needle valve "T" in atomizing air line. Set air filter/regulator "W" for 40 psig outlet pressure. Set adjusting screw on proportioning regulator "V" for 2 to 4 psig outlet air pressure.

7.4 Set oil pressure regulator "M" for 70 psig outlet pressure.

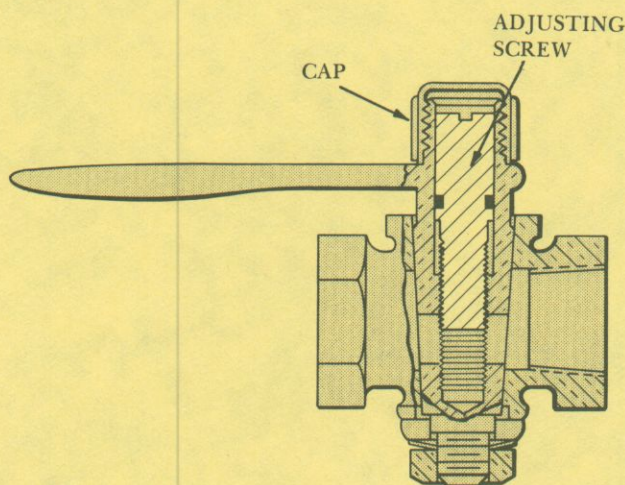
7.5 Open globe valve "P" in oil line. Oil solenoids "Y" should be open. (Under control of panel.)

7.6 Adjust duplex oil control for minimum oil flow to provide stable flame.

7.7 Cause duplex control to drive to high fire. Duplex linkage must be adjusted so oil nozzle pressure is in accordance with Figure 7.

7.8 Return to low fire and readjust linkage if necessary.

FIGURE 5



ADJUSTABLE ORIFICE COCK

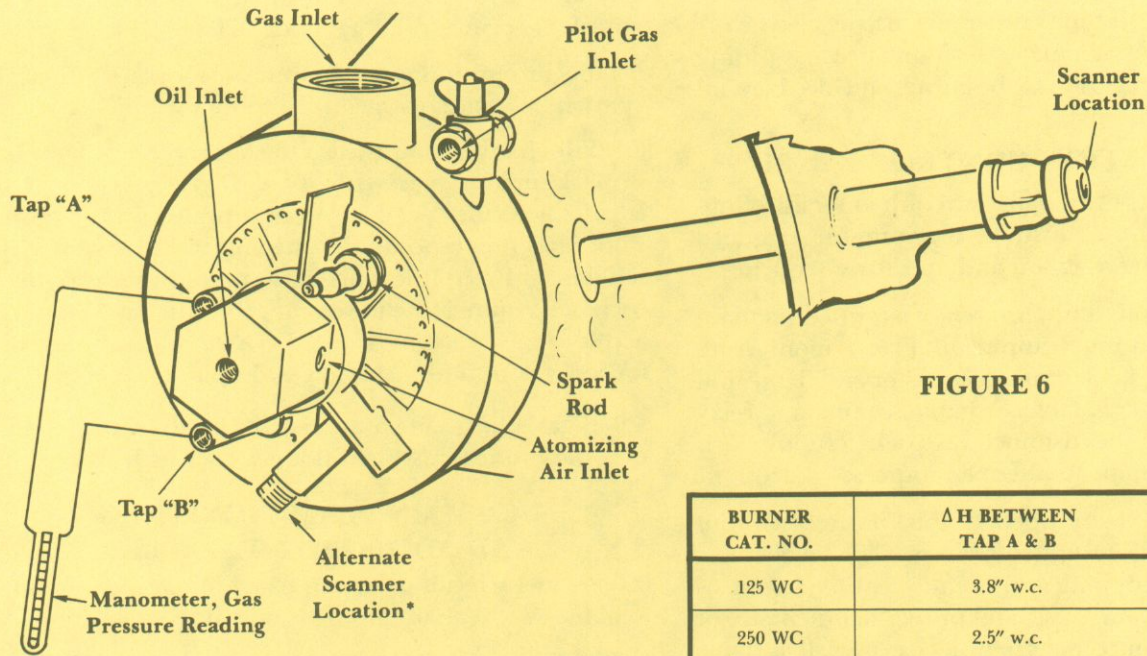


FIGURE 6

BURNER CAT. NO.	$\Delta H$ BETWEEN TAP A & B	NAT. GAS FLOW 1000 BTU/CF
125 WC	3.8" w.c.	1250
250 WC	2.5" w.c.	2500
500 WC	3.9" w.c.	5000

\*NOTE: Scanners installed here will see the ignition spark. To prevent spark interference, the control circuit must be designed to lock out the scanner while spark is present.

FIGURE 7

BURNER CAT. NO.	OIL PRESSURE AT NOZZLE — PSIG*	#2 OIL FLOW G.P.H.**
125 WC	34	8.9
250 WC	47	17.9
500 WC	60	35.7

\*Exact pressures are stamped on burner nameplate

\*\*Based on fuel oil at 140,000 Btu/Gal.







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