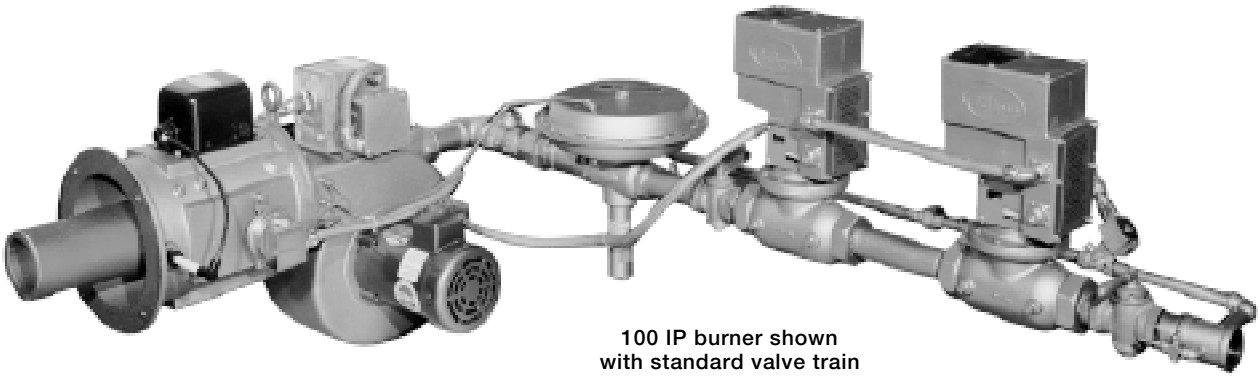
ECLIPSE INFORMATION GUIDE

IMMERSO–PAK PACKAGED BURNERS

Series 100 IP



100 IP burner shown
with standard valve train

Important Notices About Safe Burner Operation

⚠ WARNING

The burners covered in this Guide are designed to mix fuel with air and burn the resulting mixture. **All fuel burning devices can cause explosions and fires when improperly applied, installed, adjusted, controlled, or maintained.** This Guide will provide information for using these burners for their limited design purpose. Do not deviate from any instructions or application limits in this Guide without written advice from the Eclipse Combustion Division in Rockford, Illinois. Read this entire Guide before attempting to light burners. If you do not understand any part of the information in this Guide, contact your local Eclipse representative or Eclipse Combustion before proceeding further.

General Precautions

Store the burner inside. Exposure to the elements can damage the burner.

Adjustment, maintenance, and troubleshooting of the mechanical parts of this unit should be done by people with good mechanical aptitude and experience with combustion equipment.

Order replacement parts from Eclipse Combustion only. Any customer-supplied valves or switches should carry UL, FM, CSA, and/or CGA approval where applicable.

The best safety precaution is an alert and competent operator. Thoroughly instruct new operators so they demonstrate an adequate understanding of the equipment and its operation. Regular retraining must be scheduled to maintain a high degree of proficiency. Eclipse Combustion or your local Eclipse representative can provide training upon request.

The operator must have easy access to this Information Guide at all times.

1.0 Applications

Eclipse 100 Series Immerso-Pak burners are packaged nozzle-mixing burners designed to fire long single- or multi-pass immersion tubes. Applications include large industrial immersion heating equipment such as cleaning tanks, spray washers, salt baths, quenching and tempering tanks, and large asphalt tanks.

2.0 Burner Operating Parameters & Requirements

Performance Data

Note: Pressures listed below are for sizing purposes only and must NOT be used for set-up. Use separate metering orifices for burner adjustment.

	Burner Size	Tube I.D.	Max. Input	Flame Length	Gas Inlet Pressure Nat. Gas 0.6 s.g.	Gas Inlet Pressure Propane 1.5 s.g.
English Units	124	6"	1,000,000 Btu/hr.	22 ft.	7.0" w.c.	6.0" w.c.
	132	8"	1,750,000 Btu/hr.	23 ft.	7.0" w.c.	6.0" w.c.
	140	10"	2,750,000 Btu/hr.	29 ft.	10.0" w.c.	7.5" w.c.
	148	12"	4,000,000 Btu/hr.	35 ft.	12.0" w.c.	8.0" w.c.
Metric Units	124	152 mm	293 kW	6.7 m	17.4 mbar	15 mbar
	132	203 mm	513 kW	7.0 m	17.4 mbar	15 mbar
	140	254 mm	806 kW	8.9 m	24.9 mbar	18.7 mbar
	148	305 mm	1172 kW	10.7 m	29.9 mbar	19.9 mbar

Firing Chamber Limits — Operates best with neutral pressure at exhaust end of immersion tube.

Ambient Temperature Limits — -40° to +104°F (-40° to +40°C)

3.0 Immersion Tube Design

⚠ WARNING

If improperly adjusted or operated, burners can produce toxic concentrations of gases, including carbon monoxide. Venting these gases into confined, poorly ventilated areas is dangerous. To avoid this situation:

- Vent the appliance to the outdoors wherever feasible. Refer to the appliance manufacturer's instructions for flue and stack design guidelines.
- If outside venting is not possible, be certain that the building has enough volume and fresh air makeup to keep potentially harmful combustion products within the safe levels defined by OSHA or other authorities having jurisdiction.

Bends and Elbows — Immersion tubes may have standard, sweep or miter bends without affecting burner operation. However, the first elbow must be a minimum of ten tube diameters from the burner face. Figure 1 details the tube layout and a double mitered bend.

Tube Length — The tube must be long enough to permit complete combustion before fluing to the stack. If less than maximum rated input is required for the process, maximum tube length can be reduced in direct proportion to the input reduction from catalog rating.

Draft Hood — Do not seal the discharge of the immersion tube to a stack—use a draft breaking hood, as detailed in Figure 2. Be sure that the manifold and stack are large enough for the total flow of exhaust gases.

All draft hood and stack designs must conform to applicable codes.

4.0 Installation

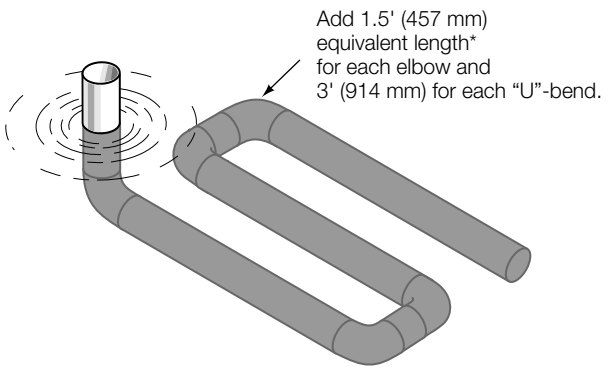
Burner Inspection — Make a thorough inspection of the burner when uncrating and before installing it. If any parts appear broken, bent, or damaged, contact your Eclipse representative or the Eclipse factory before installing the burner.

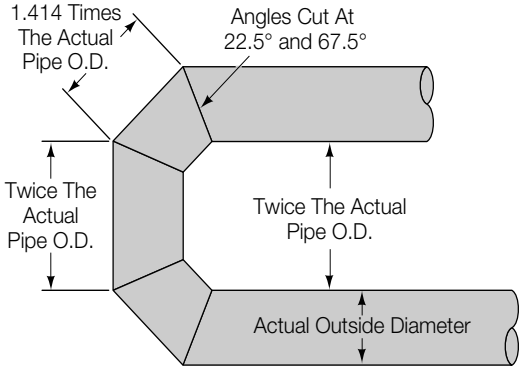
Companion Flange — A companion flange must be welded to the immersion tube. This flange may be purchased from Eclipse or supplied by others; see Figure 3.

Burner Mounting — The main burner casting has an integral mounting flange. With the supplied gasket between them, bolt the burner mounting flange to the companion flange for an airtight seal, as shown in Figure 3.

(Section 4.0 is continued on page 4)

Figure 1–Immersion Tube Design





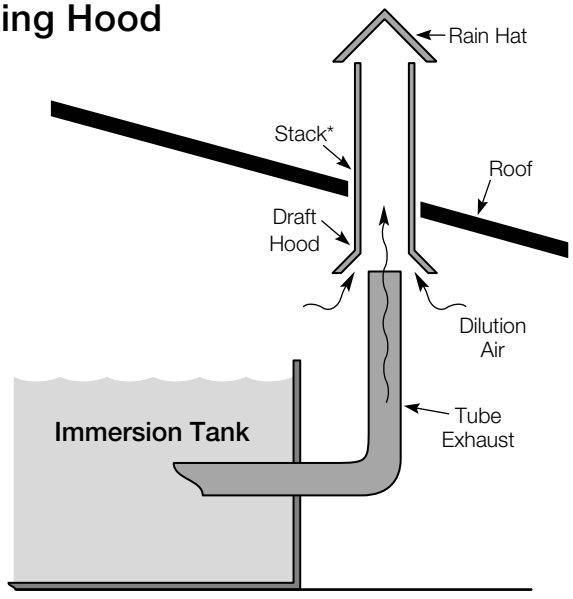
Mitered bends may be used for any size immersion tube. The double miter illustrated here is more efficient and has less pressure drop than single miter configurations. Dimensions apply to ACTUAL—not nominal—outside diameter of the immersion tube.

Burner Size	% Efficiency	English Units				Metric Units			
		Capacity, 1000's Btu/hr.		Tube I.D., Inches	Tube Length, Feet*	Capacity, Kw		Tube I.D., mm	Tube Length, m*
		Input	Output			Input	Output		
124	60	1000	600	6	18	293	176	152	5.5
	70	1000	700	6	37	293	205	152	11.3
	75	1000	750	6	48	293	220	152	14.6
132	60	1750	1050	8	23	513	308	203	7.0
	70	1750	1225	8	45	513	359	203	13.7
	75	1750	1315	8	55	513	385	203	16.8
140	60	2750	1650	10	30	806	484	254	9.0
	70	2750	1925	10	59	806	564	254	17.7
	75	2750	2060	10	73	806	604	254	22.2
148	60	4000	2400	12	40	1172	703	305	12.2
	70	4000	2800	12	69	1172	820	305	21.0
	75	4000	3000	12	80	1172	879	305	24.4

* Equivalent length based on straight length plus extra for elbows or "U"-bends as shown in the illustration above. Tube lengths are for the listed efficiencies with the corresponding maximum input. If desired, burner input, tube length, and net heat output may be reduced proportionally while maintaining the same efficiency.

Figure 2–Draft Breaking Hood

1. Use a draft breaking hood as shown. This makes burner operation less susceptible to atmospheric conditions and lowers the temperature of flue gases as they pass through the roof. Provide access between the hood and the tube in case a damper plate must be installed to prevent rumbling.
2. When multiple exhausts are manifolded together into a common stack, alway use draft hoods and size the stack to handle the total exhaust flow from all the burners, plus dilution air. This prevents cross-feeding of pressure between tubes which can cause pilot difficulties, burner instability, rumbling and popping.



* At least one pipe size larger than the tube exhaust. See applicable codes for required size and height.

4.0 Installation *(continued from page 2)*

Leave Room For Adjustment

Immerso-Pak burners can be purchased with three different valve train packages. All three packaging options integrate an adjustable bias proportionator. Thus, allow a minimum of 6" (152 mm) of space beneath the proportionator stem for bias adjustment, as shown in Figure 3.

Gas Metering Orifice

Each burner is test fired at Eclipse before shipment and supplied with a tag (Figure 6) showing the differential gas pressure that corresponds to maximum rated input. This provides only an approximate measurement of gas flow. For more precise measurement, or if the burner will be operated at less than maximum input, install a gas metering orifice upstream of the burner.

When using a gas metering orifice, provide a straight run at least ten pipe diameters upstream and at least five diameters downstream of the orifice. Failure to comply will cause inaccurate meter readings.

Piping Suggestions

Strictly follow the system designer's recommendations on pipe sizing and layout. If you insert piping elbows not planned for in the original design, you may introduce excessive pressure losses which can prevent the system from performing properly.

Use flexible nipples on burner air and gas inlets. Solid piping may restrain the burner from thermal expansion and damage the burner or its piping components.

Do not use the burner assembly to support the piping.

Gas piping must comply with American National Standard "National Fuel Gas Code" (NFPA No. 54 or ANSI Z223.1)*, or must be acceptable to the authority having jurisdiction.

General Wiring Suggestions

See Figure 4 for wiring diagrams.

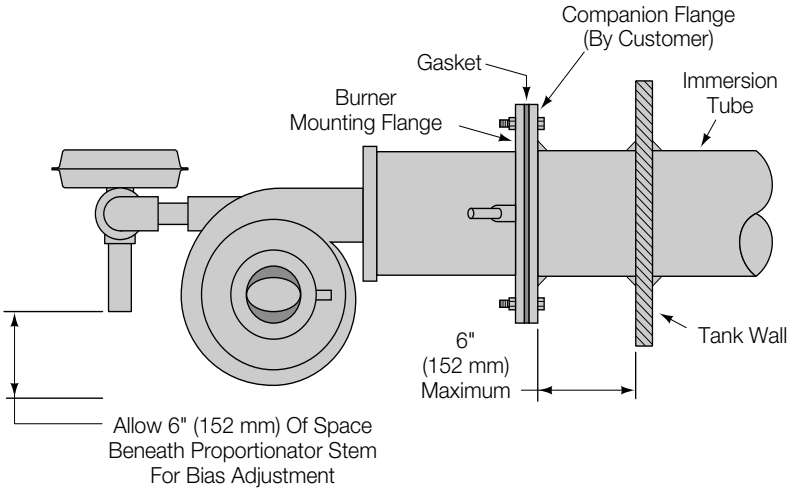
Electrical wiring must comply with the National Electric Code*, (NFPA Std. 70 or ANSI-CI 1981), or must be acceptable to the authority having jurisdiction.

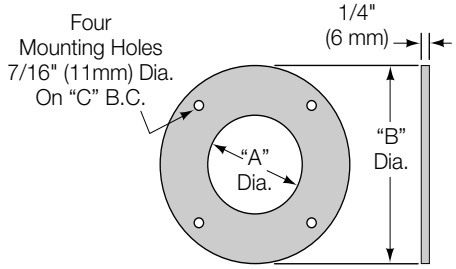
*Available from:

National Fire Protection Association
Batterymarch Park
Quincy, MA 02269

American National Standard Institute
1430 Broadway
New York, NY 10018

Figure 3–Burner Mounting



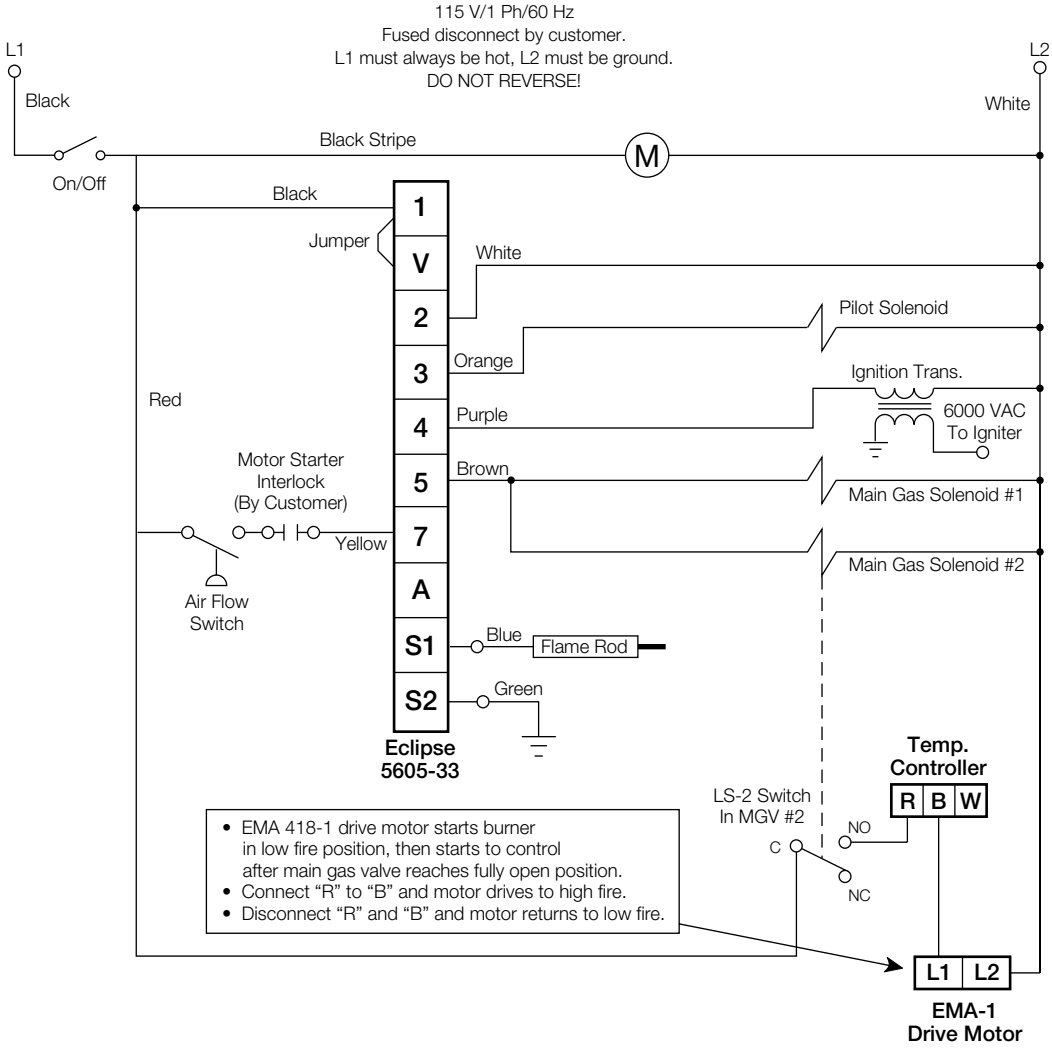


Companion Flange Dimensions

Burner	Dimensions					
	A		B		C	
	Inches	mm	Inches	mm	Inches	mm
124	6-11/16	170	11-7/8	302	10-11/16	271
132	8-11/16	221	11-7/8	302	10-11/16	271
140	10-13/16	275	14-7/8	378	14	356
148	12-13/16	325	14-7/8	378	14	356

Figure 4–Wiring Diagrams

For Standard Valve Train



For IRI Valve Trains

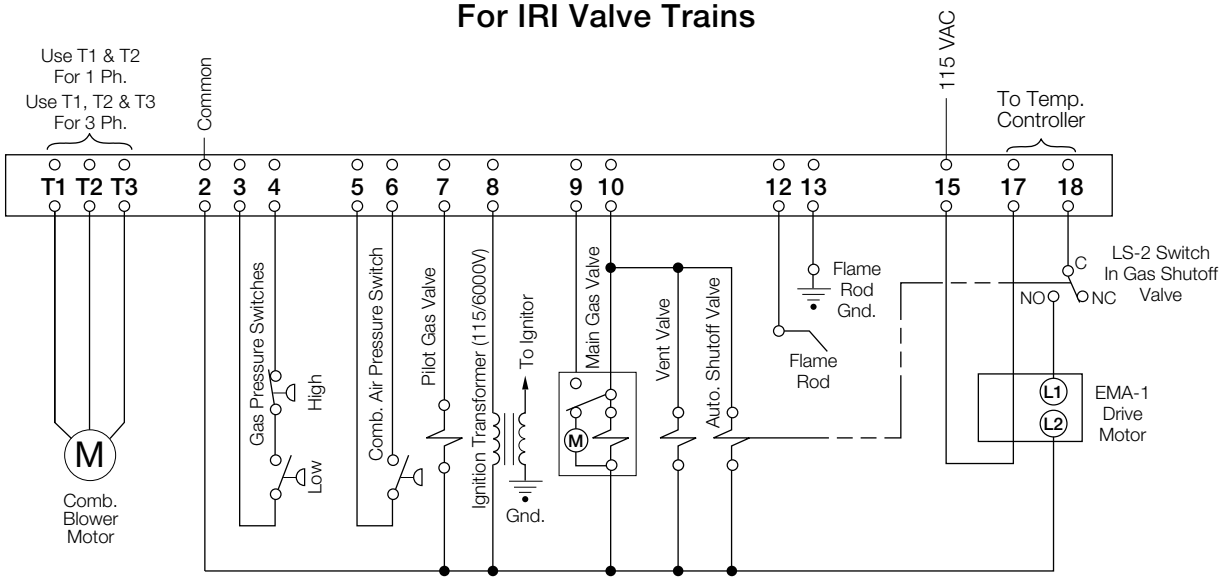
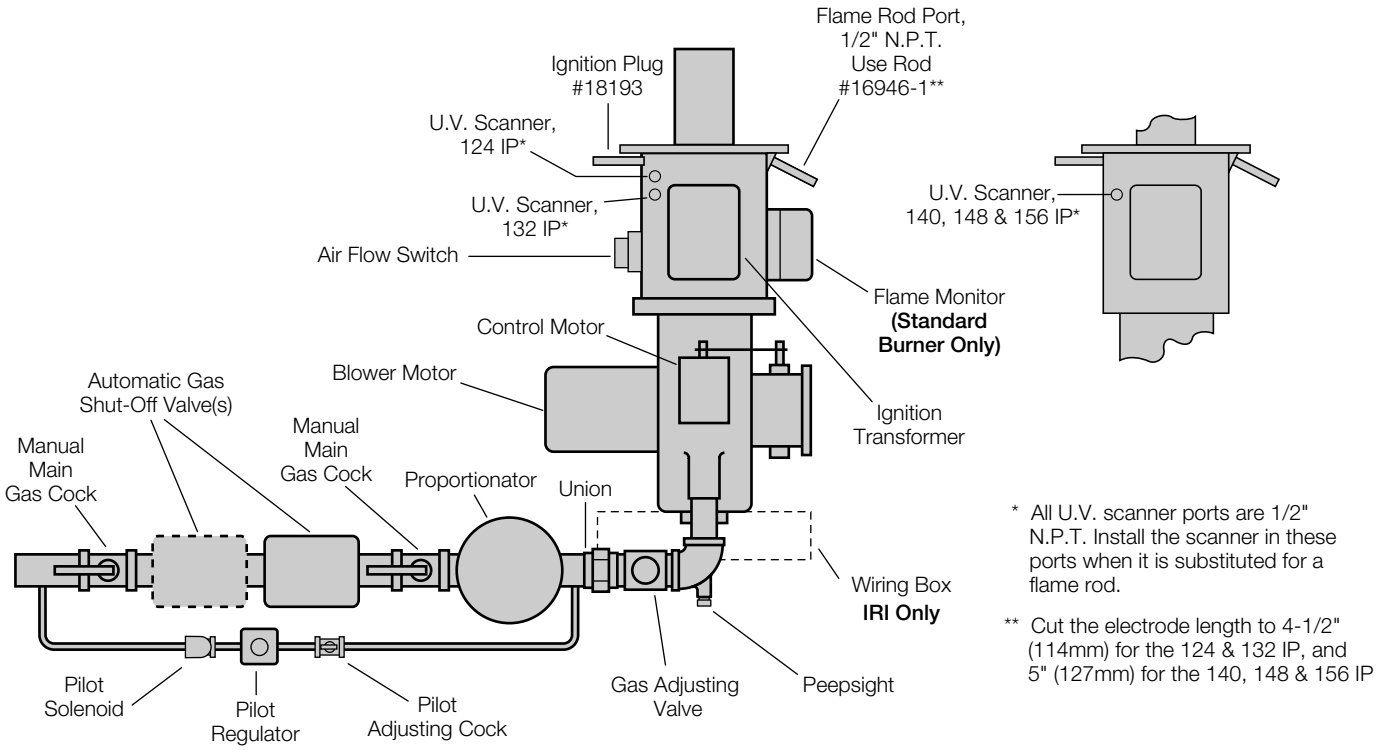


Figure 5–Components Identification



5.0 Start-Up & Adjustment

Refer to the above illustration for component identification and location.

Initial Start-up Instructions

Close the manual main gas and pilot gas cocks.

Turn the burner on/off switch to “on.”

Open the manual main gas cock and then the pilot gas cock. Always open these two valves in this sequence; reversing the sequence may blow out the pilot as the control motor moves to the high fire position.

After the pilot gas cock is opened, the pilot should light, the automatic main gas valve should open to establish a low fire flame, and the control motor should move the air butterfly valve to the open—or high fire—position. Pilot gas flow is set at the Eclipse factory during test firing and should be satisfactory for most applications. If pilot adjustment is required, see the detailed instructions in Figure 7. Pilot gas flow should be the minimum that will give reliable ignition and a steady flame signal.

Check Flue Gas

Drive the burner to high fire. Using a flue gas analyzer, measure the flue gas components in the exit end of the immersion tube. Adjust the gas butterfly to produce 2 to 4% O_2, or 10 to 10.5% CO_2 for natural gas.

Adjust High Fire Gas Flow

Using Tag Settings: Each burner is test fired at Eclipse before shipment and supplied with a tag (Figure 6) showing the differential gas pressure that corresponds to maximum rated input. Attach a manometer as shown in Figure 6, and, if necessary, adjust the air butterfly linkage until the gas differential pressure matches the pressure drop recorded on the tag. The differential pressure on the tag is for natural gas. For propane, multiply this pressure by 0.4.

Using A Gas Metering Orifice: If a gas metering orifice was installed to provide more accurate gas flow measurements, use a manometer to measure the pressure drop across the orifice. If necessary, adjust the air butterfly linkage to produce the pressure drop that corresponds to the desired high fire gas flow.

5.0 Start-Up & Adjustment *(continued)*

Check For Smoke	If smoke is present in the exhaust, gradually close the gas butterfly valve until the smoke disappears.
Adjust Low Fire	Drive the burner to low fire. Check the tube outlet for smoke. If smoke is present, adjust the adjustable bias proportionator as detailed in Figure 8. If smoke is still present, then the air butterfly valve may need to be opened more. Readjust the valve linkage to provide more air at low fire.
Recycle to Verify Firing Rates	Cycle the burner several times to verify that the system is properly adjusted at all firing rates.
Burner Shutdown	Turn the main and pilot gas valves off. Turn the burner on/off switch to "off."

Figure 6–Supplied Burner Tag

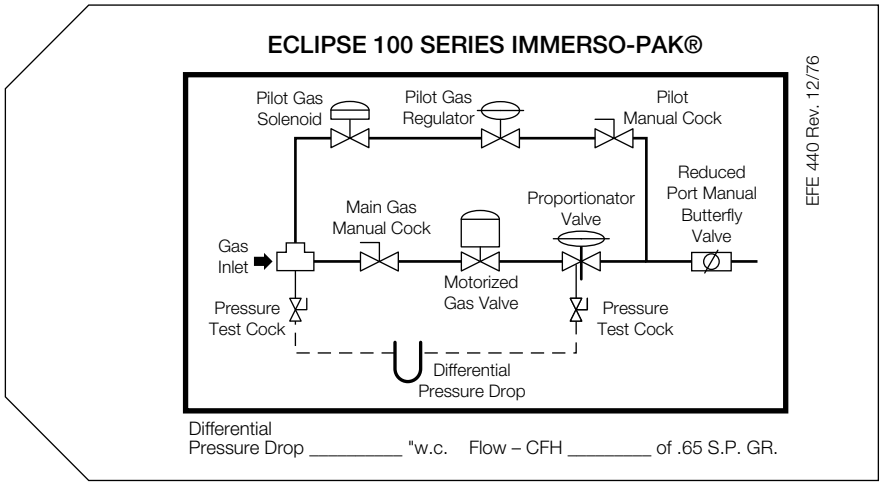
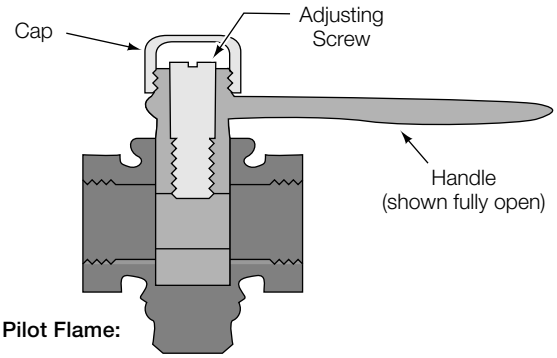


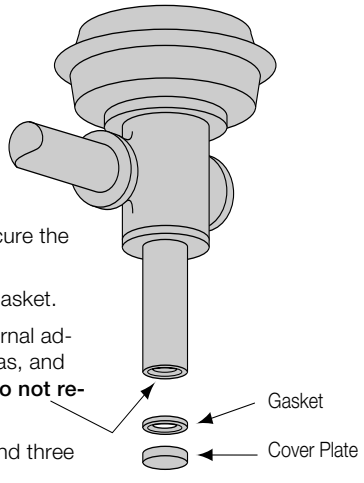
Figure 7–Pilot Adjustment



To Adjust Pilot Flame:

1) Remove the cap.
2) Turn the adjusting pin clockwise for less gas, and counterclockwise for more gas. **Do not remove the pin from the valve.**
3) Replace the cap after adjustment.

Figure 8–ABP Adjustment



To Adjust Low Fire:

1) Remove the three screws that secure the cover plate.
2) Remove the cover plate and the gasket.
3) With a screwdriver, adjust the internal adjusting screw clockwise for less gas, and counterclockwise for more gas. **Do not remove the screw from the stem.**
4) Replace the gasket, cover plate and three screws after adjustment.

6.0 Trouble-Shooting

⚠ CAUTION

Trouble shooting of panels and electrical circuits should be done by qualified plant electricians, technicians, or engineers experienced in all facets of this type of combustion equipment.

PROBLEM	CAUSE(S)
Pilot fails to light.	1. On initial start-up, gas line may be filled with air. Repeat ignition trial several times to purge. 2. No power to ignition transformer or pilot solenoid. 3. Open circuit between ignition transformer and spark plug. 4. Spark plug needs cleaning. See “Maintenance” section for instructions. 5. Spark plug improperly grounded. Do not use pipe dope on ignition plug threads. 6. Pilot gas cock screw closed. 7. Insufficient gas pressure into or out of pilot regulator.
Main flame fails to light or goes out as burner cycles to high fire.	1. Pilot set too lean, becoming unstable as air increases. 2. Insufficient pressure into or out of main gas regulator. 3. Main gas adjusting valve not open enough.
Smoke on high fire.	1. Gas flow is rich. Main gas butterfly valve is open too far.
Smoke on low fire.	1. Gas flow is rich. Proportionator spring is screwed out too far. 2. Insuffiicient air flow due to dirty blower filter or impeller. 3. Air butterfly valve is closed too far. 4. Insufficient gas pressure into proportionator, causing it to track improperly at all rates below high fire. Raise inlet gas pressure as listed in Section 2.
Burner rumbles or bangs.	1. Burner not properly set. See Section 5.0. 2. If rumbling occurs, slide a piece of steel plate over the end of the tube until the noise disappears. Then weld the plate in place.

7.0 Maintenance

Maintenance Program	A sound preventative maintenance program, carried out by qualified individuals, will greatly increase equipment reliability and productivity. Frequency of maintenance checks should reflect the duty cycle of the heating equipment and conditions such as dirt and temperature. Any maintenance program should include at least the following steps:
Check Pressure Settings	Check the burner's high and low fire air and gas settings.
Check Filters	Examine and, if necessary, clean or replace air and gas filter elements.
Check for Leaks	Check all piping connections for leaks.
Check Flame Supervision	Check the ability of the flame supervision system to function properly by simulating system failures: Simulate burner flameout by manually shutting off the gas. Trip out pressure switches and other limit interlocks. Try to light the burner before the purge and other timers have finished their cycles. If simulated limit or flame failures do not shut down the fuel system within an acceptably short period of time, immediately take the equipment out of service and correct the problem. Leak test automatic and manual reset fuel valves per insurance procedures.
Check Bolts & Screws	Check all bolts and screws for tightness.
Check for Overheating	Check the area around the burner mounting flange for signs of overheating. Gasket replacement may be necessary.
Check for Water Leakage	Check the interior of the burner and immersion tube for water accumulation. Small amounts of water may collect due to condensation of combustion products. Large amounts of water may be a sign of tube leakage.
Plug & Rod Replacement	Ignition plugs and flame rods wear out over long periods of normal burner operation. Eclipse recommends that the user keep at least one of each in stock at all times to prevent nuisance shutdowns. See Figure 5 for plug and rod numbers. The flame rod electrode lengths listed in Figure 5 extend the rod about 1/2" (13 mm) into the flame. Be certain that the flame rod is not grounded. The ignition plug specified has an adjustable electrode length. To install the plug, loosen the electrode and thread the plug into the burner. Push the electrode toward the burner centerline until it stops. Then pull the electrode back 3/32" (2 mm). Tighten the electrode in this position.