

**ACL**

Manufacturing Inc.

**ACL HIGH EFFICIENCY BURNER ASSEMBLY**

**ACL  
HIGH EFFICIENCY  
BURNER ASSEMBLY  
PATENTED BURNER**

**WARNING**

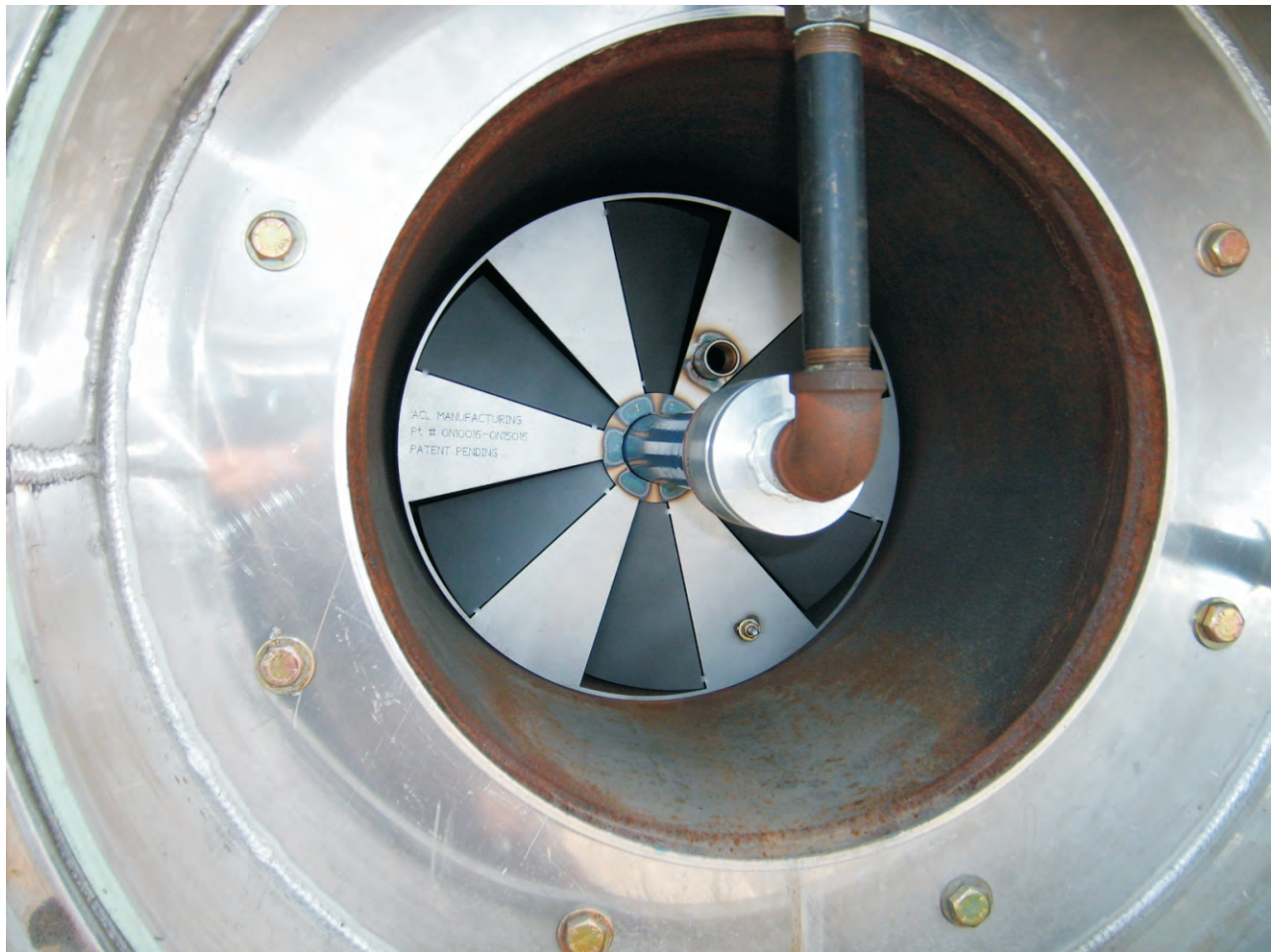
**This manual must be read in its entirety before installation of this burner. Installation must be performed by a qualified technician and must adhere to the standards set by the local regulatory authorities.**

**ACL is not responsible for the misuse or incorrect application of this product.**

# ACL HIGH EFFICIENCY BURNER ASSEMBLY

## Application

The ACL HE-ON burner assembly has been designed for use with atmospheric, natural draft fire tube heating appliances (line heaters, reboilers, dehydrators, tank heaters, etc. ) to provide highly efficient and reliable operation. A wide range of burner sizes, easily positioned into any fire tube, are available to meet specific heating requirements. Complete burner assembly includes ACL M series mixer, ON nozzle, pilot, ignitor/flame rod, pre-drilled orifice, and venturi barrel. With the addition of an ACL combustion safety controller and engineered valve train, it completes a cost effective system for safely igniting, monitoring, and controlling the heating process.



# ACL HIGH EFFICIENCY BURNER ASSEMBLY

## Features

Patented Burner

Primary air control

Low fire / High fire through single burner or separate pilot

High efficiencies ( typically 80%)

Safe and reliable ignition / flame sensing

Extremely stable at wide range of pressures ( 0.5-15 psi )

Ideal for burning low pressure gases such as tank vapors

Quiet operation

Reduced emissions (No CO and low Nox )

No flame impingement on firetubes

No flame lift-off

Unique flame profile that maximizes heat transfer

Easy to install

SST nozzles available upon request



# ACL HIGH EFFICIENCY BURNER ASSEMBLY

## ACL M Series Mixers



**M100**



**M150**



**M200**

## ACL ON Nozzles



Single Burner  
ON Nozzle



Dual Burner  
ON Nozzle

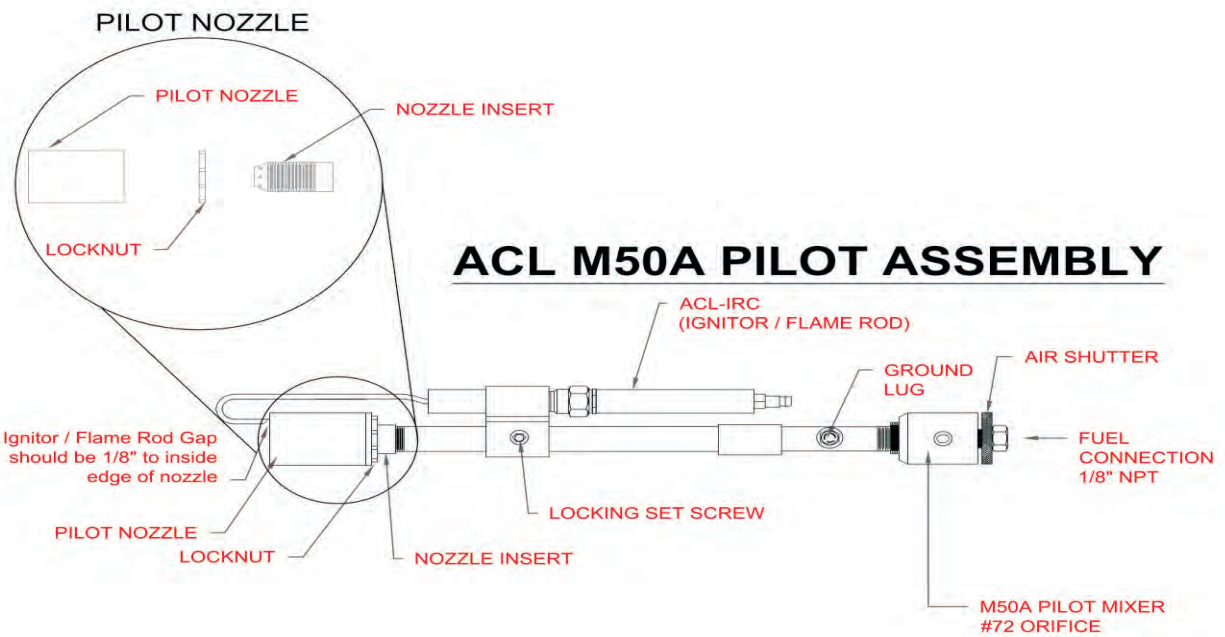


Triple Burner  
ON Nozzle

# ACL PILOT ASSEMBLIES

## ACL-PILOTS

### ACL 1500 PILOT ASSEMBLY



### ACL PILOT

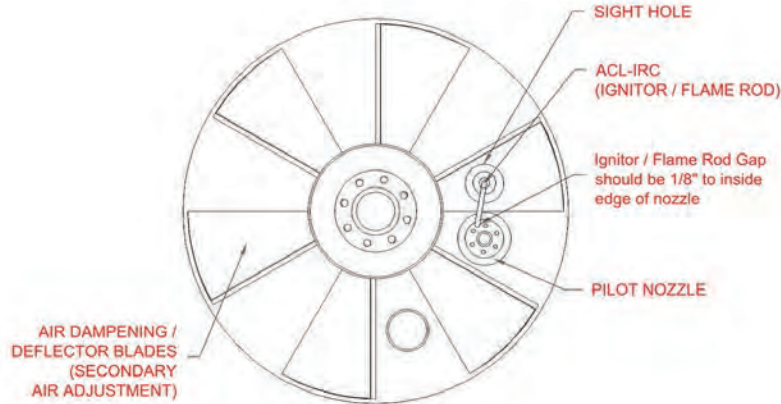
Pilot Assemblies		BTU Range	Fuel Connection Size	Auxiliary Air Inlet	Orifice Size	Recommended Application
M50A	Pilot Assembly	Up to 19,000	1/8" NPT	1/4" NPT	#72	Standard Fuel Capacity-Natural Gas/Propane Optional heat return tube to prevent freezing For ideal fuel gas conditions
ACL 1500 PILOT	Pilot Assembly	Up to 48,000	1/8" NPT	1/4" NPT	#60	Larger Fuel Capacity-Natural Gas/Propane Optional heat return tube to prevent freezing For less than ideal fuel conditions

Pilots operate at a recommended pressure range of 2 psi to 7 psi to a maximum of 15 psi  
 Pilots are recommended for burners over 1,000,000 BTU  
 The ACL 1" Burner Assembly accommodate a low fire/high fire pilot up to 1,000,000 BTU.  
 Therefore, no separate pilot is required

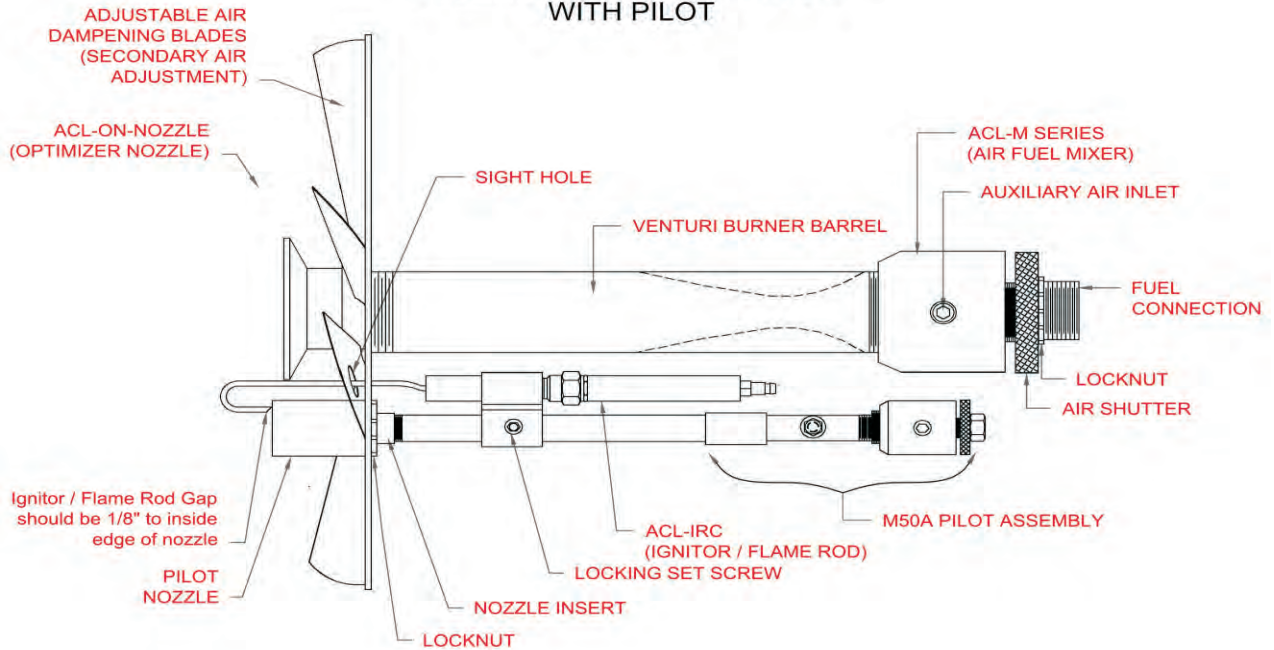
# ACL HIGH EFFICIENCY BURNER ASSEMBLY

## ACL HE-ON SINGLE BURNER

ACL HE-ON SINGLE BURNER WITH PILOT  
FRONT VIEW



ACL HE-ON SINGLE BURNER  
WITH PILOT



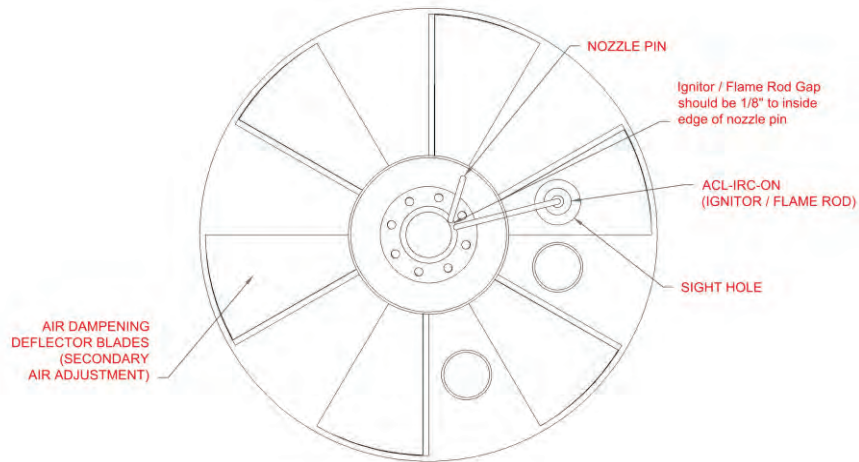
### ACL HE - ON SINGLE BURNER

ACL M Series Mixer	Mixer Connection Size	BTU Range	Fuel Connection Size	Auxiliary Air Inlet	Burner Barrel XX=Length Length Range 10" to 36"	ON Nozzle XX=Fire Tube Diameter Diameter Range 4" to 48"
M100	1" NPT	Up to 1,000,000	1/4" NPT	3/8"NPT	B100XX	ON100XX
M150	1½" NPT	Up to 1,500,000	3/4" NPT	1/2" NPT	B150XX	ON150XX
M200	2" NPT	Up to 2,500,000	3/4" NPT	1/2" NPT	B200XX	ON200XX

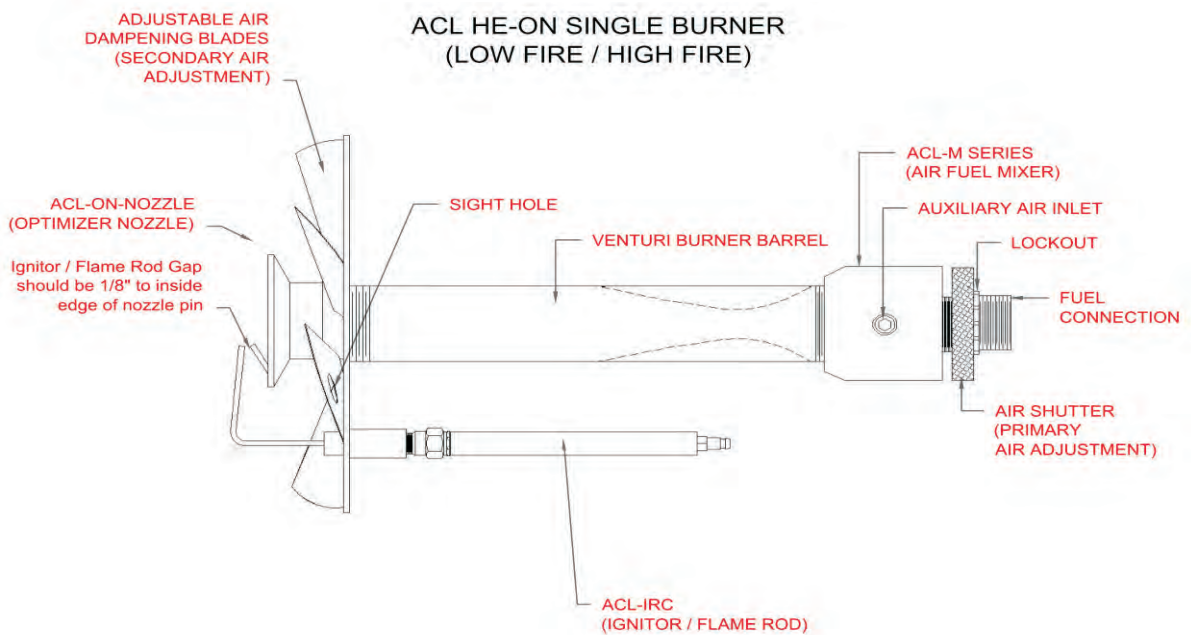
# ACL HIGH EFFICIENCY BURNER ASSEMBLY

## ACL HE-ON SINGLE BURNER LOW FIRE / HIGH FIRE

ACL HE-ON SINGLE BURNER LOW FIRE / HIGH FIRE FRONT VIEW



ACL HE-ON SINGLE BURNER  
(LOW FIRE / HIGH FIRE)



### ACL HE - ON SINGLE BURNER

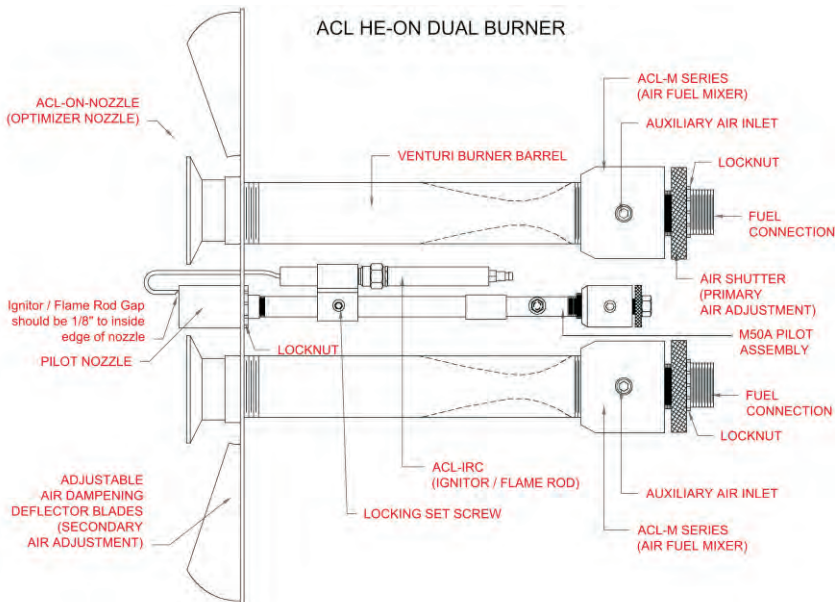
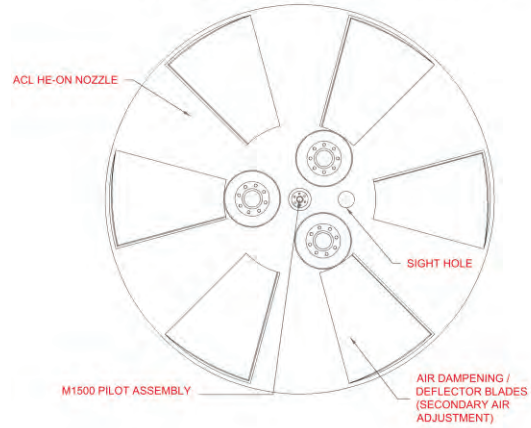
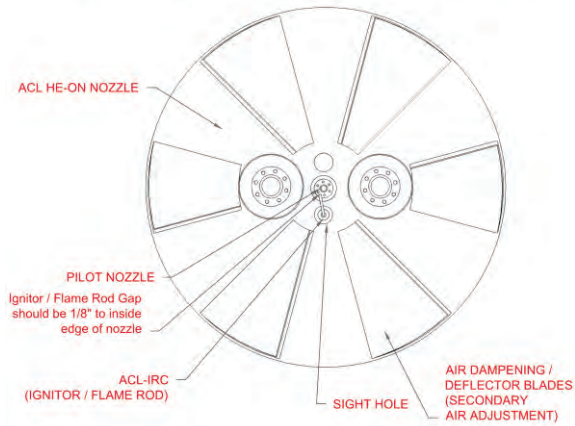
ACL M Series Mixer	Mixer Connection Size	BTU Range	Fuel Connection Size	Auxiliary Air Inlet	Burner Barrel XX=Length Length Range 10" to 36"	ON Nozzle XX= Fire Tube Diameter Diameter Range 4" to 48"
M100	1" NPT	Up to 1,000,000	1/4" NPT	3/8" NPT	B100XX	ON100XX
M150	1 1/2" NPT	Up to 1,500,000	3/4" NPT	1/2" NPT	B150X	ON150XX
M200	2" NPT	Up to 2,500,000	3/4" NPT	1/2" NPT	B200XX	ON200XX

# ACL HIGH EFFICIENCY BURNER ASSEMBLY

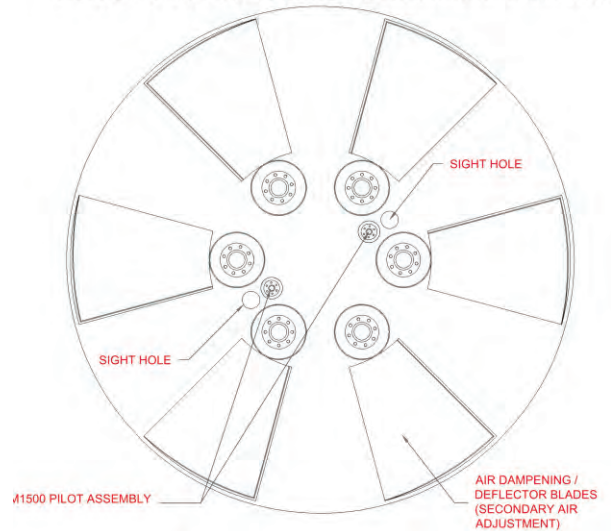
## ACL HE-ON MULTIPLE BURNER OPTIONS

ACL HE-ON DUAL BURNER WITH M50A PILOT FRONT VIEW

ACL HE-ON TRIPLE BURNER WITH 1500 PILOT FRONT VIEW



ACL HE-ON SIX BURNER WITH DUAL M1500 PILOT FRONT VIEW



### ACL HE - ON WITH MULTIPLE BURNER OPTIONS

ACL M Series Mixer	Mixer Connection Size	BTU Range	Fuel Connection Size	Auxiliary Air Inlet	Burner Barrel XX=Length Length Range 10" to 36"	ON Nozzle XX=Fire Tube Diameter Diameter Range 4" to 48"
(2) M150	1-1/2" NPT	Up to 3,000,000	(2) 3/4" NPT	1/2" NPT	(2) B150XX	ON2X150XX
(2) M200	2" NPT	Up to 5,000,000	(2) 3/4" NPT	1/2" NPT	(2) B200XX	ON2X200XX
(3) M200	2" NPT	Up to 7,500,000	(3) 3/4" NPT	1/2" NPT	(3) B200XX	ON3X200XX
(6) M200	2" NPT	Up to 15,000,000	(6) 3/4" NPT	1/2" NPT	(6) B200XX	ON6X200XX

Burners are sized at a recommended 9 psi. Operating pressure range is 1 psi to 15 psi



# ACL HIGH EFFICIENCY BURNER ASSEMBLY

## Mixer / Primary Air Adjustment

**ACL M Series Mixers** are designed to mix the primary air with the fuel supply to achieve optimum combustion. The amount of primary air coming through the mixer can be altered by adjusting the air shutter. Closing the air shutter allows less primary air to flow and opening the shutter allows more primary air to flow. Also, incorporated into the design of each mixer is an auxiliary air inlet for the addition of pressurized air to be used, if supplied, or the installation of a heat return tube (see Heat Return Tube below.) Each mixer comes with an orifice that can be sized to meet the BTU requirements of the heating application. Orifice size is based on field applications that have proven efficiencies when operating at a fuel gas operating pressure of 9 PSI. Recommended ACL Mixer / Orifice Size for use with propane or natural gas can be found on pages 10 and 11.

## ON Nozzle/ Secondary Air Adjustment

**ACL ON Nozzles** with adjustable air dampening/deflector blades are to regulate the amount of secondary air flow to achieve optimum combustion and a stable flame profile that ensures even heat distribution to the fire tube. Blades are factory set at 30° to control the secondary air, however, further field adjustments may be required to achieve optimum efficiency. Closing the adjustable blades allows less secondary air to flow and opening the adjustable blades allows more secondary air to flow. The low pressure zone, established by the unique design of the ACL ON nozzle, ensures there is no flame lift-off. A Low fire / High fire option is available on 1" ON nozzles up to 1,000,000 BTU.

## Burner Barrel

Air/ fuel mixing is maximized by the **ACL Venturi Burner Barrel**. With the ACL M Series Mixer placed in the flame arrestor chamber, the length of the burner barrel should be sufficient to position the ON Nozzle into the wetted section of the fire tube. Ensure proper directional flow of fuel mixture through venturi.

## Pilot Assembly

To incorporate the **ACL M50A** pilot assembly, place pilot nozzle insert into non-flexible sight hole on front side of ON nozzle. Attach pilot nozzle to pilot nozzle insert, from backside of ON nozzle until tight. Secure lock nut on front side of ON nozzle. (See diagram on page 5.)

To incorporate the **ACL 1500** pilot assembly, insert barrel/ignitor rod through non-flexible sight hole on front side of ON nozzle. Attach pilot nozzle from backside of ON nozzle until tight. Secure lock nut on front side of ON nozzle. If required, insert heat return tube through flexible sight hole and attach to auxiliary air inlet on mixer.

## Heat Return Tube

The **Heat Return Tube** is a 3/8" stainless steel tubing line inserted into the auxiliary air inlet of the ACL M Series mixer and extends into the pilot flame through the sight hole in the ON nozzle. The purpose of this tube is to bring back heat into the mixer, preventing hydrates from forming on the orifice and plugging off gas stream. The amount of heat can be regulated by closing and opening the air shutter on the mixer. Closing the mixer shutter forces more hot air to be drawn into the tube to prevent freezing. The heat return tube may be used on both the pilots and as well as the main burners. All ACL M Series mixers have auxiliary air inlets to provide for this feature.

## Ignitor/Flame Rod

Flame acknowledgment and reliable ignition is established by proper positioning of **ACL Ignitor/Flame Rod**. For strongest flame sensing, the Ignitor/Flame Rod gap should be 1/8" to inside edge of pilot nozzle or ON nozzle pin.

## Operation

Completely close the air shutter on the ACL HE-ON burner assembly, then open two full turns before igniting. Upon ignition and with stable fuel gas operating pressure, adjust air shutter to achieve a strong blue flame with visible orange tips. Use the locking nut to secure the air shutter in position. For further tuning, the use of a flue gas analyzer is recommended.

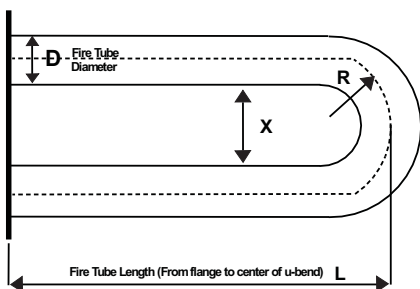
# ACL HIGH EFFICIENCY BURNER ASSEMBLY

## ACL HIGH EFFICIENCY BURNER ASSEMBLY

### Recommended ACL Mixer/Orifice Size (Propane)

Fire Tube Diameter	Fire Tube Length	Total Net Heat 1. (BTU/HR)	ACL Net Heat Required 2. (BTU/HR)	ACL Mixer	MTD Orifice Size	DIA. IN. Orifice Size
6"	6	221,124	170,095	M100	MTD-51	1/16"
	7.5	273,157	210,120	M100	MTD-48	5/64"
	9	325,190	250,146	M100	MTD-46	5/64"
8"	8	378,200	290,923	M100	MTD-43	3/32"
	10	468,520	360,400	M100	MTD-41	3/32"
	11.5	536,261	412,508	M100	MTD-37	7/64"
10"	10	583,261	448,662	M100	MTD-36	7/64"
	12	696,527	535,790	M100	MTD-31	1/8"
	14	809,100	622,385	M100	MTD-30	1/8"
12"	11	759,354	584,118	M100	MTD-30	1/8"
	14	959,631	738,177	M150	MTD-29	9/64"
	17	1,159,907	892,235	M150	MTD-24	5/32"
14"	12	907,104	697,772	M150	MTD-29	9/64"
	15	1,127,016	866,935	M150	MTD-25	5/32"
	18	1,346,927	1,036,097	M150	MTD-19	11/64"
16"	14	1,204,242	926,340	M150	MTD-24	5/32"
	17	1,455,570	1,119,670	M150	MTD-18	11/64"
	20	1,706,897	1,313,000	M200	MTD-13	3/16"
18"	16	1,543,268	1,187,129	M200	MTD-18	11/64"
	20	1,920,259	1,477,122	M200	MTD-11	3/16"
	23	2,203,003	1,694,617	M200	MTD-51	7/32"
20"	18	1,924,182	1,480,140	M200	MTD-9	13/64"
	22	2,343,061	1,802,354	M200	MTD-3	7/32"
	25	2,657,220	2,044,000	M200	MTD-1	15/64"

Please call for fire tubes not listed for more precise orifice sizing.



Actual ACL M Series Mixer and orifice size may vary by application (values are approximate). Recommended fuel gas operating pressure of 9 psi .

1. Maximum heat transfer of tube.
2. Approximate maximum heat required when using ACL Burner.

**D**=Fire Tube Inside Diameter

**L**= Fire Tube Length from flange to center of U bend

**X**= Distance between Inside of Fire Tube

**R**= Radius of Fire Tube U Bend

# ACL HIGH EFFICIENCY BURNER ASSEMBLY

## ACL HIGH EFFICIENCY BURNER ASSEMBLY

### Recommended ACL Mixer/Orifice Size (Natural Gas)

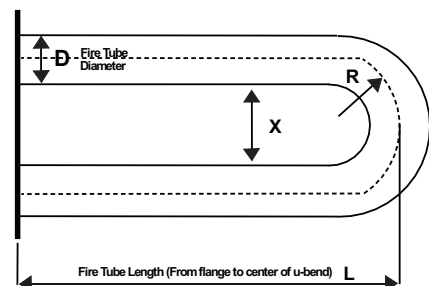
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	7.5	273,157	210,120	M100	MTD-42	3/32"
	9	325,190	250,146	M100	MTD-38	7/64"
8"	8	378,200	290,923	M100	MTD-36	7/64"
	10	468,520	360,400	M100	MTD-31	1/8"
	11.5	536,261	412,508	M100	MTD-30	1/8"
10"	10	583,261	448,662	M100	MTD-29	1/8"
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	14	809,100	622,385	M100	MTD-22	5/32"
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14"	12	907,104	697,772	M100	MTD-18	11/64"
	15	1,127,016	866,935	M100	MTD-11	3/16"
	18	1,346,927	1,036,097	M100	MTD-4	7/32"
16"	14	1,204,242	926,340	M100	MTD-9	13/64"
	17	1,455,570	1,119,670	M150	MTD-3	7/32"
	20	1,706,897	1,313,000	M150	MTD-B	15/64"
18"	16	1,543,268	1,187,129	M150	MTD-2	7/32"
	20	1,920,259	1,477,122	M150	MTD-E	1/4"
	23	2,203,003	1,694,617	M150	MTD-H	17/64"
20"	18	1,924,182	1,480,140	M150	MTD-E	1/4"
	22	2,343,061	1,802,354	M200	MTD-J	9/32"
	25	2,657,220	2,044,000	M200	MTD-L	9/32"

Please call for fire tubes not listed for more precise orifice sizing.

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1. Maximum heat transfer of tube.
2. Approximate maximum heat required when using ACL Burner.

D=Fire Tube Inside Diameter    X= Distance between Inside of Fire Tube  
 L= Fire Tube Length from flange to center of U bend    R= Radius of Fire Tube U Bend





**Website: [www.aclmfg.com](http://www.aclmfg.com)**

## **Limited Warranty**

Seller warrants that the product hereby purchased is, upon delivery, free from defects in material and workmanship and that any product which is found to be defective in such workmanship or material will be repaired or replaced by Seller for a period of one year from purchase date. Warranty of such items do not include shipping, installation or set-up.

## **Liability Statement**

ACL Manufacturing Inc. Shall not be liable for any special, indirect, consequential or other damages of a like general nature, including, without limitation, loss of profits or production, or loss of expenses of any nature incurred by the buyer or any third party.

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