



ACL

Manufacturing

A Division of ClearRushCo.

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.

www.clearrushco.com

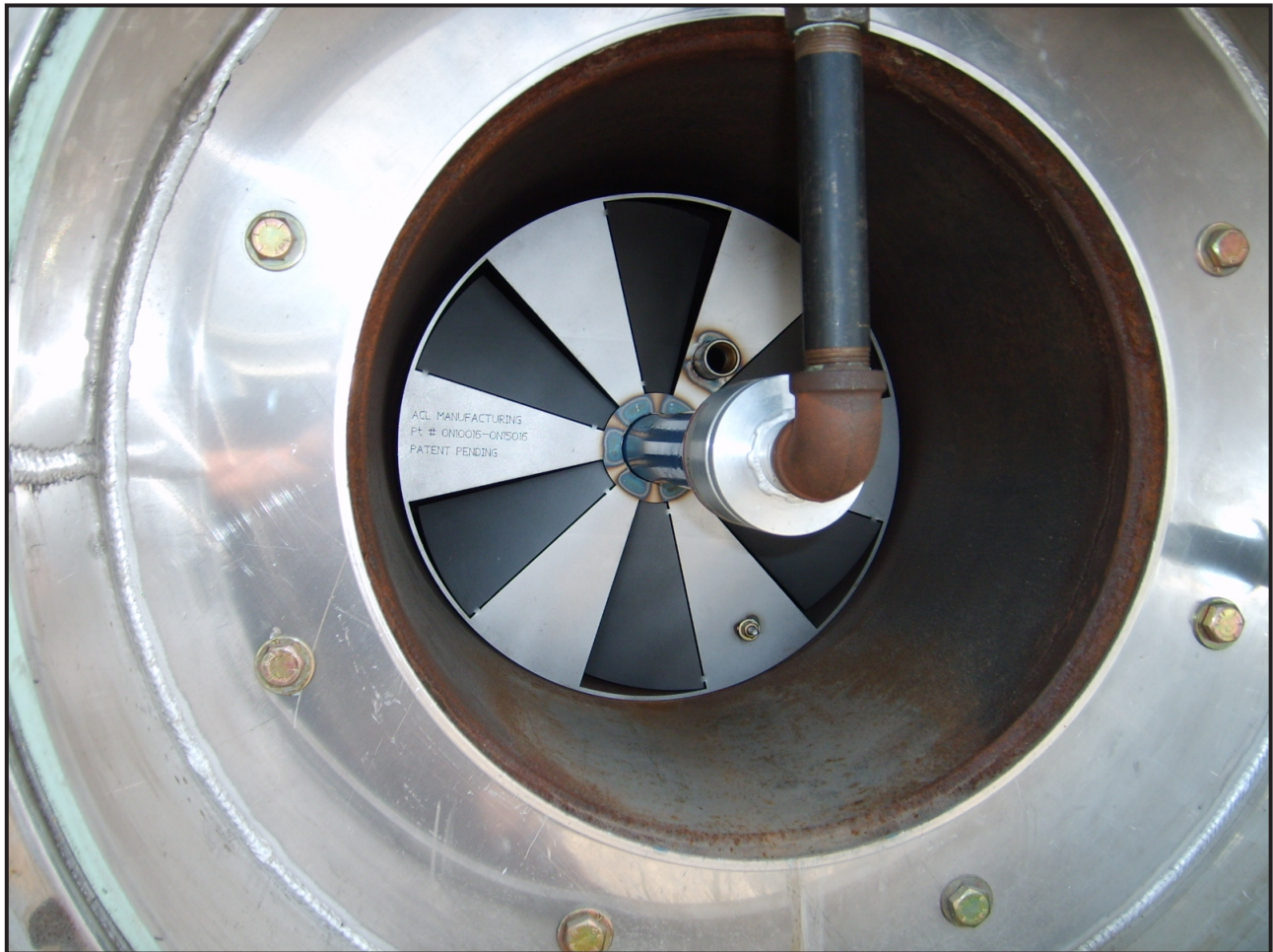
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Clear Rush Co.
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Sundre, AB T0M 1X0
Canada

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. An optional mixer sleeve may be added to support a heat return or for burning BTEX vapours.



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

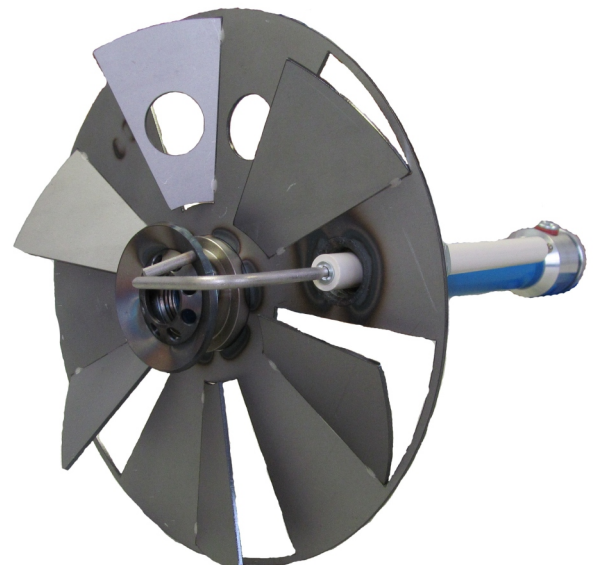
No flame lift-off

Unique flame profile that maximizes heat transfer

Easy to install

SST nozzles available upon request

Optional Mixer Sleeve for heat return or BTEX vapour burning.



ACL M Series Mixers



M100



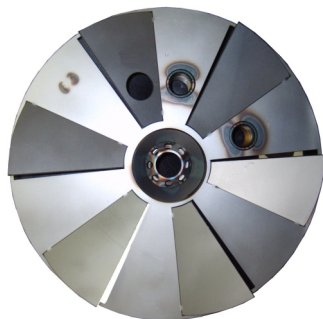
M150



M200

(Optional Mixer sleeve for heat return or BTEX gas tube is also available).

ACL ON Nozzles



Single Burner
ON Nozzle



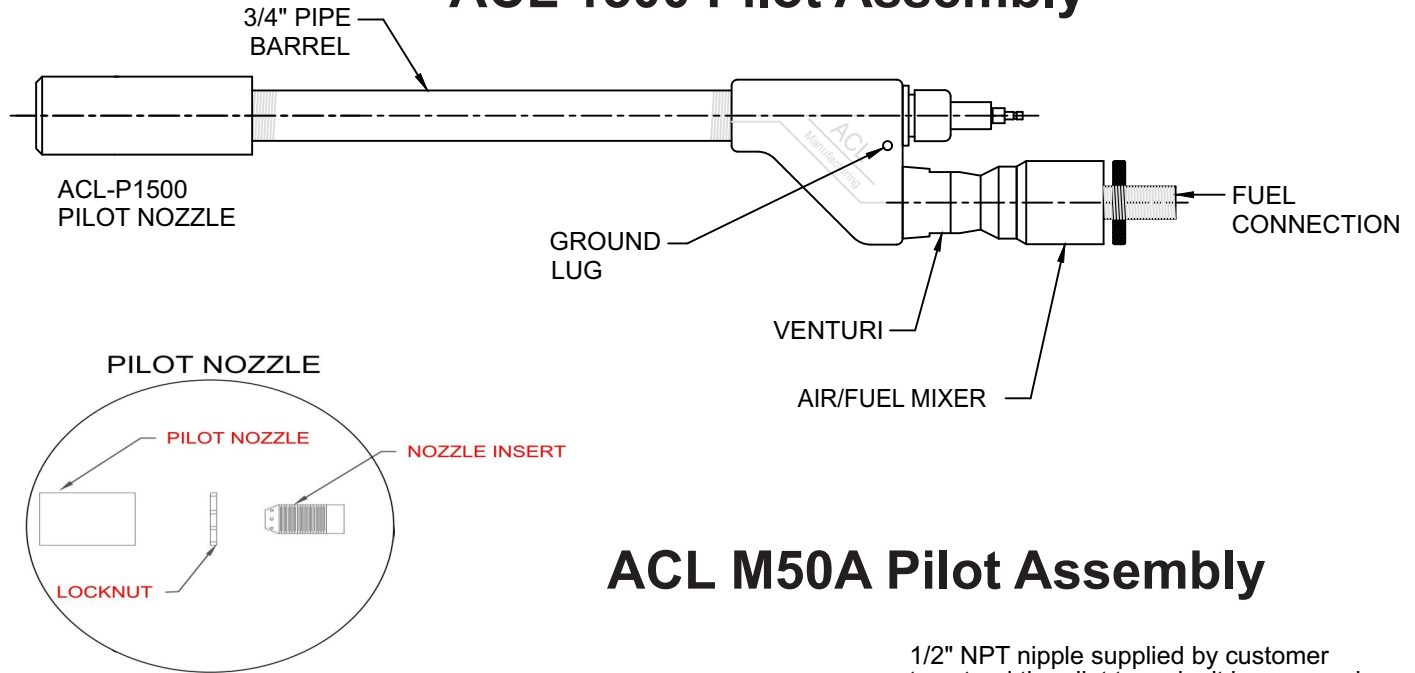
Dual Burner
ON Nozzle



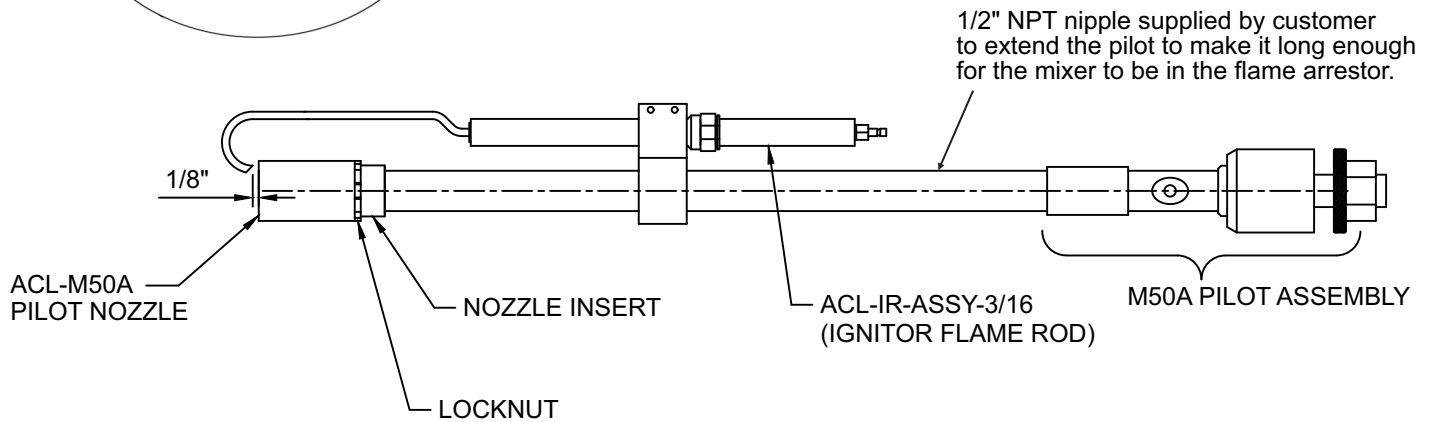
Triple Burner
ON Nozzle

ACL Pilot Assemblies

ACL 1500 Pilot Assembly



ACL M50A Pilot Assembly

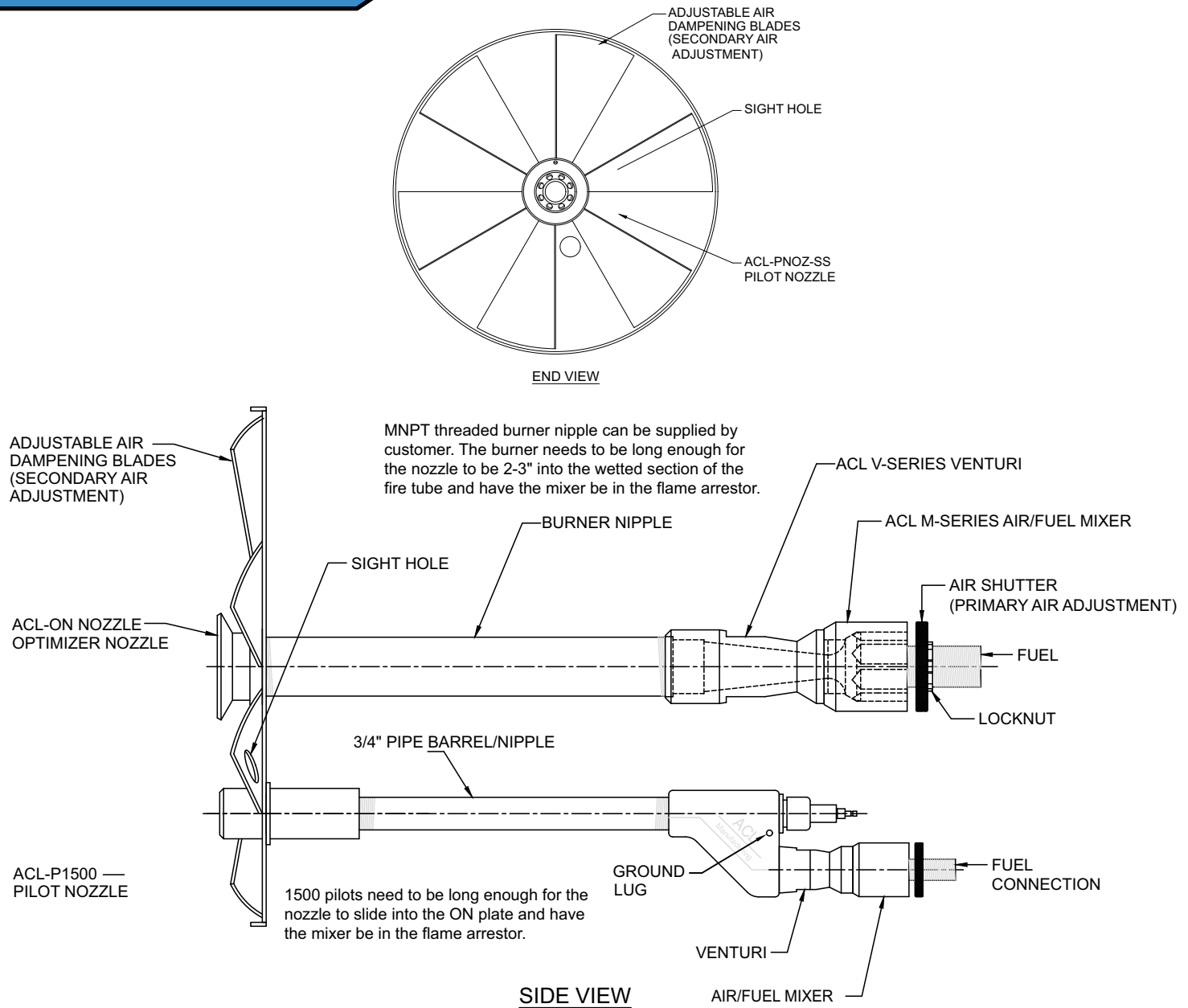


ACL PILOT

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 19,000	1/8" NPT	1/4" NPT	#72	Larger Burner Applications: Combustors / Incinerators Easily removed for maintenance Strong Stable Pilot

Pilots operate at a recommended pressure range of 2 psi to 7 psi to a maximum of 15 psi (separate pilot: 4-5 psi for natural gas, up to 7 psig for propane)
Pilots are recommended for burners over 1,000,000 BTU
The ACL 1" Burner Assemblies accommodate a low fire/high fire pilot up to 1,000,000 BTU.
Therefore, no separate pilot is required

ACL HE ON Single Burner



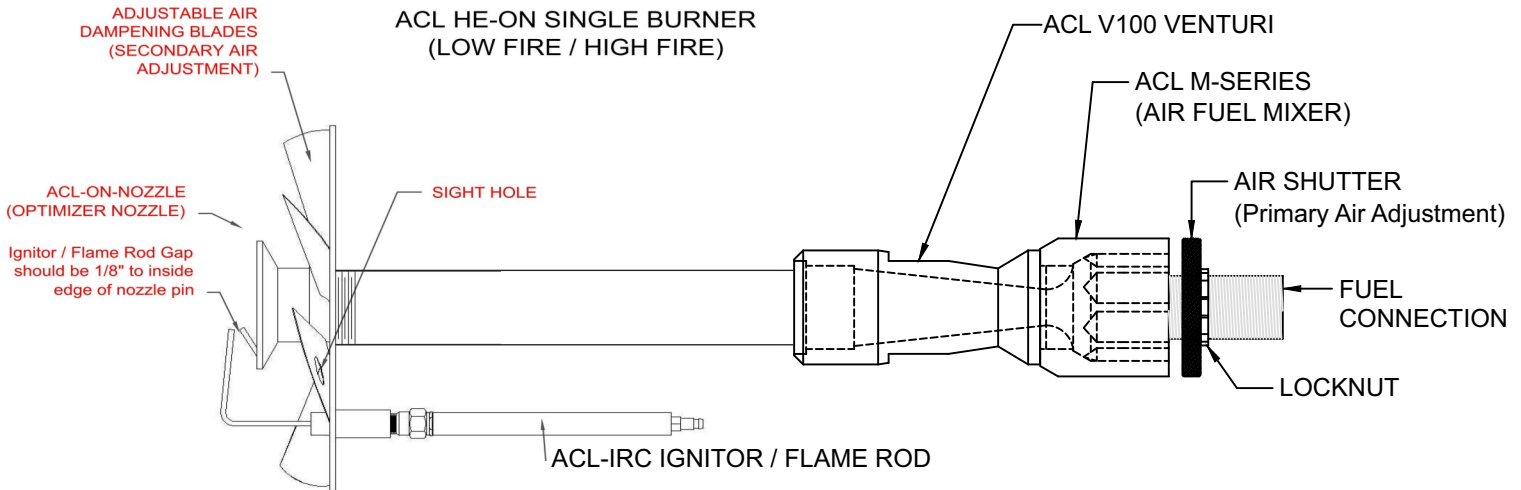
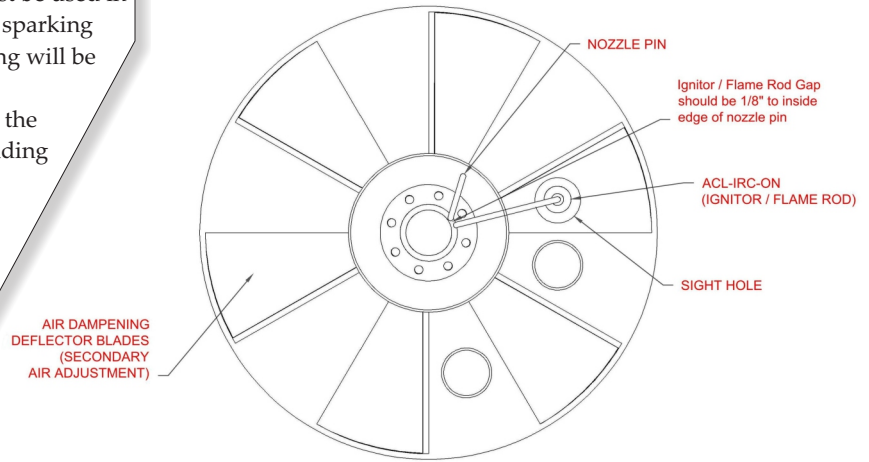
ACL HE - ON SINGLE BURNER

ACL M Series Mixer	Mixer Connection Size	BTU Range	Fuel Connection Size	Auxiliary Air Inlet	Burner Nipple XX=Length Range 10" to 36"	ON Nozzle XX=Fire Tube Diameter Range 4" to 48"	ACL Venturi
M100	1" NPT	Up to 1,000,000	1/4" NPT	3/8"NPT	Optional Customer Supplied	ON100XX	V100
M150	1½" NPT	Up to 1,500,000	3/4" NPT	1/2" NPT	B150XX	ON150XX	V150
M200	2" NPT	Up to 2,500,000	3/4" NPT	1/2" NPT	B200XX	ON200XX	V200

ACL HE ON Single Burner Low Fire / High Fire

Low Fire / High Fire flame sensing is provided through the ignitor rod and the Nozzle Pin on the ON Nozzle. The Nozzle Pin must be used in order to achieve optimal flame sensing. If the ignitor rod is sparking on the Low Pressure Ring or on the nozzle, the flame sensing will be erratic and intermittently will cause a flame fail condition. The ignition rod must be bent 2 inches from the ceramic on the ignitor rod assembly at slightly more than a 90 angle. Bending the ignitor rod at 2 inches allows the ceramic to protrude through the burner plate at an optimal 1/4 inch. Insert the ignitor rod assembly into the strain relief and align it with the Nozzle Pin (see side view of burner assembly). Mark the ignitor rod and cut off the extra length with bolt cutters or linesmen pliers. This will allow a sharp edge to the ignition rod and improved flame sensing. Loosely tighten the strain relief just enough to hold the ignition rod. Perform a final alignment with the ignition rod to the Nozzle pin allowing an 1/8 inch gap and tighten the strain relief.

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



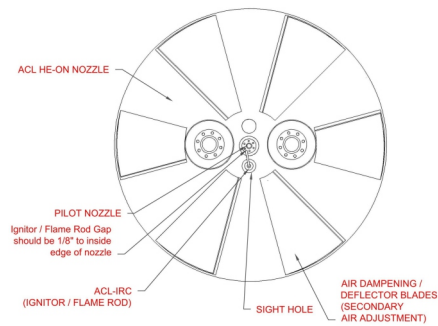
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M100	1" NPT	Up to 1,000,000	1/4" NPT	3/8" NPT	B100XX	ON100XX	V100
M150	1½" NPT	Up to 1,500,000	3/4" NPT	1/2" NPT	B150X	ON150XX	V150
M200	2" NPT	Up to 2,500,000	3/4" NPT	1/2" NPT	B200XX	ON200XX	V200

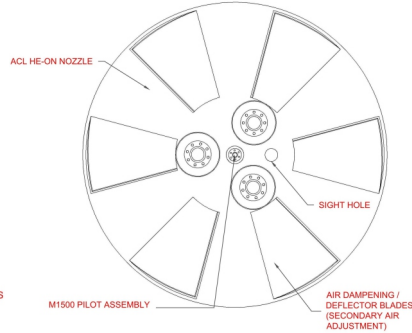
The ACL 1" Burner Assemblies accommodate a low fire/high fire pilot up to 1,000,000 BTU. Therefore, no separate pilot is required.

ACL HE ON Multiple Burner Options

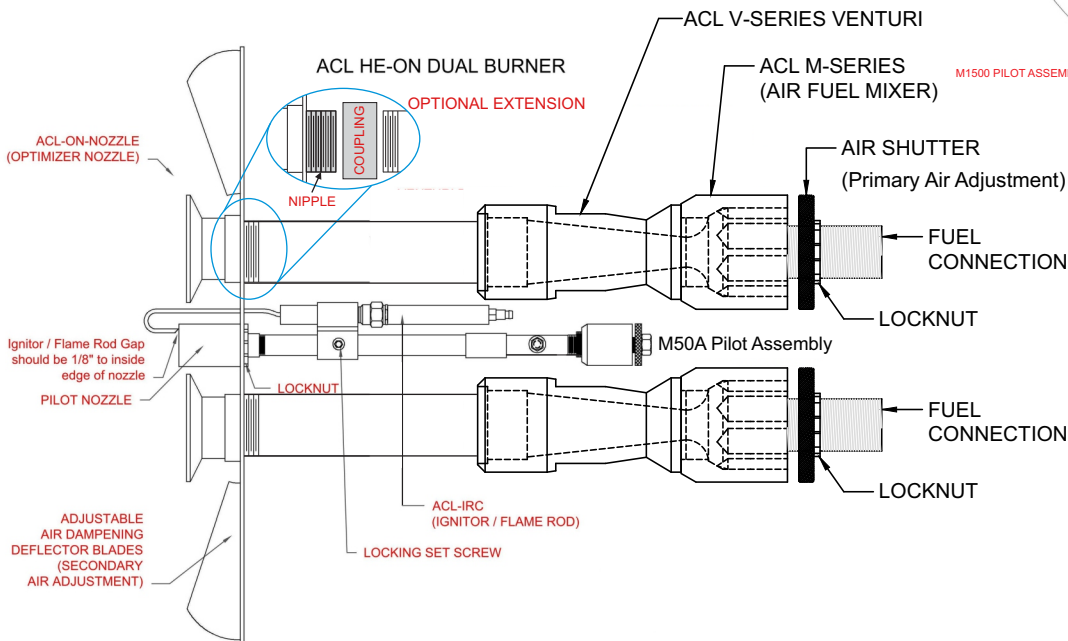
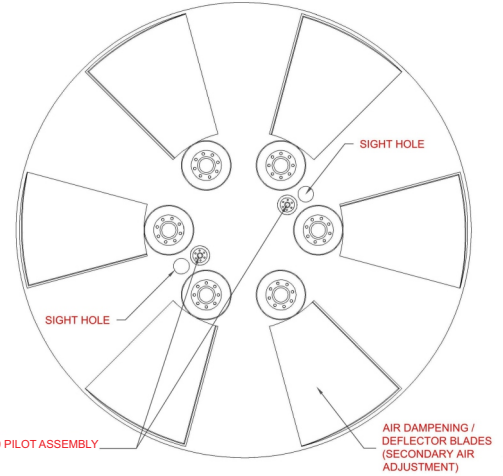
ACL HE-ON DUAL BURNER WITH M50A PILOT FRONT VIEW



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 Nipple XX=Length Range 10" to 36"	ON Nozzle XX=Fire Tube Diameter Range 4" to 48"	ACL Venturi
(2) M150	1-1/2" NPT	Up to 3,000,000	(2) 3/4" NPT	1/2" NPT	(2) B150XX	ON2X150XX	(2) V150
(2) M200	2" NPT	Up to 5,000,000	(2) 3/4" NPT	1/2" NPT	(2) B200XX	ON2X200XX	(2) V200
(3) M200	2" NPT	Up to 7,500,000	(3) 3/4" NPT	1/2" NPT	(3) B200XX	ON3X200XX	(3) V200
(6) M200	2" NPT	Up to 15,000,000	(6) 3/4" NPT	1/2" NPT	(6) B200XX	ON6X200XX	(6) V200

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

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. A optional mixer sleeve may be attached to the back of the mixer, providing an auxiliary air inlet for the addition of pressurized air (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 need to be set to 30 degrees to control the secondary air. However, further field adjustments may be required to achieve optimum efficiency, depending on drafting of heater. 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.

Venturi and Burner Nipple

Air/ fuel mixing is maximized by the **ACL Venturi and the Burner Nipple**. The length of the burner nipple should be sufficient to position the ON Nozzle into the wetted section of the fire tube while keeping the ACL M Series Mixer in the flame arrestor and not the fire tube. Ensure proper directional flow of fuel mixture through venturi by connecting venturi end to the mixer. Burner length can be extended on the open end to the burner nozzle if required (see ACL HE-ON Dual Burner diagram).

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 the backside of ON nozzle until tight. Secure lock nut on front side of ON nozzle. (See diagram on page 5.) The M50A air/fuel mixer needs to be positioned so that it is in the flame arrestor.

To incorporate the **ACL 1500** pilot assembly, slide the 1500 pilot through non-flexible sight hole on front side of ON nozzle until the nozzle ring stops nozzle movement. The 1500 needs to be long enough for the mixer to be in the flame arrestor. If required, insert heat return tube through flexible sight hole and attach to auxiliary air inlet on mixer sleeve.

Heat Return Tube

The **Heat Return Tube** is a 3/8" stainless steel tubing line inserted into the air inlet of the mixer sleeve covering the back 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" - 1/4" to the inside edge of the pilot nozzle or ON nozzle pin.

Operation

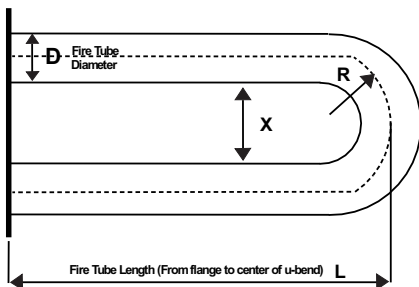
Completely close the air shutter on the ACL HE-ON burner assembly, then open two full turns before igniting. Upon ignition and with stable fuel gas operating pressure, adjust air shutter to achieve a strong blue flame with visible orange tips. Use the locking nut to secure the air shutter in position.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

ACL HIGH EFFICIENCY BURNER ASSEMBLY

Recommended ACL Mixer/Orifice Size (Propane)

Fire Tube Diameter	Fire Tube Length	Total Net Heat (Fire Tube Max) (BTU/HR) Note 1	ACL Required Heat Input (BTU/HR) Note 2	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.

Note 1. Maximum heat transfer of tube.

Note 2. Approximate maximum heat required when using ACL Burner. (Approx. firing rate of ACL burner which is about 20% than that of a traditional 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

ACL HIGH EFFICIENCY BURNER ASSEMBLY

Recommended ACL Mixer/Orifice Size (Natural Gas)

Fire Tube Diameter	Fire Tube Length	Total Net Heat (Fire Tube Max) (BTU/HR) Note 1	ACL Required Heat Input (BTU/HR) Note 2	ACL Mixer	MTD Orifice Size	DIA. IN. Orifice Size
6"	6	221,124	170,095	M100	MTD-44	3/32"
	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"
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	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"

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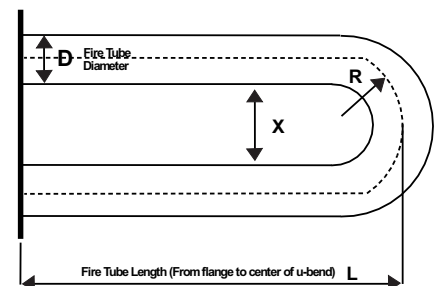
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L= Fire Tube Length from
flange to center of U bend

X= Distance between Inside of
Fire Tube
R= Radius of Fire Tube U Bend





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Website: 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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