

# ACL

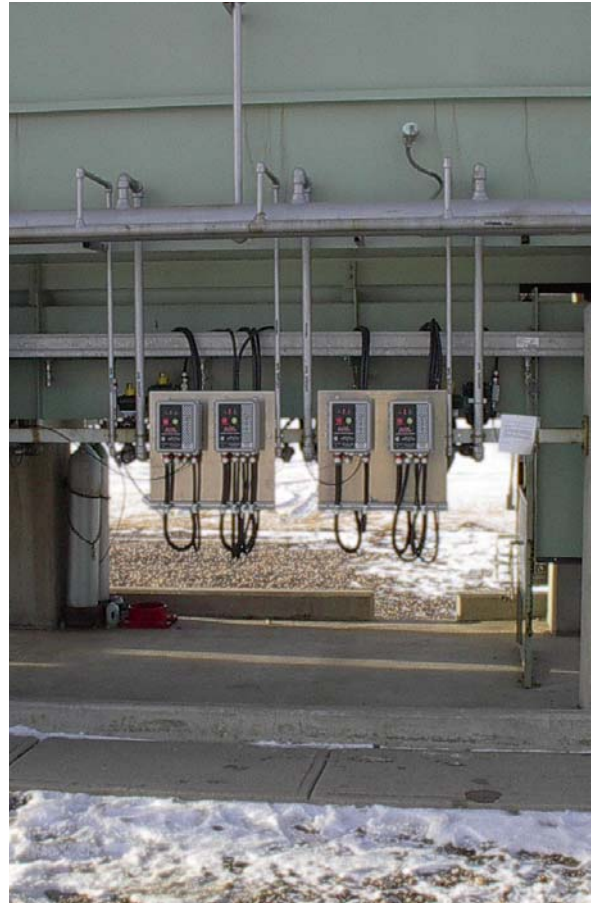
Manufacturing Inc.

## ACL 5000 Combustion Safety Control

The ACL 5000 provides ignition, flame fail, proof of closure, run status, alarm and shutdown capabilities and temperature control contacts for all gas fired heaters.

### Features

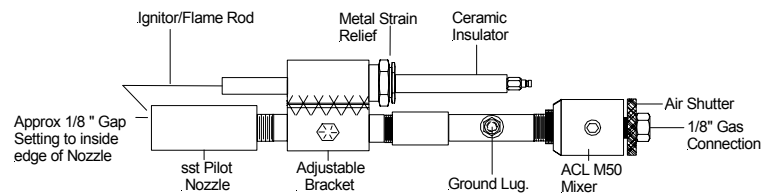
- Simple to use, no programming necessary
- Built in logic allows for automatic ignition & re-light, shutdown interlocks, alarm out, remote stop & remote start, proof of closure and temperature control contacts.
- Versatile power supply 9-30 VDC, 120 VAC 50/60 Hz. & Solar.
- Fastest flame out response time of 0.8 seconds.
- CSA approved for Class 1, Div 2 location.
- CSA approved C22.2 No 199-M89. Combustion safety controls and solid-state Ignitors for Gas & Oil burning equipment.
- CSA B149.3 Compatible.
- Nema 4x enclosure, corrosion resistant and weatherproof.



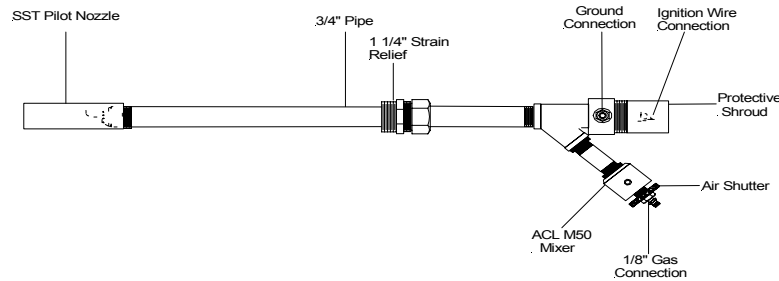
### Simple Design

- No programming necessary
- Two button operation (Stop & Start)
- New innovative design allows ignition and flame fail with the use of one flame rod
- Control and ignition components are all housed in the Nema 4x enclosure control box
- Easily installed into any burner.

## Pilot Assembly



## Optional Pilot Assembly



## Application

The ACL 5000 ignition control system is designed to be used for industrial sized burner applications where a continuous pilot is used. An approved slow opening valve must be used for large BTU heaters.

## Theory of Operation

The ACL 5000 utilizes a single ignitor/flame rod to provide both flame acknowledgement and ignition at the pilot tip. When the ACL 5000 starts its ignition sequence, fuel gas travels to the pilot tip where the ignitor/flame rod is located and sparking. Once the gas is lit, the flame becomes a current path for the ignitor/flame rod for flame acknowledgement and the unit stops sparking. If the pilot flame is extinguished, the current path is broken and the ignitor/flame rod starts sparking within 1 second.

## Sequence of Operation

	System On Light	Pilot Light	Solenoid #1	Solenoid #2	Alarm Light/ Alarm Contacts	Ignition	Run Status Contacts
Stop/reset pressed	OFF	OFF	OFF	OFF	OFF	OFF	OPEN
Push start 5 second trial for ignition	ON	ON	ON	OFF	OFF	ON	CLOSED
Pilot flame lit	ON	ON	ON	OFF	OFF	OFF	CLOSED
20 seconds later (T1 adjustable)	ON	ON	ON	ON	OFF	OFF	CLOSED
Pilot flame blows out	ON	ON	ON	ON	OFF	ON	CLOSED
Fails to light after 5 seconds	ON	OFF	OFF	OFF	OFF	OFF	OPEN
25 seconds later (T2 adjustable)	OFF	OFF	OFF	OFF	ON	OFF	OPEN

## Installation

Every ACL 5000 comes complete with:

- ACL 5000 controller
- ACL M-50 pilot mixer & nozzle
- 10' ground wire
- 10' high voltage wire complete with ends
- 6.5' non-metallic flex complete with connectors
- Ignitor/flame rod complete with mounting hardware
- Speed control valve

## Mounting

The ACL-5000 can be mounted in a Class 1 Div 2 area, usually close to the burner. The 10' of high voltage ignition lead, (longer lengths not recommended) must be run in the non metallic flex provided or free air. **Note:** Lead lengths in excess of 10' or use of metal or metallic sheathed conduit may result in a diminished ignitor rod voltage. A ground wire (also supplied) must be connected between the ground lug on the burner assembly and the bonding ground terminal on the main circuit board. If the controller must be mounted farther away from the burner assembly, the ignition module, which is mounted on the main circuit board, may be mounted in or near the burner housing using the optional, CSA approved, ACL5000R remote mount kit.

## Power Connection

The ACL-5000 is available in 12-24 VDC or an optional 120 VAC. Voltage requirements must be specified when ordering. The supply voltage of each unit is clearly marked inside the door on the specification label and on the circuit board beside its respective terminal. **Incorrect polarity on 12-24 VDC units may result in damage to circuit board components.** The terminal marked ground is for power supply or system ground and the terminal marked bonding ground is strictly for the ground wire to the burner assembly. It is important that a ground wire (supplied) be connected between the bonding ground terminal and the burner assembly to provide an uninterrupted path for the flame acknowledgement current.

## Solenoid Outputs

There are two solenoid output terminals on the main circuit board marked solenoid #1 and solenoid #2. The output voltage at these terminals is always the same as the controller supply voltage. The combined power consumption of solenoids connected to a system should not exceed 12 watts for a 12 VDC unit, 24 watts for a 24 VDC unit and 30 watts for a 120 VAC unit. (ACL Manufacturing carries a line of Class I Div I extra low watt solenoid valves available in all three voltages.) Solenoid #1 output connects to the pilot or low fire solenoid and is energized when a start is initiated. Solenoid #2, (main burner) energizes only after the pilot or low fire flame has been proven. The time delay between proof of flame and energizing of output #2 is factory set at 20 seconds and is adjustable with T1.

### **S/D Interlock**

The shutdown interlock provides a means of connecting other shutdown devices such as low level or high temperature switches for additional protection. A jumper is installed at the factory and should only be removed to utilize this feature. Shutdown devices connected (in series) to the S/D interlock terminals must be dry contacts and be in a closed state during normal operating conditions. If any of the S/D switches go to a fault condition, their contacts will open, de-energizing the solenoid output and shutting down fuel to the burner. The controller will attempt one 5 second re-light but will be unsuccessful and go into alarm. Once the fault condition is corrected the system can be restarted by pressing the stop/reset and then the start buttons. **Note:** If a restart is attempted without clearing the fault condition the controller will again attempt a re-light, without energizing the solenoid output and will return to an alarm condition. Alternately the heater shutdown devices may be connected in series to the remote S/D terminals. When using this wiring method the controller will not attempt a re-light when one of the switches opens due to a fault condition and subsequently will not give any local annunciation. When the shutdown devices are connected to the remote S/D and not the S/D interlock a jumper must be placed across the S/D interlock terminals.

### **Alarm Output**

Alarm output status provides the user with a normally closed and normally open set of dry contacts. The only time these contacts change state is when the controller has been unsuccessful in lighting the pilot assembly after 1 try.

### **Remote Stop**

The remote stop function is available when the jumper is removed and a momentary normally closed contact button or remote relay contact (N/C) is utilized. This remote stop shuts down the ACL 5000 completely. NOTE: Must be dry contacts. The remote stop can also be used to wire in the heater shutdowns. See S/D interlock.

### **Remote Start**

The remote start function is available when a momentary normally open contact button or remote relay contact (N/O) is utilized. When contacts close momentarily the unit initiates starting sequence. NOTE: Must be dry contacts.

### **Proof of Closure**

This feature allows controller to use valves with proof of closure switches for valve status. When valve switch contacts are in an open state confirming the valve may be open, the controller will not start. The contacts must be closed in order for controller to start. Once start is initiated, the contacts from proof of closure switch can then change state.

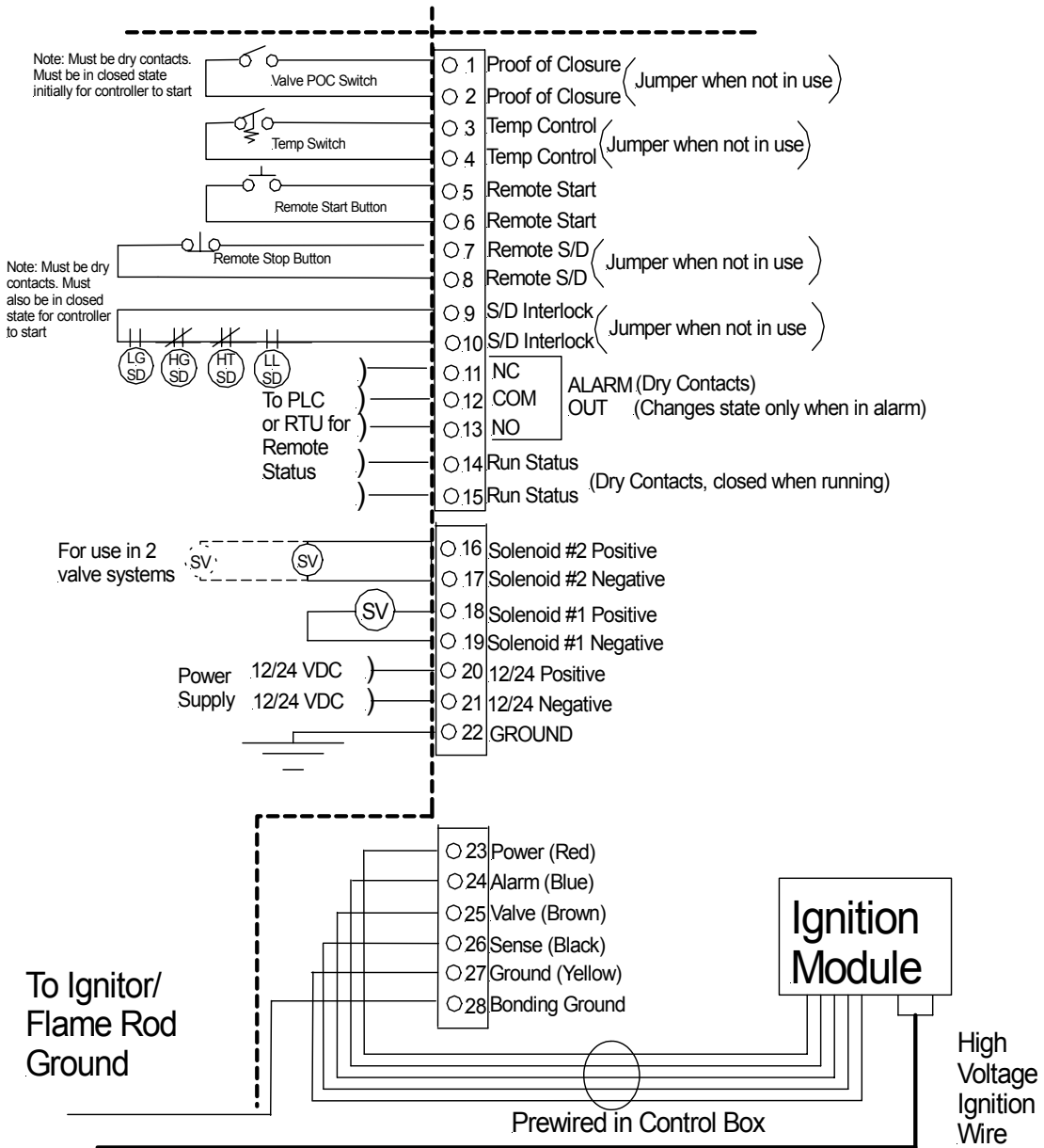
### **Temperature Control**

The temperature control option is provided to allow the use of a temperature switch to turn on & off solenoid output #2, controlling the main gas valve to the burner. This does not override the shut down logic of the output. When using this option, the temperature switch must have dry contacts. When not in use, a jumper must be installed as per electrical drawings.

### **Run Status**

This output provides a run status of the controller. These contacts are a normally open set of dry contact when the controller is off or in alarm state. When the controller is running normally, these contacts are closed.

# ACL 5000 12/24 VDC

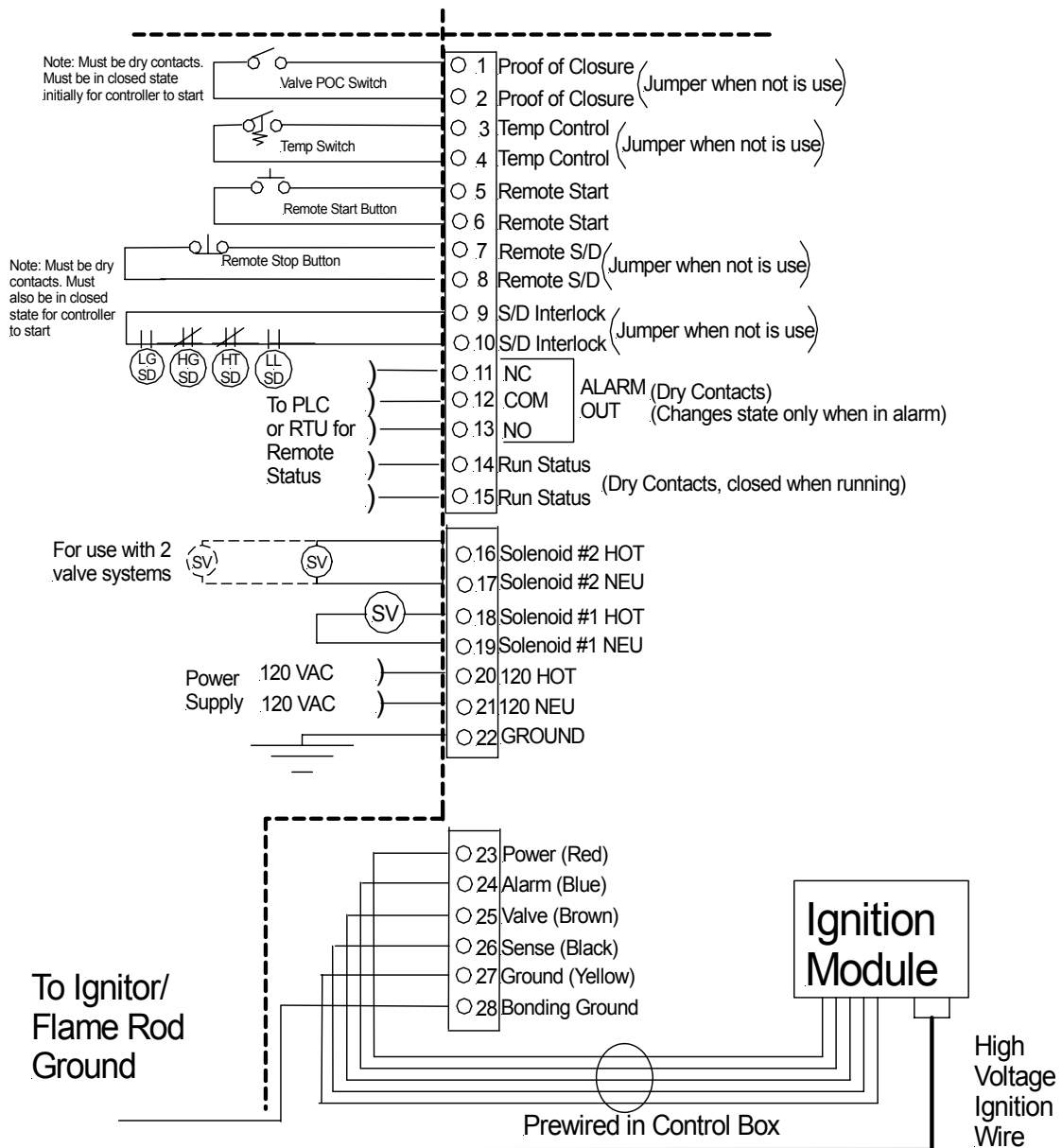


To Ignitor/Flame Rod

Specifications		
Voltage	12 VDC	24 VDC
Current	.204 amps	.102 amps
Power	2.45 W	2.45 W
Solenoid valve rating per solenoid output	12 W	24 W
Operating temp	-40 C to 60 C	
Flame sensitivity	1 micro amp minimum	
Flame failure response time	0.8 seconds maximum	
Spark rate	25 sparks/second	

Note: low power solenoids of .85 and 1.8 watts are available for solar power operations as well as all voltages

# ACL 5000 120 VAC



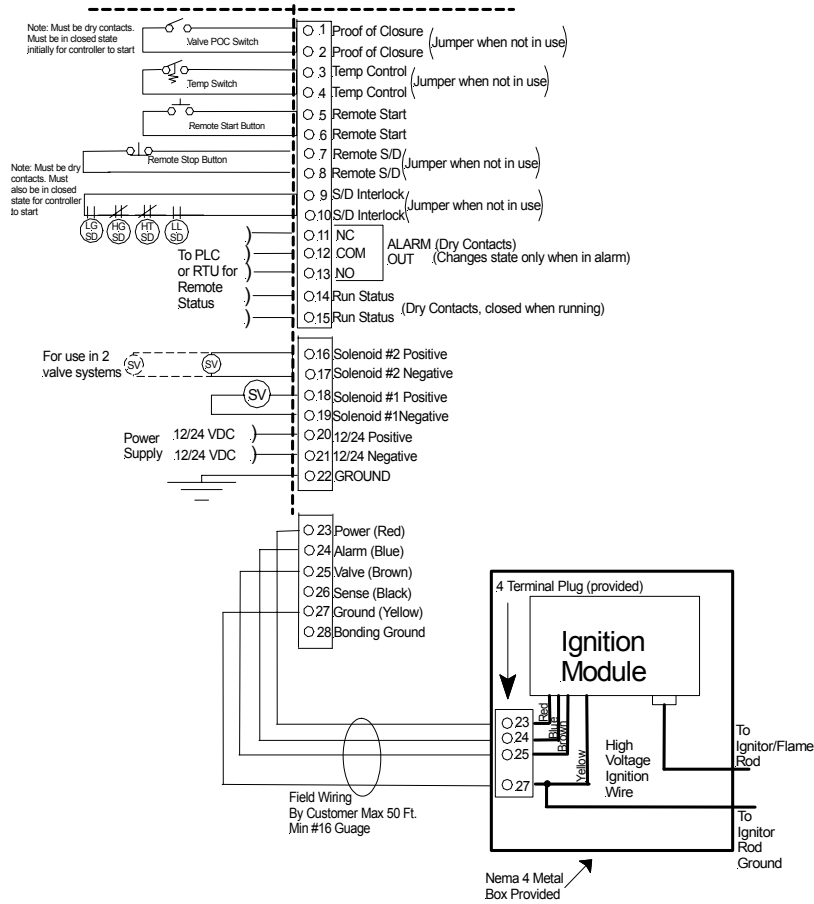
To Ignitor/Flame Rod

Specifications	
Voltage	120/240 VAC
Current	1.05 amps
Power	12.75 W
Solenoid valve rating per solenoid output	30 W
Operating temp	-40 C to 60 C
Flame sensitivity	1 micro amp minimum
Flame failure response time	0.8 seconds maximum
Spark rate	25 sparks/second

Note: low power solenoids of .85 and 1.8 watts are available for solar power operations as well as all voltages

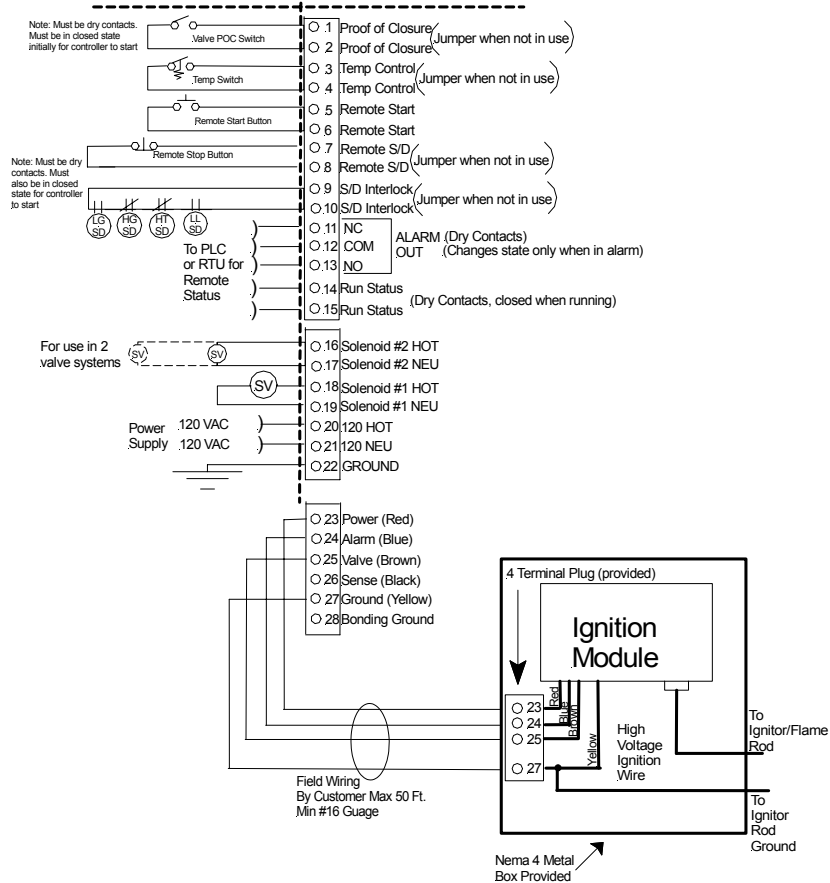
## Optional Remote Mount Ignition Module

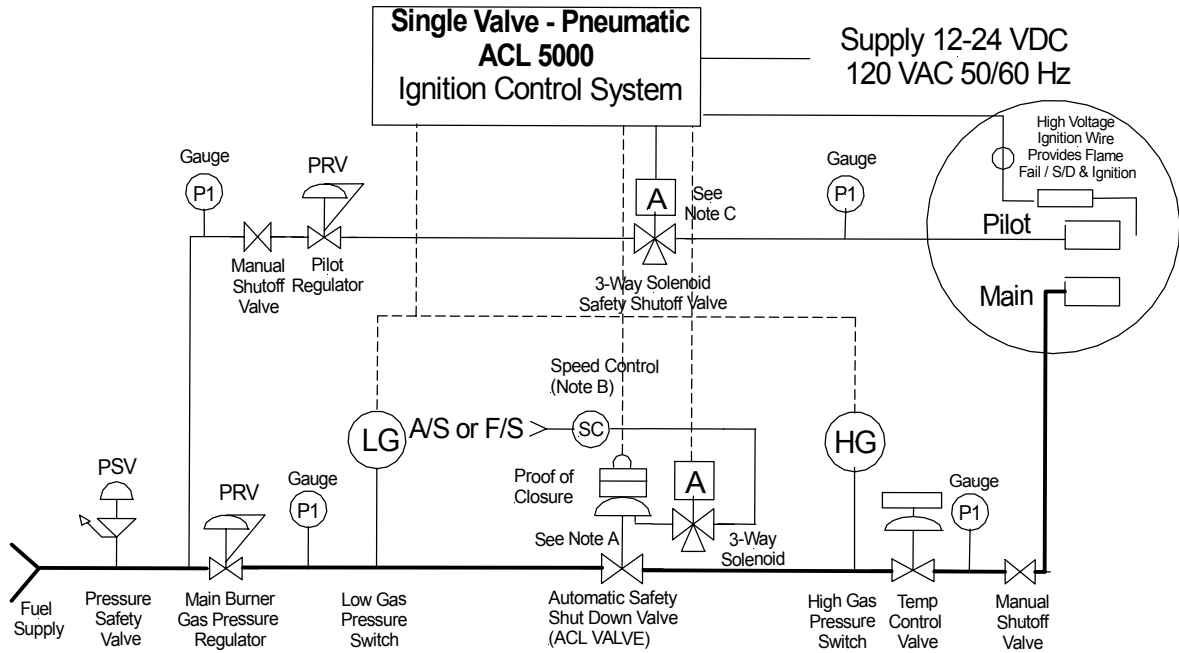
### ACL 5000 12/24 VDC



## Optional Remote Mount Ignition Module

### ACL 5000 120 VAC



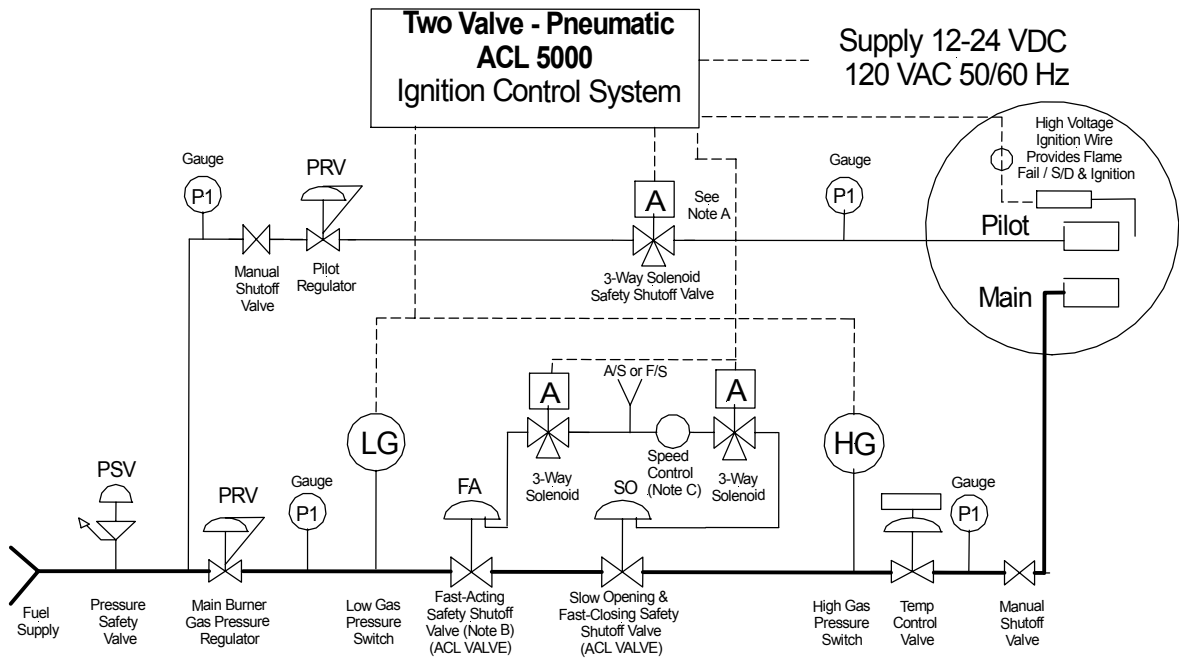


Note A: Auto safety shutdown valve with proof of closure switch  
Must be in accordance with CGA Standard 6.5/ANSI Z21.21  
and marked C/1 or in accordance with CGA Standard 3.9

Note B: 1/4" x 1/4" Speed Control Valve Supplied

Note C: CSA approved Class 1 Div 1 solenoid valve-ACL-SV-SSO 1/8" solenoid valve

NOTE: This drawing is recommended for use with gas appliances that must conform to CSA B149.3.  
Valve train diagram #3 Single Burner Application

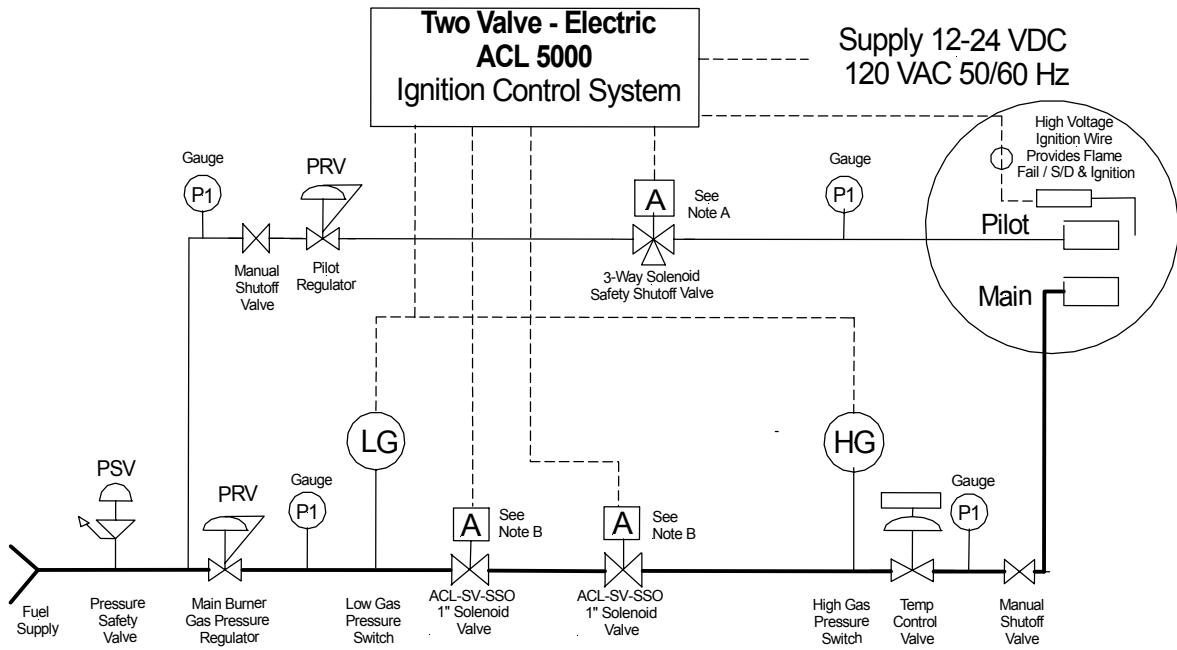


Note A: Solenoid CSA Certified Class I Div I

Note B: Must be in accordance with CGA Standard 6.5/ANSI Z21.21  
and marked C/1 or in accordance with CGA Standard 3.9

Note C: 1/4" x 1/4" Speed Control Valve Supplied

Note: This drawing is recommended for use with gas appliances that must conform to CSA B149.3 Valve Train diagram #3 Single Burner Application

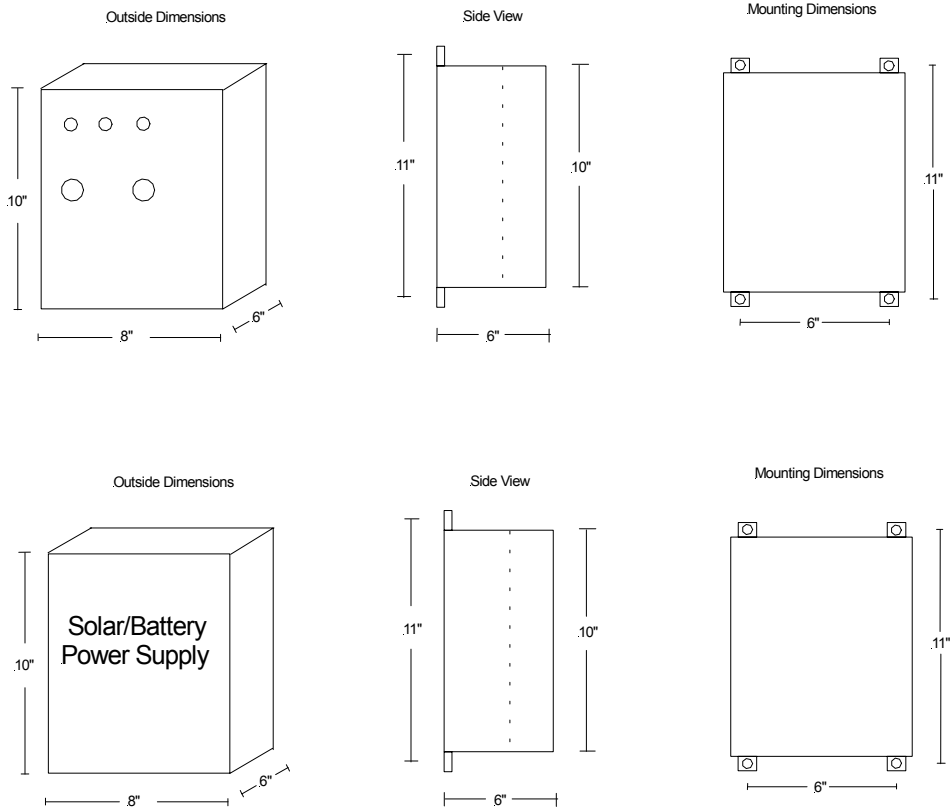


Note A: Solenoid CSA Certified 6.5-2000 C/I Class I Div I    ACL-SV-SSO 1/8" solenoid valve

Note B: Solenoid CSA Certified 6.5-2000 C/I Class 1 Div 1    ACL-SV-SSO 1" solenoid valve

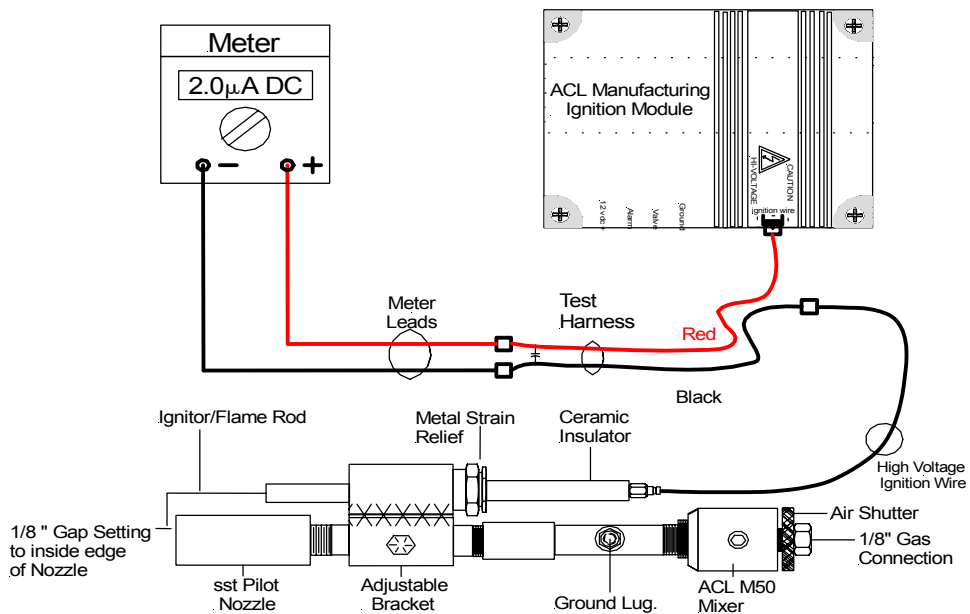
Note: This drawing is recommended for use with gas appliances that must conform to CSA B149.3 Valve Train diagram #3 Single Burner Application

## Control Box Dimensions



## Flame Signal Test Procedure

1. Turn Power off to ACL Controller
2. Remove high-voltage ignition wire from ignition module and insert meter leads w/test harness as shown.
3. Turn on power and initiate start sequence.
4. Meter will give erratic readings during ignition period but should settle down between 1-2  $\mu\text{A}$  reading on meter.
5. Adjust air shutter on pilot mixer and adjust pressure on regulator to achieve a flame signal close to 2  $\mu\text{A}$  which is optimum.



## Troubleshooting Guide

### Fails to attempt ignition

Blown fuse	Replace fuse 4 amp max-F1,F2 on circuit board
Battery voltage low (solar pkg. only)	Charge battery to minimum of 11.5 volts. Check solar panel connections.
Poor power connections	Check connections on terminal strips
Defective ignition module	Remove module and send for repair/replace
Defective control board	Remove control board & send for repair
Electrode shorted out	Ensure proper gap approx. 1/8"
Stop/Reset or Start button failed	Disconnect button wiring from annunciator board terminals on the inside of controller door. With meter, check both buttons for normally open state . When the button is pushed, contacts should momentarily close. Replace push buttons as required.
Proof of closure circuit open	If proof of closure feature is being utilized disconnect proof of closure field wiring on circuit board terminals. Place temporary jumper across terminals to verify operation. If proof of closure feature is not used, ensure a permanent jumper is installed.
Short circuit in solenoid #1 field wiring	Disconnect field wiring from solenoid #1 terminals on circuit board. Push start, if controller functions normally, correct field wiring.
Remote shutdown circuit open	Remove field wiring from remote shutdown terminals and install jumper to confirm operation. Correct wiring or P.L.C. program.

### Attempts ignition, but doesn't light ("pilot on" light comes on)

Fuel gas supply to pilot may be too high or too low	Pilot fuel gas supply should be set at 5 psi, adjust air/fuel mix on pilot, and adjust regulator
Gap setting on ignitor/flame rod not correct	Gap should be approximately 1/8".
Poor ground	Ensure ground connections are good in control box and at pilot assembly in fire tube.
Pilot solenoid failure	Replace solenoid
Plugged orifice on pilot	Clean out pilot orifice

### Attempts ignition, but doesn't light ("pilot on" light does not come on)

Shutdown interlock circuit is open	Verify operation by removing shutdown interlock field wiring and install jumper in interlock terminals. If field circuit is determined to be open, correct fault (low level, high temp, etc.) or check for incorrect wiring.
Faulty ignition module	Replace ignition module

### Weak or erratic spark

Ignition cable may be too long, optimum length is 10 ft. or less	Shorten cable
Ignition wire installed in metallic sheathed flex	Install ignition wire in non-metallic sheathed flex or free air
Defective ignition module	Replace ignition module
Gap setting too wide	Shorten gap setting to approx. 1/8"
Ignition cable defective or insulation worn	Replace cable
Poor ground	Check ground at both ends (control box & ignitor end)

### Pilot flame lit but doesn't acknowledge

Ignitor/flame rod not positioned correctly	Position flame rod tip to the side of one of the small holes in burner nozzle maintaining 1/8" spark gap.
Pilot gas pressure incorrect	Pressure setting approx 5 psi
Air shutter on mixer closed off	Open & adjust air shutter on mixer until good pilot established
Ground not connected properly	Connect ground between mixer ground and bonding ground in controller
Defective ignition cable or poor connection	Make sure cable ends are connected well. A poor connection interrupts current path for acknowledgement but still allows a spark to occur.
Poor connection between ignition module and board	Check connections on wiring harness between ignition module and main board
Defective ignition module	Replace