ACL Manufacturing
A Division of ClearRushCo

Installation Manual

for the

ACL3200 Flare Stack / Incinerator Ignition Systems

WARNING

This manual must be read in its entirety before installation of this controller. 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.

V 0.4

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Table of Contents

Introduction

The ACL3200 is a flare stack/incinerator control system that provides control for both high-energy sparking ignitors (HE mode) and high voltage Pilot Ignition (PI mode) or non-Pilot Ignition (I mode) sparking ignition systems. A Flame Ionization mode (FI) is also available for use with ACL ignition modules incorporating the extra Alarm and Valve signals for flame detection.

These systems can incorporate a continuous pilot as well as run on continuous or intermittent ignition. All systems are fully retractable.

ACL3200 Pilot Ignition (PI) System

The ACL3200 Pilot Ignition (PI) System uses a continuous pilot and a high voltage sparker to light the pilot. A thermocouple is used for measuring the temperature of the pilot's flame. An alarm will signal if the ACL3200 detects that the pilot is out (temperature is below the setpoint temperature). Once the Start button is pressed on the front of the unit, the ACL3200 will automatically start sparking in regular intervals based on the onboard timer settings until it detects that the pilot is lit and up to temperature.

ACL3200 Ignition (I) System

The ACL3200 Ignition (I) System is a continuous sparking system used in an application where fuel gas is not available. Once the Start button is pressed, it will periodically turn on the sparker output based on the onboard timer settings providing a high voltage spark to light the flare.

ACL3200 High Energy (HE) System

The ACL3200 High Energy (HE) System is a continuous sparking system that uses a high-energy exciter. There is no pilot required as this unit will continually spark at a user defined interval set by the onboard timer. This high-energy exciter delivers a strong spark that is capable of lighting under water, in severe weather conditions, and where no fuel gas is available for a pilot.

ACL3200 Flame Ionization (FI) System

The ACL3200 Flame Ionization (FI) System uses a continuous pilot and a high voltage sparker to light the pilot. It uses a single ignitor/flame rod to provide both flame acknowledgment and ignition. An alarm will signal if the ACL3200 detects that the pilot is out, or if the flame failed to light. Once the Start button is pressed on the front of the unit, the ACL3200 will automatically start sparking in regular intervals based on the onboard timer settings until it detects that the pilot is lit.

The two independent thermocouple temperature set points can be adjusted with the six Hex rotary DIP switches on the top of the ACL3200's circuit board: three for each temperature setpoint. The setpoint switches are organized as a hundreds increment (0 to 1100°C (or 1500°F or 2000°F) in steps of 100), a tens increment (0 to 90 in steps of 10), and a ones increment (0 to 9).

Additional user preferences can be configured through DIP switches including TC1/2 enable, shutdown latch control, solenoid driver power setting, 4-20mA output select, and dead band range selection.

The ACL3200 Controllers are able to communicate remotely with Modbus Master Devices. A Modbus Master Device may be a Programmable Logic Controller, a PC, or another device. The ACL3200 Controller is a Modbus Slave Device that implements the Modbus RTU protocol on an RS-485, half-duplex, physical connection. The default Modbus communication parameters are 9600 baud, 8 data bits, no parity bits, one stop bit (“8N1”), Modbus Slave ID (Modbus address) 2.

The ACL3200 has a hardware revision of 4A and firmware revision 0.4 (minimum).

ACL3200 Features

ACL3200 Controller Features List	
•	No Programming required
•	12/24VDC operation. Solar capable as well.
•	Low power consumption
•	CSA approved for Class I, Div 2 locations
•	Operational ambient temperature of -40° to +60° Celsius
•	CSA approved C22.2 No 199-M89. Combustion safety controls and solid-state Ignitors for Gas & Oil burning equipment
•	CSA B149.3 - 10 compliant, meets NFPA standards
•	Type 4x enclosure, corrosive resistant and weatherproof
•	Modbus RTU (over RS485) communications capability
•	100% fail safe design
•	Local and Remote On/Off (Start/Stop) controls
•	Brownout Protection. ACL3200 will continue in previous state if a brownout/blackout condition is detected.
•	Onboard solenoid driver option for power reduction to solenoids and peak-hold solenoids
•	Onboard solenoid output short circuit detection and notification (via Alarm Status)
•	Two adjustable type-K thermocouple inputs for monitoring two separate temperature points (flame temp. and process temp.)
•	Provides control logic for **PI**, **HE**, **FI**, and **I** ignition systems
•	Two Shutdown inputs: Remote On/Off and Shutdown. Both require normally closed (NC) dry contacts
•	Onboard adjustable timer for ignitor On/Off control
•	Onboard scaled thermocouple adjustments
•	Adjustable dead band from 1, 2, 3 and 5 degrees C (°C) or 2, 4, 6 and 10 degrees F (°F)

Operation Summary

Supply 12 or 24VDC to the Main Input Power connections on the ACL3200 Controller referring to the wiring diagram "Figure 5 - ACL3200 Wiring Diagram - PI Mode".

Set the onboard ignition timer to the desired On and Off times using the "IGN Timer-ON" and "IGN Timer-OFF" rotary DIP switches. Select the desired thermocouples to enable: TC1, or TC2, or both using the "TC1 E/D" and "TC2 E/D" DIP switches. The temperature setpoint rotary hex DIP switches set the desired setpoint for each respective thermocouple. Once the temperature setpoints are set to the proper values for the desired process (flare stack, incinerator, etc.), the system is ready for turning on. The green System On LED on the front panel of the ACL3200 should be on, indicating that power is on but waiting to be started. Once the Start button is pushed, the ACL3200 will automatically begin the sparking timer (confirmed by the Pilot On LED flashing).

A flashing System On LED indicates a power failure has occurred. Reset this condition by pressing the Stop button, toggling the Remote On/Off terminal (switch) input, or by issuing a Modbus Remote Stop, then Start, command.

In Pilot Ignition (PI) Mode, when the main input power is present, the controller does not sense a pilot flame, and is calling for heat (measured temperatures are below the setpoint temperatures), the controller will attempt ignition and the pilot (or "Valve") solenoid output will provide voltage to the pilot solenoid valve (if used), providing pilot gas for ignition. The Remote On/Off and Shutdown terminals must be in a permissive state for this to occur. An automatic timer controls the ignition On and Off times, allowing the controller to restart the ignition sequence if there is a failure to light within the set ignition On time. The automatic timer can be overridden and the ignitor turned on for a longer period of time by manually holding in the Start button.

THIS EQUIPMENT IS SUITABLE FOR USE IN CLASS1 DIVISION 2, GROUPS A,B,C & D OR NONHAZARDOUS LOCATIONS ONLY

WARNING - EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR THE SUITABILITY FOR CLASS 1 DIVISION 2

WARNING: EXPOSURE TO SOME CHEMICALS MAY DEGRADE THE SEALING PROPERTIES OF MATERIALS USED IN THE FOLLOWING DEVICES:

Relays K1 – K6
Twelve-position DIP switch S6
Four-position DIP switch S8

Note: Ignition wire lengths in excess of 10' or use of metal or metallic sheathed conduit to convey the ignition wire may result in a diminished ignitor rod spark and flame signal strength.

Additional Documents

The following additional documents for the ACL3200 Combustion Safety Controller are available. Contact an ACL representative to obtain this document.

Document Filename	Document Description
ACL3200_Rev_4A_Modbus_Installation_Manual.pdf	Modbus documentation containing more in-depth register descriptions and additional technical details.

Quickstart Installation Procedure

ACL3200 Flare Stack / Incinerator Ignition System

The Quickstart Installation Instructions assumes the user has some familiarity with Flare Stack / Incinerator Ignition System Installations.

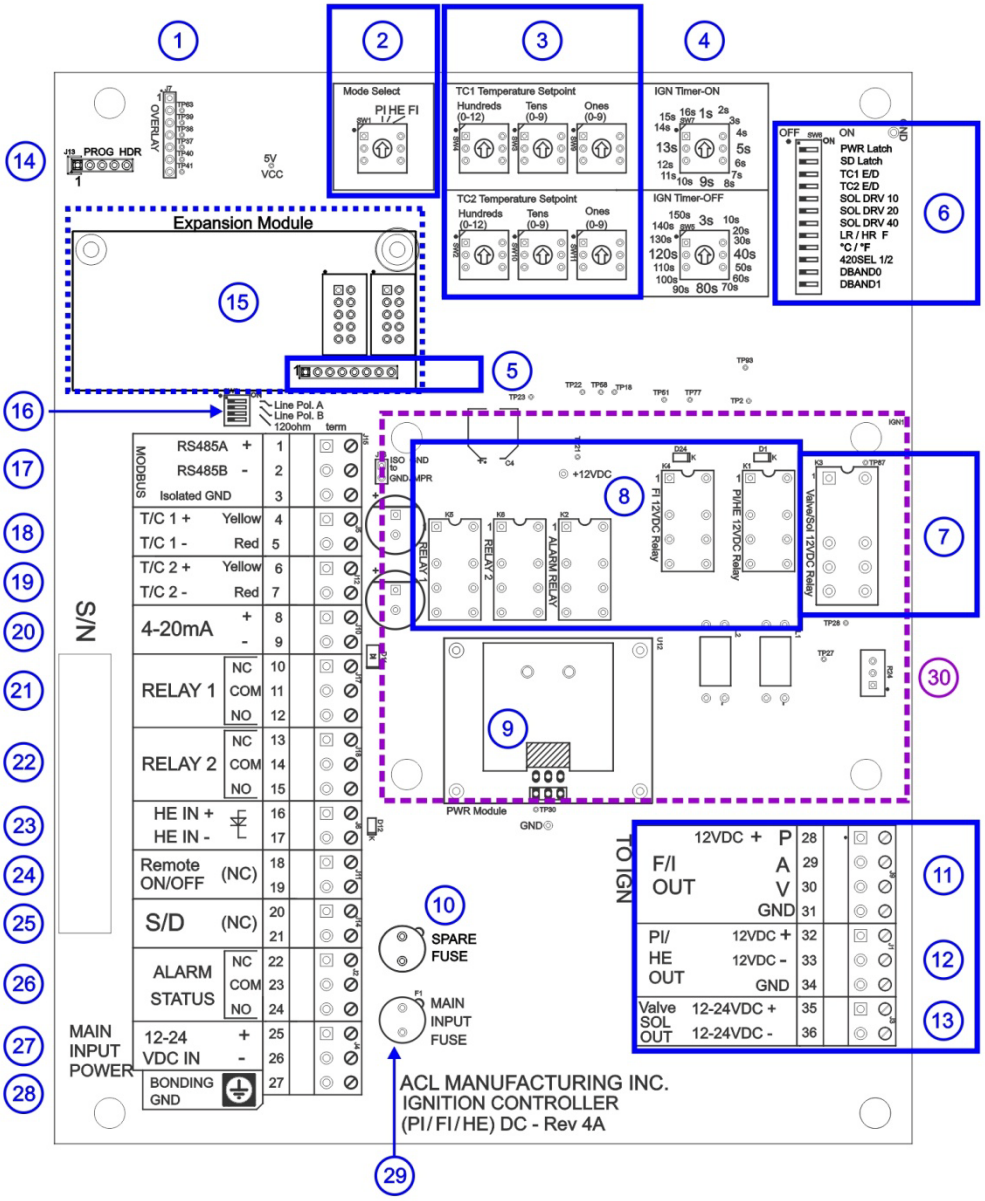
Pilot Ignitor (PI)
Continuous gas pilot
Timer operated ignitor with thermocouple temperature shutoff
Air/Fuel mixer
Automatic pilot with relight
Alarm provided by thermocouple sensing
Fully retractable
Stainless Steel construction
1400lb winch and 5/32 SST aircraft hoisting cable

High Energy Spark Ignitor (HE)
Continuous spark ignition (adjustable, periodic on/off time)
Timer operated ignitor
Alarm provided by electronic sensing of spark integrity
Ignitor provides a spark in extremely severe conditions
No gas required
Fully retractable
Stainless Steel construction
1400lb winch and 5/32 SST aircraft hoisting cable

Flame Ionization (FI)
Continuous gas pilot
Timer operated ignitor with thermocouple temperature shutoff
Air/Fuel mixer
Automatic pilot with relight
Alarm provided by flame ionization
Fully retractable
Stainless Steel construction
1400lb winch and 5/32 SST aircraft hoisting cable

Ignitor (I) (Set to "HE" mode)
Continuous spark ignition (adjustable, periodic on/off time)
Timer operated ignitor
No gas required
Fully retractable
Stainless Steel construction
1400lb winch and 5/32 SST aircraft hoisting cable

Figure 1 – ACL3200 Controller Main Board, Top View



#	Name	Category	Mode	Description
1	Overlay (Keypad) Header	Inputs/Control	All	7-pin Header connector that the flex cable from the Keypad overlay on the front panel connects to.
2	Mode Select Rotary DIP Switch	Inputs/Control	All	Main Mode Select Switch: 0 - Pilot Ignitor (PI), 1 - High Energy Exciter / Ignitor only (HE / I), or 2 - Flame Ionization (FI) modes. Wiring setup and operation is different for each mode.
3	Temperature Setpoint Rotary DIP Switches	Inputs/Control	All	Rotary DIP switches for setting Temperature Setpoints for TC1 and TC2. Each switch controls either the Hundreds (0-15), the Tens (0-9), or the Ones (0-9) digits. PI: TC1 is for flame detection, TC2 is for process temp HE: TC1 and TC2 are for process temp only (do not affect igniter operation) FI: TC1 and TC2 are for process temp only (do not affect igniter operation)

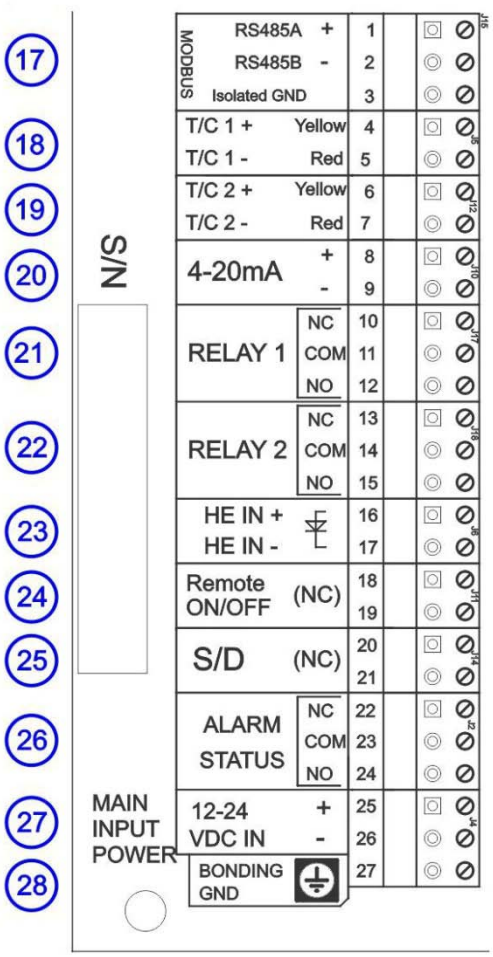
4	Igniter Auto Timer Rotary DIP Switches	Inputs/Control	All	Rotary DIP switches for setting the Igniter's automatic timer ON and OFF times for all modes.
5	Display Header	Display	All	8-pin header connector that the ACL3200 display flex cable connects to. (The ACL3200 display is optional).
6	Main DIP Switches	Inputs/Control	All	DIP switches for user options configuration and for Low Power solenoid driver settings for the Valve solenoid terminal output (see "DIP Switch Option Settings" section).
7	Valve Solenoid Relay	Output Solenoid	All	Relay used for controlling power delivery to the solenoid valve. Double-pole double-throw relays are connected in series to add an extra measure of safety in case one set of contacts fails while in the normally open position.
8	Control Relays	Inputs/Control	All	Relays used for controlling power switching to ignition module and for alarm status.
9	Input Power to 12VDC Power Module	Power	All	Power regulator that converts 10-30VDC input voltage to a stable 12VDC output voltage for control. (This 12VDC output is not used for outputting to solenoids).
10	Spare Fuse	Power	All	Spare 2A fuse for field servicing.
11	"To IGN" Ignition Module Terminals for FI mode	Control	FI	Input/Output terminal connections for the ACL Ignition Module in Flame Ionization (FI) mode: "P"ower, "A"larm, "V"alve, Ground. (Jumper "P" to "V" for PI and HE modes to use the Valve solenoid output for these modes)
12	PI/HE/I Igniter Output Terminals	Control	PI, HE, I	Output terminal connections for the Igniter in Pilot Ignition (PI), Ignition (I), or High Energy (HE) mode. "12VDC+" outputs a regulated 12VDC. "12VDC -" and "GND" are both connected to ground.
13	Solenoid Valve Terminal	Output Solenoid	All	Solenoid output terminal for Pilot/Valve. The output is current limited to 2A maximum.
14	Programming Header	Programming	N/A	Programming header (factory use only) for reprogramming the onboard microcontroller.
15	Expansion Module Location	Expansion	All	Location for future expansion modules
16	Modbus DIP Switch	Modbus/RS485	All	DIP switches for selecting termination options for the Modbus/RS485 communications cable (See ACL3200 Modbus manual)
17	Modbus Terminals	Modbus/RS485	All	Terminals for connecting a Modbus/RS485 communications cable. ACL3200 is a Modbus RTU slave in a 8N1, 9600 baud default configuration. Active in all modes.
18	Thermocouple 1	Inputs/Control	PI	Thermocouple 1 input terminal connections. Ensure proper polarity for correct operation. Use ungrounded thermocouples. TC1 is for flame sensing in PI mode and process monitoring in HE, FI, and I modes. TC1 controls dry contact Relay 1. - "NC" and "COM" are connected together if TC1 measurement is lower than the setpoint. - "NO" and "COM" are connected together if TC1 measurement is higher than the setpoint.
19	Thermocouple 2	Inputs/Control	All	Thermocouple 2 input terminal connections. Ensure proper polarity for correct operation. Use ungrounded thermocouples. TC2 is used for process monitoring. TC2 controls dry contact Relay 2. - "NC" and "COM" are connected together if TC2 measurement is lower than the setpoint. - "NO" and "COM" are connected together if TC2 measurement is higher than the setpoint.
20	4-20mA Output	Output Status	All	The 4-20mA output generates an isolated current output relative to the measured temperature on either TC1 or TC2.

				Selectable via DIP switch "420SEL 1/2": - "OFF" = TC1 measurement is output on 4-20mA output - "ON" = TC2 measurement is output on 4-20mA output
21	Relay 1 Output (dry contacts)	Control	PI	Relay 1 is present to allow users to control external valves, switches, or other controls based on the TC1 measurement. TC1 controls dry contact Relay 1 switching. - "NC" and "COM" are connected together if TC1 measurement is lower than the setpoint. - "NO" and "COM" are connected together if TC1 measurement is higher than the setpoint.
22	Relay 2 Output (dry contacts)	Control	All	Relay 2 is present to allow users to control external valves, switches, or other controls based on the TC2 measurement. TC2 controls dry contact Relay 2 switching. - "NC" and "COM" are connected together if TC2 measurement is lower than the setpoint. - "NO" and "COM" are connected together if TC2 measurement is higher than the setpoint.
23	High Energy Exciter Diode Terminals	Inputs/Control	HE	The High Energy Exciter Diode terminals are used to monitor the sparking of the High Energy Exciter and determine when the sparker tip needs replacing.
24	Remote On/Off (NC)	Inputs/Control	All	Remote On/Off input terminal connections. Keep wire jumper in place if not used.
25	Shutdown (NC)	Inputs/Control	All	Shutdown input terminal connections. Keep wire jumper in place if not used.
26	Alarm Status	Alarm (Dry Contacts)	All	Alarm Status input terminal connections Alarm indicated when "NC" and "COM" are connected. No Alarm indicated when "NO" and "COM" are connected.
27	Main Power Input Terminals	Power	All	Main 12-24VDC input terminal connections
28	Extra Earth Ground Terminal	Power	All	Extra earth ground terminal connection to assist in providing stable ground connections for solenoids, ignition modules, or other hardware
29	Main Input Fuse	Power	All	Main 2A input fuse
30	Ignition Module Mounting Location	Hardware	FI (optional)	The Ignition Module Mounting Location indicates the area where the ACL Ignition Module may be installed.

Input and Control Connections

Refer to the below diagram when reading the Input and Control Connections section.

Figure 2 - ACL3200 Input and Control Connections



The following table outlines control inputs and outputs that are dry contacts (no voltage) and ones that require connection to dry contacts (if used):

Input and Control Connections Requiring Dry Contacts	Voltage on Control Inputs	Output and Control Connections That Are Dry Contacts
Remote On/Off	12VDC	
Shutdown	12VDC	
	N/A	Relay 1
	N/A	Relay 2
Alarm Status	N/A	Alarm Status

Interruption or disconnection of the Remote On/Off or Shutdown inputs will turn off or prevent power delivered to the ACL Ignition Module and turn off power to the solenoid. A jumper should be installed in the Remote On/Off (terminals 18 and 19) and Shutdown (S/D) (terminals 20 and 21) terminals when not in use.

27 Main Power Input

The ACL3200 Ignition System Controller operates on an input voltage range between 10 and 30 Volts DC. Typical input voltages are 12VDC and 24VDC. Whatever input voltage is delivered to the ACL3200 on the Main Power Input terminals is the same voltage delivered to the solenoid valve output. Solenoids attached to the solenoid output on the ACL3200 ("Valve SOL Out") need to have matching control voltages (Eg. all 12VDC or all 24VDC) that also match the input voltage. The solenoid output can supply a maximum of 2 amps to attached solenoids.

Although the ACL3200 will operate with input voltages as low as 10VDC, some larger solenoid valves may not operate on such a low voltage. For this reason, try to maintain the input voltage as close to (or slightly higher than) the required voltage for the desired solenoids.

The Main Power Input terminals are:

Terminal Number	Description	Typical Input Values	Allowable Input Range
25	VDCIN + (positive)	12VDC or 24VDC	10 VDC (min) - 30 VDC (max)
26	VDCIN - (negative)	0V (GND)	0V (GND)
27	Ground	0V (GND)	0V (GND)

The VDCIN - (negative) terminal is connected to ground internally on the ACL3200 printed circuit board.

The Main power inputs (VDCIN + and VDCIN -) are protected against reverse polarity. The ACL3200 will not operate if the main input power wires are reversed and it will not cause damage to the ACL3200 electronics.

17 Modbus / RS485 Communication Connections

The three Modbus/RS485 terminals are used for connecting the ACL3200 Controller to a Modbus communications channel. The ACL3200 Controller is a Modbus Slave Device that implements the Modbus RTU protocol on an RS-485, half-duplex, physical connection. The default Modbus communication parameters are 9600 baud, 8 data bits, no parity bits, one stop bit (“8N1”), Modbus Slave ID (Modbus address) 2.

The RS485 signal naming convention used in this document and by many RS485 transceiver vendors is reversed from what the EIA/TIA-485 specification states:

ACL3200 Modbus/RS485 Documentation	EIA/TIA-485 Naming Convention	Modbus Specification Name	Description
A (“RS485 A +” or "D0 A+")	B	D1	Non-Inverting, Transceiver Terminal 1, V1 voltage (V1 > V0 for binary 1 (OFF) state
B (“RS485 B –” or "D1 B-")	A	D0	Inverting, Transceiver Terminal 0, V0 voltage (V0 > V1 for binary 0 (ON) state
Isolated GND (or common GND)	C	Common	Signal and Optional Power Supply common ground

Due to the potential for large amounts of noise on the Modbus communication cable, the “Isolated Ground” terminal is connected to earth ground on the ACL3200 board to improve noise immunity.

Refer to the document "ACL3200_Rev_3A_Modbus_Installation_Manual.pdf" for additional details on additional Modbus registers, programming, testing, and troubleshooting.

18 19 Thermocouple 1 and 2 Inputs ("T/C1" or "TC1", "T/C2" or "TC2")

The ACL3200 controller accepts two type-K (ungrounded) thermocouples. They are clearly marked on the board for each thermocouple and polarity (See wiring diagrams).

Terminal Number	Description	Temperature Range
4	T/C 1 Yellow +	0°C to 1100°C (32°F to 2012°F)
5	T/C 1 Red -	
6	T/C 2 Yellow +	0°C to 1100°C (32°F to 2012°F)
7	T/C 2 Red -	

The temperature range for each thermocouple is 0°C to 1100°C (32°F to 2012°F).

In PI mode, Thermocouple 1 is used as a flame sense temperature measurement input and controls Relay 1 switching. Thermocouple 2 is used as a process temperature measurement and controls Relay 2 switching.

In HE mode, Thermocouple 1 and Thermocouple 2 are used as process temperature measurements and control Relay 1 and Relay 2 switching, respectively.

In FI mode, Thermocouple 1 and Thermocouple 2 are used as process temperature measurements and control Relay 1 and Relay 2 switching, respectively.

20 4-20mA Terminals

The 4-20mA terminals provide a loop-powered, isolated, 4mA to 20mA converter that generates a current output proportional to the measured temperature on either TC1 or TC2 (selectable via DIP switch).

21 Relay 1 Input

Relay 1 is present to allow users to control external valves, switches, or other controls based on the Thermocouple 1 (TC1) measurement. In all modes, Relay 1 is turned off ("NC" is connected to "COM") when the ACL3200 system is off. If TC1 is enabled via DIP switch "TC1 E/D", it needs to be attached to a Type-K thermocouple to operate properly. The Alarm LED will flash quickly and the system will be turned off if there is an open fault detected with the thermocouple (if enabled).

In all modes (PI, HE, FI, I), TC1 controls the dry contact Relay 1 switching. "NC" is connected (shorted) to "COM" if TC1 measurement is lower than the TC1 setpoint temperature. "NO" is connected (shorted) to "COM" if TC1 measurement is higher than the TC1 setpoint temperature.

Terminal Number	Terminal Name	Mode	Relay 1 Operational Description
10	NC - Normally Closed	All	"NC" is connected (shorted) to "COM" if TC1 measurement is lower than the TC1 setpoint temperature
11	COM - Common	All	Common connection in both Relay 1 switched states
12	NO - Normally Open	All	"NO" is connected (shorted) to "COM" if TC1 measurement is higher than the TC1 setpoint temperature

Relay 2 Input

Relay 2 is present to allow users to control external valves, switches, or other controls based on the Thermocouple 2 (TC2) measurement. In all modes, Relay 2 is turned off ("NC" is connected to "COM") when the ACL3200 system is off. If TC2 is enabled via DIP switch "TC2 E/D", it needs to be attached to a Type-K thermocouple to operate properly. The Alarm LED will flash quickly and the system will be turned off if there is an open fault detected with the thermocouple (if enabled).

In all modes (PI, HE, FI, I), TC2 controls the dry contact Relay 2 switching. "NC" is connected (shorted) to "COM" if the TC2 temperature measurement is lower than the TC2 setpoint temperature. "NO" is connected (shorted) to "COM" if TC2 measurement is higher than the TC2 setpoint temperature.

Terminal Number	Terminal Name	Mode	Relay 2 Operational Description
10	NC - Normally Closed	All	"NC" is connected (shorted) to "COM" if TC2 measurement is lower than the TC2 setpoint temperature
11	COM - Common	All	Common connection in both Relay 2 switched states
12	NO - Normally Open	All	"NO" is connected (shorted) to "COM" if TC2 measurement is higher than the TC2 setpoint temperature

HE IN Input

The HE IN terminals ("HE IN +" and "HE IN -") are used in HE mode for connecting to the HE ignitor's matching diode connections. The HE IN terminals are used for sensing the pulsing of the HE tip to detect when tip replacement is required. Leaving the HE IN terminals unconnected while in HE mode prevents the ACL3200 from determining when tip replacement is required and will reduce the system's efficiency (and may prevent proper operation) by not giving it the ability to detect when the HE tip needs replacing.

Remote On/Off (NC) Input

The Remote On/Off switch allows the user to hard wire a remote switch or relay for controlling the ACL3200. These terminals must be wired to dry contacts of a remote switch or relay when used. The Remote On/Off switch directly turns on and off the power delivered to either of the ignition module outputs (PI/HE and FI). The Remote On/Off switch is one of three methods for controlling whether the system state is On or Off, in all modes, as long as all other shutdowns are closed. The other two methods are the Stop/Reset and Start buttons on the overlay, and the Modbus Stop/Start commands. A wire jumper must remain across the Remote On/Off terminals when not in use.

Like the main Start and Stop/Reset overlay buttons, the Remote On/Off switch also acts as a reset to clear any latched shut downs that have tripped and been detected by the ACL3200. A shutdown configured as a latched shutdown prevents the system from automatically restarting after it detects any interruption in continuity on the Shutdown input terminals. If a

latched shutdown trips, then quickly resets itself, the ACL3200 will detect this, prevent the system from automatically restarting, and alert the user on the LED display (and via Modbus) by slowly flashing the Alarm LED.

The ACL3200 overlay will slowly flash the Alarm LED when the Remote On/Off input has been tripped and/or remains open.

Terminal Number	Description	Allowable Input Range	Voltage on Remote On/Off Contacts
18	Remote On/Off + (NC)	None: use dry contacts	12VDC when closed, ground when open
19	Remote On/Off - (NC)	None: use dry contacts	12VDC regardless of open/closed status

Shutdown Input

The Shutdown switch input allows the user to hard-wire a remote switch or relay for controlling the ACL3200. These terminals must be wired to dry contacts of a remote switch (level, pressure, or auxiliary switch) or relay when used. The Shutdown switch directly turns on and off the power delivered to either of the ignition module outputs (PI/HE and FI). If more than one shutdown switch is used, they must be wired in series. The Shutdown switch controls the power delivered to the ignition module as long as the Remote On/Off switch is closed. A wire jumper must remain across the Shutdown terminals when not in use.

Opening of any switch attached to the Shutdown input will shut off the ignition module and de-energize the valve solenoid inputs. The Shutdown inputs are tied into the control logic for the S/D Latch DIP switch. If the S/D Latch DIP switch is off, then it is in "Unlatched S/D" mode which means that the ACL3200 will attempt to restart ignition when any switch attached to the S/D inputs clears. If the S/D Latch DIP switch is on, then it is in "Latched S/D" mode. A shutdown configured as a latched shutdown prevents the system from automatically restarting after it detects any interruption in continuity on the input terminals for the selected shutdown. If a latched shutdown trips, then quickly resets itself, the ACL3200 will detect this, prevent the system from automatically restarting, and alert the user by slowly flashing the Alarm LED (and via Modbus).

The ACL3200 Alarm LED will flash slowly when the Shutdown input has been tripped and/or remains open.

Terminal Number	Description	Allowable Input Range
20	Shutdown +	None: use dry contacts
21	Shutdown -	None: use dry contacts

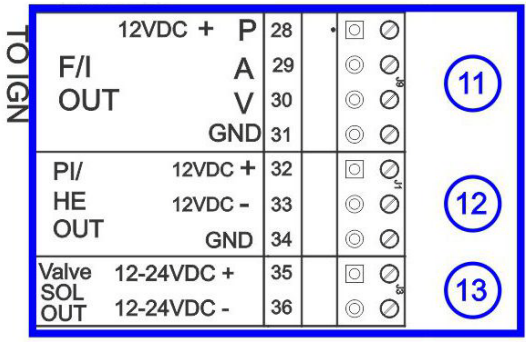
Alarm Status Output

The Alarm Status outputs provides remote indication of an Alarm condition on the ACL3200. When power to the ACL3200 is off, the Alarm Status contacts are open between "NO" and "COM" and closed between "NC" and "COM", indicating an Alarm condition. The contacts are also in an Alarm condition when the ACL3200 is in a shutdown state. Eg: the Shutdown switch or the Remote On/Off switch is open. This provides a complete fail-safe indicator to a remote control center of the status of the ACL3200 controller.

Terminal Number	Description	Max Contact Rating
22	Alarm Status "NC"	Power: 60W, 62.5VA Voltage: 220VDC, 250VAC
23	Alarm Status "COM"	Power: 60W, 62.5VA Voltage: 220VDC, 250VAC
24	Alarm Status "NO"	Power: 60W, 62.5VA Voltage: 220VDC, 250VAC

#	Mode	Possible Alarm Conditions
1	All	Power is off
2	All	Overlay unplugged
3	All	Remote On/Off switch is open
4	All	Shutdown switch is open
5	All	Shutdown Latch condition
6	All	Power Fail Latch condition
7	All	Short detected on solenoid valve output terminals
8	All	Modbus Stop command received
#	Mode	Mode Specific Alarm Conditions
9	PI	TC1 below TC1 setpoint (Pilot flame not present)
10	PI	Thermocouple 1 (TC1) fault/open
11	PI	Thermocouple 2 (TC2) fault/open (if enabled)
12	HE	HE IN signal not pulsing, HE tip replacement needed
13	HE	Thermocouple 1 (TC1) fault/open (if enabled)
14	HE	Thermocouple 2 (TC2) fault/open (if enabled)
15	FI	Flame Fail (Alarm signal from ACL Ignition Module)
16	FI	Thermocouple 1 (TC1) fault/open (if enabled)
17	FI	Thermocouple 2 (TC2) fault/open (if enabled)

Output Connections (Ignitor and Valve Solenoid) 11 12 13



11 Flame Ionization (FI) Ignition Module Inputs & Outputs

The four terminals marked as "To IGN" on the main circuit board need to be wired directly to the ACL Ignition Module using an FI wiring harness if FI mode is chosen. This provides two-way communication between the ACL3200 and the ignition module, creating a complete combustion safety control and burner ignition system. (See wiring diagram for FI mode)

All of the below signals need to be attached between the ACL3200 and the ignition module for the ACL3200 system to work properly in FI mode.

Terminal Number	Designation	Description	Direction
28	P	Power (12VDC)	Power output to Ignition Module
29	A	Alarm	Input signal from Ignition Module
30	V	Valve	Input signal from Ignition Module
31	GND	Ground	Ground

12 Pilot Ignition (PI) / High Energy (HE) / Ignition (I) Module Outputs

The three terminals marked as "PI/HE OUT" on the main circuit board need to be wired directly to the ACL PI Ignition Box. This allows the ACL3200 to provide auto-timer functionality to the ignition box. (See wiring diagram for PI, HE, or I mode depending on user's install requirements).

All of the below signals need to be attached between the ACL3200 and the ignition module for the flare stack / incinerator system to work properly.

Terminal Number	Designation	Description	Direction
32	12VDC +	Power, 12VDC +	Power output "+" to PI Ignition Box
33	12VDC -	Power, 12VDC -	Power output "-" to PI Ignition Box (ground)
34	GND	Ground	Ground

13 Valve (Pilot) Solenoid Outputs

The solenoid valve output connection is designed for driving an external solenoid valve (or two). The valve output is rated for a maximum of 2A current output. The main input voltage (either 12VDC or 24VDC) is fused and then directed through a relay, a current sense circuit, a low power driver circuit, and then output to the solenoid valve terminal.

The Valve (Pilot) Solenoid terminals provide power to the Valve solenoid (if used). The valve allows gas to flow for initial ignition and flame sensing. During normal operation, in all modes, the ACL3200 turns on the valve solenoid while attempting to light the flame.

For the valve solenoid to work properly in PI, HE, and I modes, the "P" and "V" terminals (28 and 30) in the "F/I OUT" input/output section need a wire jumper installed between them.

The valve output has a low power solenoid feature provided by an onboard solenoid driver circuit. This circuit can reduce power consumption of the solenoids by as much as 80%. This circuit also helps eliminate any noise that may be produced by some solenoids, and helps extend the life of the solenoids.

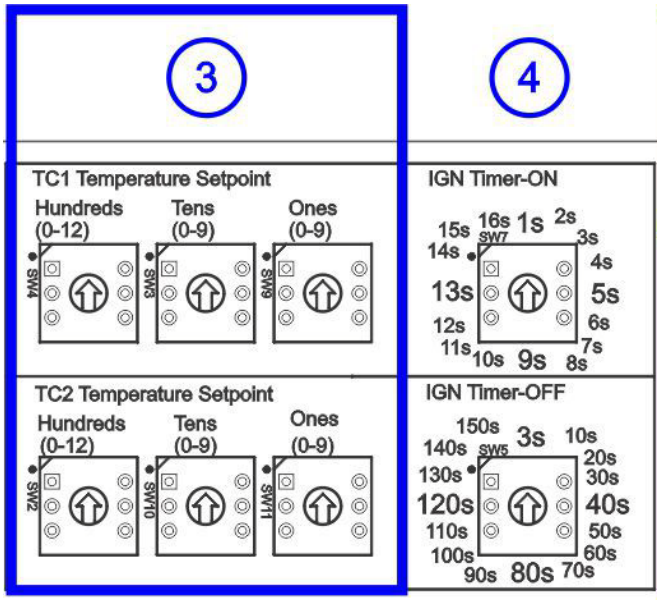
The Low Power Solenoid DIP switches need to be set to the setting required to ensure that the solenoid(s) with the highest power requirement remain open when desired. For more information on the Low Power Solenoid Driver, see the Low Power Solenoid (Solenoid Driver) DIP Switches on page 21.

Adjusting Temperature Setpoints and Ignitor On/Off Times

The ACL3200 Controller provides a simple control interface to the user on the ACL3200 main circuit board for setting temperature setpoints. Three rotary DIP switches are provided for setting each temperature setpoint. The setpoint switches are organized as a hundreds increment (0 to 1100°C (or 1500°F or 2000°F) in steps of 100), a tens increment (0 to 90 in steps of 10), and a ones increment (0 to 9).

These settings can be overridden by modbus temperature setpoint commands.

Figure 3 - ACL3200 Controller Setpoint Rotary DIP Switches



#	Rotary DIP Switches	Description
3	Thermocouple 1 (TC1) and Thermocouple 2 (TC2) Temperature Setpoint Rotary DIP Switches	Rotary DIP switches for setting Temperature Setpoints for TC1 and TC2. Each switch controls either the Hundreds (0-11), the Tens (0-9), or the Ones (0-9) digits. PI: TC1 is for flame detection, TC2 is for process temp HE: TC1 is for process temp, TC2 is for process temp FI: TC1 is for process temp, TC2 is for process temp
4	Ignitor Timer On and Off Rotary DIP Switches	Rotary DIP switches for setting the Igniter's automatic timer ON and OFF times for all modes.

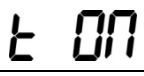
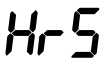
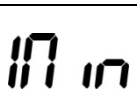
The following Temperature Setpoint Setting Table lists the result of each rotary DIP switch setting on the temperature setpoint for each thermocouple. The three setpoint values, one for each dial, are summed together.

LR / HR F	°C / °F	Hundreds Setting	Temperature Setpoint Contribution	Tens Setting	Temperature Setpoint Contribution	Ones Setting	Temperature Setpoint Contribution
Not Applicable	°C	0	0	0	0	0	0
		1	100	1	10	1	1
		2	200	2	20	2	2
		3	300	3	30	3	3
		4	400	4	40	4	4
		5	500	5	50	5	5
		6	600	6	60	6	6

		7	700	7	70	7	7
		8	800	8	80	8	8
		9	900	9	90	9	9
		A	1000	A	90	A	9
		B	1100	B	90	B	9
		C	1100	C	90	C	9
		D	1100	D	90	D	9
		E	1100	E	90	E	9
		F	1100	F	90	F	9
		Range is 0 - 1100°C (maximum is 1100°C)					
LR ("OFF") Low Range F	°F	0	0	0	0	0	0
		1	100	1	10	1	1
		2	200	2	20	2	2
		3	300	3	30	3	3
		4	400	4	40	4	4
		5	500	5	50	5	5
		6	600	6	60	6	6
		7	700	7	70	7	7
		8	800	8	80	8	8
		9	900	9	90	9	9
		A	1000	A	90	A	9
		B	1100	B	90	B	9
		C	1200	C	90	C	9
		D	1300	D	90	D	9
		E	1400	E	90	E	9
		F	1500	F	90	F	9
		Range is 0 - 1599°F (maximum is 2012°F)					
HR ("ON") High Range F	°F	0	500	0	0	0	0
		1	600	1	10	1	1
		2	700	2	20	2	2
		3	800	3	30	3	3
		4	900	4	40	4	4
		5	1000	5	50	5	5
		6	1100	6	60	6	6
		7	1200	7	70	7	7
		8	1300	8	80	8	8
		9	1400	9	90	9	9
		A	1500	A	90	A	9
		B	1600	B	90	B	9
		C	1700	C	90	C	9
		D	1800	D	90	D	9
		E	1900	E	90	E	9
		F	2000	F	90	F	9
		Range is 500 - 2012°F (maximum is 2012°F)					

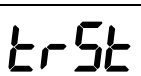
ACL3200 Controller Valve Solenoid Timer On Message Sequence

The ACL3200 measures the total time that the Valve Solenoid has been on. This can be used to help users calculate heat or energy output for the valve controlled by the Valve Solenoid. The measured time can be read out of the ACL3200 via Modbus. The time can also be displayed on the 4-digit display (if installed) by holding down the Stop button for more than 5 seconds to start the following sequence:

Sequence State Number	TMain Solenoid Timer On Messages	Description
1		"Solenoid" - T/Main Solenoid Display mode starts
2		Time on
3	 (Eg: Time in days)	T/Main on time in days (0 to 9999)
4		"Days"
5	 (Eg: Time in hours)	T/Main on time in hours (0 to 23)
6		"Hours"
7	 (Eg: Time in minutes)	T/Main on time in minutes (0 to 59)
8		"Minutes"
9	(Sequence is Complete)	Current Temperature will then be displayed for the selected thermocouple

To reset the Valve Solenoid "ON" time (to all zeros) using the keypad, perform the following sequence:

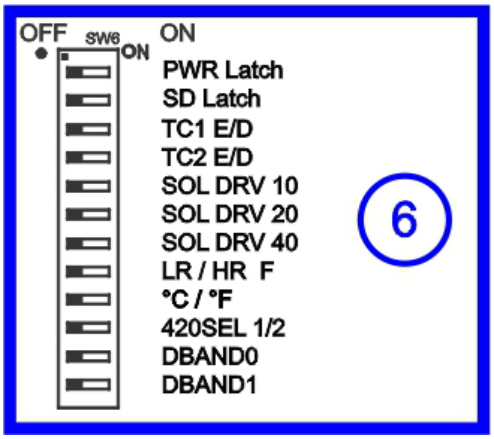
- Hold the "Stop" button in for five seconds until the "SOL" message shows on the display.
- Continue holding the "Stop" button while now pressing and holding the "Start" button for another 4 seconds.
- The following sequence will occur to inform you that the T/Main solenoid "ON" time was reset:

Sequence State Number	TMain Solenoid Timer Reset	Description
1		"Solenoid" - T/Main Solenoid
2		Time reset to all zeros for Day, Hours, Minutes
	(Done)	Current Temperature will then be displayed for the selected thermocouple

DIP Switch Option Settings

Main DIP Switch (SW6, 12-pin)

For the main DIP switches, an "OFF" setting means the DIP switch is moved to the left. An "ON" setting means the DIP switch is moved to the right.



DIP Switch Number	Name on Circuit Board	Description	OFF	ON	Operation
12	PWR LATCH	Power Fail Latch			Power Fail Latch mode is Off. The ACL3200 will attempt ignition restart automatically after powerup sequence is done, provided that all shutdowns are clear and no other issues are detected.
				(Default)	Power Fail Latch mode is On. The ACL3200 will wait in Power Fail Latch mode and not attempt ignition restart until the On/Off switch, Remote On/Off terminal, or Modbus Remote Stop/Start is toggled Off, then On.
11	SD LATCH	Shutdown Latch	(Default)		Shutdown Latch mode is Off. The ACL3200 will attempt ignition restart automatically after the Shutdown has cleared, provided that all other On/Off or POC terminals are clear and no other issues are detected.
					Shutdown Latch mode is On. The ACL3200 will wait in Shutdown mode and not attempt ignition restart until the On/Off switch, Remote On/Off terminal, or Modbus Remote Stop/Start is toggled Off, then On.
10	TC1 E/D	Thermocouple 1 Enable/Disable	(Default)		Thermocouple 1 (TC1) Enabled for use (Default).
					Thermocouple 1 (TC1) Disabled. Relay 1 will not switch based on Thermocouple 1 measurements.
9	TC2 E/D	Thermocouple 2 Enable/Disable			Thermocouple 2 (TC2) Enabled for use.
				(Default)	Thermocouple 2 (TC2) Disabled (Default). Relay 2 will not switch based on Thermocouple 2 measurements.
8	SOL DRV 10	Solenoid Low Power Drive, 10%	(Default)		When DIP switch is off, the ACL3200 does not add 10% to the cycle time sum for driving the solenoids.

<table>
<tr><td></td><td></td><td></td><td></td><td></td><td>ACL3200 adds 10% to the total cycle time sum for driving the solenoids.</td></tr>
<tr><td>7</td><td>SOL DRV 20</td><td>Solenoid Low Power Drive, 20%</td><td>(Default)</td><td></td><td>When DIP switch is off, the ACL3200 does not add 20% to the cycle time sum for driving the solenoids.</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td>ACL3200 adds 20% to the total cycle time sum for driving the solenoids.</td></tr>
<tr><td>6</td><td>SOL DRV 40</td><td>Solenoid Low Power Drive, 40%</td><td>(Default)</td><td></td><td>When DIP switch is off, the ACL3200 does not add 40% to the cycle time sum for driving the solenoids.</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td>ACL3200 adds 40% to the total cycle time sum for driving the solenoids.</td></tr>
<tr><td>5</td><td>LR / HR F</td><td>HE mode select 0 switch</td><td>(Default)</td><td></td><td rowspan="2">One DIP switch is used to select between the Low Range and High Range Fahrenheit Temperature setting for the "Hundreds" digits for the setpoints. This is used to set the Temperature setpoint scale to use when Fahrenheit temperature scale is selected (DIP Switch 4, "°C / °F ").

<table><tr><th>LR / HR F</th><th>Temperature Range</th></tr><tr><td>OFF</td><td>Low Range: 0°F - 1599°F</td></tr><tr><td>ON</td><td>High Range: 500°F - 2012°F (max)</td></tr></table></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>4</td><td>°C / °F</td><td>Degrees Celsius / Degrees Fahrenheit Select Switch</td><td>(Default)</td><td></td><td>When DIP switch is OFF, temperature setpoints are used in degrees Celsius.</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td>When DIP switch is ON, temperature setpoints are used in degrees Fahrenheit.</td></tr>
<tr><td>3</td><td>420SEL 1/2</td><td>4-20mA Select 1/2</td><td></td><td></td><td>Selects the Thermocouple 1 temperature measurement to output on the 4-20mA output.</td></tr>
<tr><td></td><td></td><td></td><td></td><td>(Default)</td><td>Selects the Thermocouple 2 temperature measurement to output on the 4-20mA output.</td></tr>
<tr><td>2</td><td>DBAND0</td><td>Deadband 0</td><td>(Default)</td><td></td><td rowspan="3">Two DIP switches are used to select the desired deadband temperature range around the setpoint temp where the ACL3200's decisions are made.

<table><tr><th>DBAND1</th><th>DBAND0</th><th>°C</th><th>°F</th></tr><tr><td>OFF</td><td>OFF</td><td>1</td><td>2</td></tr><tr><td>OFF</td><td>ON</td><td>2</td><td>4</td></tr><tr><td>ON</td><td>OFF</td><td>3</td><td>6</td></tr><tr><td>ON</td><td>ON</td><td>5</td><td>10</td></tr></table>
A larger deadband range prevents the igniter from turning on if the measured temperature hovers around the setpoint.</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>1</td><td>DBAND1</td><td>Deadband 1</td><td>(Default)</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

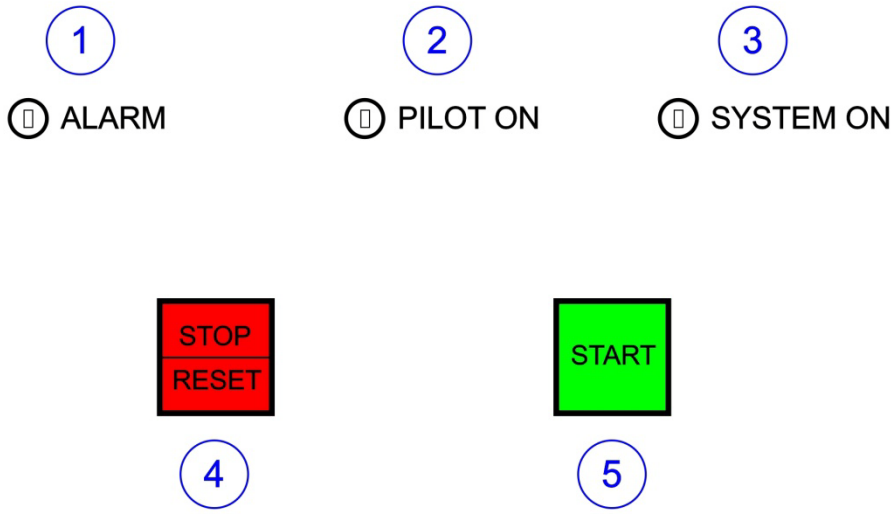
Low Power Solenoid (Solenoid Driver) DIP Switches (# 6-8)

The Low Power Solenoid Drivers are individual control circuits added to each solenoid output that saves power drawn by the solenoid by altering the cycle time that power is delivered to the solenoid once it is driven fully on. Larger solenoids require more power to keep them open, therefore needing a larger cycle time (eg: 40%). The cycle time percentage is determined by adding the contribution of each DIP switch. For example, to drive the solenoids at 60% cycle time, turn on DIP switches marked "40" and "20". To drive the solenoids at 30% cycle time, turn on DIP switches marked "20" and "10". If all "SOL DRV x" DIP Switches are "OFF", then the valve solenoid is driven at fully on (100% cycle time).

Front Panel Buttons and LED Status Indicators

The ACL3200 Controller provides a simple status and control interface to the user on the overlay mounted on the front of the ACL3200's box. Three status LEDs provide status and feedback while two membrane push buttons provide Start/Stop control.

Figure 4 - ACL3200 Controller Front Panel Overlay



#	Indicator LED(s)	Mode	Description
1	Alarm LED	PI	Red LED indicating that there's an Alarm. LED On, Flashing Quickly = a Thermocouple fault or open is present LED On, Flashing Slowly = a Shutdown occurred LED On Solid = a Flame Fail occurred
		HE	Red LED indicating that there's an Alarm. LED On, Flashing Quickly = a Thermocouple fault or open is present LED On, Flashing Slowly = a Shutdown occurred LED On, Short Single Flash (while PI/HE relay is on) = HE sparking tip may need replacement
		FI	Red LED indicating that there's an Alarm. LED On, Flashing Quickly = a Thermocouple fault or open is present LED On, Flashing Slowly = a Shutdown occurred LED On Solid = a Flame Fail occurred
		I	Red LED indicating that there's an Alarm. LED On, Flashing Quickly = a Thermocouple fault or open is present LED On, Flashing Slowly = a Shutdown occurred
2	Pilot On LED	PI	Amber LED indicating that the Pilot flame is present or that the system is sparking the ignitor. LED On, Flashing Quickly = system is on and sparking the ignitor in a timed sequence (PI/HE relay is off currently) LED On Solid = PI/HE Relay is on (sparking)
		HE	Amber LED indicating that the Pilot flame is present or that the system is sparking the ignitor. LED On, Flashing Quickly = system is on and sparking the ignitor in a timed sequence (PI/HE relay is off currently) LED On Solid = PI/HE Relay is on (sparking)
		FI	Amber LED indicating that the Pilot flame is present or that the system is sparking the ignitor.

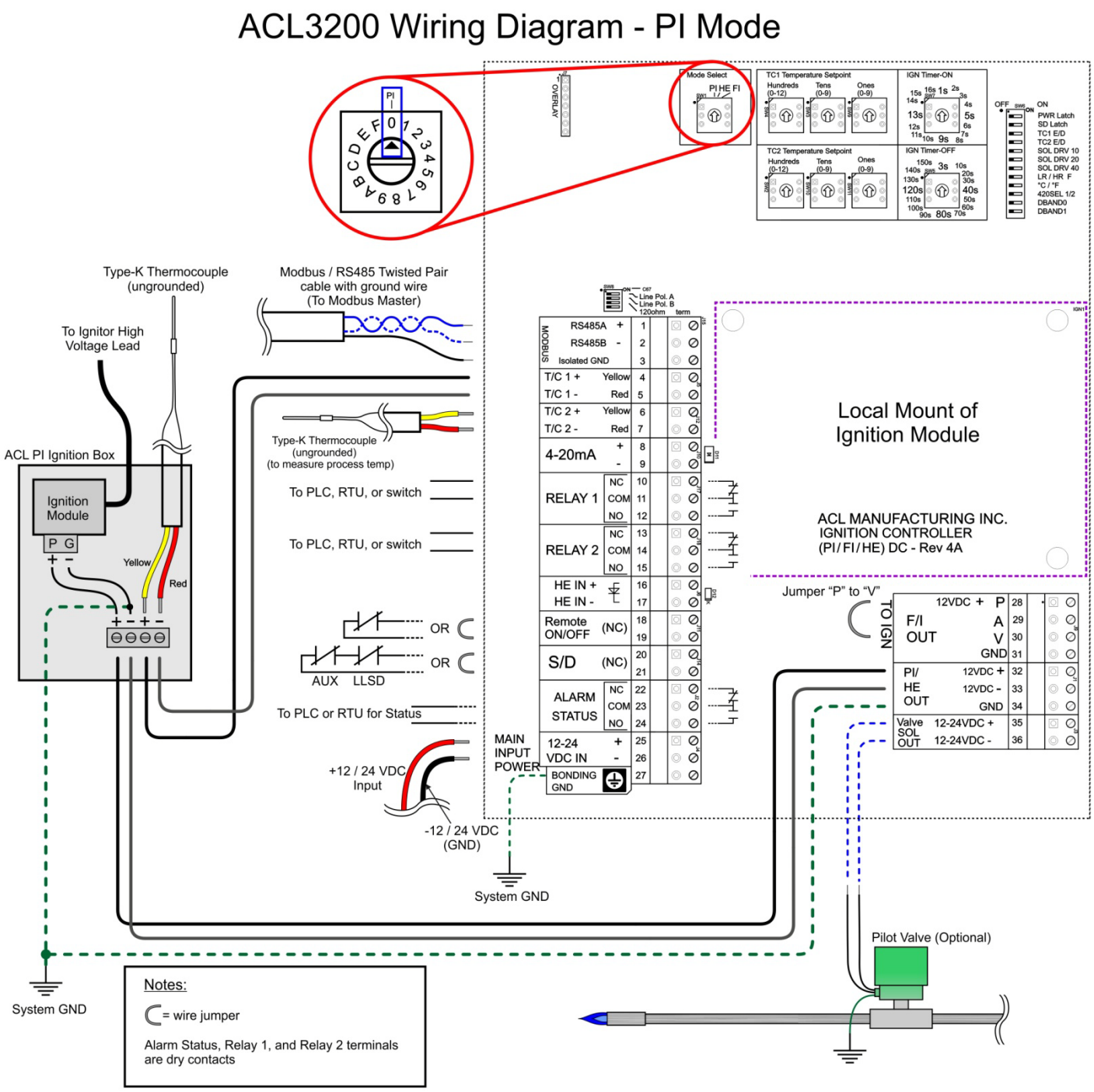
			LED On, Flashing Quickly = system is on and sparking the ignitor in a timed sequence (PI/HE relay is off currently) LED On Solid = Pilot flame is detected
		I	Amber LED indicating that the Pilot flame is present or that the system is sparking the ignitor. LED On, Flashing Quickly = system is on and sparking the ignitor in a timed sequence (PI/HE relay is off currently) LED On Solid = PI/HE Relay is on (sparking)
3	System On LED	PI	Green LED indicating that the controller is On. LED On Flashing = a Power Failure occurred LED On Solid = Power is On
		HE	Green LED indicating that the controller is On. LED On Flashing = a Power Failure occurred LED On Solid = Power is On
		FI	Green LED indicating that the controller is On. LED On Flashing = a Power Failure occurred LED On Solid = Power is On
		I	Green LED indicating that the controller is On. LED On Flashing = a Power Failure occurred LED On Solid = Power is On

#	Overlay Button	Mode	Description
4		All	Pressing the Stop Button will cause the system to stop: power to ignitor outputs will be shutoff. Valve solenoid power output will be turned off. Pressing the Stop button will also clear any shutdown indicators present on the LED display. Other methods of shutting off the system include: - Remote On/Off in the Off position (open contacts) - Modbus Remote Stop command - Shutdown terminals (system will restart automatically if SD terminals close again and the SD Latch DIP switch is off)
5		All	Pressing the Start button will cause the system to start Pressing the Start button will also clear any shutdown indicators present on the LED display. Other methods of turning on the system include: - Remote On/Off toggled Off, then On again (open contacts, then close contacts again) - Modbus Remote Start command

Pilot Ignitor (PI) Connection Diagram

The following diagram shows the wiring connections for the ACL3200 Flare Stack / Incinerator Ignition System in PI mode.

Figure 5 - ACL3200 Wiring Diagram - PI Mode



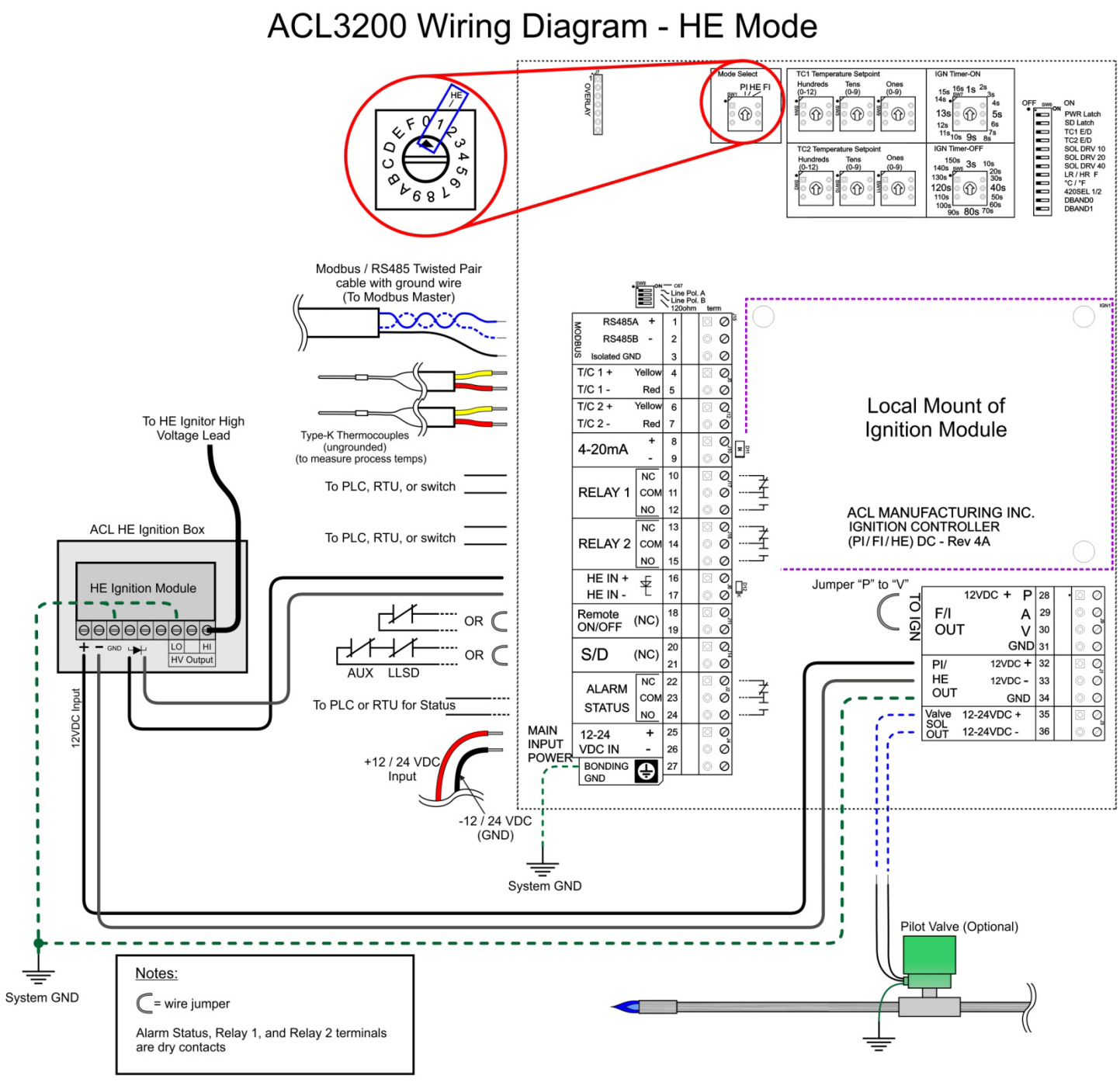
Minimum Required Wiring Connections - PI Mode
Thermocouple 1, ACL3200 to PI Ignition box and Type-K TC
PI / HE Out to ACL PI Ignition Box: 12VDC+, 12VDC-, GND
Main Input Power (+12/24VDC, -12/24VDC)
Ignitor High Voltage Lead

Optional or Additional Functionality Connections - PI Mode
Thermocouple 2 (Set "TC2 E/D" DIP switch to Disabled if not used)
Remote On/Off switch (jumper if not used)
Shutdown (jumper if not used)
Alarm Status (dry contacts)
Valve (Pilot) Solenoid Output (Connect a wire jumper from "FI Out" "P" terminal to "V" if Valve Solenoid Output is desired in HE mode)
Relay 1 dry contacts (controlled by TC1)
Relay 2 dry contacts (controlled by TC2)
4-20mA output (TC1 or TC2 selectable)
Modbus RTU, RS485

High Energy Ignitor (HE) Connection Diagram

The following diagram shows the wiring connections for the ACL3200 High Energy Ignition System in HE mode.

Figure 6 - ACL3200 Wiring Diagram - HE Mode



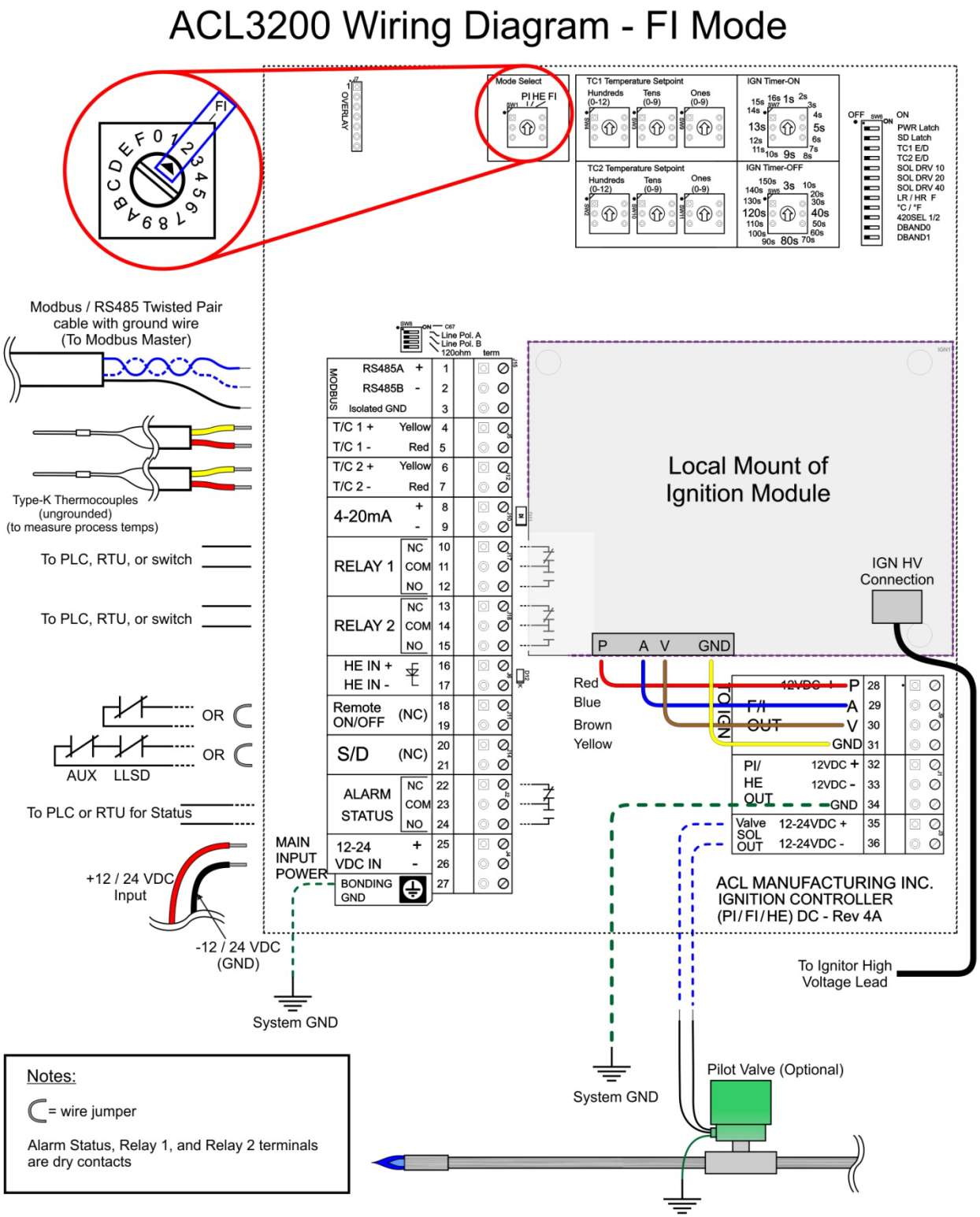
Minimum Required Wiring Connections - HE Mode
PI / HE Out to ACL HE Ignition Box: 12VDC+, 12VDC-, GND
ACL HE Ignition Box Diode Anode and Cathode to "HE IN +" (Anode) and "HE IN -" (Cathode)
Main Input Power (+12/24VDC, -12/24VDC)
Ignitor High Voltage Lead

Optional or Additional Functionality Connections - HE Mode
Thermocouple 1, ACL3200 to Type-K TC (Set "TC1 E/D" DIP switch to Disabled if not used)
Thermocouple 2, ACL3200 to Type-K TC (Set "TC2 E/D" DIP switch to Disabled if not used)
Remote On/Off switch (jumper if not used)
Shutdown (jumper if not used)
Alarm Status (dry contacts)
Valve (Pilot) Solenoid Output (Connect a wire jumper from "FI Out" "P" terminal to "V" if Valve Solenoid Output is desired in HE mode)
Relay 1 dry contacts (controlled by TC1)
Relay 2 dry contacts (controlled by TC2)
4-20mA output (TC1 or TC2 selectable)
Modbus RTU, RS485

Flame Ionization (FI) Connection Diagram

The following diagram shows the wiring connections for the ACL3200 Flame Ionization Ignition System in FI mode.

Figure 7 - ACL3200 Wiring Diagram - FI Mode



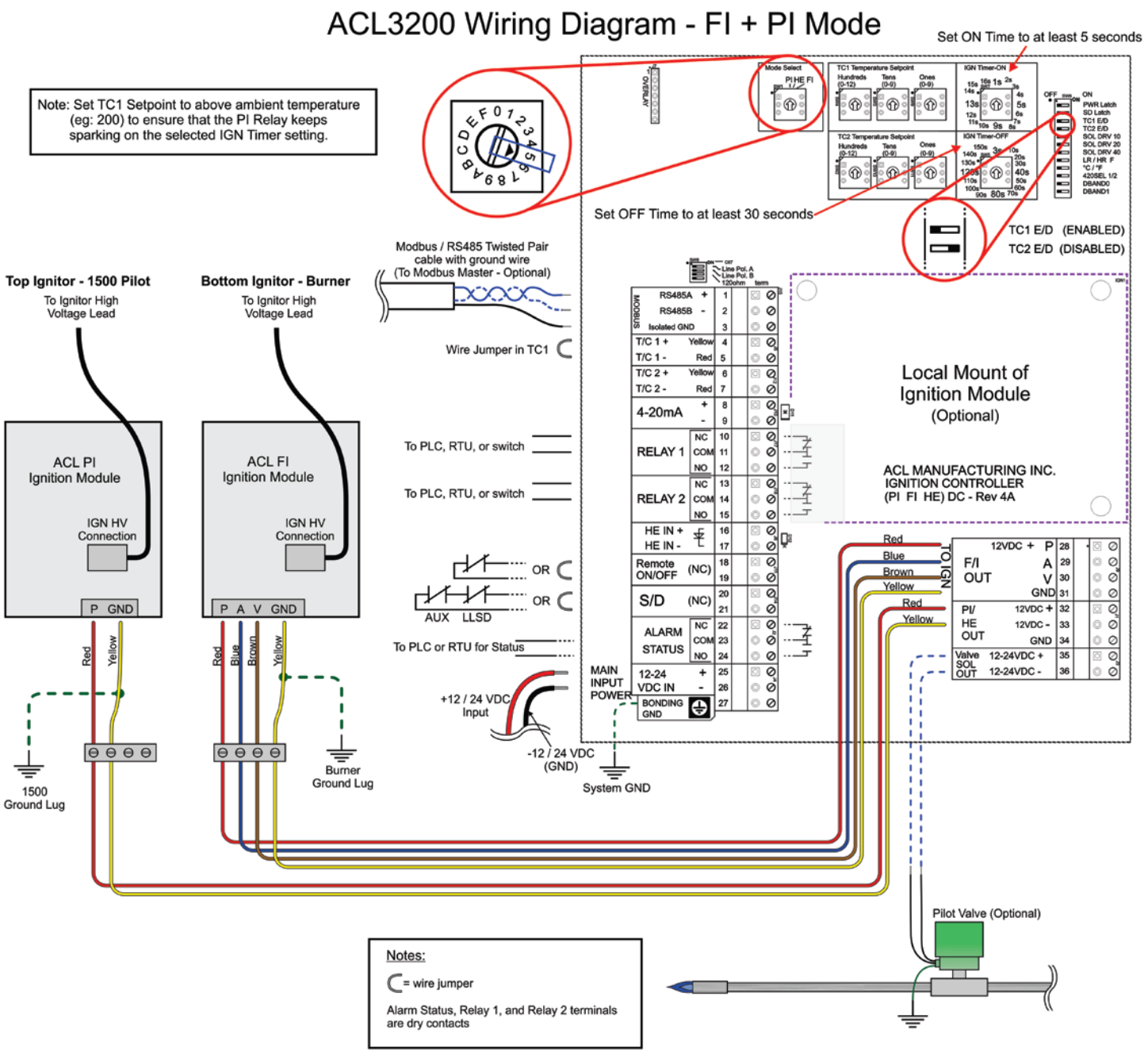
Minimum Required Wiring Connections - FI Mode
FI Out to ACL FI Ignition Box: 12VDC + (P)ower, (A)larm, (V)alve, GND
Main Input Power (+12/24VDC, -12/24VDC)
Ignitor High Voltage Lead

Optional or Additional Functionality Connections - FI Mode
Thermocouple 1, ACL3200 to Type-K TC (Set "TC1 E/D" DIP switch to Disabled if not used)
Thermocouple 2, ACL3200 to Type-K TC (Set "TC2 E/D" DIP switch to Disabled if not used)
Remote On/Off switch (jumper if not used)
Shutdown (jumper if not used)
Alarm Status (dry contacts)
Valve (Pilot) Solenoid Output
Relay 1 dry contacts (controlled by TC1)
Relay 2 dry contacts (controlled by TC2)
4-20mA output (TC1 or TC2 selectable)
Modbus RTU, RS485

Flame Ionization (FI) + Pilot Ignition (PI) Connection Diagram

The following diagram shows the wiring connections for the ACL3200 Flame Ionization Ignition System in FI + PI mode. This wiring diagram is for use with a system with two ignition modules. An example of this type of system will be a combustor with a low pressure burner in the bottom of the combustor and a high pressure flare (ACL 1500 Pilot ignitor) at the top of the combustor's stack. The Mode Select switch needs to be turned to Mode "5" for this mode and TC1 needs to be enabled.

Figure 8 - ACL3200 Wiring Diagram - FI + PI Mode



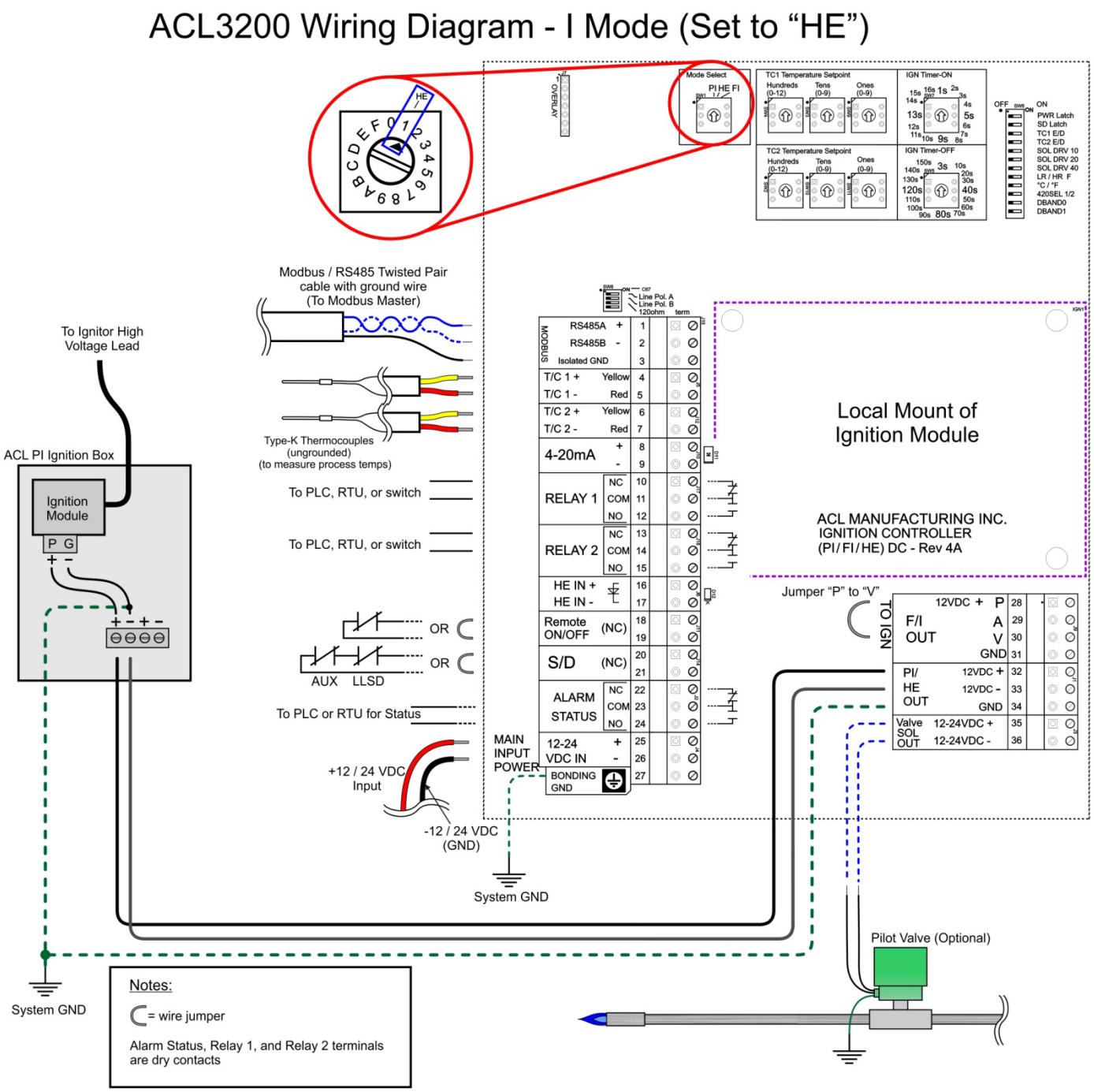
Minimum Required Wiring Connections - FI + PI Mode
FI Out to ACL FI Ignition Box, bottom ignitor: 12VDC + (P)ower, (A)larm, (V)alve, GND
Main Input Power (+12/24VDC, -12/24VDC)
FI Ignitor High Voltage Lead
Thermocouple 1, ACL3200 to PI Ignition box and Type-K TC OR Wire jumper in TC1
PI / HE Out to ACL PI Ignition Box: 12VDC+, 12VDC-, GND
PI Ignitor High Voltage Lead

Optional or Additional Functionality Connections - FI + PI Mode
Thermocouple 1, ACL3200 to Type-K TC. Put a jumper in TC1 if a thermocouple is not used. This will force the PI ignitor to spark for a few seconds every few minutes.
Thermocouple 2, ACL3200 to Type-K TC (Set "TC2 E/D" DIP switch to Disabled if not used)
Remote On/Off switch (jumper if not used)
Shutdown (jumper if not used)
Alarm Status (dry contacts)
Valve (Pilot) Solenoid Output
Relay 1 dry contacts (controlled by TC1)
Relay 2 dry contacts (controlled by TC2)
4-20mA output (TC1 or TC2 selectable)
Modbus RTU, RS485

Ignitor Only (I) Connection Diagram

The following diagram shows the wiring connections for the ACL3200 Ignitor Only Ignition System in I mode.

Figure 9 - ACL3200 Wiring Diagram - I Mode



Minimum Required Wiring Connections - I Mode
PI / HE Out to ACL I Ignition Box: 12VDC+, 12VDC-, GND
Main Input Power (+12/24VDC, -12/24VDC)
Ignitor High Voltage Lead

Optional or Additional Functionality Connections - I Mode
Thermocouple 1, ACL3200 to Type-K TC (Set "TC1 E/D" DIP switch to Disabled if not used)
Thermocouple 2, ACL3200 to Type-K TC (Set "TC2 E/D" DIP switch to Disabled if not used)
Remote On/Off switch (jumper if not used)
Shutdown (jumper if not used)
Alarm Status (dry contacts)
Valve (Pilot) Solenoid Output (Connect a wire jumper from "FI Out" "P" terminal to "V" if Valve Solenoid Output is desired in HE mode)
Relay 1 dry contacts (controlled by TC1)
Relay 2 dry contacts (controlled by TC2)
4-20mA output (TC1 or TC2 selectable)
Modbus RTU, RS485

Appendix A - Applicable Standard and Code Requirements

CSA Standard C22.2 No.0-10 - General Requirements-Canadian Electrical Code Part II

CAN/CSA-C22.2 No. 0.4-04 - Bonding of Electrical Equipment

CSA Standard C22.2 No. 94-M91 - Special Purpose Enclosures

CSA Standard C22.2 No. 142-M1987 - Process Control Equipment

CSA C22.2 No. 199-M89 - Combustion Safety Controls and Solid-State Ignitors for Gas and Oil Burning Equipment

CSA Standard C22.2 No. 213-M1987 - Non-Incendive Electrical Equipment for Use in Class I, Division 2 Hazardous Locations

UL Standard 50, 12th Edition- Industrial Control Equipment for Use in Hazardous (Classified) Locations

UL746C, 6th Edition - Standard for Polymeric Materials - Use in Electrical Equipment Evaluations

UL 508, 17th Edition - Industrial Control Equipment

ANSI/UL 698 13th Edition- Industrial Control Equipment for use in Hazardous (Classified) Locations

ANSI Z21.20-2005 - Automatic Gas Ignition Systems and Components

ANSI ISA 12.12.01-2007- Non Incendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations

Appendix B - ACL3200 Rev 4A Technical Specifications

General Notes:

- All components on the ACL3200 Controller are RoHS compliant.

Modbus Notes:

- Receivers are designed to fail-safe to a logic high output state if inputs (terminals A and B) are left un-driven or shorted. If the bus is un-driven for long periods of time, the receivers are designed to not require line polarization on the bus (adding a pullup resistor to "A" and a pulldown resistor to "B"). Line polarization may be enabled (via the two DIP switches on the top of the ACL3200 Controller) for use with other devices on the same RS-485 bus.
- Drivers are protected from excess current flow caused by bus contention or output short-circuits by both an internal current limit and a thermal-overload shutdown.
- RS-485 inputs (terminals A and B) are protected against ESD (Electrostatic Discharge) events up to +/- 15kV (Air-Gap and Human Body Model) and up to +/- 8kV Contact Discharge (IEC61000-4-2).

Specification	**Default Value**	**Possible Values or Range**
Modbus Protocol	Modbus RTU	Modbus RTU
Modbus Slave ID (address)	2	1 - 247
Modbus/RS-485 Serial Settings:		
Baud rate	9600	300, 1200, 2400, 4800, 9600, 19200, 38400
Number of data bits	8	8
Parity bit setting	None	None, Even, Odd
Stop bits	1	1, 2 (only with parity set to "None")
Operating Temperature		-40°C to 60°C
RS-485 (Modbus) Signals:		
Input voltage on A and B signals		-7 VDC to +12 VDC
Driver Short Circuit Current Limit		+/- 250mA maximum
Differential Driver Output, No Load		5 VDC
Differential Driver Output, R_L = 54ohms		1.5 VDC minimum 2.7 VDC typical 5 VDC maximum
Receiver Input Resistance		96kohm minimum (1/8th of a Modbus "Unit Load")
Receiver Differential Threshold (VA – VB)		-200mV minimum -125mV typical -40mV maximum
Receiver Input Hysteresis		25mV typical
Termination		None or 120ohms (2-pin jumper may be installed by user)
Line Polarization Resistors		560 ohms +/- 1%, selectable by user via two DIP switches
Line Polarization Pullup voltage		5 VDC +/- 1% (5% max)
Line Polarization Pulldown voltage		RS-485 Isolated or Common GND (0V)

Inputs and Control Outputs:		
Main Power Input, Voltage Range		10VDC (minimum) to 29VDC (maximum)
System Current Draw, no solenoid outputs on		300mA Max, 180 mA typical (at 12VDC)
System Current Draw, Pilot solenoid output on, no Low Power solenoid drivers engaged		
Solenoid Outputs:		
Voltage Output on Solenoid terminals (12VDC main input)		Main Power Input minus a small voltage drop that is dependent on current draw and temperature: Solenoid outputs are 11.8V to 11.98V (approx.)
Voltage Output on Solenoid terminals (24VDC main input)		Main Power Input minus a small voltage drop that is dependent on current draw and temperature: Solenoid outputs are 23.8V to 23.98V (approx.)
Voltage Output on Solenoid terminals (10VDC main input)		Main Power Input minus a small voltage drop that is dependent on current draw and temperature: Solenoid outputs are 9.8V to 9.98V (approx.)
Physical Dimensions:		
Length		8.750” (222.25mm)
Width		7.000” (177.8mm)
Height, maximum (from bottom of components on bottom layer to top of components on top layer)		1.130” (28.70mm)

Appendix C - Troubleshooting

Flare Stack / Incinerator Troubleshooting

#	Issue	Possible Reason	Corrective Action
1	Fails to attempt ignition	Blown fuse	Check if the System On LED is on or blinking: it should always be lit or blinking, regardless of mode. If System On LED is off, replace fuse with a 2A max fuse
		Supply voltage too low	Ensure that the minimum input voltage is 11.5VDC (measured with a volt meter) for use with 1 solenoid output
		Poor power connections	Check all connections on the terminal strips. Ensure that there are no short circuits, that the wires are tightly gripped inside the terminals, and that the screws on each terminal are tight.
		Shutdown terminal not closed	Ensure that Shutdown terminals are closed: 12VDC should be present on both the S/D+ and S/D- terminals
		Remote On/Off terminal not closed	Ensure that Remote On/Off terminals are closed: 12VDC should be present on both the S/D+ and S/D- terminals
2	Attempts ignition but pilot doesn't light	Fuel gas supply to Pilot may be too high or too low	Pilot fuel gas supply should be set at 5 pounds
		Gap setting on ignitor/flame rod not correct	Gap should be approximately 1/8" (3.175mm) and rod tip needs to be cut to a sharp point
		Ignition cable defective or insulation worn	Check continuity through the ignition cable. Multimeter should read close to zero ohms. If not, cable needs to be replaced.
		Poor ground connection	Ensure that good, thick ground connections are made at the ACL3200 and at the Pilot/burner valve
		Pilot solenoid failure	Check supply power to solenoid. Check gas flow through solenoid
		Plugged orifice on Pilot	Clean out Pilot orifice (Do Not redrill!)
3	Weak or Erratic Spark	Gap setting too wide or rod not cut to a point	Shorten gap setting to approximately 1/8" (3.175mm) and recut the ignitor rod tip
		Ignition cable defective or insulation worn	Check continuity through the ignition cable. Multimeter should read close to zero ohms. If not, cable needs to be replaced.
		Poor ground connection	Ensure that good, thick ground connections are made at the ACL3200 and at the ignitor tip
		Contaminated ignitor rod or Pilot nozzle	Remove Pilot assembly, clean rod and nozzle, and reinstall
4	Solenoid valve not opening	PI/I/HE modes: F/I Out "P" and "V" not shorted	A wire jumper is required between the "P" and "V" terminals to use the Valve solenoid output in PI/I/HE modes.
		FI mode:	Recheck all connections are tightly screwed into the F/I OUT terminals and that there are no short circuits.
5	Solenoid valve opens but then closes again	Wrong Low Power Solenoid Driver setting for the attached	Verify that the Low Power Solenoid Driver DIP switch settings are matched to the solenoid valves

	(intermittent operation)	solenoids	connected to the ACL3200. (See DIP switch section under "SOL DRV x" DIP switches)
		Voltage droop on input	Some larger solenoid valves rated for 12VDC require an output voltage very near to 12VDC. Measure the output voltage on the solenoid terminals to ensure that it's sufficient (approx. >= 11.5VDC). Higher current drawn on each solenoid output will cause slightly higher voltage drops which may interfere with solenoid operation. Input voltage may need to be boosted to 12.5VDC if multiple large solenoids are attached to one solenoid output.

Notes:

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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.

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