cimarron
CREATING A CLEANER ENVIRONMENT®

ARCONTROL™ BASE

USER MANUAL

https://www.arcontrolbms.com

Revision B

March 2020

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1 Introduction

Thank you for purchasing the ARControl, our most popular ignition package. This manual will provide you with important information that will help you understand the system, setup the system and how the system operates. Please keep the manual in an accessible location for future reference. At Cimmaron Energy Inc. we are always here to assist you with any service or spare part needs. Contact us at:

Phone: 1-844-746-1676

Website: https://www.arcontrolbms.com

1.1 Hardware Installation

The ARControl should be installed according to the directions provided in this manual and **always** be in compliance with local electrical codes and the specifications of the operating company. This section will cover general instructions regarding safety as well as specific wiring and materials required for the safe and successful operation of the ARControl.

⚠ WARNING!

Failure to comply with the following safety warning(s) may result in serious personal injury or death.

- Ensure the power is not connected until the final step of installation.
- Failure of the grounding system integrity can result in personal injury, damage, or failure of operation. The equipment must be grounded in accordance with instructions and devices and wiring connected to the controller must be according to the appropriate electrical code
- Ensure that no personnel nor any objects come into contact with the ignition module, terminals, or damaged coil wiring. The ignition coil can generate 38kV and is considered a hazard.
- If using an external power supply, do not power the ARControl with a supply rated for more than 24VDC.

NOTICE

Failure to comply with the following safety warning(s) may result in damage to the product.

- When installation is complete, ensure that the enclosure is properly sealed and the fasteners are tight. The enclosure will ensure that the internal components are not affected by moisture, ice, or debris.
- Disconnect and remove the battery during transportation or when the ARControl will not be operated for a period of time.

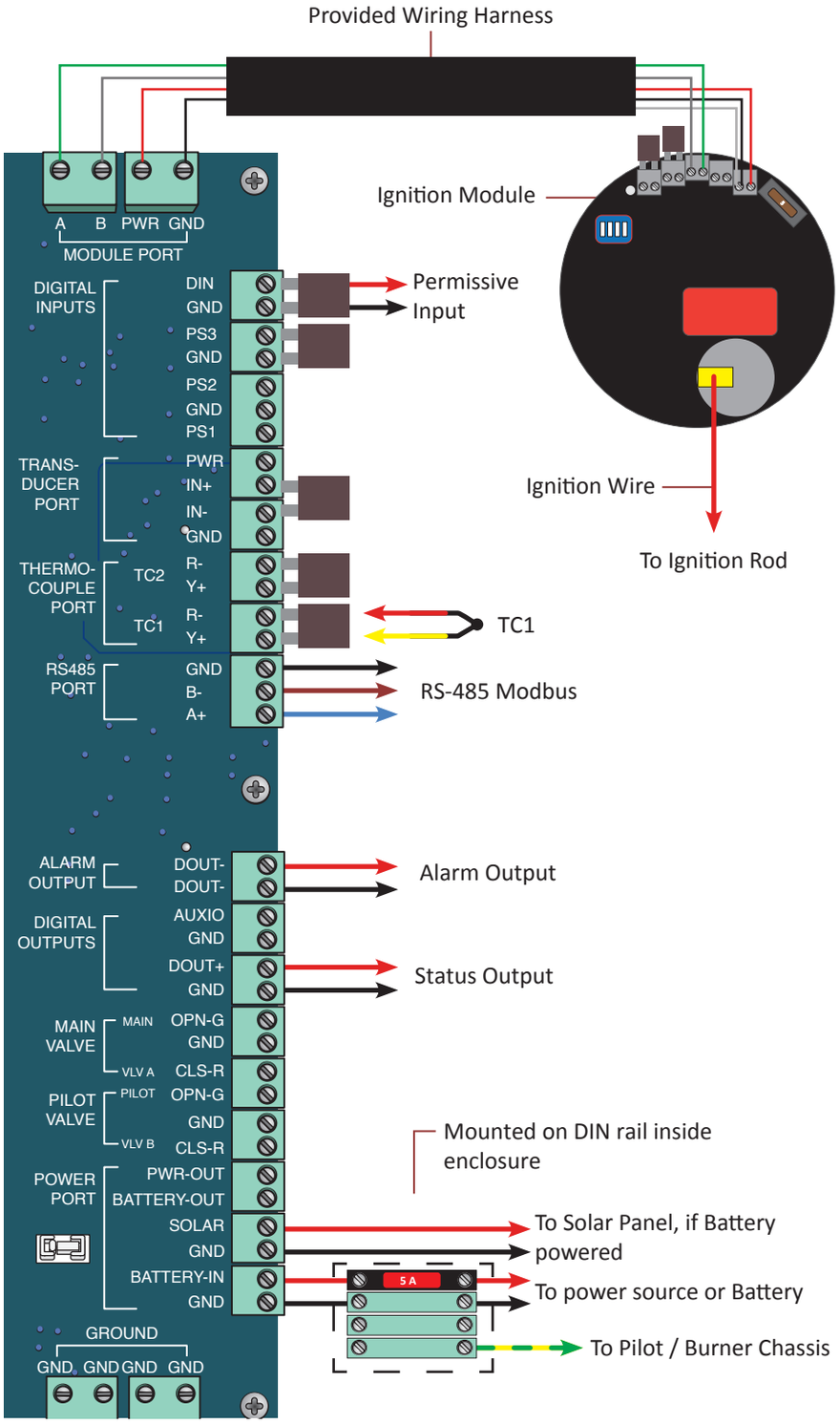
Follow these guidelines when installing the ARControl:

- A switch or circuit breaker must be included in the installation; it must be suitably located and easily reached. It must be marked as the disconnecting device for the equipment.
- Proper earth grounding per local electrical codes must be utilized in the installation.
- If the ARControl is used in a manner not specified by Cimarron Energy, Inc., the protection provided by the equipment may be impaired.
- If the BMS Module (1870-511) is used in conjunction with the ARControl it must be mounted externally of the ARControl in order for the ARControl to remain regulatory compliant.
- Use the hardware supplied with the ARControl. The hardware kit supplied with the ARControl contains an aluminum pre-drilled mounting bracket, and (4) 3/4-inch bolts and nuts.
- Locate the unit out of traffic and working areas, away from excessive heat, and above areas where water and liquids may accumulate. Visibility of the display will be enhanced if not facing direct sun.
- Measure the wiring distance. The ignition cable is restricted to a length of 25 feet maximum.

Follow these steps to install the ARControl:

1. Locate and open the hardware kit.
2. Attach the mounting flanges to the back of the ARControl with the supplied hardware.
3. Holes will need to be drilled in the bottom of the enclosure to accommodate the cables and conduit to the unit. It is recommended to use a step drill bit to drill the holes.
4. Mount the ARControl via the flanges to a secure location and away from heat sources.
5. Mount provided ignition rod assembly to pilot or burner assembly.
6. Attach provided cable conduit using provided glands to enclosure and burner chamber.
7. Mount ignition module to the DIN rail inside of enclosure. **WARNING: Mounting ignition module inside enclosure VOIDS the 1960-155 ARControl Class I Division 2 rating.** Connect ignition wire to tab of the ignition module spark transformer,
8. run it through the conduit and attach it to ignition rod assembly . Wire the Ignition Module to the ARControl's Module Port using the
9. provided wiring harness.
10. Attach the free end of the grounding wire (green wire with yellow trace) to the burner's chassis.
11. Connect the power source to the power and ground terminal blocks.
12. Navigate to **START IGNITION** and press **OK**. The system will start the ignition cycle in automatic mode.

The solar power package includes a battery in a DIN-mountable battery tray, solar panel, and 9 feet of cable for connection to the ARControl. Mount the bracket and panel facing sunlight in a suitable location.



Notes: Factory Jumpers

- Remove jumper if installing outside wiring
- BMS module ***must*** be set to address 1 (Dip switch 1 on)

Image 1.1.1 · Hardware installation

1.2 Wiring for Operation

This section covers general wiring for most common applications. **Important!** All wiring should be done in accordance with local regulations and within the specifications of the site or equipment owner. If there are questions not answered by this manual or the wiring diagrams, please call Cimarron Energy at 1-844-746-1676 for assistance.

1.2.1 Connecting the Power

The ARControl is designed to operate from either 12 or 24 volt power supplies or batteries. Power supplies should be rated Class II and capable of sourcing a minimum of 2 amps. Batteries should be either 12 or 24 volt and have a minimum 12 Ah (amp-hour) capacity.

1.2.2 Connecting a Solar Panel and Battery (if required)

Solar Charing

The ARControl contains an integrated solar charger. The solar charger is capable of charging a 12 volt 12 Ah SLA (sealed lead acid) battery. A solar panel rated for 12 volt systems with a maximum current output of 2 amps is recommended. Installations that require more charging current than provided by the internal solar charger should utilize a properly sized external solar charger and battery.

Power Pack

The standard ARControl Power Pack (PN: 1960-160) contains a 12 volt 12 Ah SLA battery in a sturdy DIN-mountable bracket and a 5 watt 12 volt solar panel with 9 feet of cable and a mount ng bracket. The battery and bracket clips onto the bottom DIN rail in the ARControl enclosure. The solar panel can be mounted with a U-bolt to a pole or to any other structure that can accommodate the mount ng holes. Be sure to locate the solar panel south facing in an area free from obstruction of the sun throughout the ent rety of the day.

Fusing

The ARControl has three user-replaceable fuses. The fuse on the DIN mounted terminal block that connects to BATTERY IN on the ARControl utilizes a 5 amp ATC or ATO fuse. The ARControl board is fused at both the POWER PORT and MODULE PORT with 2 amp ceramic fuses (PN: 3181-002). The POWER PORT fuse protects all of the valve outputs and the digital outputs. The MODULE PORT fuse protects the power output to the Ignition Module. There are two spare 2 amp ceramic fuses located in the SPARE FUSES location on the ARControl board.

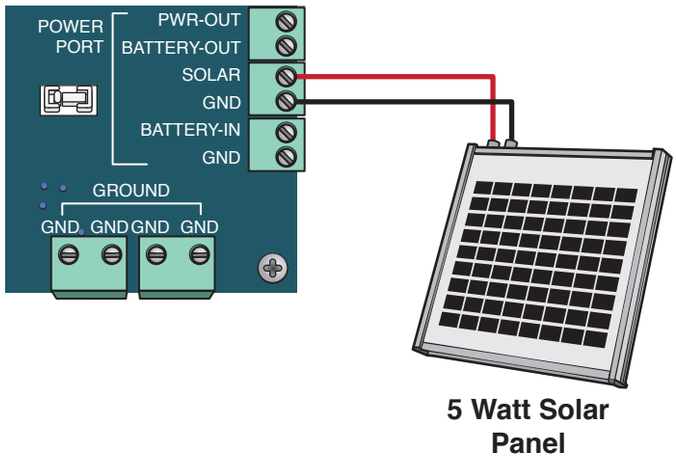


Image 1.2.1 · Solar panel wiring

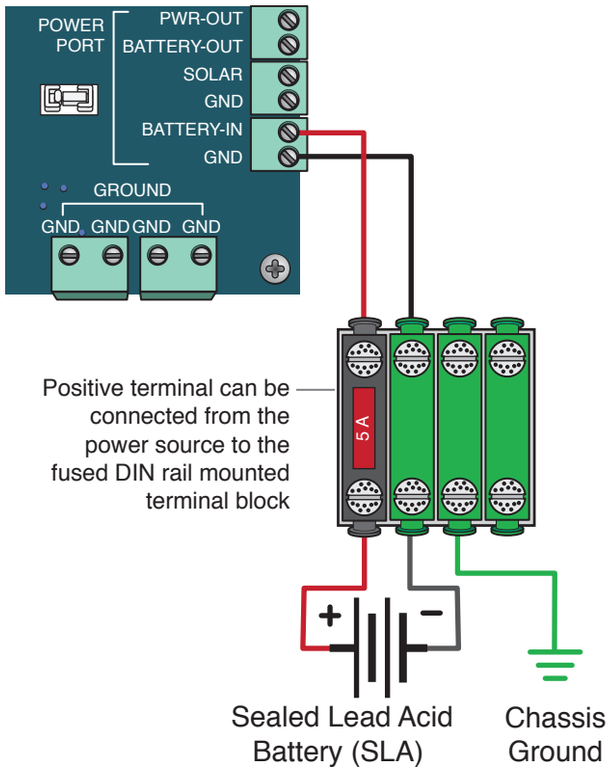


Image 1.2.2 · Battery pack wiring

1.2.3 Connecting a Thermocouple (if used)

TC1 is the only thermocouple input. The input has a readout on the system main screen and the thermocouple value gets recorded in the data logs (Image 1.2.3).

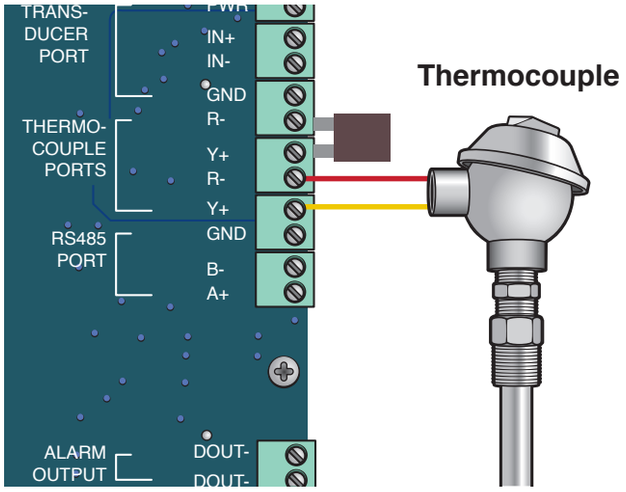


Image 1.2.3 · Thermocouple (TC1) wiring

1.2.4 Communication via Modbus RS-485

To use Modbus communication, use the RS-485 PORT on the board, attaching the A+ and B- wiring as well as the GND to the external PLC or communication device. Notifications of alarms can also be retrieved via Modbus (Image 1.2.4).

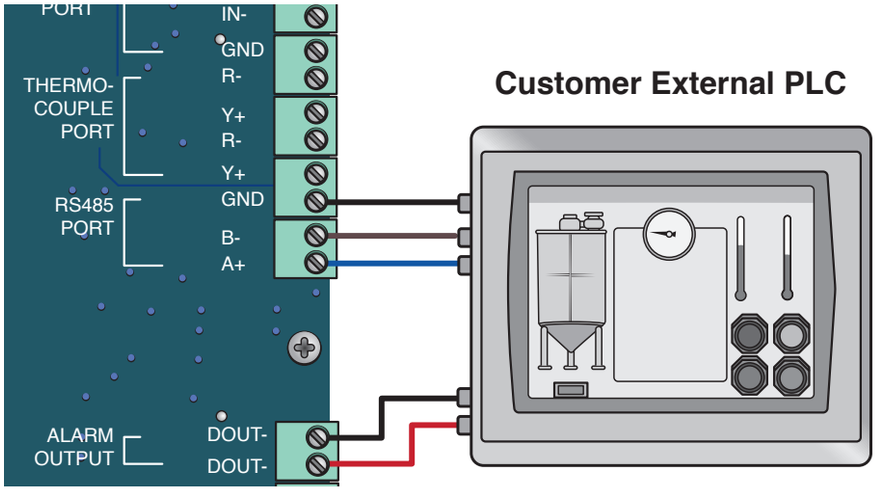


Image 1.24 · Modbus RS-485 wiring

1.2.5 Connecting the Ignition Module

The wiring from the Ignition Module is connected to the MODULE PORT at the top of the ARControl board. Both thermocouple inputs are jumpered short. The DIP switch must be set to address position 1 (Image 1.2.5).

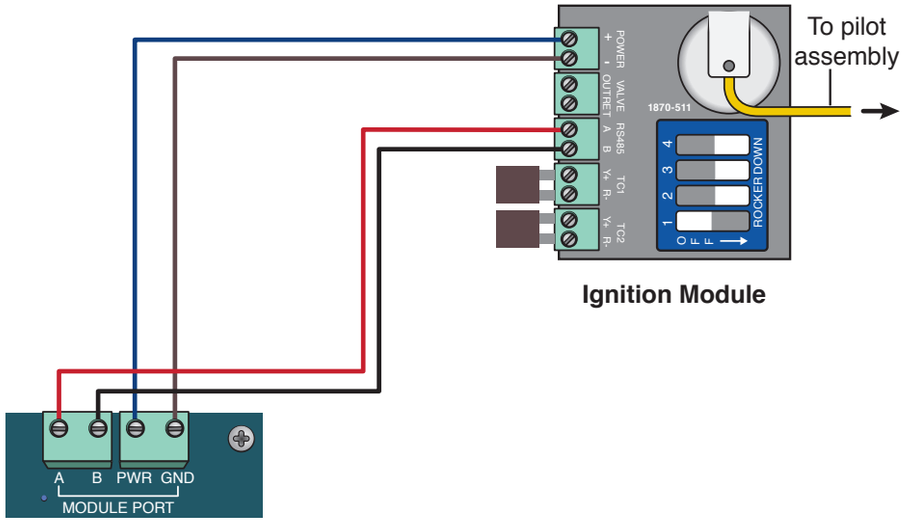


Image 1.2.5 · Ignition module wiring

1.2.6 PERMISSIVE (DIN) Input

The **PERMISSIVE (DIN)** input comes with a jumper installed from the factory. To use the **PERMISSIVE (DIN)** input, remove the jumper and connect to an external PLC's dry contact switch output or some other external switch. The **PERMISSIVE (DIN)** is active when the circuit is open (Image 1.2.6).

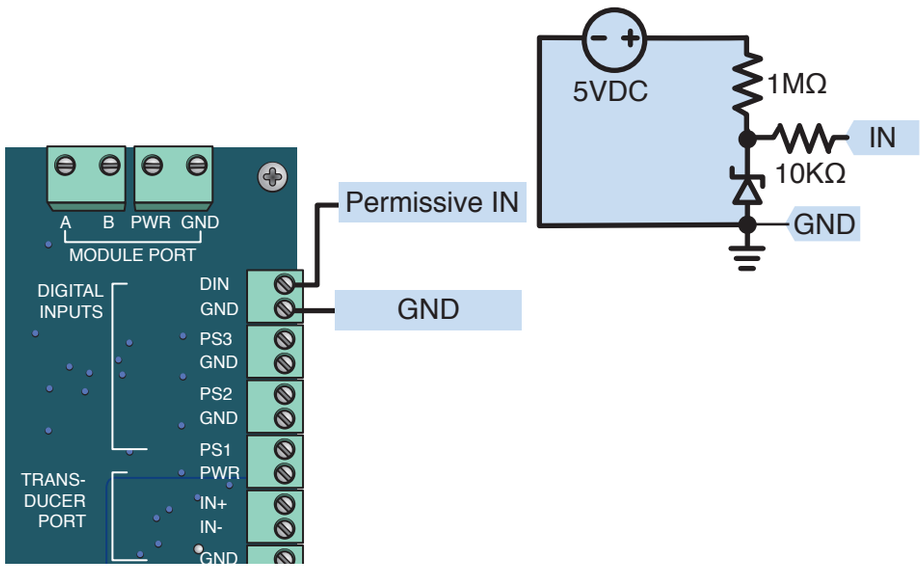


Image 1.2.6 · PERMISSIVE (DIN) input wiring

1.2.7 Status Output

The status output indicates if the system is detecting flame at the pilot. This output sources power and can drive an indicator light or interface with an external PLC (Image 1.2.7).

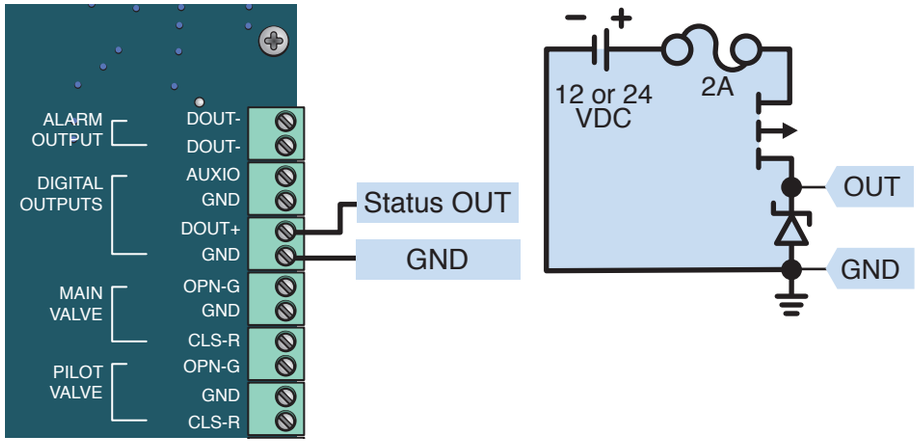


Image 1.2.7 · Status output wiring

1.3 Application Information

1.3.1 Alarm Output

The alarm output is active when the ARControl is in an alarm state. The alarm behaves as an open switch when it is active. External alarm circuitry should be limited to less than 50mA (Image 1.3.1).

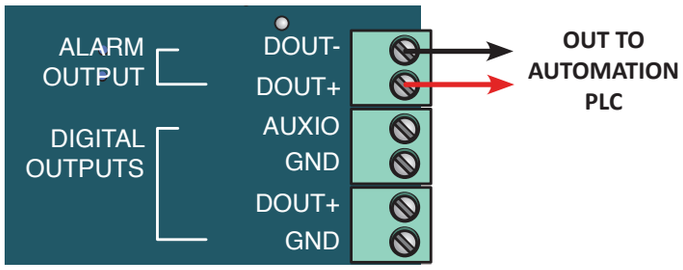
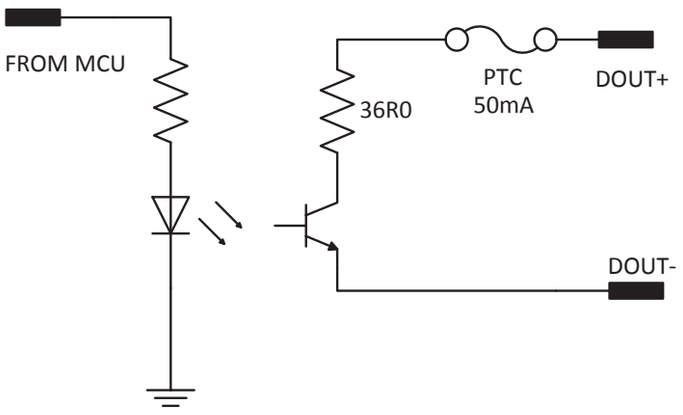


Image 1.3.1 · Alarm output inactive



Alarm output inactive/closed switch circuit diagram

1.3.2 STATUS OUTPUT (DOUT+)

When the **STATUS OUTPUT (DOUT+)** output is **active** the output behaves as a **closed switch** bridging the units battery input to the **STATUS OUTPUT (DOUT+)** (Image 1.3.2).

Therefore, if the system is powered by 12V then when the **STATUS OUTPUT (DOUT+)** is active one can expect 12V at the output. However, due to reverse polarity blocking and fusing the output is slightly below 12V at the output.

When the **STATUS OUTPUT (DOUT+)** is **inactive** then it behaves as if switch bridging the units battery input to the **STATUS OUTPUT (DOUT+)** is **open**.

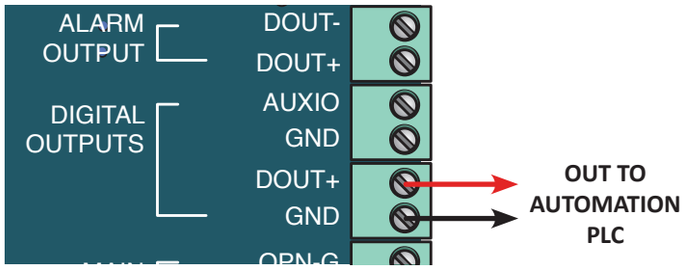
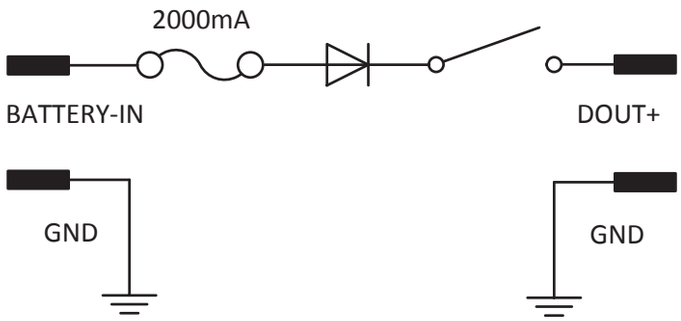


Image 1.3.2 · STATUS OUTPUT (DOUT+) active - closed switch



Digital input open circuit diagram

2 System Overview

2.1 User Interface

The system user interface (Image 2.1.1) consists of a text display and seven keys (Table 2.1.1) that are used for menu navigation, selecting options on menu items and entering or exiting menus.

The text display provides information regarding menus, submenus, system modes, selectable options, current mode operation states and alarms. The text display features automatic shutoff after 60 seconds without user interaction through the keyboard. The automatic shutoff feature helps save power which is especially important in remote installations that are solar powered.

Pressing any key will wake up the text display and bring it to the top of the Main menu. If the **STOP** key is pressed while the text display is off, it will both send the unit in to the **STOP** state and wake up the text display. Additionally, if the system enters in any of the alarm states (see section 4 System Operation for further information on alarm states) this will also wake up the text display if the text display is off and it will bring the alarm state screen.

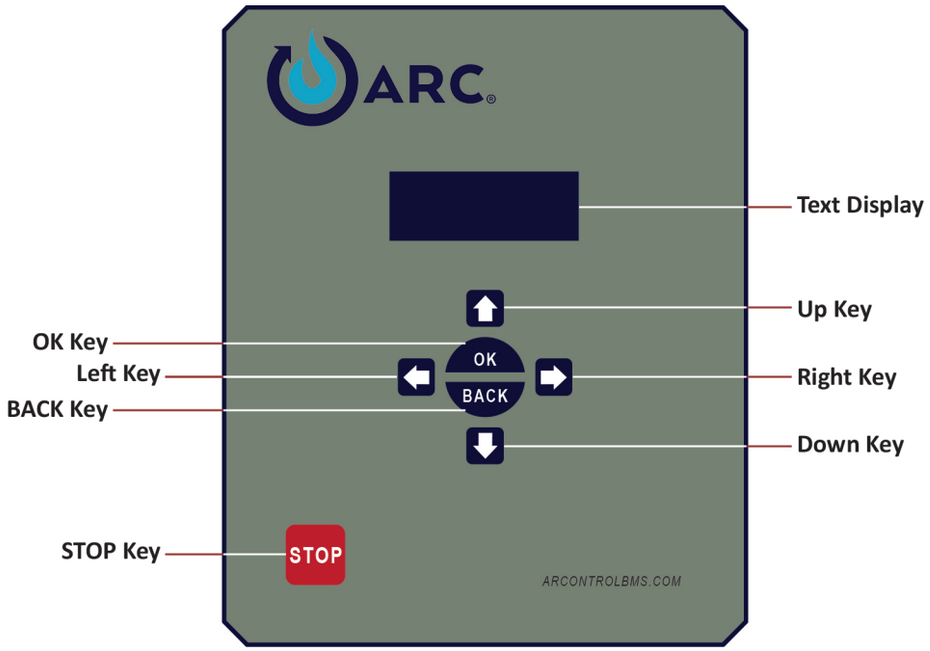


Image 2.1.1 · System user interface

KEY	USE	DESCRIPTION
Up	Use to scroll up menu items	
Down	Use to scroll down menu items	
Left	Use to toggle through selectable options	Selectable options are shown between angle brackets **< >**
Right	Use to toggle through selectable options	Selectable options are shown between angle brackets **< >**
OK	Use to enter a submenu and select or enter menu item choice	The **OK** key allows the entering of menu item actions and choices, and to and accept or deny system confirmation screens.
BACK	Use to exit a selected submenu or cancel / deny prompts	
STOP	Use to put the system in **STOP** state	The **STOP** key interrupts any current operation and sends the system to the **STOPPED** state.

Table 2.1.1 · User interface keys

2.2 System Splash Window

When the system powers up the System Splash window (Image 2.2.1) will appear for 2 seconds. The splash window contains the company name, system name and finally the system's firmware identification version number and revision level.

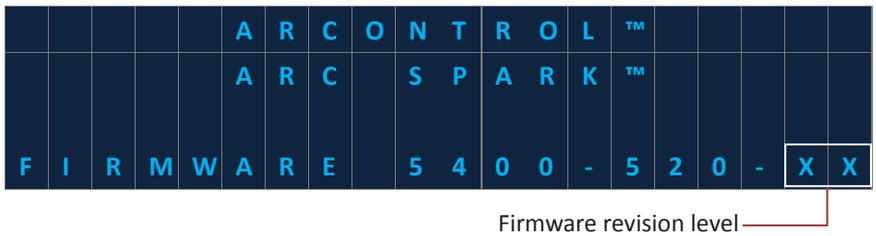


Image 2.2.1 · System splash window

2.3 System Menu

The **System Menu** is shown in the text display (Image 2.3.1). It will show the following:

- Current mode
- Current state
- Additional information about the current state and prompts for actionable menu items
- Thermocouple 1 temperature (F)
- The current battery voltage
- The current solar input voltage
- Settings submenu
- Service information submenu

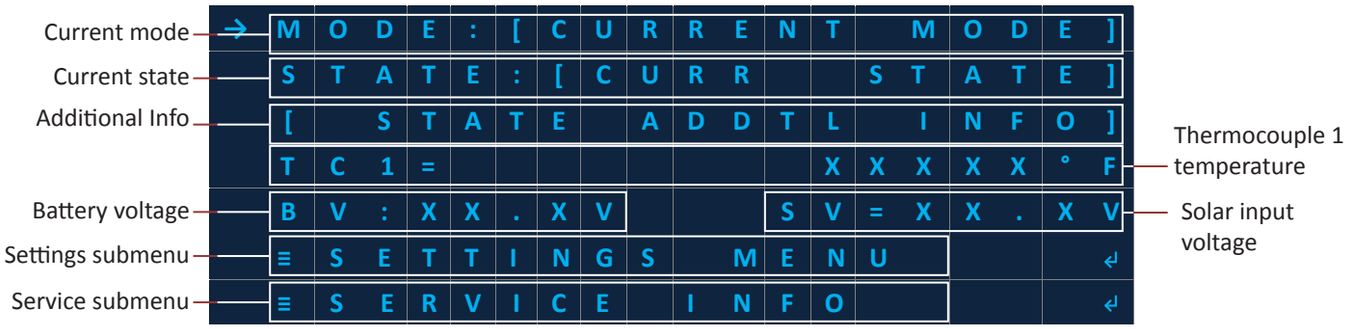


Image 2.3.1 · System menu

2.4 System Menu Symbols

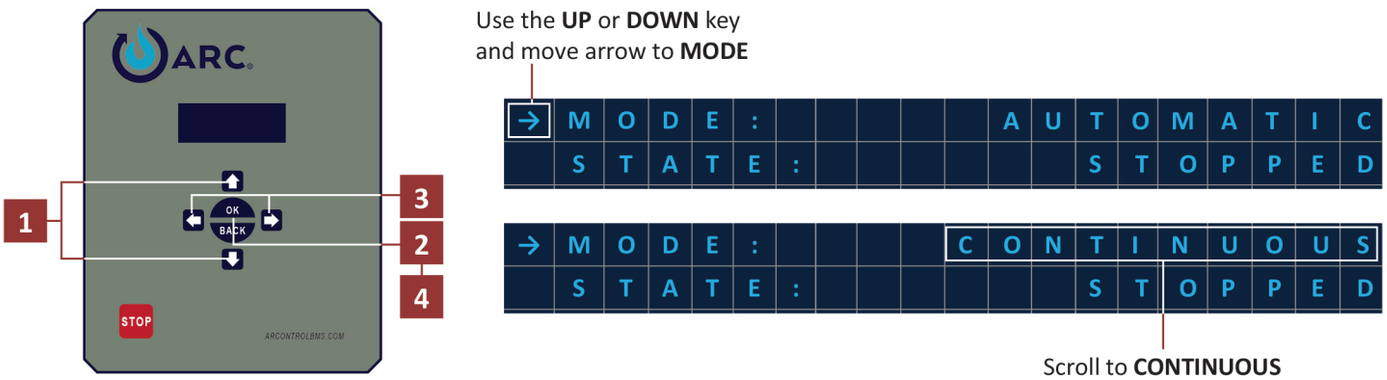
The symbols shown in the **System Menu** signify the following:

→	Indicates current menu selection
≡	Indicates a submenu
↵	Indicates an actionable menu item
< >	Indicates a user selectable option
[ ]	Indicates dynamic text related to user selection
X X X X X X . X	Indicates placeholders for numerical values

The following are some examples of using the **System Menu**.

Example A: Changing the operation mode from **AUTOMATIC** to **CONTINUOUS**.

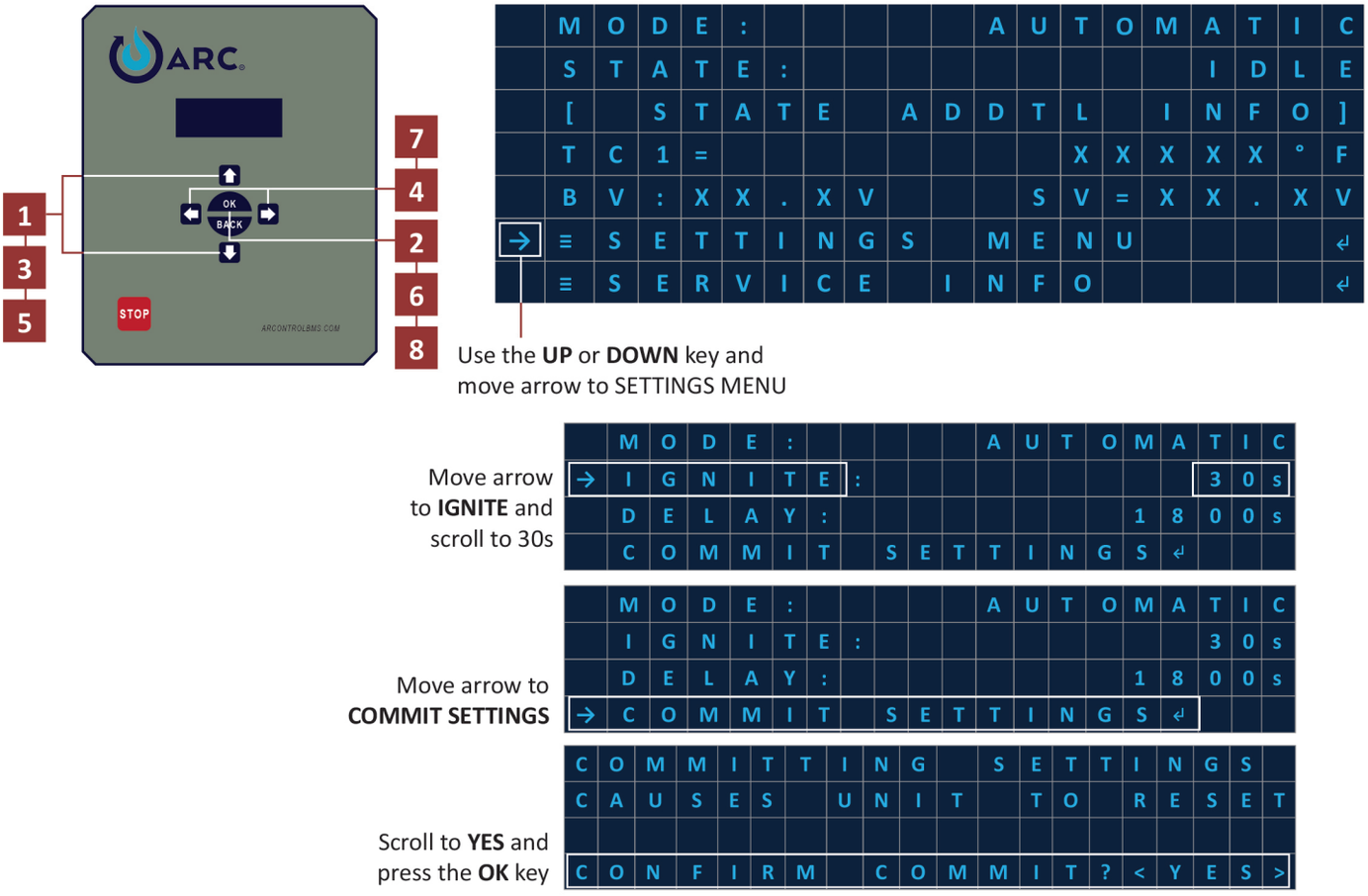
1. Use the **UP** or **DOWN** key and select **MODE**.
2. Press the **OK** key.
3. Using **LEFT** and **RIGHT** key scroll to the **CONTINUOUS** menu entry.
4. Press the **OK** key. The system will now be in the **CONTINUOUS** mode. **Note:** The current state of the mode is shown in the **STATE** row.



Example A · Change operation mode

Example B: Changing the ignition timer from 10s to 30s (**Note:** Only affects **AUTOMATIC** mode).

1. Use the **UP** or **DOWN** key to **SETTINGS MENU**.
2. Press the **OK** key.
3. In the submenu, use the **UP** or **DOWN** key to **IGNITE**.
4. Use the **LEFT** or **RIGHT** key and scroll to the **30s** menu entry.
5. Use the **UP** or **DOWN** key to **COMMIT SETTINGS**.
6. Press the **OK** key.
7. Use the **LEFT** or **RIGHT** key and scroll to the **YES** menu entry.
8. Press the **OK** key to confirm / commit.



Example B · Change ignition timer setting

2.5 Thermocouple 1 (TC1)

TC1 is the temperature readout of thermocouple 1. It is always in degrees Fahrenheit. If a jumper is connected the read-out will display the ambient temperature. If TC1 is not connected and the jumper is not in place the display will show the Overflow condition (Table 2.5.1). This helps identify a possible open TC1.

CONDITION	TEXT	
Overflow	TC1=	+ ∞ °F
Underflow	TC1=	- ∞ °F
Normal	TC1=	XXXXX °F

Table 2.5.1 · TC1 conditions

2.6 Service Info Menu

The Service Info Menu (Image 2.6.1) displays contact information for ARControl sales and service department, the firmware ID number and CRC (cyclic redundancy check), the current operating mode and its settings, the status of pertinent IO, and actions to clear the data logs or set the date and time.

The ignition and delay durations of the current mode are displayed in seconds. These can be changed under the Settings Menu. The state of **PERMISSIVE (DIN)** input is displayed, along with the battery and solar voltages.

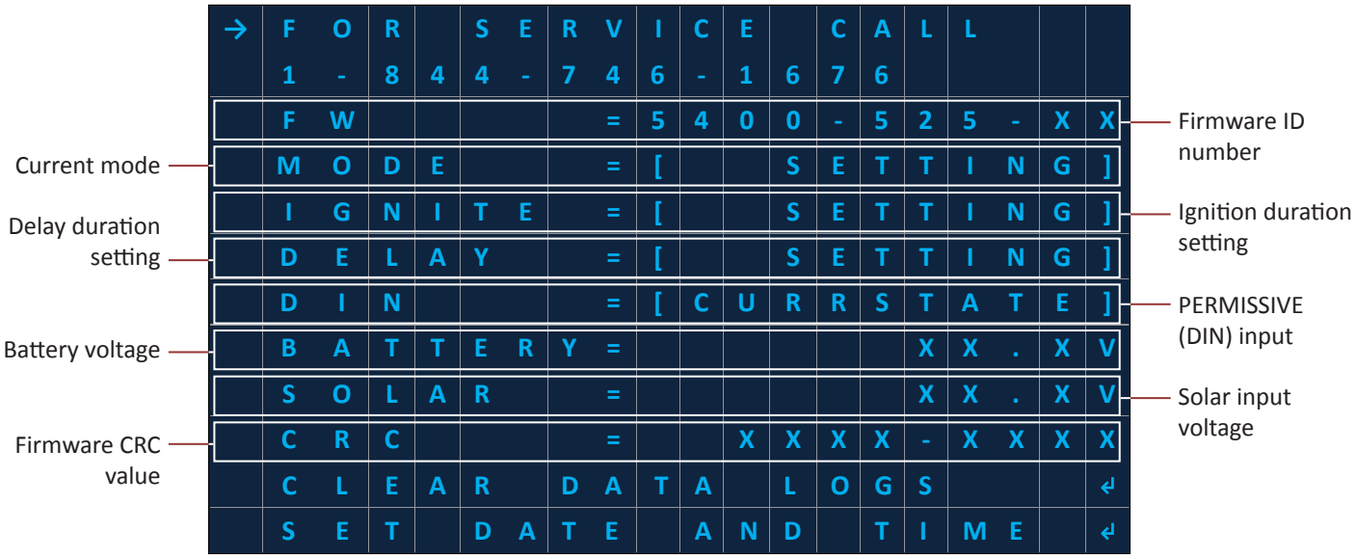


Image 2.6.1 · Service info menu

2.7 Data Logs

The system can create and store two types of data logs:

Time-based: logs are generated in time intervals of 15 minutes.

Event-based: logs are generated when events of special interest happen in the system. Below is the list of events that are logged by the system (Table 2.7.1).

LOG TYPE	EVENT
LOGS ERASED	All previously logs erased
POWER ON	Unit has been powered on
POWER OFF	Unit was powered off
INTERVAL	15 minutes interval has occurred
DATA DOWNLOAD	Previous data has been downloaded
SETTINGS CHANGE	System settings have changed
FIRMWARE UPDATE	Firmware has been updated to a new revision
STATE CHANGE	System current state has changed

Table 2.7.1 · Event data log types

Data is broken down into three groups, System data, Digital data and Analog data. Both log types contain the same data as follows: (Tables 2.7.2, 2.7.3, 2.7.4)

GROUP	HEADER	DESCRIPTION
SYSTEM DATA	TIME STAMP	Time stamp in the format YYYYMMddhhmmss. This time stamp format facilitates data manipulation and plotting.
	DATE	Records date of the occurred logged data.
	TIME	Records time of the occurred logged data.
	LOG TYPE	Records the event that triggered data to be logged.
	MODE	Denotes the mode setting at the time when the logged was recorded.
	STATE	Denotes the mode setting at the time when the logged was recorded.
	LOCKOUT	Denotes the current lockout code from the ignition unit at the time when the logged was recorded.

Table 2.7.2 · System data

GROUP	HEADER	DESCRIPTION
DIGITAL DATA	FLAME INDICATOR	Denotes the state of the Flame indicator output **(DOUT)** as either inactive or active at the time when the logged was recorded.
	ALARM	Denotes the state of the Alarm output as either inactive or active at the time when the logged was recorded.
	PERMISSIVE (DIN)	Denotes the state of the Permissive **(DIN)** input as either inactive or active at the time when the logged was recorded.

Table 2.7.3 · Digital data

GROUP	HEADER	DESCRIPTION
ANALOG DATA	TEMPERATURE UNITS	Denotes the temperature units for the ambient temperature record and thermocouple 1 record.
	AMBIENT TEMPERATURE	Records the ambient temperature reading from the system at the time when the log was recorded.
	THERMOCOUPLE 1	Records the thermocouple 1 reading from the system at the time when the log was recorded.
	BATTERY VOLTAGE	Records the battery voltage reading from the system at the time when the log was recorded.
	SOLAR VOLTAGE	Records the solar voltage reading from the system at the time when the log was recorded.

Table 2.7.4 · Analog data

2.7.1 Retrieving the Data Logs

The data logs are easily retrieved by inserting a USB drive (FAT formatted) into the USB drive port of the system. The system will write the data logs to a CSV file under a folder named ARControl on the root of the USB drive. The CSV log file is named after the time the log was generated in the format YYYYMMddhhmmss.

2.7.2 Clearing the Data Logs

The Clear Data Logs command is located in the Service Info sub-menu. Pressing OK will prompt a confirmation screen confirming whether or not to delete all of the previously log data (Image 2.7.2).

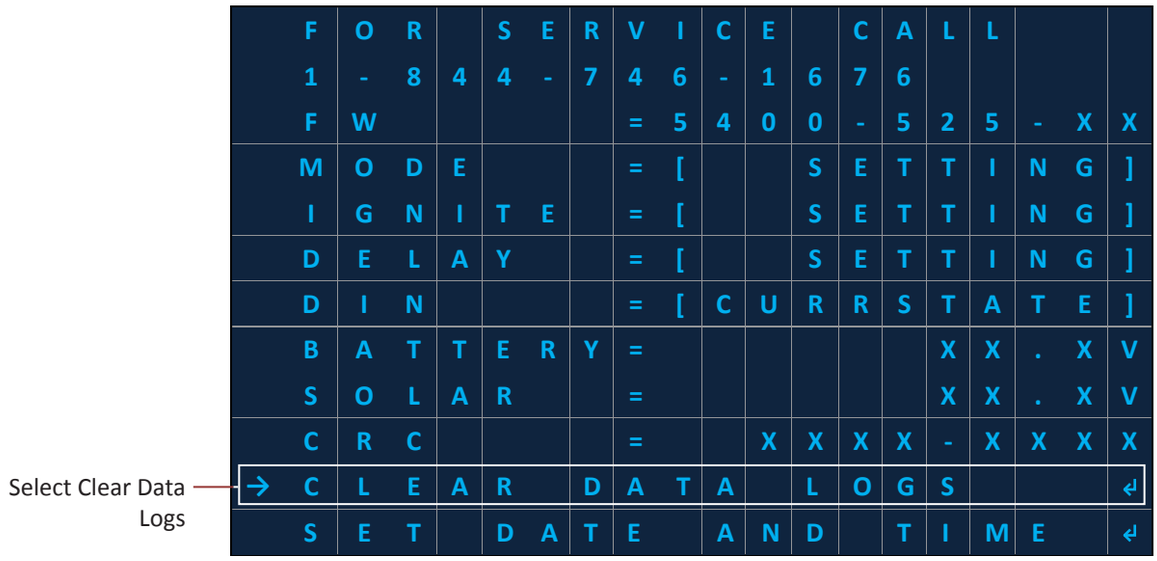


Image 2.7.2 · Clear data logs

Follow these steps to clear the Data Logs:

1. Press the **OK** key.
2. Use the **LEFT** or **RIGHT** key to select Yes or No (Image 2.7.3).
3. Press the **OK** key to confirm / commit.

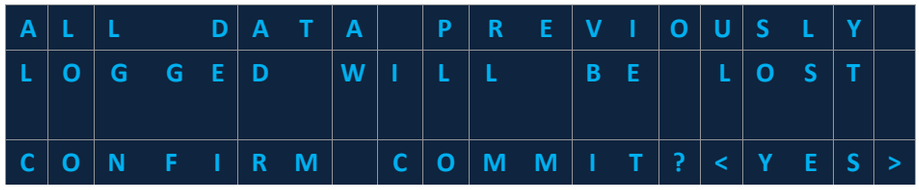


Image 2.7.3 · Select Yes or No

2.8 Modus Protocol

The system's RS-485 port supports a limited subset of the Modbus protocol for communications. The system supports Modbus RTU mode and **only** supports function 3, giving an external PLC the ability to read several configuration settings and system variables.

2.8.1 Modbus Communication Parameters

The communication parameters for the system are fixed as follows (Table 2.7.1):

SETTING	VALUE
ADDRESS	56
BAUD RATE	19200 bps
WORD ORDER	LSW
SERIAL DATA SETUP	8-N-1

Table 2.8.1 · Modbus communication parameters

2.8.2 Modbus Configuration Registers

Modbus configuration registers are as follows (Table 2.8.2):

REGISTER NUMBER	NAME	DESCRIPTION		DEFAULT	TYPE	R/W
0	UNUSED	Unused/Reserved for expansion. Always reads 0.		0	N/A	R
1	FIRMWARE VERSION	Current version of the firmware		525	UINT16	R
2	FIRMWARE REVISION	Current revision of the firmware		2	UINT16	R
3	FIRMWARE CRC MSW	Cyclic Redundancy Check most significant word		41825	UINT32	R
4	FIRMWARE CRC LSW	Cyclic Redundancy Check least significant word		16147	UINT32	R
5	MODE	**Option**	**Register Value**	0	UINT16	R
		AUTOMATIC	0			
		MANUAL	1			
		CONTINUOUS	2			
7	IGNITION TIME	**Option**	**Register Value**	30	UINT16	R
		10s	10			
		30s	30			
9	WAIT TIME	**Option**	**Register Value**	0	UINT16	R
		0s	0			
		1800s	1800			

Table 2.8.2 · Modbus configuration registers

2.8.3 Modbus Variable Registers

Modbus variable registers are as follows (Table 2.8.3):

REGISTER NUMBER	NAME	DESCRIPTION		TYPE	R/W
210	TC 1 VALUE	Range	Value	INT16	R
		Min	-32768		
		Max	32767		
218	DIN/PERMISSIVE STATE	Active	1	UINT16	R
		Inactive	0		
226	ALARM STATE	Active	1	UINT16	R
		Inactive	0		
230	BATTERY VOLTAGE	Min	0	UINT16	R
		Max	65535		
231	SOLAR VOLTAGE	Min	0	UINT16	R
		Max	65535		
232	TEMPERATURE	Min	-32768	INT16	R
		Max	32767		

Table 2.8.3 · Modbus variable registers

REGISTER NUMBER	NAME	DESCRIPTION			TYPE	R/W
		Mode	State vs Register Value			
200	CURRENT SYSTEM STATE		State	Register Value	UINT16	R
		AUTOMATIC	UNKNOWN	0		
			STOPPED	1		
			PILOT ON	2		
			IGNITE	3		
			PILOT FAILED	4		
			PERMISSIVE (DIN) OPEN	5		
			LOW BATTERY	6		
			DELAY	7		
			BMS LOCKOUT	8		
		CONTINUOUS	UNKNOWN	0		
			STOPPED	1		
			PILOT ON	2		
			IGNITE	3		
			FLAME LOST	4		
			PERMISSIVE (DIN) OPEN	5		
			LOW BATTERY	6		
			IGNITE WARNING	7		
			BMS LOCKOUT	8		
		MANUAL	UNKNOWN	0		
			STOPPED	1		
			PILOT ON	2		
			IGNITE	3		
			UNKNOWN	4		
			PERMISSIVE (DIN) OPEN	5		
			LOW BATTERY	6		
			IGNITE WARNING	7		
			BMS LOCKOUT	8		

Table 2.8.3 · Modbus variable registers (continued)

3 System Settings

The **Settings Menu** allows the user to see the current system settings, modify the settings and commit them to the system. This section will explain what each setting is, how to enter the **Settings Menu** and how to change the setting options.

3.1 Settings Overview

The ARControl has three system settings, these include mode (**MODE**), ignition duration (**IGNITE**) and delay duration (**DELAY**). The **MODE** setting is used to select the mode of operation: **AUTOMATIC**, **CONTINUOUS** or **MANUAL** (Table 3.1.1).

MODE SETTINGS	SUMMARY
AUTOMATIC	Provides timed ignition and settable delay period before going in to a pilot failed state.
CONTINUOUS	Provides continuous ignition without timing out.
MANUAL	Provides the user manual control of the ignition timing.

Table 3.1.1 · MODE setting

The **IGNITE** setting is used to set the length of time that the system will spark. The setting has two options, 10 seconds (10s) and 30 seconds (30s) . **Note:** The **IGNITE** setting has no effect when in the **CONTINUOUS** or **MANUAL** modes (Table 3.1.2).

IGNITE SETTINGS	SUMMARY
10s	10 seconds (only applicable in the AUTOMATIC mode)
30s	30 seconds (only applicable in the AUTOMATIC mode)

Table 3.1.2 · IGNITE setting

The **DELAY** setting is used to set the length of time allowed for the system to attempt to establish the presence of flame, from the moment the ignition period is over to the point the system transitions into the **PILOT FAILED** alarm state. The setting has two options, 0 seconds (0s) and 1800 seconds (1800s). **Note:** The **DELAY** setting has no effect when in the **CONTINUOUS** or **MANUAL** modes (Table 3.1.3).

When set to the 0 seconds (0s) option, the system transitions immediately from the end of the ignition period to the **PILOT FAILED** alarm state. When set to the 1800 seconds (1800s) option, there is a 30 minute delay, between the end of the ignition period and the transition to the **PILOT FAILED** alarm state.

DELAY SETTINGS	SUMMARY
0s	0 seconds (only applicable in the AUTOMATIC mode)
1800s	1800 seconds (only applicable in the AUTOMATIC mode)

Table 3.1.3 · DELAY setting

3.2 Settings Menu

To change the settings you must enter the **Settings Menu**. Follow these steps to enter the **Settings Menu**:

1. Use the **UP** or **DOWN** key and select **SETTINGS MENU** (Image 3.2.1).
2. Press the **OK** key.

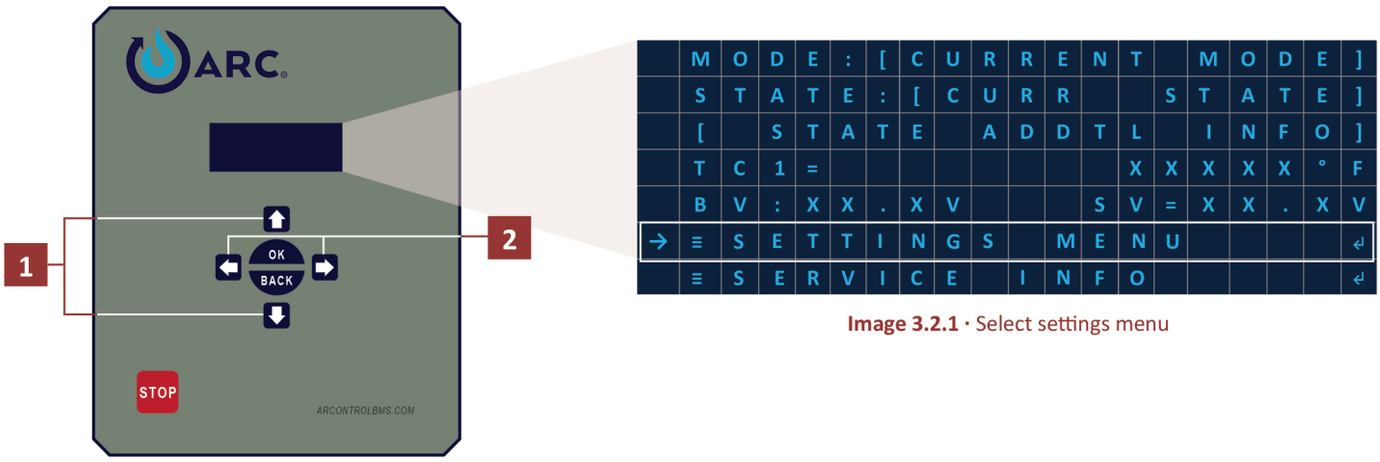


Image 3.2.1 · Select settings menu

Once in the **Settings Menu** the system settings will be displayed (Image 3.2.2).

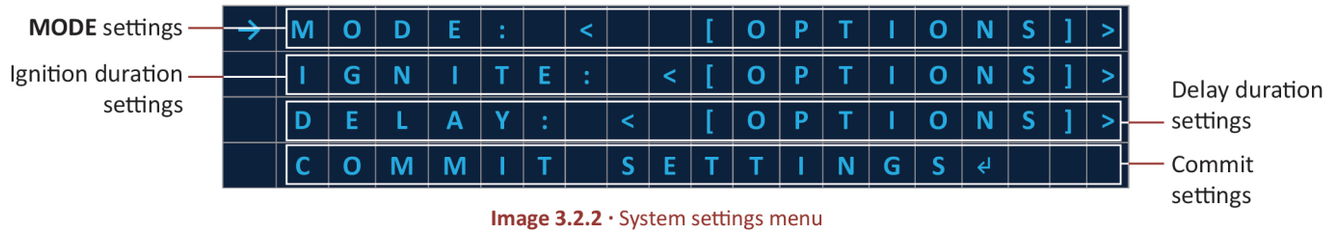


Image 3.2.2 · System settings menu

The default system settings are (Image 3.2.3):

- **MODE** (AUTOMATIC)
- **IGNITE** (10s)
- **DELAY** (1800s)

Image 3.2.3 · Default system settings

3.3 Changing System Settings

Follow these steps to change system settings:

1. Using the **UP** and **DOWN** key to move the arrow on the left hand side of the menu and navigate to desired setting.
2. Using **LEFT** and **RIGHT** key scroll through the possible options for the setting. For example, change the ignition duration to 30 seconds (Image 3.3.1)
3. If needed, repeat steps 1 and 2 for the remaining settings.

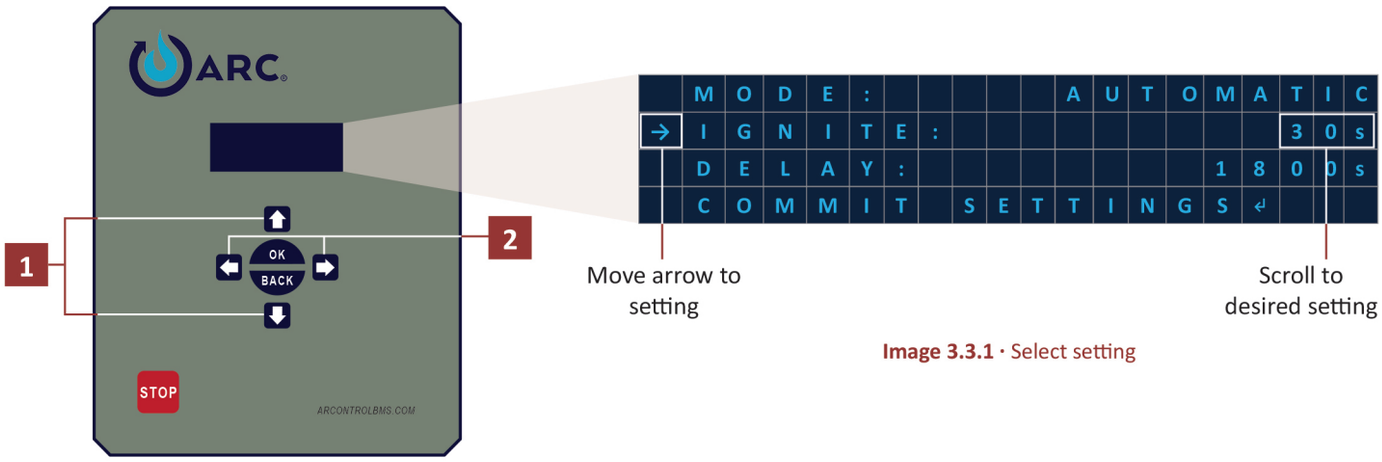


Image 3.3.1 · Select setting

4. When satisfied with the setting changes use the **UP** and **DOWN** key and navigate to the **COMMIT SETTINGS** command (Image 3.3.2).
5. Press **OK**, this will bring up the confirmation screen (Image 3.3.3). **Note:** Use the **LEFT** and **RIGHT** key to scroll and change the confirmation to either **YES** or **NO**. Alternatively, the user can press the **BACK** key to enter **NO** as the confirmation and go back to **Settings Menu**. **Important!** Once the user has committed the setting the system will reset and reboot.
6. Press the **OK** key to confirm.

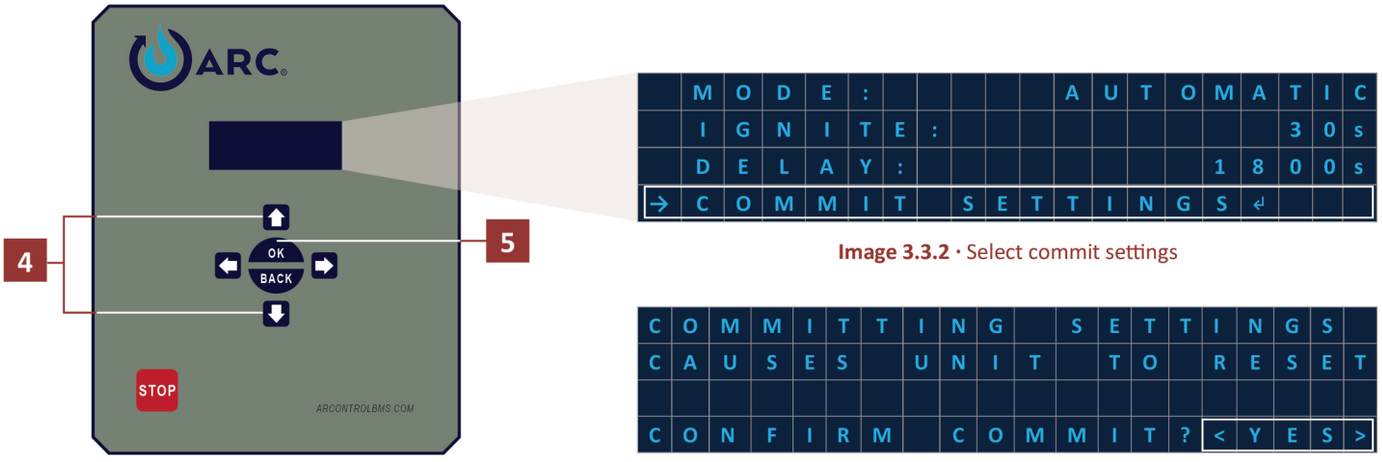


Image 3.3.2 · Select commit settings

Image 3.3.3 · Confirmation screen

3.4 Setting the Date and Time

Setting the Date

Follow these steps to set the system date.

1. Use the **UP** or **DOWN** key to **SETTINGS MENU**.
2. Press the **OK** key.
3. In the submenu, use the **UP** or **DOWN** key and scroll to **DATE**.
4. Press the **OK** key.
5. Use the **LEFT** or **RIGHT** key and enter the month (Image 3.4.1).
6. Press the **OK** key.
7. Use the **LEFT** or **RIGHT** key and enter the day (Image 3.4.2).
8. Press the **OK** key.
9. Use the **LEFT** or **RIGHT** key and enter the year (Image 3.4.3).

Setting the Time

Follow these steps to set the system time.

10. Press the **OK** key and return to the submenu.
11. In the submenu, use the **UP** or **DOWN** key and scroll to **TIME**.
12. Press the **OK** key.
13. Use the **LEFT** or **RIGHT** key and enter the hour (Image 3.4.4).
14. Press the **OK** key.
15. Use the **LEFT** or **RIGHT** key and enter the minute (Image 3.4.5).
16. Press the **OK** key.
17. Use the **LEFT** or **RIGHT** key and enter AM or PM (Image 3.4.6).
18. Press the **OK** key.

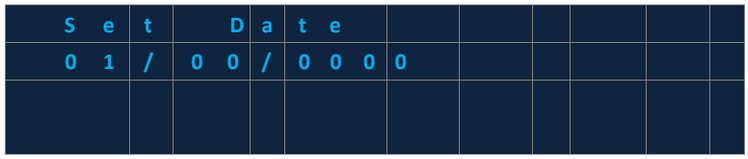


Image 3.4.1 · Enter month

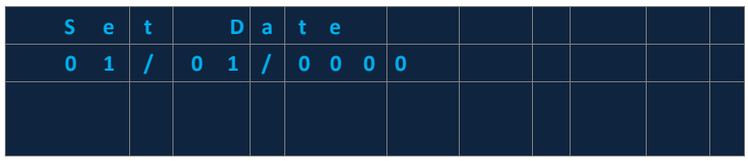


Image 3.4.2 · Enter day

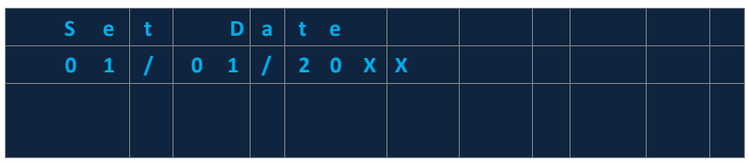


Image 3.4.3 · Enter year

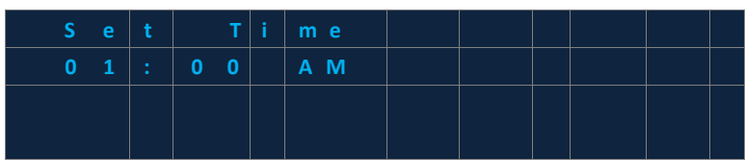


Image 3.4.4 · Enter hour

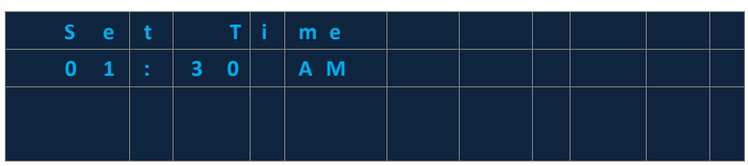


Image 3.4.5 · Enter minute

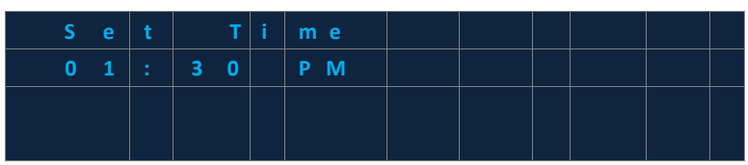


Image 3.4.6 · Select AM or PM

4 System Operation

⚠ WARNING!

Failure to comply with the following safety warning(s) may result in serious personal injury or death.

- Do not open when in operational mode.

Each mode of operation, **AUTOMATIC**, **CONTINUOUS**, and **MANUAL** have multiple operation and alarm states. Additionally, information about the current state and prompts for actionable menu items is presented in the main menu state additional information entry (**STATE ADDTL INFO**) (Table 4.1). This section provides detailed information about each mode, states and transitions between states.

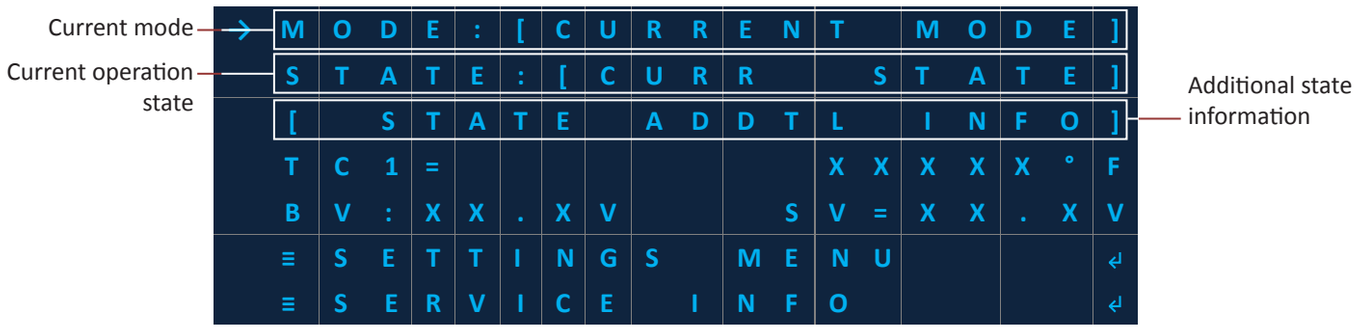


Image 4.1 · Main Menu

MODE	OPERATION STATES	STATE ADDTL INFO	DESCRIPTION
AUTOMATIC	**STOPPED**	**START IGNITION**	Prompt to start ignition
	IGNITE	**DDDDDDDD:hh:mm:ss**	Duration in current state (Days : hours : minute : second format)
	PILOT ON	**mm:ss**	Duration in current state (Minute : second format)
	DELAY	**mm:ss**	Duration in current state (Minute : second format)
CONTINUOUS	**STOPPED**	**START IGNITION**	Prompt to start ignition
	IGNITE	**DDDDDDDD:hh:mm:ss**	Duration in current state (Days : hours : minute : second format)
	FLAME PRESENT	**DDDDDDDD:hh:mm:ss**	Duration in current state (Days : hours : minute : second format)
	IGNITE WARNING	**DDDDDDDD:hh:mm:ss**	Duration in current state (Days : hours : minute : second format)
MANUAL	**STOPPED**	**IGNITE HOLD OK**	Prompt to start ignition
	IGNITE	**RELEASE OK IF LIT**	Prompt to stop ignition
	PILOT ON	**DDDDDDDD:hh:mm:ss**	Duration in current state (Days : hours : minute : second format)

Table 4.1 · Modes and operation states

4.1 AUTOMATIC Mode

4.1.1 AUTOMATIC Mode Overview

AUTOMATIC mode provides a timed ignition period and a settable delay period between the end of the ignition period and the transition to the **PILOT FAILED** alarm state. Additionally, **AUTOMATIC** mode offers automatic re-ignition if flame is lost.

The following flow diagram (Image 4.1.1) provides an overview of how the system operates in **AUTOMATIC** mode. To better understand how the system operates in **AUTOMATIC** Mode, read **4.1.2 AUTOMATIC Mode Operation States** and **4.1.3 AUTOMATIC Mode Alarms States**. When set to **AUTOMATIC** mode:

A. The system will power up in **STOPPED** state (A).
B. After the user selects **START IGNITION**, and presses the **OK** key, the system will transition to the **IGNITE** state and attempt to ignite the flame (A to B).
C. If a flame is detected then the system will transition to the **PILOT ON** state (B to C).
D. If a flame is not detected then the system will transition to the **DELAY** state (B to D).
E. If a flame is detected in the **DELAY** state the system will transition to the **PILOT ON** state (D to C). If a flame is not detected while in the **DELAY** state the system will transition to the **PILOT FAILED** state (D to E).
F. After addressing the alarm state(s), pressing the **OK** key will transition the system to the **IGNITE** state (E to B).

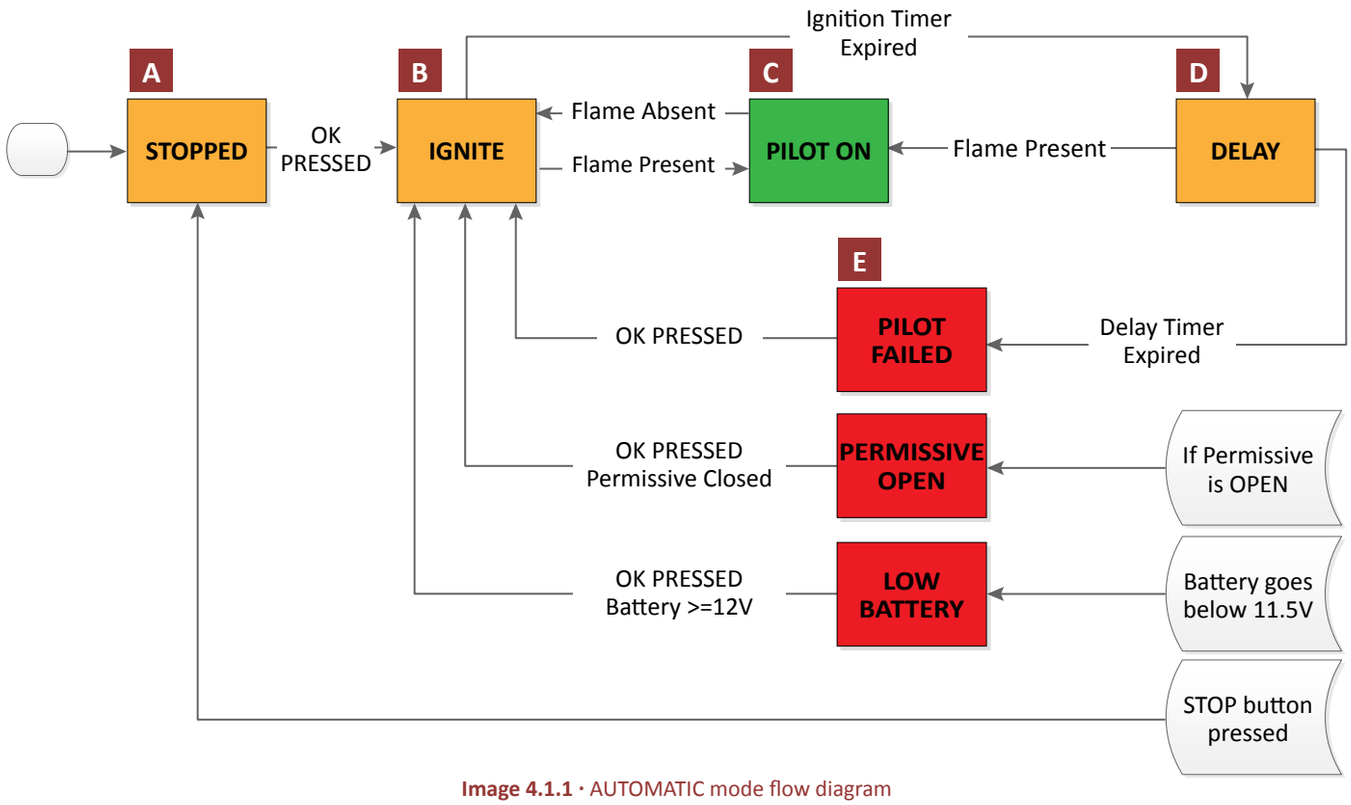


Image 4.1.1 · AUTOMATIC mode flow diagram

4.1.2 AUTOMATIC Mode Operation States

The **AUTOMATIC** mode has four states of operation, these include (Table 4.1.1):

STATE	DESCRIPTION
STOPPED	The system is waiting to start ignition.
IGNITE	Start ignition has been initiated and the system is attempting to detect a flame.
PILOT ON	A flame has been detected.
DELAY	A flame has not been detected during the **IGNITE** state. The system continues attempting to detect a flame for the delay period selected in the system settings. If a flame is detected the system transitions to the **PILOT ON** state. If a flame is not detected then the system transitions to the **PILOT FAILED** alarm state.

Table 4.1.1 · AUTOMATIC mode operation states

STOPPED state

In **AUTOMATIC** mode upon power up the system starts on the **STOPPED** state. **Note:** If the system is in either **IGNITE**, **PILOT ON** or **DELAY** states the system can transition to the **STOPPED** state by pressing the **STOP** button. From the Main menu, follow these steps to exit the **STOPPED** state and transition to the **IGNITE** state:

1. Use the **UP** or **DOWN** key and select **STATE ADDTL INFO** (Image 4.1.3).
2. Press the **OK** key.
3. Using **LEFT** and **RIGHT** key scroll to the **START IGNITION** menu entry (Image 4.1.4).
4. Once in the **START IGNITION** menu entry press the **OK** key. The system will transition to the **IGNITE** state.

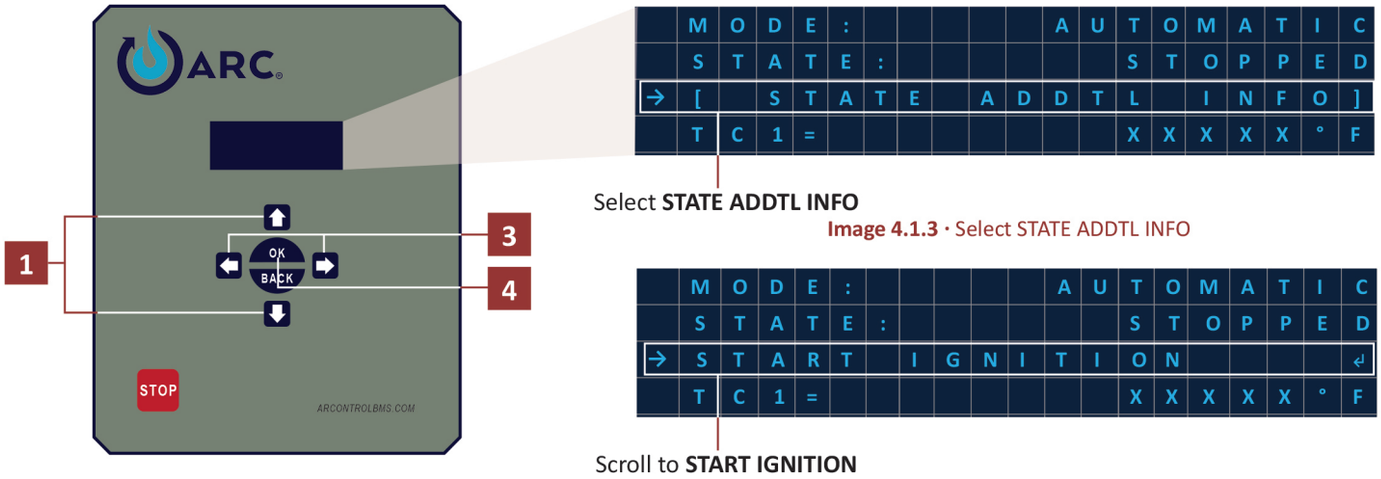


Image 4.1.3 · Select STATE ADDTL INFO

Image 4.1.4 · Select START IGNITION

IGNITE state

Once in the **IGNITE** state, the system ignites up to 30 or 10 seconds depending on the current ignition duration setting if flame is not detected. If flame is not detected in the 30 or 10 seconds span, the system transitions to the **DELAY** state. If the system detects a flame within the 30 or 10 seconds span, then the system transitions to the **PILOT ON** state.

Note: Any time the systems exits the **IGNITE** state the ignition 30 or 10 second timer is reset. While in the **IGNITE** state the **ALARM OUTPUT** and the **STATUS OUTPUT (DOUT+)** output will be inactive, and the main menu **STATE ADDTL INFO** entry will show the current countdown of the **IGNITE** state.

The text display shows the run time in the format “mm:ss” where “mm” represents the number of minutes and the "ss" represents the number of seconds remaining in the **IGNITE** countdown state (Image 4.1.5).

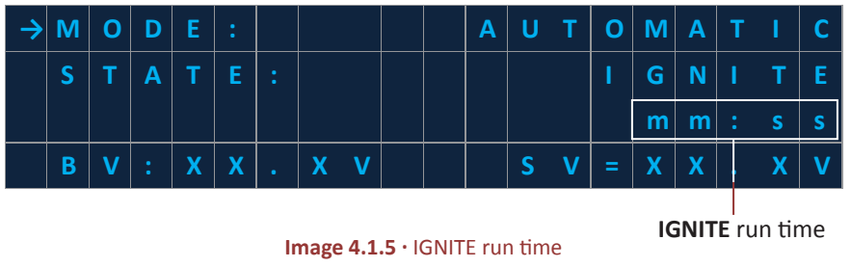


Image 4.1.5 · IGNITE run time

PILOT ON state

The **PILOT ON** state is entered when the flame is determined to be present in either the **IGNITE** state or the **DELAY** state. **PILOT ON** state is exited only when flame is determined to be absent by the system, at this time the system transitions to the **IGNITE** state or when the user presses the **STOP** key.

While in the **PILOT ON** state the **ALARM OUTPUT** will be inactive while the **STATUS OUTPUT (DOUT+)** output will be active. The main menu state additional information entry will show the 'accumulated' or 'total' time that the system has been in the **PILOT ON** state. The **PILOT ON** run time counter is reset any time the **PILOT ON** state is exited.

The text display shows the run time in the format “dddddddd:hh:mm:ss” where “dddddddd” represents the number of days that the system has been in the **PILOT ON** state. Next, “hh” represents the number of hours (in 24-hour format), “mm” represents the number of minutes and “ss” represents the number of seconds in the **PILOT ON** state (Image 4.1.6).

Image 4.1.6 · PILOT ON run time

DELAY state

If a flame is not detected in the **IGNITE** state the system will transition to the **DELAY** state.

In the **DELAY** state, the system waits up to 1800 or 0 seconds (depending on the current delay duration setting) to see if a flame is detected. If a flame is not detected in the 1800 or 0 seconds span, the system will transition to the **PILOT FAILED** alarm state. If the system detects flame within the 1800 or 0 seconds span, then the system transitions to the **PILOT ON** state.

Any time the system exits the **DELAY** state the ignition 1800 or 0 second timer is reset. While in the **DELAY** state the **ALARM OUTPUT** and the **STATUS OUTPUT (DOUT+)** output will be inactive and the main menu state additional information entry will show the current countdown of the **DELAY** state. This **DELAY** countdown counter is reset any time the **DELAY** state is exited.

The text display shows the run time in the format “mm:ss” where “mm” represents the number of minutes and “ss” represents the number of seconds remaining in the **DELAY** state countdown (Image 4.1.7).

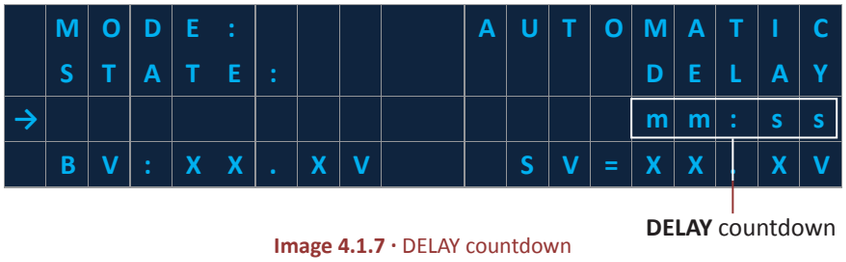


Image 4.1.7 · DELAY countdown

4.1.3 AUTOMATIC Mode Alarm States

The **AUTOMATIC** mode has three alarm states, these include (Table 4.1.2):

STATE	DESCRIPTION
PILOT FAILED	The system enters the **PILOT FAILED** state when a flame has not been detected during the period of time setup in the system settings for the **DELAY** state.
LOW BATTERY	The **LOW BATTERY** state appears any time the system is battery voltage drops below 11.5V for 12V operation or 23V for 24V operation.
PERMISSIVE (DIN) OPEN	The **PERMISSIVE (DIN) OPEN** state appears any time the PERMISSIVE (DIN) input is open.

Table 4.1.2 · AUTOMATIC mode alarm states

It is important to note that multiple alarm states may occur simultaneously. To help the user from having to clear several alarms in a row the system displays the state of the **PERMISSIVE (DIN)** input and current battery voltage to help determine if any subsequent alarms would happen and if so take corrective action before clearing the alarm.

Consider the following rules when managing alarm states:

- If all alarms happen simultaneously then they would be serviced with the hierarchy shown in Table 4.1.2.
- If an alarm state condition occurs when the system is already in an alarm state, the system will remain under the initial alarm state.
- If the first alarm is cleared and the second alarm condition is still present, the system will immediately transition to the alarm state caused by the second alarm condition.

When the system is in an alarm state, the text display will show the alarm state, current state of the **PERMISSIVE (DIN)** input, the current battery voltage and the message to press the **OK** key to clear the alarm (Image 4.1.8).

Image 4.1.8 · Alarm display

If the user does press the **OK** key, then an alarm clear confirmation screen appears (Image 4.1.9). When prompted, confirm your selection on the alarm clear confirmation screen.

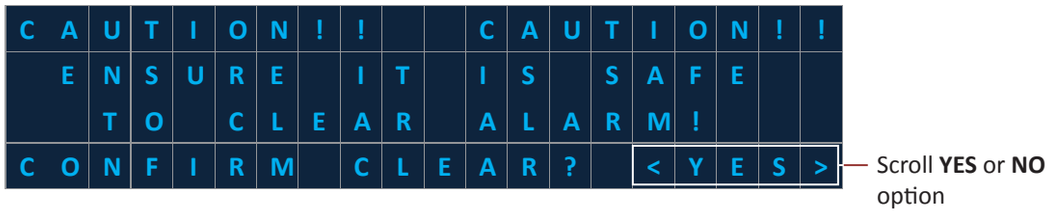


Image 4.1.9 · Alarm clear confirmation screen

PILOT FAILED state

The **PILOT FAILED** state appears when a flame has not been detected after the 1800s or 0s timer has expired in the **DELAY** state (Image 4.1.10). While in the **PILOT FAILED** state the **ALARM OUTPUT** will be active and the **STATUS OUTPUT (DOUT+)** output will be inactive.

To exit the **PILOT FAILED** state, press **OK** and then confirm the clear on the confirmation screen. Clearing the **PILOT FAILED** state will transition the system to the ignite state. Pressing the **STOP** key has no effect.

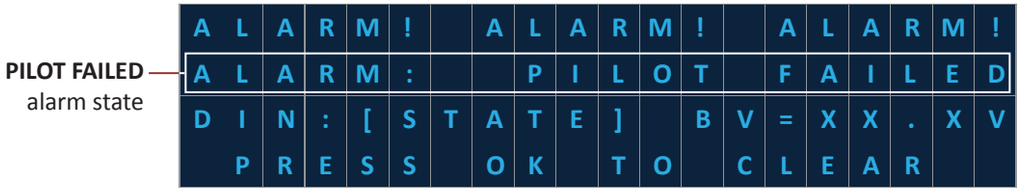


Image 4.1.10 · PILOT FAILED alarm display

LOW BATTERY state

Upon power up the system will auto-determine if the system is operating at 12V or 24V. **Note:** If the battery input voltage is equal to or greater than 16V then it is assumed the system is running at 24V. If the voltage is less than 16V then it is assumed that the system is running at 12V.

Unless the system is in an alarm state already, any time the battery voltage drops below 11.5V for 12V operation or 23V for 24V operation, the system will transition to the **LOW BATTERY** state (Image 4.1.11). While in the **LOW BATTERY** state the **ALARM OUTPUT** will be active and the **STATUS OUTPUT (DOUT+)** output will be inactive.

To exit the **LOW BATTERY** state, make sure the battery voltage is higher than the 11.5V or 23V threshold, then press the **OK** key and then confirm the clear on the confirmation screen. Clearing the **LOW BATTERY** state will transition the system to the ignite state. Pressing the **STOP** key has no effect.

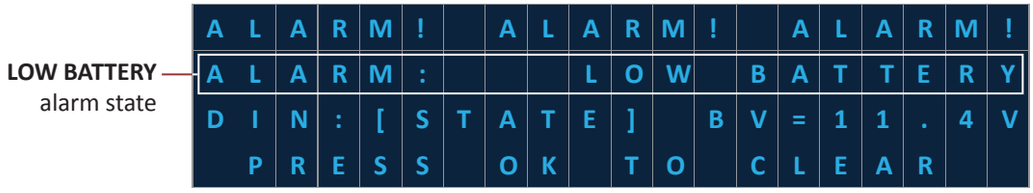


Image 4.1.11 · LOW BATTERY alarm display

PERMISSIVE (DIN) OPEN state

If at any time during operation the external dry contact switch connected at the **PERMISSIVE (DIN)** input goes open, then the system transitions to the **PERMISSIVE (DIN) OPEN** state, unless the system is in an alarm state already (Image 4.1.12). **Note:** The **PERMISSIVE (DIN) OPEN** state the **ALARM OUTPUT** will be active and the **STATUS OUTPUT (DOUT+)** output will be inactive.

To exit the **PERMISSIVE (DIN) OPEN** state, make sure the **PERMISSIVE (DIN)** input is closed then press **OK** and confirm on the confirmation screen (Image 4.1.13). Clearing the **PERMISSIVE (DIN) OPEN** state will transition the system to the **IGNITE** state. Pressing the **STOP** key has no effect.

Image 4.1.12 ·PERMISSIVE (DIN) OPEN alarm display

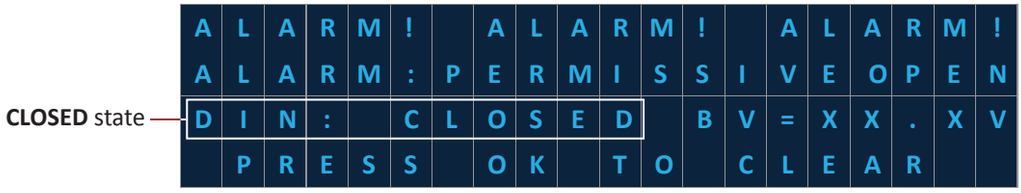


Image 4.2.13 · PERMISSIVE (DIN) CLOSED alarm display

4.2 CONTINUOUS Mode

4.2.1 CONTINUOUS Mode Overview

CONTINUOUS mode offers a continuous ignition without a timeout period. In **CONTINUOUS** mode the system ignites if flame it is not detected and goes back to igniting if the flame is lost. Also, in **CONTINUOUS** mode, if the system ignites for 30 minutes without establishing flame presence, the system continues igniting but activates the alarm output.

The following flow diagram (Image 4.2.1) provides an overview of how the system operates in **CONTINUOUS** mode. To better understand how the system operates in **CONTINUOUS** Mode, read **4.1.2 CONTINUOUS Mode Operation States** and **4.1.3 CONTINUOUS Mode Alarms States**. When set to **CONTINUOUS** mode:

A. The system will power up in **STOPPED** state (A).
B. After the user selects **START IGNITION**, and presses the **OK** key, the system will transition to the **IGNITE** state and attempt to ignite the flame (A to B).
C. If a flame is detected then the system will transition to the **FRAME PRESENT** state (B to C).
D. If a flame is not detected then the system will transition to the **IGNITE WARNING** state (B to D).
E. If a flame is detected in the **IGNITE WARNING** state the system will transition to the **FLAME PRESENT** state (D to C).
F. If a flame is not detected while in the **IGNITE WARNING** state the system will continuously attempt to ignite a flame indefinitely. If a flame is detected the system transitions to the **FLAME PRESENT** state. If a flame is not detected the text display will indicate the system is in the **IGNITE WARNING** state and the **STATE ADDTL INFO** entry shows the current run time.
G. After addressing the alarm state(s), pressing the **OK** key will transition the system to the **IGNITE** state (E to B).

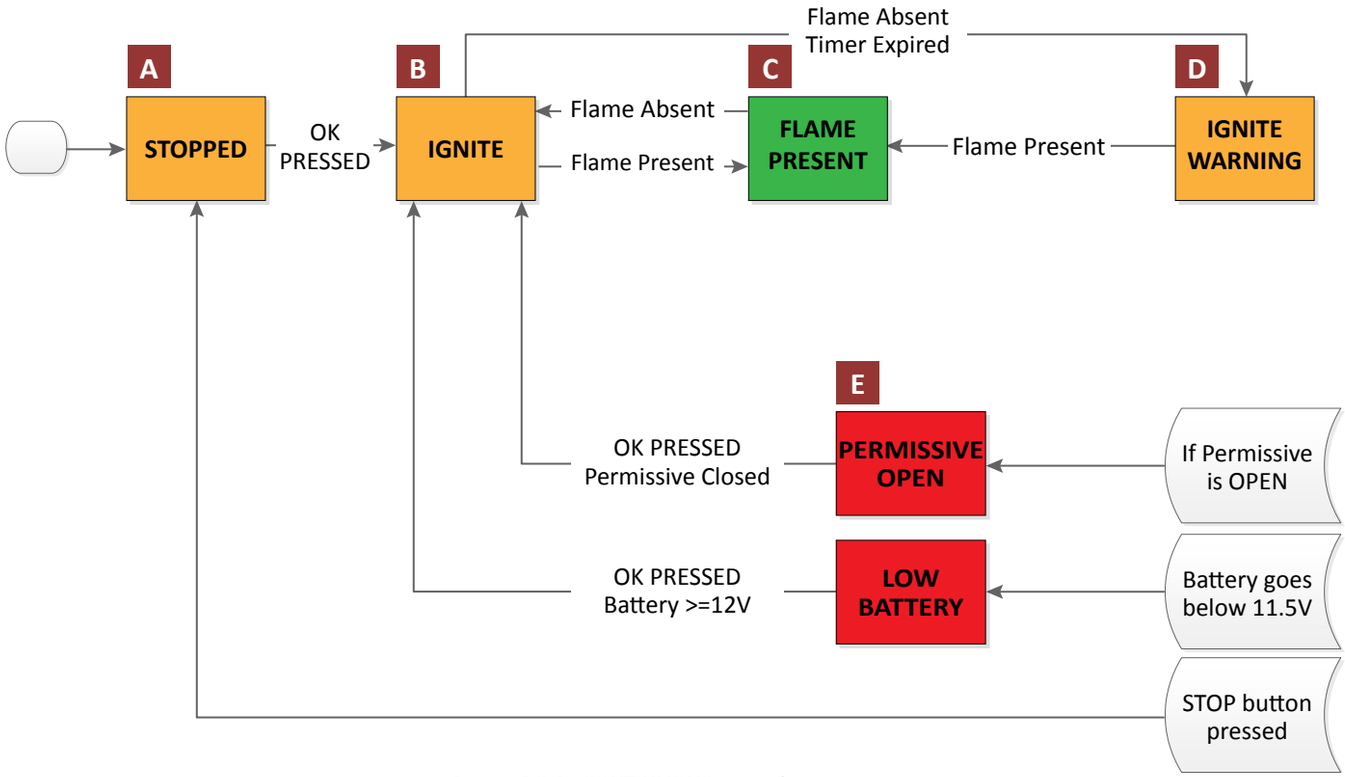


Image 4.2.1 · CONTINUOUS mode flow diagram

4.2.2 CONTINUOUS Mode Operation States

The **CONTINUOUS** mode has four states of operation, these include (Table 4.2.1):

STATE	DESCRIPTION
STOPPED	The system is waiting to start ignition.
IGNITE	Start ignition has been initiated and the system will attempt to detect a flame for 30 minutes.
FLAME PRESENT	A flame has been detected and the system is operating.
IGNITE WARNING	A flame has not been detected during the **IGNITE** state. The system will continuously attempt to ignite a flame indefinitely. If a flame is detected the system transitions to the **FLAME PRESENT** state. If a flame is not detected the text display will indicate the system is in the **IGNITE WARNING** state and the state additional information entry shows the current run time.

Table 4.2.1 · CONTINUOUS mode operation states

STOPPED state

In **CONTINUOUS** mode upon power up the system starts on the **STOPPED** state. **Note:** If the system is in either **IGNITE**, **FLAME PRESENT** or **IGNITE WARNING** states the system can transition to the **STOPPED** state by pressing the **STOP** button. From the Main menu, follow these steps to exit the **STOPPED** state and transition to the **IGNITE** state:

1. Use the **UP** or **DOWN** key and select **STATE ADDTL INFO** (Image 4.2.3).
2. Press the **OK** key.
3. Using **LEFT** and **RIGHT** key scroll to the **START IGNITION** menu entry (Image 4.2.4).
4. Once in the **START IGNITION** menu entry press the **OK** key. The system will transition to the **IGNITE** state.

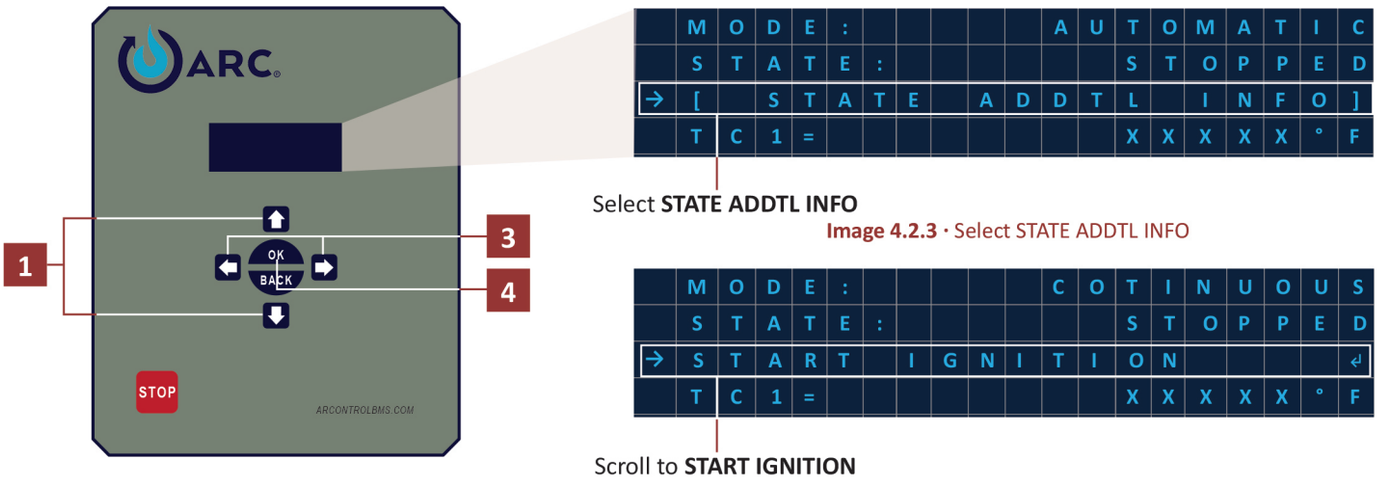


Image 4.2.3 · Select STATE ADDTL INFO

Image 4.2.4 · Select START IGNITION

IGNITE state

Once in the **IGNITE** state, if a flame is not detected the system will continue to attempt ignition for up to 30 minutes. If flame is not detected within 30 minutes, the system transitions to the **IGNITE WARNING** state where it keeps igniting indefinitely. If the system detects a flame within the 30 minute span, the system will transition to the **FLAME PRESENT** state.

Note: Any time the systems exits the **IGNITE** state the ignition 30 minute counter is reset. While in the **IGNITE** state the **ALARM OUTPUT** and the **STATUS OUTPUT (DOUT+)** output will be inactive, and the main menu state additional information entry will show the current countdown of the **IGNITE** state.

The text display shows the run time in the format “mm:ss” where “mm” represents the number of minutes and the "ss" represents the number of seconds remaining in the **IGNITE** countdown state (Image 4.2.5).

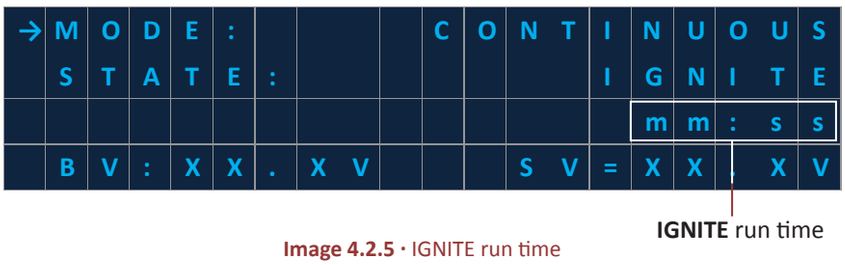


Image 4.2.5 · IGNITE run time

FLAME PRESENT state

The **FLAME PRESENT** state is entered when the flame is determined to be present in either the **IGNITE** state or the **IGNITE WARNING** state. **FLAME PRESENT** state is exited only when flame is determined to be absent by the system, at this time the system transitions to the **IGNITE** state or when the user presses the **STOP** key.

While in the **FLAME PRESENT** state the Alarm output will be inactive while the **STATUS OUTPUT (DOUT+)** output will be active. The main menu state additional information entry will show the current run time of the pilot on since the system entered **FLAME PRESENT**. This **FLAME PRESENT** run time counter is reset any time the **FLAME PRESENT** state is exited.

The text display shows the run time in the format “dddddddd:hh:mm:ss” where “dddddddd” represents the number of days that the system has been in the **FLAME PRESENT** state. Next, “hh” represents the number of hours (in 24-hour format), “mm” represents the number of minutes and “ss” represents the number of seconds in the **FLAME PRESENT** state (Image 4.2.6).

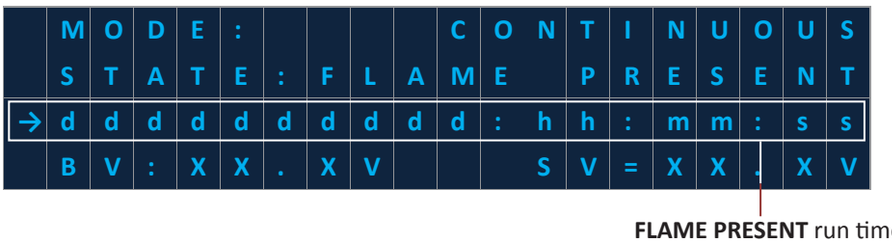


Image 4.2.6 · FLAME PRESENT run time

IGNITE WARNING state

If a flame is not detected in the **IGNITE** state the system will transition to the **IGNITE WARNING** state. The **IGNITE WARNING** is identical to the **IGNITE** state with two notable differences. First, the **ALARM OUTPUT** is active and the **STATUS OUTPUT (DOUT+)** output is inactive The second difference is the system now ignites indefinitely.

This can notify the user that system has not been able to establish a flame for 30 minutes. The main menu state additional information entry will show the current run time of the **IGNITE WARNING** since the system entered **IGNITE WARNING**. This **IGNITE WARNING** run time counter is reset any time the **IGNITE WARNING** state is exited.

The text display shows the run time in the format “ddddddd:hh:mm:ss” where “ddddddd” represents the number of days that the system has been in the **IGNITE WARNING** state. Next, “hh” represents the number of hours (in 24-hour format), “mm” represents the number of minutes and “ss” represents the number of seconds in the **FLAME PRESENT** state (Image 4.2.7).

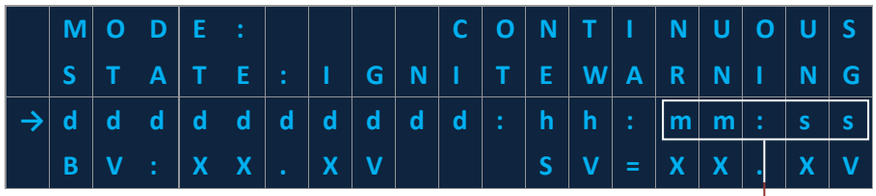


Image 4.2.7 · IGNITE WARNING countdown

4.2.3 CONTINUOUS Mode Alarm States

The **CONTINUOUS** mode has two alarm states, these include (Table 4.2.2):

STATE	DESCRIPTION
LOW BATTERY	The **LOW BATTERY** state appears any time the system is battery voltage drops below 11.5V for 12V operation or 23V for 24V operation.
PERMISSIVE (DIN) OPEN	The **PERMISSIVE OPEN** state appears any time the PERMISSIVE (DIN) input is open.

Table 4.2.2 · CONTINUOUS mode alarm states

It is important to note that multiple alarm states may occur simultaneously. To help the user from having to clear several alarms in a row the system displays the state of the **PERMISSIVE (DIN)** input and current battery voltage to help determine if any subsequent alarms would happen and if so take corrective action before clearing the alarm.

Consider the following rules when managing alarm states:

- If all alarms happen simultaneously then they would be serviced with the hierarchy shown in Table 4.2.2.
- If an alarm state condition occurs when the system is already in an alarm state, the system will remain under the initial alarm state.
- If the first alarm is cleared and the second alarm condition is still present, the system will immediately transition to the alarm state caused by the second alarm condition.

When the system is in an alarm state, the text display will show the alarm state, current state of the **PERMISSIVE (DIN)** input, the current battery voltage and the message to press the **OK** key to clear the alarm (Image 4.2.8).

Image 4.2.8 · Alarm display

If the user does press the **OK** key, then an alarm clear confirmation screen appears (Image 4.2.9). When prompted, confirm your selection on the alarm clear confirmation screen.

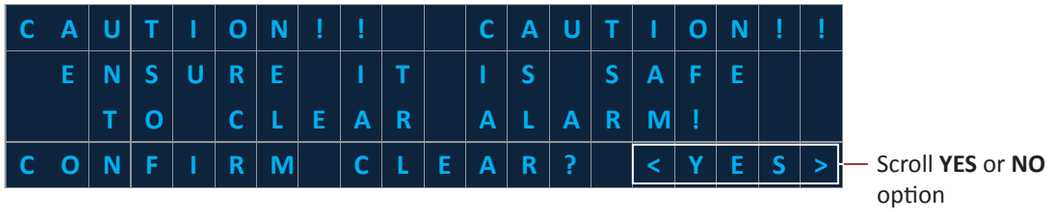


Image 4.2.9 · Alarm clear confirmation screen

LOW BATTERY state

Upon power up the system will auto-determine if the system is operating at 12V or 24V. **Note:** If the battery input voltage is equal to or greater than 16V then it is assumed the system is running at 24V. If the voltage is less than 16V then it is assumed that the system is running at 12V.

Unless the system is in an alarm state already, any time the battery voltage drops below 11.5V for 12V operation or 23V for 24V operation, the system will transition to the **LOW BATTERY** state (Image 4.2.10). While in the **LOW BATTERY** state the **ALARM OUTPUT** will be active and the **STATUS OUTPUT (DOUT+)** output will be inactive.

To exit the **LOW BATTERY** state, make sure the battery voltage is higher than the 11.5V or 23V threshold, then press the **OK** key and then confirm the clear on the confirmation screen. Clearing the **LOW BATTERY** state will transition the system to the ignite state. Pressing the **STOP** key has no effect.

Image 4.2.10 · LOW BATTERY alarm display

PERMISSIVE (DIN) OPEN state

If at any time during operation the external dry contact switch connected at the **PERMISSIVE (DIN)** input goes open, then the system transitions to the **PERMISSIVE (DIN) OPEN** state, unless the system is in an alarm state already (Image 4.2.11). **Note:** The **PERMISSIVE (DIN) OPEN** state the **ALARM OUTPUT** will be active and the **STATUS OUTPUT (DOUT+)** output will be inactive.

To exit the **PERMISSIVE (DIN) OPEN** state, make sure the **PERMISSIVE (DIN)** input is closed then press **OK** and confirm on the confirmation screen (Image 4.1.12). Clearing the **PERMISSIVE (DIN) OPEN** state will transition the system to the **IGNITE** state. Pressing the **STOP** key has no effect.

Image 4.2.11 ·PERMISSIVE (DIN) OPEN alarm display

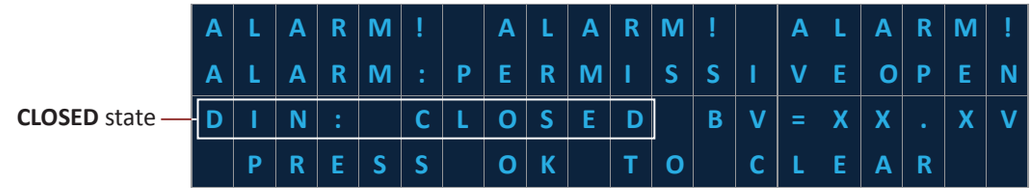


Image 4.2.12 · PERMISSIVE (DIN) CLOSED alarm display

4.3 MANUAL Mode

4.3.1 MANUAL Mode Overview

MANUAL mode provides the user manual control of the ignition timing, the user is required to hold the **OK** key for the system to ignite. Once the **OK** button is released and flame is present the system goes to pilot on otherwise the system sits in idle to allow the user to do the next manual attempt. If the system loses flame after it has been establish the system goes to a flame lost alarm state.

The following flow diagram (Image 4.3.1) provides an overview of how the system operates in **MANUAL** mode. To better understand how the system operates in **MANUAL** Mode, read **4.3.2 MANUAL Mode Operation States** and **4.3.3 MANUAL Mode Alarms States**. When set to **MANUAL** mode:

A. The system will power up in **STOPPED** state (A).
B. The user presses, and holds, the **OK** key until they are confident the pilot or burner is lit (A to B).
C. The system will look at the flame sense system. If the flame is determined to be absent the system will go to the **STOPPED** state (C to A).
D. If the flame is determined to be present the system will transition to the **PILOT ON** state (B to D).
E. The **PILOT ON** state is exited when the flame is determined to be absent by the system. At this time the system transitions to the **FLAME LOST** state when the user presses the **STOP** key (D to E).
F. After addressing the alarm state(s), pressing the **OK** key will transition the system to the **STOPPED** state (E, F to A).

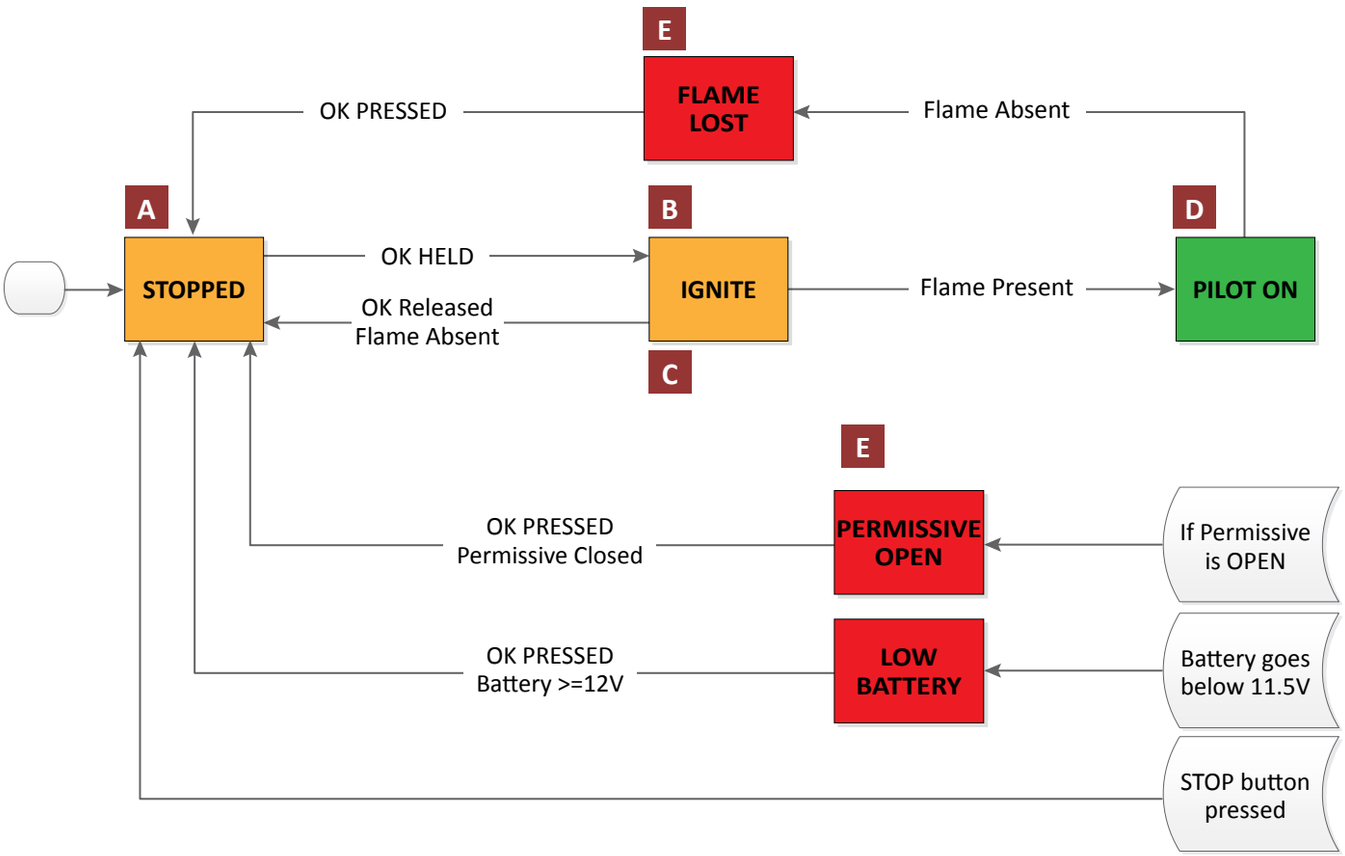


Image 4.3.1 · MANUAL mode flow diagram

4.3.2 MANUAL Mode Operation States

The **MANUAL** mode has three states of operation, these include (Table 4.3.1):

STATE	DESCRIPTION
STOPPED	The system is waiting to start ignition.
IGNITE	The user presses, and holds, the **OK** key until they are confident the pilot or burner is lit. The system will look at the flame sense system. If the flame is determined to be absent the system will go to the **STOPPED** state.
PILOT ON	A flame has been detected and the system is operating.

Table 4.3.1 · MANUAL mode operation states

STOPPED state

In **MANUAL** mode upon power up the system starts on the **STOPPED** state. **Note:** If the system is in the **PILOT ON** state the system can transition to the **STOPPED** state by pressing the **STOP** button. From the Main menu, follow these steps to exit the **STOPPED** state and transition to the **IGNITE** state:

1. Use the **UP** or **DOWN** key and select **STATE ADDTL INFO** (Image 4.3.3).
2. Press the **OK** key.
3. Using **LEFT** and **RIGHT** key scroll to the **HOLD OK TO IGNITE** menu entry (Image 4.3.4).

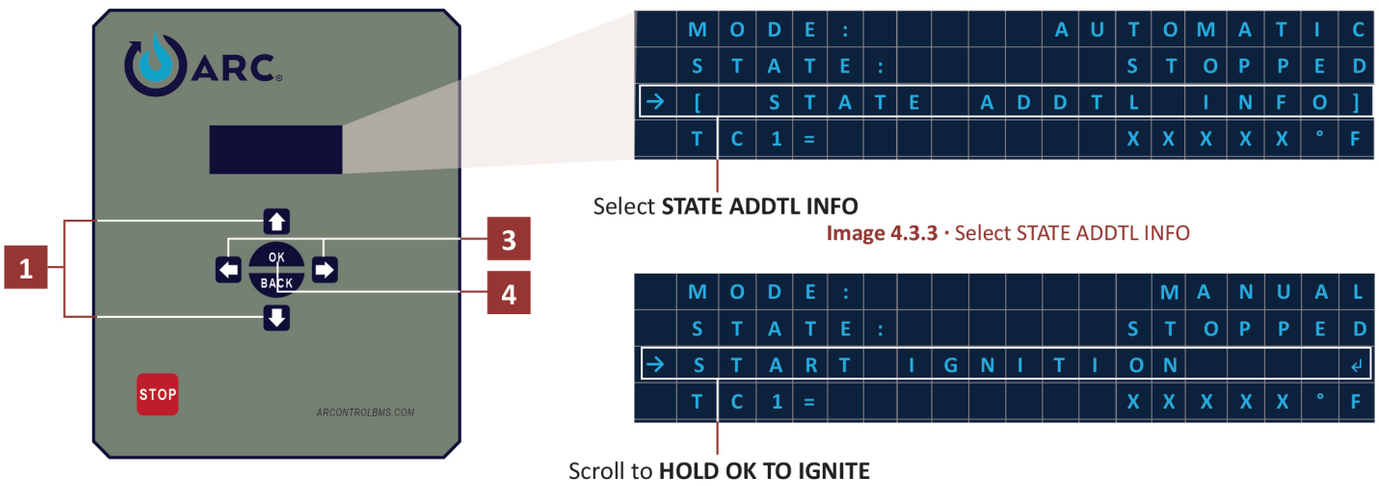


Image 4.3.3 · Select STATE ADDTL INFO

Image 4.3.4 · Select HOLD OK TO IGNITE

IGNITE state

In the **IGNIT**E state, the system ignites for as long as the user keeps the **OK** key pressed and held (Image 4.3.5). This allows the user to ignite until they are confident the pilot or burner is lit. Once the **OK** key is released, the system will transition to the **PILOT ON** state if flame is present or the **STOPPED** state if flame is not present (Image 4.3.6).

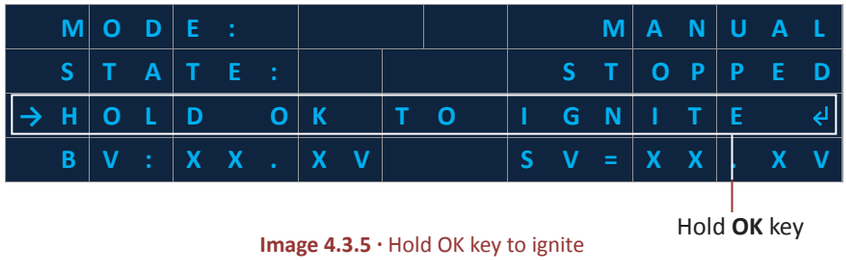


Image 4.3.5 · Hold OK key to ignite

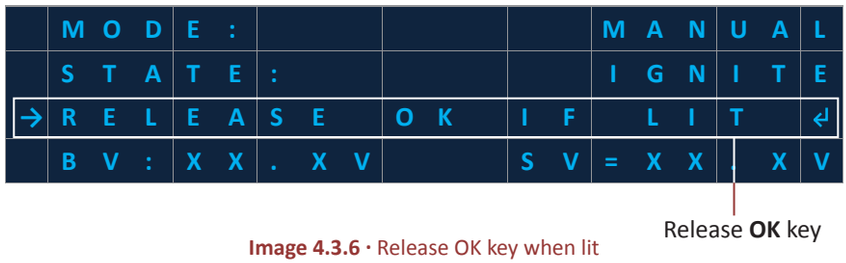


Image 4.3.6 · Release OK key when lit

PILOT ON state

The **PILOT ON** state is entered when the user releases the **OK** key while in the **IGNITE** state and flame is present. The **PILOT ON** state is exited when flame is absent or the user presses the **STOP** key. If the **STOP** key is pressed the system will transition to the **STOPPED** state.

While in the **PILOT ON** state the **ALARM OUTPUT** will be inactive and the **STATUS OUTPUT (DOUT+)** output will be active. The main menu state additional information entry will show the 'accumulated' or 'total' time that the system has been in the **PILOT ON** state. The **PILOT ON** run time counter is reset any time the **PILOT ON** state is exited.

The text display shows the run time in the format “ddddddd:hh:mm:ss” where “ddddddd” represents the number of days that the system has been in the **PILOT ON** state. Next, “hh” represents the number of hours (in 24-hour format), “mm” represents the number of minutes and “ss” represents the number of seconds in the **PILOT ON** state (Image 4.3.7).

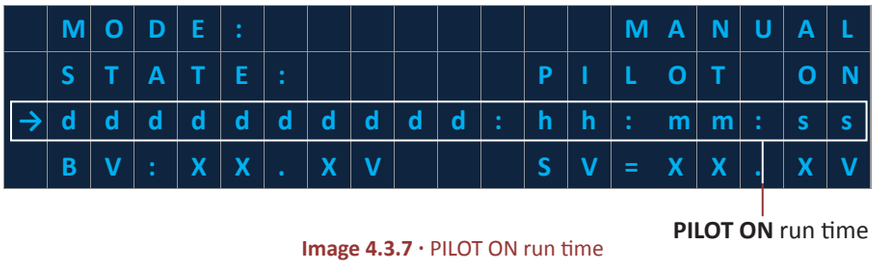


Image 4.3.7 · PILOT ON run time

4.3.3 MANUAL Mode Alarm States

The **MANUAL** mode has three alarm states, these include (Table 4.3.2):

STATE	DESCRIPTION
FLAME LOST	If at any time the flame is determined to be absent in the **PILOT ON** state, the system transition to the **FLAME LOST** state.
LOW BATTERY	The **LOW BATTERY** state appears any time the system is battery voltage drops below 11.5V for 12V operation or 23V for 24V operation.
PERMISSIVE (DIN) OPEN	The **PERMISSIVE (DIN) OPEN** state appears any time the PERMISSIVE (DIN) input is open.

Table 4.3.2 · MANUAL mode alarm states

It is important to note that multiple alarm states may occur simultaneously. To help the user from having to clear several alarms in a row the system displays the state of the **PERMISSIVE (DIN)** input and current battery voltage to help determine if any subsequent alarms would happen and if so take corrective action before clearing the alarm.

Consider the following rules when managing alarm states:

- If all alarms happen simultaneously then they would be serviced with the hierarchy shown in Table 4.3.2.
- If an alarm state condition occurs when the system is already in an alarm state, the system will remain under the initial alarm state.
- If the first alarm is cleared and the second alarm condition is still present, the system will immediately transition to the alarm state caused by the second alarm condition.

When the system is in an alarm state, the text display will show the alarm state, current state of the **PERMISSIVE (DIN)** input, the current battery voltage and the message to press the **OK** key to clear the alarm (Image 4.3.8).

Image 4.3.8 · Alarm display

If the user does press the **OK** key, then an alarm clear confirmation screen appears (Image 4.3.9). When prompted, confirm your selection on the alarm clear confirmation screen.

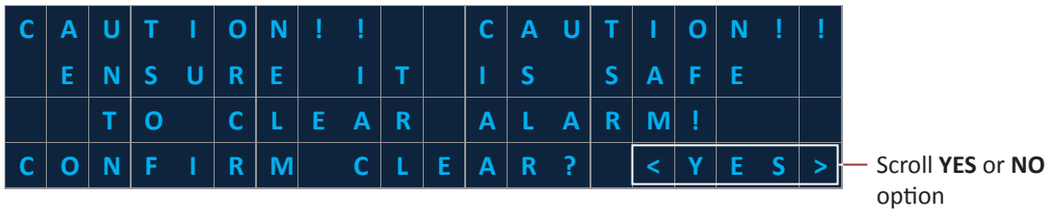


Image 4.3.9 · Alarm clear confirmation screen

FLAME LOST state

If at any time the flame is determined to be absent in the **PILOT ON** state, the system transitions to the **FLAME LOST** state (Image 4.3.10). While in the **PILOT FAILED** state the **ALARM OUTPUT** will be active and the **STATUS OUTPUT (DOUT+)** output will be inactive.

To exit the **FLAME LOST** state, press **OK** and confirm the clear on the confirmation screen. Clearing the **FLAME LOST** state will transition the system to the **STOPPED** state. Pressing the **STOP** key has no effect.

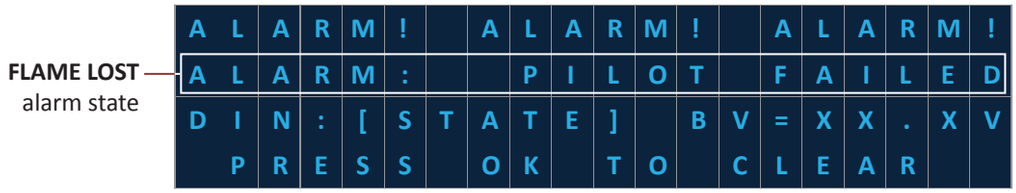


Image 4.3.10 · FLAME LOST alarm display

LOW BATTERY state

Upon power up the system will auto-determine if the system is operating at 12V or 24V. **Note:** If the battery input voltage is equal to or greater than 16V then it is assumed the system is running at 24V. If the voltage is less than 16V then it is assumed that the system is running at 12V.

Unless the system is in an alarm state already, any time the battery voltage drops below 11.5V for 12V operation or 23V for 24V operation, the system will transition to the **LOW BATTERY** state (Image 4.3.11). While in the **LOW BATTERY** state the **ALARM OUTPUT** will be active and the **STATUS OUTPUT (DOUT+)** output will be inactive.

To exit the **LOW BATTERY** state, make sure the battery voltage is higher than the 11.5V or 23V threshold, then press the **OK** key and then confirm the clear on the confirmation screen. Clearing the **LOW BATTERY** state will transition the system to the **STOPPED** state. Pressing the **STOP** key has no effect.

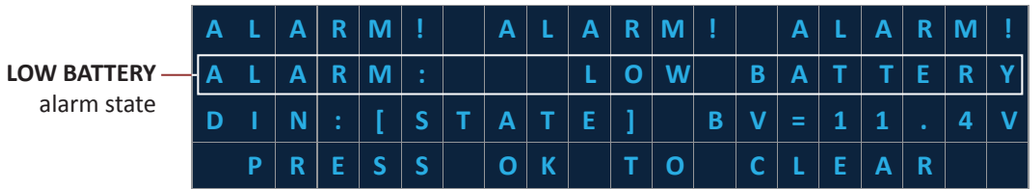


Image 4.3.11 · LOW BATTERY alarm display

PERMISSIVE (DIN) OPEN state

If at any time during operation the external dry contact switch connected at the **PERMISSIVE (DIN)** input goes open, then the system transitions to the **PERMISSIVE (DIN) OPEN** state, unless the system is an alarm state already (Image 4.3.12). **Note:** The **PERMISSIVE (DIN) OPEN** state the **ALARM OUTPUT** will be active and the **STATUS OUTPUT (DOUT+)** output will be inactive.

To exit the **PERMISSIVE (DIN) OPEN** state, make sure the **PERMISSIVE (DIN)** input is closed then press **OK** and confirm on the confirmation screen (Image 4.3.13). Clearing the **PERMISSIVE (DIN) OPEN** state will transition the system to the **STOPPED** state. Pressing the **STOP** key has no effect.

Image 4.3.12 · PERMISSIVE (DIN) OPEN alarm display

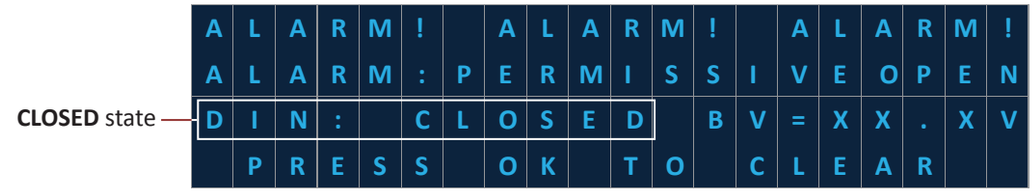


Image 4.3.13 · PERMISSIVE (DIN) CLOSED alarm display

5 Troubleshooting

PROBLEM	SOLUTION
System will not exit **PERMISSIVE (DIN)** open alarm state	Make sure **PERMISSIVE (DIN)** input is closed circuit or jumped short.
System will not spark	Make sure ignition module address dip switch is set to 1.
System will not detect flame	Make sure that grounding wire is attached to the pilot/burner chassis.
System is in low battery mode too often	• Verify the solar panel is positioned facing southward without any obstructions from the Sun. • Verify the battery and solar panel are sized properly to handle the system power requirements. • Verify the gauge of wire used for the battery and solar panel are sized properly to handle the system power requirements.
DIGITAL OUTPUT (DOUT+) output does not output any power	Check the POWER PORT BATTERY-IN FUSE on the ARControl main board. Replace with spare if fuse blown.

BMS FAULT	Description
CHECK FLAME ROD	The flame sense circuitry is detecting an issue with the flame sense signal. • This could be caused by a poor signal path. Check wiring, grounding, spark gap, and flame rod positioning. • This could be caused by a turbulent pilot flame. Ensure the pilot flame is blue, calm, and conical.
CHECK BMS WIRING	The ARControl cannot communicate with the BMS Module. • Check ARControl to BMS Module wiring. • Ensure the DIP switch address is set to 1.
SERVICE BMS	• Ensure BMS Module thermocouple inputs are jumped closed. • Ensure nothing is connected to the BMS Module valve output. • The BMS Module may have detected an internal fault and requires replacement.

6 Maintenance & Service

⚠ WARNING!

Failure to comply with the following safety warning(s) may result in serious personal injury or death.

- Do not service in a hazardous area

Spare Parts

PART NUMBER	DESCRIPTION
3181-002	ARControl 2 Amp Spare Fuse
1870-511	BMS Module - Black Ignition Module Puck
1960-171	BMS Module on DIN Rail Mounting Bracket
1960-160	5 Watt Solar Panel & 12 Volt 12 Amp Hour SLA Battery with Mounting Brackets
2130-012	12 Volt 12 Amp Hour SLA Battery
143176	12" Type K Thermocouple, ¼" diameter, ½" NPT

Please contact Cimarron Energy, Inc. for information in regard to maintenance, parts, or service:

1-844-746-1676

11025 Equity Dr., Suite 200, Houston, TX 77041

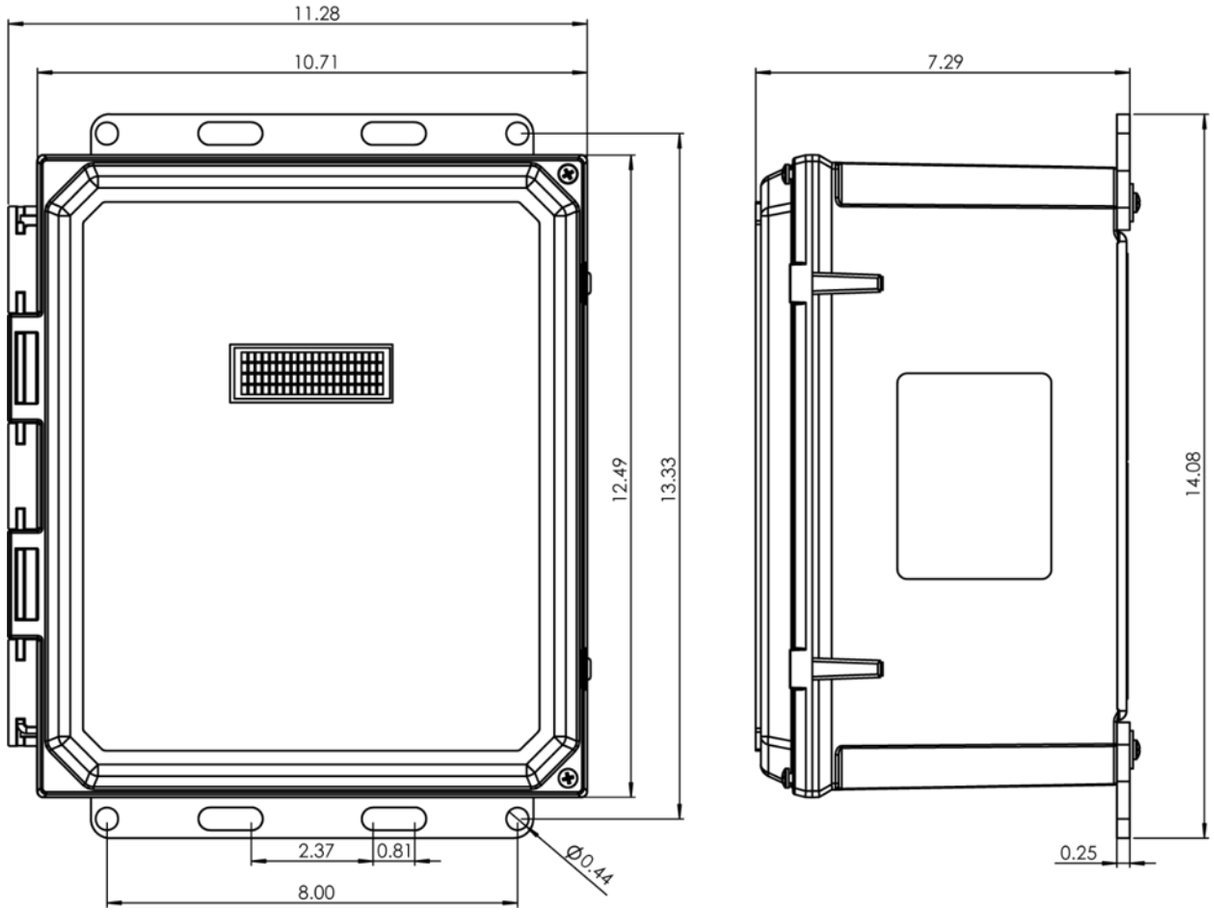
www.cimarronenergy.com

7 Approvals

- Class I, Division 2, Groups C and D, T4A, Tamb. -40°C to +60°C, Type 4X
- CAN/CSA-C22.2 NO. 61010-1:2012
- CAN/CSA C22.2 NO. 213:2015
- ANSI/ISA 12.12.01: 2015
- UL 61010-1 (3rd Edition)
- ANSI/ISA-61010-1
- CAN/CSA-C22.2
- UL 50E (Ed. 2)

8 Equipment Ratings

PARAMETER	MINIMUM	TYPICAL	MAXIMUM	UNITS
Ambient Temperature	-40		60	°C
Relative Humidity (Non-Condensing)			100	%
Enclosure Rating		NEMA 4X		
Operating Voltage		12 or 24		VDC
Operating Current	0.015		2	A
Solar Voltage		12 or 24		VDC
Solar Current			2	A
ALARM Output Voltage In	3		50	VDC
ALARM Output Current			50	mA
(DOUT) Pilot Status Voltage Output		12 or 24		VDC
(DOUT) Pilot Status Current Output			2	A
Thermocouple 1 & 2 Type		K		
(DIN)Permissive Input Voltage		5	30	VDC



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Revision B

March 2020