PROFIRE

PF2150-F FLARE CONTROLLER

PF2150-FMD

PRODUCT MANUAL

DOC-001179
v1.0_WEB

PROFIRE

Warning:

All PF2150 installations must follow the installation, commissioning, operation, and maintenance procedures outlined in this manual. Failure to comply with the instructions and warnings in this manual may result in death, serious injury, electrocution, property damage, product damage, and/or government fines. All PF2150 installations must be performed in accordance with local electrical code(s) by a capable electrician, and must be field inspected by the Authority Having Jurisdiction to ensure compliance with local electrical and gas codes.

Explosion hazard. Do not disconnect while the circuit is live or unless the area is free of ignitible concentrations.

Explosion hazard. Do not remove or replace fuses unless power has been disconnected or the area is free of ignitible concentrations.

All safety functions must be end-to-end proven following commissioning of the system.

This equipment is suitable for use in Class I, Division 2, Groups A,B,C and D or non-hazardous locations only.

Substitution of components may impair suitability for Class I, Division 2.

Avertissement:

Toutes les installations PF2150 doivent être conformes aux procédures d'installation, de mise en service, d'utilisation et d'entretien décrites dans ce manuel. Le non-respect des instructions et des avertissements de ce manuel peut entraîner la mort, des blessures graves, l'électrocution, des dommages matériels, des dommages au produit et/ou des amendes gouvernementales. Toutes les installations PF2150 doivent être effectuées conformément au(x) code(s) électrique(s) local(aux) par un électricien compétent, et doivent être inspectées sur place par l'autorité compétente afin de garantir la conformité aux codes locaux de l'électricité et du gaz.

Risque d'explosion. Ne pas débrancher pendant que le circuit est sous tension ou à moins que l'emplacement ne soit exempt de concentrations inflammables.

Risque d'explosion. Ne pas retirer ni remplacer les fusibles ni à moins que l'alimentation n'ait été coupée ou que l'emplacement ne soit exempt de concentrations inflammables.

Toutes les fonctions de sécurité doivent être éprouvées de bout en bout après la mise en service du système.

Cet équipement convient à une utilisation en Classe I, Division 2, Groupes A, B, C et D ou uniquement dans des emplacement non dangereux.

La substitution de composants peut rendure ce materiel inacceptable pour les emplacements de Classe I, Division 2.

CONTENTS

1 SCOPE

The PF2150-F Flare Ignition System (FIS) is an automated controller designed to monitor and control industrial open flaring applications. It provides reliable burner ignition, ionization flame detection, thermocouple flame detection and peripheral input device monitoring. The user interface provides real-time system status and state information as well as Modbus support, detailed alert annunciation, system diagnostics and data logging.

This document provides detailed descriptions of the PF2150-F inputs, outputs and operating sequence as well as installation, maintenance and commissioning instructions. This document is applicable for all PF2150-FMD controllers with the following hardware and firmware versions:

FIS CARD HARDWARE VERSION	UI CARD HARDWARE VERSION	PF2150-F FIRMWARE VERSION
v1.2	v1.1	F 1.0.5

2 APPROVALS AND RATINGS

2.1 CERTIFICATIONS

The PF2150-F is certified to the following standards:

PF2150-FMD
Burner Control System for use in Hazardous Locations
UL 60730-2-5/ ANSI Z21.20:22 • CSA C22.2 No. 60730-2-5
UL 121201 • CSA-C22.2 No. 213
Class I Div 2 Group ABCD; T4A
Class I, Zone 2, Group IIC T4 – US Only

UL 50; UL 50E; CSA C22.2 #94.1; CSA C22.2. #94.2; CSA C22.2 #60529
Type 4/4X Enclosure

2.2 PRODUCT RATINGS

SYSTEM PARAMETER	VALUE
Operating Temperature	-40°C to 55°C (-40°F to 131°F)
Storage Temperature	-40°C to 55°C (-40°F to 131°F)
Input Voltage	$12V_{DC}$, 8.0A max $24V_{DC}$, 4.2A max For use with a Class 2 power supply

2.3 ENCLOSURE RATINGS

SYSTEM PARAMETER	VALUE
Material	Polycarbonate
Type Rating	Type 4/4X
Ingress Protection Rating	IP66
Dimensions	291mm x 243mm x 178mm (11.5” x 9.6” x 7.0”)
Weight	2.6 kg / 5.8 lbs

2.4 POWER CONSUMPTION

	12V MODE	24V MODE
Running • Screen Off • No USB	0.7W	1.0W
Running • Screen Off • USB installed	1.1W	1.4W
Running • Screen On • USB installed	1.2W	1.5W

2.5 UI CARD TERMINAL RATINGS

TERMINAL	NAME	RATING
1	PFN +	PFN+ and - Power In: 10.2 - 32.4V_{DC}, 500mA Max PFN A and B Communication: -7V – 7V common mode range
2	PFN A	
3	PFN B	
4	PFN -	
5	MODBUS -	RS-485, -7V – 7V common mode range with reference to terminal 5 (-)
6	MODBUS A	
7	MODBUS B	
8	MODBUS -	
-	USB	5V_{DC}, 200mA Max
-	KEYPAD	3V_{DC}, 4.75 kΩ Source Impedance

2.6 FIS CARD TERMINAL RATINGS

TERMINAL	NAME	RATING
1	UI +	Power Out: 10.2 - 32.4V_{DC}, 500mA Max PFN: -7V – 7V Common Mode Range
2	UI A	
3	UI B	
4	UI -	
5	4-20mA OUT OUT	20mA Max Output, Expected Load: < 350Ω ±0.1 mA accuracy
6	4-20mA OUT GND	
7	PoC PWR	Current: 30mA max Voltage: matches system voltage up to a maximum of 13.5V
8	PoC SIG IN	30V_{DC} max Energized: 1.25mA or greater, De-energized: 0.5mA or less
9	PILOT +	Valve Output Rating: 12V_{DC}, 5.0A max per output; 7.8A max combined total, Pilot duty 24V_{DC}, 4.0A max per output; 4.0A max combined total, Pilot duty Pulsed Output with configurable PWM
10	PILOT -	
11	SSV1 +	
12	SSV1 -	
13	SSV2 +	
14	SSV2 -	
15	STATUS A	40 V_{DC} max 1A max
16	NOT USED	
17	STATUS B	
18/19/20	VIN –	12V Mode: 10.2 - 16.2 V_{DC} (12V_{DC} nominal) 24V Mode: 20.4 - 32.4 V_{DC} (24V nominal)
21/22	VIN +	
23	ESD PWR	Current: 30mA max Voltage: matches system voltage up to a maximum of 13.5V
24	ESD SIG IN	30V_{DC} max Energized: 1.25mA or greater, De-energized: 0.5mA or less
25	START PWR	Current: 30mA max Voltage: matches system voltage up to a maximum of 13.5V
26	START SIG IN	30V_{DC} max Energized: 1.25mA or greater, De-energized: 0.5mA or less
27	AUX TEMP +	Type K thermocouple -100°C to 1350°C ± 2°C accuracy
28	AUX TEMP -	
29	PILOT TEMP +	
30	PILOT TEMP -	
31	MAIN TEMP +	
32	MAIN TEMP -	
33	PRESSURE PWR	Current: 30mA max Voltage: matches system voltage up to a maximum of 13.5V
34	PRESSURE SIG IN	30V_{DC} max Digital Mode: Energized: 1.25mA or greater, De-energized: 0.5mA or less 4-20 Mode: 2.08V max voltage drop at 20mA (1.00V typical), ±0.1 mA accuracy
35	HIGH PRESSURE PWR	Current: 30mA max Voltage: matches system voltage up to a maximum of 13.5V
36	HIGH PRESSURE SIG IN	30V_{DC} max Energized: 1.25mA or greater, De-energized: 0.5mA or less
37	LEVEL PWR	Current: 30mA max Voltage: matches system voltage up to a maximum of 13.5V
38	LEVEL SIG IN	30V_{DC} max Digital Mode: Energized: 1.25mA or greater, De-energized: 0.5mA or less 4-20 Mode: 2.08V max voltage drop at 20mA (1.00V typical), ±0.1 mA accuracy
39	ION +	Intermittent 80-130 V_{RMS} Output
40	ION -	
41	IGNITION COIL -	Pulsed output at system input voltage Expected Load: Inductive
42	IGNITION COIL +	

[1] All wiring must be adequately sized in accordance with local electrical codes.

3 CONTROLLER INTERFACE

3.1 KEYPAD

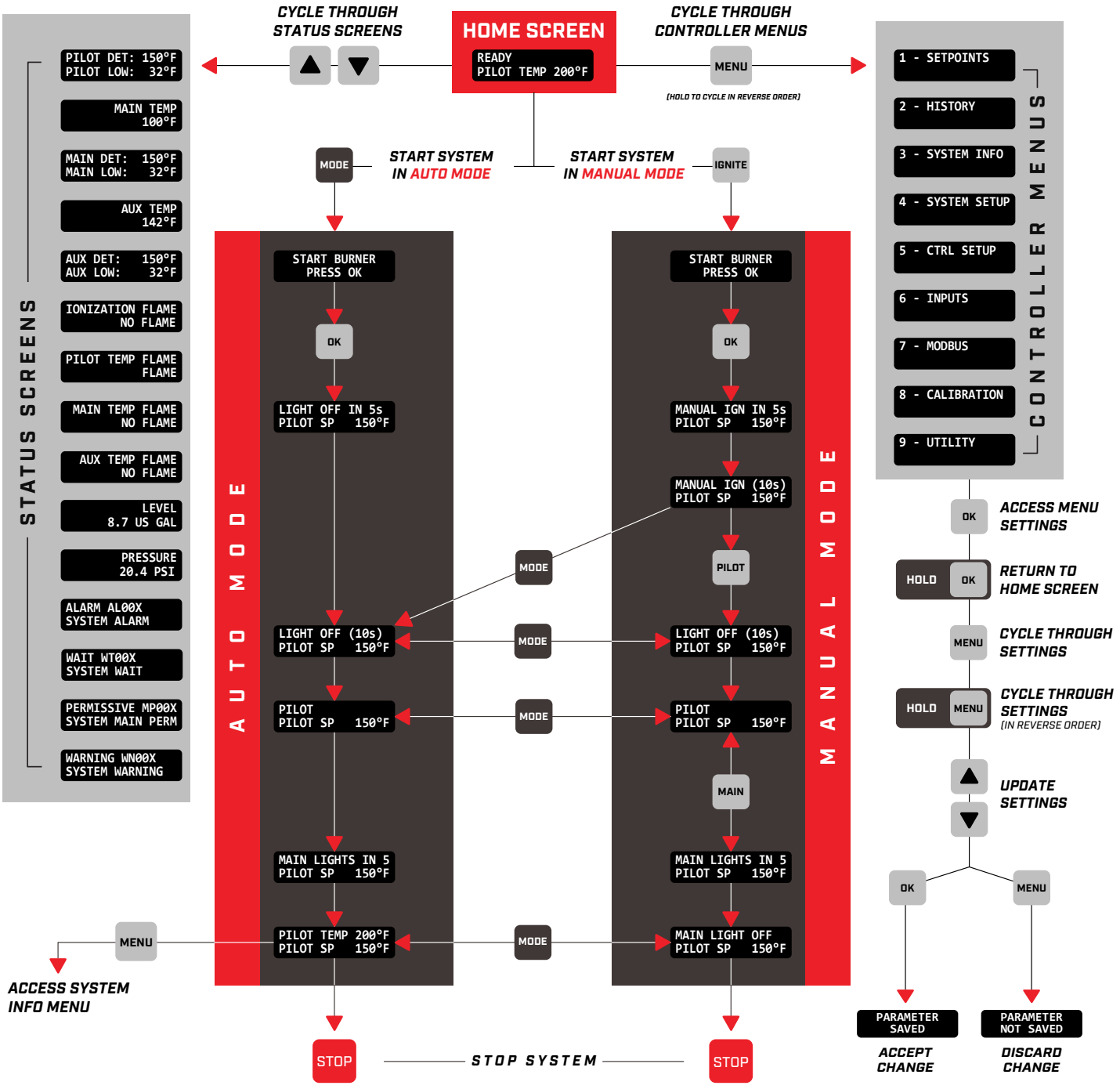
INDICATOR LEDS

LED	BEHAVIOR	DESCRIPTION
FLAME	On	System is detecting flame presence
	Off	System is detecting flame absence
	Blinking	A configured flame detection input is between its associated Low Temp SP setting and Flame Detect SP setting.
AUTO	On	System is in Auto Mode
	Off	System is in Manual Mode
	Blinking	Wait present when running in Auto Mode
MANUAL	On	System is in Manual Mode
	Off	System is in Auto Mode
	Slow blinking	System is in Alarm state
	Fast flashing	System is in Lockout state
PILOT	On	Pilot Output energized
	Off	Pilot Output de-energized
IGNITE	On	Coil Output energized
	Off	Coil Output de-energized
MAIN	On	SSV1 Output energized
	Off	SSV1 Output de-energized
	Blinking	Main Permissive present when running in Auto Mode

BUTTONS

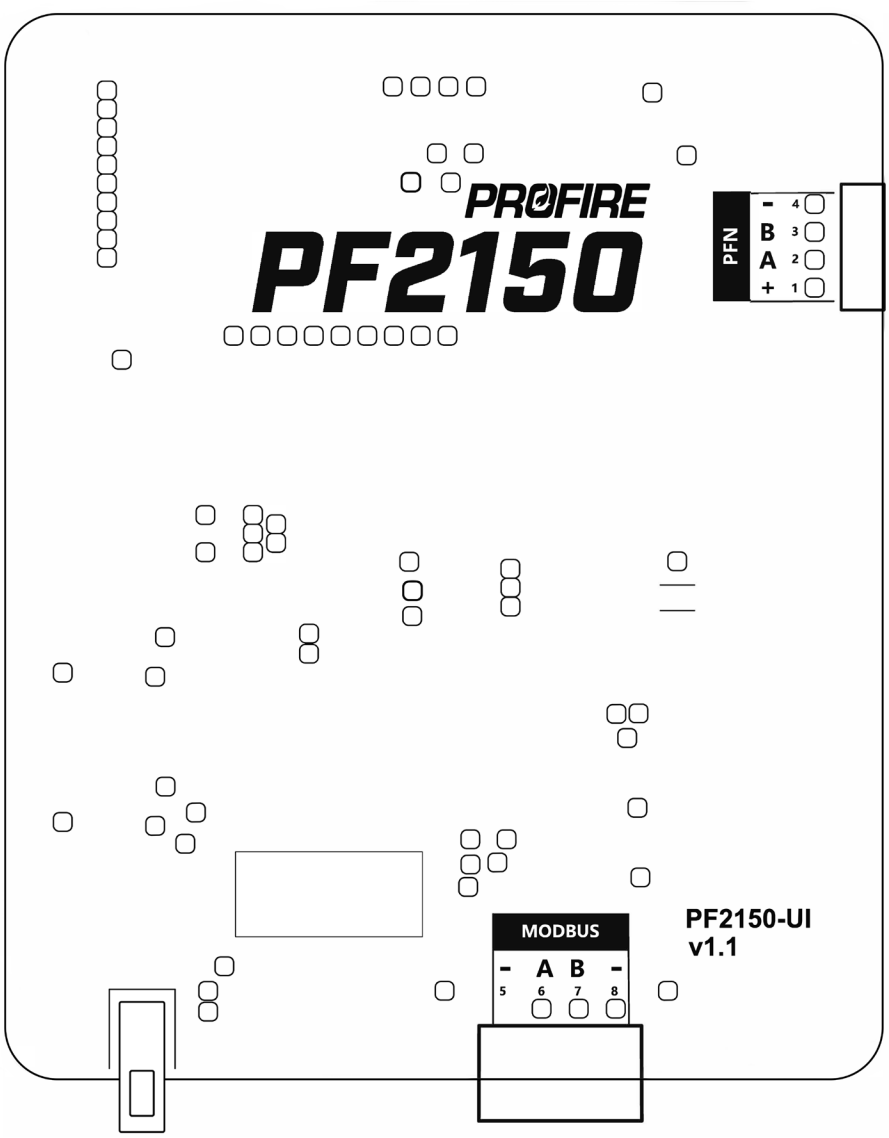
BUTTON	ACTION	FUNCTIONS
STOP	Press	Stop the system
MENU	Press	Access controller menus
		Discard settings changes
		Scroll through controller menus
	Hold	Scroll through controller menus in reverse order
▲	Press	Scroll through controller status information on the Status Screen
		Change Process Setpoint setting while running in Auto Mode
▼		Change settings from controller menus
	Hold	Change settings at an accelerated rate
OK	Press	Acknowledge Lockout message
		Access controller menu contents
		Accept a request to start the system
		Accept settings changes
	Hold	Return to home screen
	Long hold	Password logout
MODE	Press	Swap between Manual Mode and Auto Mode
		Send a request to start the system in Auto Mode
PILOT	Press	Energize/de-energize Pilot Output when running in Manual Mode
	Hold	No effect
IGNITE	Press	Send a request to start the system in Manual Mode
	Hold	No effect
MAIN	Press	Energize/de-energize SSV Outputs when running in Manual Mode
	Hold	No effect

3.2 SCREEN NAVIGATION



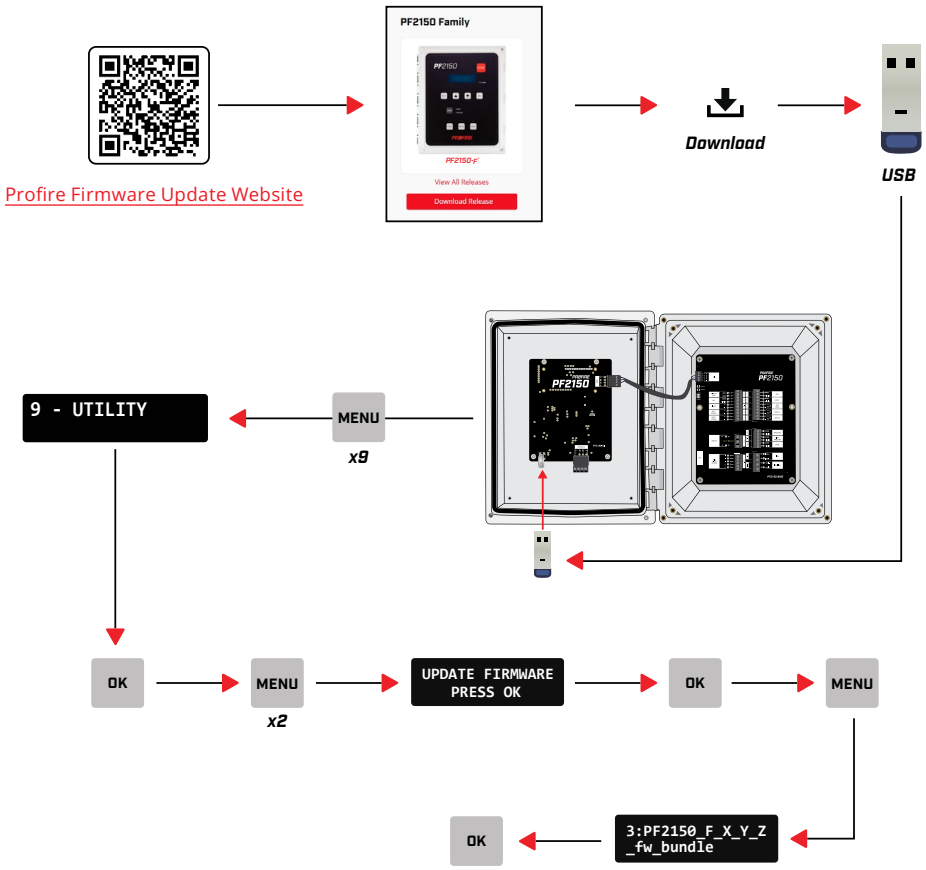
3.3 USER INTERFACE CARD

The User Interface (UI) Card includes a 2-line display and connections to the keypad and FIS card. There is a USB port for settings backup/restore, firmware update, and data logging as well as additional terminals to connect to a Modbus client.



3.4 SOFTWARE UTILITIES

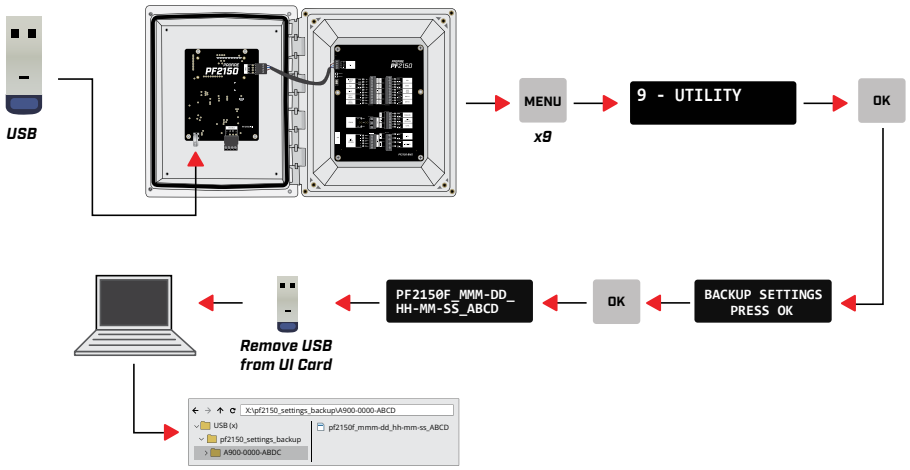
3.4.1 FIRMWARE UPDATE



1. Navigate to Profire Firmware Update Website
2. Select appropriate firmware bundle and download it to a USB storage device
3. Insert USB into PF2150 system
4. Navigate to Menu 9 - Utility and select Update Firmware
5. Select appropriate firmware bundle to begin update. System will automatically perform a Settings Backup prior to beginning the update, and will return to the Home Screen once firmware update is complete.

   System will return to the Home Screen once firmware update is complete
6. Perform a Settings Restore and configure any new settings appropriately.
7. Perform all site commissioning checks prior to starting the system

3.4.2 SETTINGS BACKUP



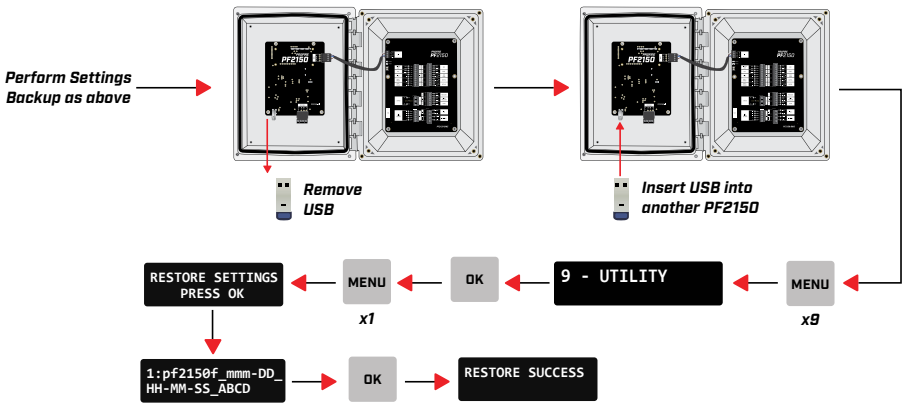
1. Insert USB into PF2150 system

2. Navigate to Menu 9 - Utility and select Backup Settings

3. Settings file will be saved to the USB in the form:
pf2150f_mmm-dd_HH-MM-SS_ABCD
where:
mmm-dd = date of backup
HH-MM-SS = time of backup
ABCD = last 4 digits of FIS serial number

3.4.3 SETTINGS RESTORE

Settings Restore can be used to load saved settings files onto a PF2150 – The steps below outline the procedure for transferring settings from a commissioned PF2150 to an uncommissioned PF2150, but the same procedure can be used to restore settings following a firmware update or settings reset.



1. Perform Settings Backup (as in previous section) on the commissioned PF2150 to save desired settings file to a USB.

2. Transfer USB to uncommissioned PF2150

4. Navigate to Menu 9 - Utility and select Restore Settings

3. Select desired settings file and press OK
Note: file must be located in a folder on the USB named "pf2150_settings_backup" in order for it to be shown on the screen for selection.

3.4.4 DATA LOGGING

With a USB storage device installed, the following items are saved to the USB at an interval specified by the Data Logging Period setting (MENU 7 – MODBUS):

- Date
- Time
- Run Status
- Pilot Output Status
- SSV 1 Output Status
- SSV 2 Output Status
- Pilot Output Voltage
- SSV 1 Output Voltage
- SSV 2 Output Voltage
- POC Input Status
- ESD Input Status
- Start Input Status
- Pressure Input Status (Digital)
- Level Input Status (Digital)
- High Pressure Input Status
- Pressure Input Reading (4-20)
- Level Input Reading (4-20)
- Ion Flame Status
- Pilot Temp Flame Status
- Main Temp Flame Status
- Aux Temp Flame Status
- Pilot Temp Input Reading
- Main Temp Input Reading
- Aux Temp Input Reading
- Ambient Temp Reading
- Pilot Temp High Temp Setpoint
- Pilot Temp Flame Detect Setpoint
- Pilot Temp Low Temp Setpoint
- Main Temp High Temp Setpoint
- Main Temp Flame Detect Setpoint
- Main Temp Low Temp Setpoint
- Aux Temp High Temp Setpoint
- Aux Temp Flame Detect Setpoint
- Aux Temp Low Temp Setpoint
- System Voltage

3.5 CONTROLLER SETTINGS

3.5.1 SETPOINTS MENU

SETTING	DEFAULT	RANGE	DESCRIPTION
Pilot Temp Flame Detect Setpoint	185°F 85°C	-40°F to 2462°F -40°C to 1350°C	Temperature above which flame is considered to be present on the Pilot Temp thermocouple input when configured as a pilot flame detection input.
Pilot Temp Low Temp Setpoint	32°F 0°C	-40°F to 2462°F -40°C to 1350°C	Temperature below which WN003 Low Pilot Temp warning is present.
Pilot Temp Deadband	3.6°F 2°C	0°F to 180°F 0°C to 100°C	High Temp ESD Mode: Amount that Pilot Temp must drop below configured Pilot Temp High Temp Setpoint for AL012 High Pilot Temp alarm to clear once set. Flame Detect Mode: Amount that Pilot Temp must drop below configured Pilot Temp Flame Detect Setpoint for the system to register a transition from pilot flame presence to flame absence. Either Mode: Amount that Pilot Temp must increase above configured Pilot Low Temp Setpoint for WN003 Low Pilot Temp warning to clear once set.
Main Temp Flame Detect Setpoint	185°F 85°C	-40°F to 2462°F -40°C to 1350°C	Temperature above which flame is considered to be present on the Main Temp thermocouple input when configured as a main flame detection input.
Main Temp Low Temp Setpoint	32°F 0°C	-40°F to 2462°F -40°C to 1350°C	Temperature below which WN004 Low Main Temp warning is present.
Main Temp Deadband	3.6°F 2°C	0°F to 180°F 0°C to 100°C	High Temp ESD Mode: Amount that Main Temp must drop below configured Main Temp High Temp Setpoint for AL013 High Main Temp alarm to clear once set. Flame Detect Mode: Amount that Main Temp must drop below configured Main Temp Flame Detect Setpoint for the system to register a transition from main flame presence to absence. Either Mode: Amount that Main Temp must increase above configured Main Low Temp Setpoint for WN004 Low Main Temp warning to clear once set.
Aux Temp Flame Detect Setpoint	185°F 85°C	-40°F to 2462°F -40°C to 1350°C	Temperature above which flame is considered to be present on the Aux Temp thermocouple input when configured as a pilot or main flame detection input.
Aux Temp Low Temp Setpoint	32°F 0°C	-40°F to 2462°F -40°C to 1350°C	Temperature below which WN005 Low Aux Temp warning is present.
Aux Temp Deadband	3.6°F 2°C	0°F to 180°F 0°C to 100°C	High Temp ESD Mode: Amount that Aux Temp must drop below configured Aux Temp High Temp Setpoint for AL014 High Aux Temp alarm to clear once set. Flame Detect Mode: Amount that Aux Temp must drop below configured Aux Temp Flame Detect Setpoint for the system to register a transition from flame presence to absence. Either Mode: Amount that Aux Temp must increase above configured Aux Low Temp Setpoint for WN005 Low Aux Temp warning to clear once set.

3.5.2 HISTORY MENU

ITEM	DESCRIPTION
Ionization Flame Fail Count	Displays the number of flame failures on the Ionization Input since that last power cycle.
Pilot Temp Flame Fail Count	Displays the number of flame failures on the Pilot Temp Input since that last power cycle.
Main Temp Flame Fail Count	Displays the number of flame failures on the Main Temp Input since that last power cycle.
Aux Temp Flame Fail Count	Displays the number of flame failures on the Aux Temp Input since that last power cycle.
View Event Log	Displays the event log on screen.
Clear Event Log	Resets the event log.
Export Event Log	Saves the event log to USB.

3.5.3 SYSTEM INFO MENU

ITEM	DESCRIPTION
Pilot Temp	Displays the current Pilot Temp Input reading.
Main Temp	Displays the current Main Temp Input reading.
Aux Temp	Displays the current Aux Temp Input reading.
Ambient Temp	Displays the current ambient temperature reading.
Level	Displays the current Level Input reading.
Pressure	Displays the current Pressure Input reading.
4-20mA Output	Displays the current 4-20mA output signal.
System Voltage	Displays the current input voltage reading.
Date & Time	Displays the date and time. Read-only; can be edited in Menu 4.
Location	Displays the location of the controller. Read-only; can be edited in Menu 4.
Controller State	Displays the current state of the controller.
Bootloader Version	Displays the bootloader version of the system.
FIS Bundle	Displays the firmware bundle version of the FIS card
UI Bundle	Displays the firmware bundle version of the UI card
Hardware Variant	Displays the system product variant

3.5.4 SYSTEM SETUP MENU

SETTING [SECURITY LEVEL]	DEFAULT	RANGE	DESCRIPTION
Ignition Mode	Coil	Coil	Configures the Igniton Output for use with an ignition coil.
		HEI	Configures the Igniton Output as an enable signal for a high energy ignition device.
Spark Mode	Until Flame	Until Flame	Configures the system to de-energize the Coil Output when pilot flame is present.
		Reignition	Configures the system to energize the Coil Output to attempt to re-ignite a lost pilot flame during the configured Pilot Flame Lockout Time.
		Continuous	Configures the system to energize the Coil Output continuously while running.
Spark Interval	8 seconds	8 to 60 seconds	The time between Coil Output pulses when energized.
Auto Relight	Enabled	Disabled	Configures the system to stop and lock out upon flame failure.
		Enabled	Configures the system to automatically attemp re-ignition upon flame loss.
Voltage Restart	Disabled	Disabled	Configures the system to shut down and lock out upon power loss while running.
		Enabled	Configures the system to start automatically upon power up following a loss of power while running.
Pilot Startup Delay Time	15 seconds	0 to 600 seconds	Time for which the system holds in Pilot state upon initial startup before proceeding to main.
Lockout on Main Flame Fail	Disabled	Disabled	Configures the system to continue running upon main flame failure.
		Enabled	Configures the system to shut down and lock out upon main flame failure.
Low Pressure Delay	2 seconds	2 to 20 seconds	Time for which a low-pressure event must persist before the system considers a low trip condition to be present.
Level Delay	2 seconds	2 to 20 seconds	Time for which a level event must persist before the system considers a trip condition to be present.
Status Contact Mode	Run Status	Run Status	Configures the Status Contact to be closed when the system is in a running state.
		Level Control	Configures the Status Contact to be closed when Level Input is below configured Level Control Setpoint.

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SETTING [SECURITY LEVEL]	DEFAULT	RANGE	DESCRIPTION
L1 Password Enable	Disabled	Disabled	Configures the system to protect all settings with the Level 2 password.
		Enabled	Configures the system to allow adjustment of L1-protected settings with the Level 1 password.
Sleep Timeout	Never	Never	Configures the system to keep the user interface screen on at all times.
		5 Minutes	Configures the system to de-energize the user interface screen after 5 minutes of inactivity.
		10 Minutes	Configures the system to de-energize the user interface screen after 10 minutes of inactivity.
		15 Minutes	Configures the system to de-energize the user interface screen after 15 minutes of inactivity.
Pilot Valve PWM	60%	1 to 100%	Configures the duty cycle of the Pilot Output signal.
SSV PWM	60%	1 to 100%	Configures the duty cycle of SSV1 Output and SSV2 Ouput signals.
Input Voltage	12V	12V	Configures the system to be powered by a 12VDC Power supply.
		24V	Configures the system to be powered by a 24VDC Power supply.
UI Comm Loss	Disabled	Disabled	Configures the system to continue running upon loss of communication between FIS and UI card.
		Enabled	Configures the system to shut down and lock out upon loss of communication between FIS and UI card while running.
Temperature Units	Fahrenheit	Celsius	Configures the system to display all temperature readings and settings in Celsius.
		Fahrenheit	Configures the system to display all temperature readings and settings in Fahrenheit.
Date & Time		Any valid date and time	Configures the date and time of the system.
Location		Alphanumeric entry upto 16 characters long	Controller location. This field is for user reference only; it is not used by the controller in any way.
Reset Settings	-	-	Resets all settings to their default values.

3.5.5 CONTROL SETUP MENU

SETTING [SECURITY LEVEL]	DEFAULT	RANGE	DESCRIPTION
Ionization Flame Detection Mode	Disabled	Disabled	Configures the system to ignore the Ionization Flame Input.
		Pilot Only	Configures the Ionization Flame Input for use a pilot flame detection input.
		Pilot and Main	Configures the Ionization Flame Input for use a pilot and main flame detection input.
Pilot Temp Mode	Flame Detect	Flame Detect	Configures the Pilot Temp thermocouple input for use as a Type K thermocouple pilot flame detection input.
		High Temp ESD	Configures the Pilot Temp thermocouple input for use as a Type K thermocouple high-temperature shutdown input.
		Display Only	Configures the Pilot Temp thermocouple input for use as a read-only Type K thermocouple input.

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SETTING [SECURITY LEVEL]	DEFAULT	RANGE	DESCRIPTION
Pilot Temp High Temp Setpoint	2462°F 1350°C	-40°F to 2462°F -40°C to 1350°C	Temperature above which AL012 High Pilot Temp alarm is present when Pilot Temp thermocouple input is configured as a high temp shutdown input.
Main Temp Mode	Disabled	Disabled	Configures the Main Temp thermocouple input to be ignored by the system.
		Flame Detect	Configures the Main Temp thermocouple input for use as a Type K thermocouple main flame detection input.
		High Temp ESD	Configures the Main Temp thermocouple input for use as a Type K thermocouple high-temperature shutdown input.
		Display Only	Configures the Main Temp thermocouple input for use as a read-only Type K thermocouple input.
Main Temp High Temp Setpoint	2462°F 1350°C	-40°F to 2462°F -40°C to 1350°C	Temperature above which AL013 High Main Temp alarm is present when Main Temp thermocouple input is configured as a high temp shutdown input.
Aux Temp Mode	Disabled	Disabled	Configures the Aux Temp thermocouple input to be ignored by the system.
		Pilot Flame Detect	Configures the Aux Temp thermocouple input for use as a Type K thermocouple pilot flame detection input.
		Main Flame Detect	Configures the Aux Temp thermocouple input for use as a Type K thermocouple main flame detection input.
		High Temp ESD	Configures the Aux Temp thermocouple input for use as a Type K thermocouple high-temperature shutdown input.
		Display Only	Configures the Aux Temp thermocouple input for use as a read-only Type K thermocouple input.
Aux Temp High Temp Setpoint	2462°F 1350°C	-40°F to 2462°F -40°C to 1350°C	Temperature above which AL014 High Aux Temp alarm is present when Aux Temp thermocouple input is configured as a high temp shutdown input.
Pilot Detect	Any	All	Configures the system to consider pilot flame to be present only when all configured pilot flame detection inputs are detecting flame presence.
		Any	Configures the system to consider pilot flame to be present when any configured pilot flame detection input is detecting flame presence.
Pilot Flame Establishment Time	10 seconds	0 to 900 seconds	The time given to establish pilot flame presence upon pilot light off before the system shuts down and locks out due to pilot light off failure.
Pilot Flame Failure Lockout Time	4 seconds	0 to 7200 seconds	The time for which pilot flame absence must persist for the system to register a pilot flame failure. Note: Configuring this setting as 0 disables the Pilot Flame Lockout Time (i.e., the system will not shut down upon pilot flame failure)
Pilot Off Mode	Disabled	Disabled	Configures the system to keep the Pilot Output energized in main-fuel states.
		Enabled	Configures the system to de-energize the Pilot Output following main flame establishment.

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SETTING [SECURITY LEVEL]	DEFAULT	RANGE	DESCRIPTION
Main Detect	Any	All	Configures the system to consider main flame to be present only when all configured main flame detection inputs are detecting flame presence.
		Any	Configures the system to consider main flame to be present when any configured main flame detection input is detecting flame presence.
Main Flame Failure Lockout Time	4 seconds	0 to 7200 seconds	The time for which main flame absence must persist for the system to register a main flame failure. Note: Configuring this setting as 0 disables the Main Flame Lockout Time (i.e., the system will not shut down upon main flame failure)
4-20mA Output Mode	Disabled	Disabled	Configures the system to disable the 4-20mA Output.
		Pilot Temp Echo	Configures the system to echo the Pilot Temp input measurement (mapped between the configured Temp Echo Span Min and Temp Echo Span Max settings) on the Analog Output as a 4-20mA signal.
		Main Temp Echo	Configures the system to echo the Main Temp input measurement (mapped between the configured Temp Echo Span Min and Temp Echo Span Max settings) on the Analog Output as a 4-20mA signal.
		Aux Temp Echo	Configures the system to echo the Aux Temp input measurement (mapped between the configured Temp Echo Span Min and Temp Echo Span Max settings) on the Analog Output as a 4-20mA signal.
		Pressure Echo	Configures the system to echo the Pressure Input signal on the Analog Output as a 4-20mA signal.
		Level Echo	Configures the system to echo the Level Input signal on the Analog Output as a 4-20mA signal.
Temp Echo Span Min	-148°F -100°C	-148°F to 2462°F -100°C to 1350°C	Temperature corresponding to a 4mA output signal on the Analog Output when configured for temperature echo.
Temp Echo Span Max	2462°F 1350°C	-148°F to 2462°F -100°C to 1350°C	Temperature corresponding to a 20mA output signal on the Analog Output when configured for temperature echo.

3.5.6 INPUTS MENU

SETTING (SECURITY LEVEL)	DEFAULT	RANGE	
Level Input	Digital	Disabled	Configures the Level Input to be ignored by the system.
		Digital	Configures the Level Input as a digital level input.
		4-20	Configures the Level Input for use with a 4-20mA level transmitter.
Level Units	US Gallons	Litres	Configures the system to display all level readings and settings in litres.
		m3	Configures the system to display all level readings and settings in cubic metres.
		US Gallons	Configures the system to display all level readings and settings in US Gallons.
		bbl	Configures the system to display all level readings and settings in oil barrels.
		ft3	Configures the system to display all level readings and settings in cubic feet.
		Percent	Configures the system to display all level readings and settings in percent.
		Milliamps	Configures the system to display all level readings and settings in milliamps.
Level Digital Mode	Alarm	Alarm	Configures the system to keep from running under level trip conditions when configured as a digital input.
		Wait	Configures the system to keep from energizing fuel valve outputs under level trip conditions when configured as a digital input.
Level High Trip Mode	Alarm	Alarm	Configures the system to keep from running under high-level trip conditions when configured as a 4-20mA input.
		Wait	Configures the system to keep from energizing fuel valve outputs under high-level trip conditions when configured as a 4-20mA input.
Level Low Trip Mode	Alarm	Alarm	Configures the system to keep from running under low-level trip conditions when configured as a 4-20mA input.
		Wait	Configures the system to keep from energizing fuel valve outputs under low-level trip conditions when configured as a 4-20mA input.
Level Span Max	32 gal 120 L	0 to 2,641,720 gal 0 to 10,000,000 L	Level corresponding to a 20mA level transmitter input signal.
Level Span Min	0 gal 0 L	0 to 2,641,720 gal 0 to 10,000,000 L	Level corresponding to a 4mA level transmitter input signal.
Level High Trip	31 gal 117 L	0 to Span Max	Level above which a high trip condition is considered to be present on the Level Input when configured in 4-20 mode.
Level Low Trip	16 gal 60 L	0 to Span Max	Level below which a low trip condition is considered to be present on the Level Input when configured in 4-20 mode.
Level Control Setpoint	28 gal 105 L	0 to Span Max	Level determining Status Contact behaviour when configured for Level Control.
Level Deadband	0.4 gal 1.5 L	Up to 6.25% of span	Tolerance applies around level setpoints to avoid bouncing between states when input measurement is close to configured setpoints.
Pressure Input	Digital	Disabled	Configures the Pressure Input to be ignored by the system.
		Digital	Configures the Pressure Input for use with a digital low-pressure switch.
		4-20	Configures the Pressure Input for use with a 4-20mA pressure transmitter.

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SETTING [SECURITY LEVEL]	DEFAULT	RANGE	
Pressure Units	psi	kPa	Configures the system to display all pressure readings and settings in kilopascals.
		psi	Configures the system to display all pressure readings and settings in pounds per square inch.
		inch wc	Configures the system to display all pressure readings and settings in inches of water.
		oz/in2	Configures the system to display all pressure readings and settings in ounces per square inch.
		kg/cm2	Configures the system to display all pressure readings and settings in kilograms per square centimetre.
		Percent	Configures the system to display all pressure readings and settings in percent.
		Milliamps	Configures the system to display all pressure readings and settings in milliamps.
Low Pressure Mode	Alarm	Alarm	Configures the system to keep from running under low-pressure trip conditions.
		Wait	Configures the system to keep from energizing fuel valve outputs under low-pressure trip conditions.
		Warning	Configures the system to notify the user (with no other action) under low-pressure trip conditions.
		Main Permissive	Configures the system to keep from energizing main-fuel valve outputs under low-pressure trip conditions.
Pressure Span Max	30 psi 207 kPa	0 psi to 14504 psi 0 kPa to 100000 kPa	Pressure corresponding to a 20mA pressure transmitter input signal.
Pressure Span Min	0 psi 0 kPa	0 psi to 14504 psi 0 kPa to 100000 kPa	Pressure corresponding to a 4mA pressure transmitter input signal.
Pressure High Trip	26 psi 177 kPa	0 to Span Max	Pressure above which a high trip condition is considered to be present on the Pressure Input when configured in 4-20 mode.
Pressure Low Trip	0 psi 0 kPa	0 to Span Max	Pressure below which a low trip condition is considered to be present on the Pressure Input when configured in 4-20 mode.
Pressure Deadband	0.4 psi 2.6 kPa	Up to 6.25% of span	Tolerance applies around pressure setpoints to avoid bouncing between states when input measurement is close to configured setpoints.
High Pressure Input	Enabled	Disabled	Configures the High Pressure Input to be ignored by the system.
		Enabled	Configures the High Pressure Input as a digital hiph pressure input.
POC Input	Enabled	Disabled	Configures the POC Input to be ignored by the system.
		Enabled	Configures the POC Input for use with a digital proof of main valve closure switch.
Start Input	Disabled	Disabled	Configures the Start Input to be ignored by the system.
		Enabled	Configures the Start Input as a digital remote start input.

3.5.7 MODBUS MENU

SETTING [SECURITY LEVEL]	DEFAULT	RANGE	DESCRIPTION
Modbus Enable	Disabled	Disabled	Configures the system to disable Modbus communication and USB data logging.
		Enabled	Configures the system to enable Modbus communication and USB data logging.
Server Address	1	1 to 247	The Modbus server address of the PF2150-F controller.

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SETTING [SECURITY LEVEL]	DEFAULT	RANGE	DESCRIPTION
Baud Rate	9600	9600	Configures the system to use a baud rate of 9600 for Modbus communication.
		19200	Configures the system to use a baud rate of 19200 for Modbus communication.
Stop Bits	1	1	Configures the system to use 1 stop bit for Modbus communication.
		2	Configures the system to use 2 stop bits for Modbus communication.
Parity	None	None	Configures the system to use no parity for Modus communication.
		Odd	Configures the system to use odd parity for Modus communication.
		Even	Configures the system to use even parity for Modus communication.
Termination Resistor	Disabled	Disabled	Configures the system to bypass the on-board Modbus termination resistor.
		Enabled	Configures the system to switch in the on-board 120Ω Modbus termination resistor.
Data Logging Period	5 seconds	5 seconds to 300 seconds	The time between data entries logged to the USB when data logging is enabled.

3.5.7.1 MODBUS CLIENT CONFIGURATION REQUIREMENTS

Ensure Modbus client device is configured as follows:

NAME	REQUIREMENT	NOTES
Protocol	Modbus RTU	Modbus TCP is not directly supported but can be used with a TCP/IP to RTU Gateway installed.
Physical Implementation	RS-485	Half-duplex RS-485 communication
Minimum Interpacket Delay	20ms	
Minimum Response Timeout	500ms	Recommended response timeout is 1 second or larger.
Minimum Time Between Writes	5 seconds	It is recommended that settings be written only when changed; continuous writing of settings should be avoided.
Minimum Time Between Reads	1 second	
Server Address **Baud Rate** **Stop Bits** **Parity**	As required	Must be configured to match PF150-FMD Modbus settings above.
Multiplication Factor	As required	A "10x" in the register tables below indicates that the value returned is 10 times its actual value. Any required conversion must be done by the client device.

3.5.8 CALIBRATION MENU

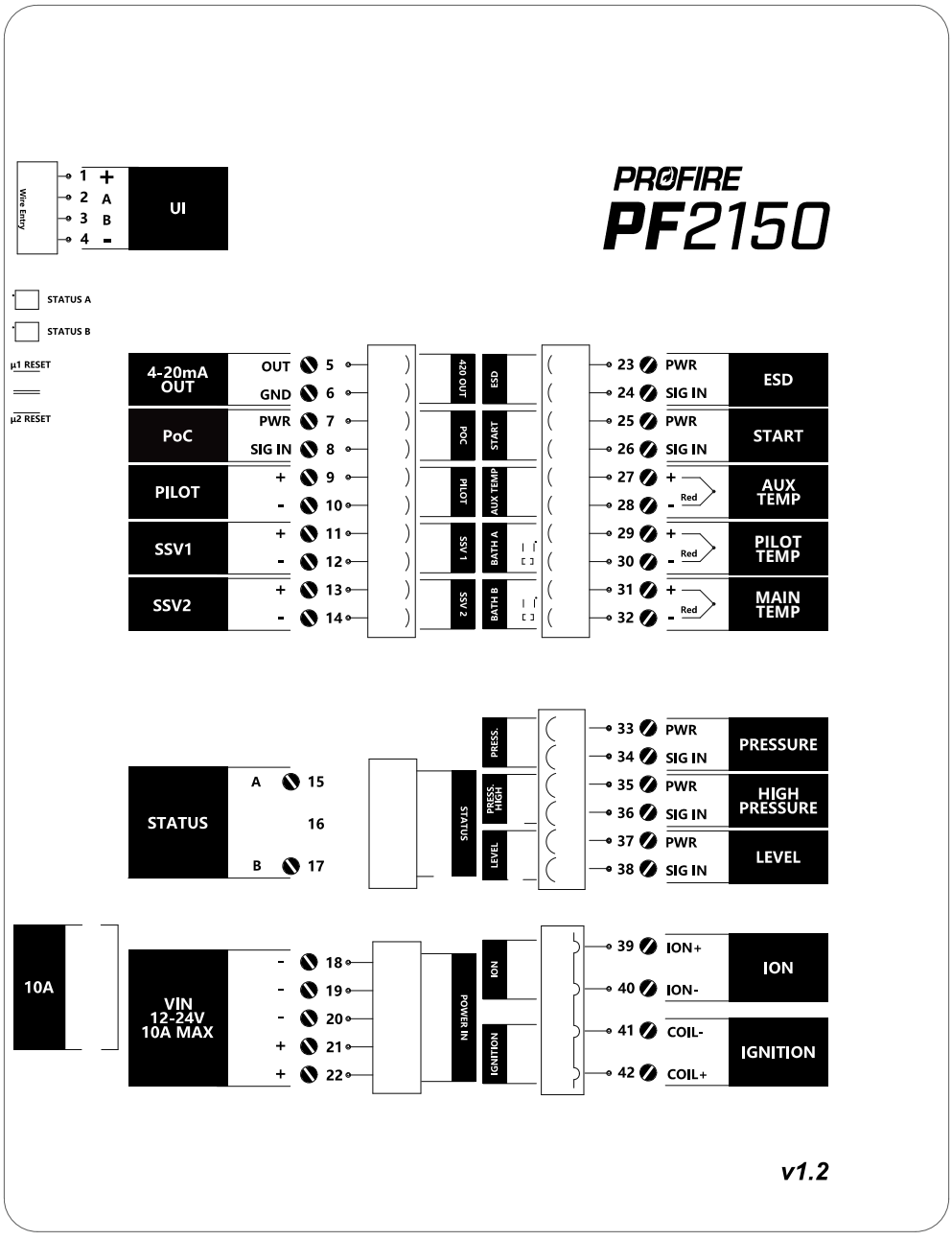
Follow on-screen instruction to field-calibrate level and pressure inputs.

3.5.9 UTILITY MENU

ITEM	DESCRIPTION
Backup Settings	Saves current settings to USB.
Restore Settings	Loads a settings file from USB. **Note: Settings file must be located in a folder on the USB named "pf2150_settings_backup"**
Update Firmware	Updates system firmware with approved PF2150-F firmware bundles saved to USB.
Keypad Test	Tests keypad/screen/LED functionality

4 FIS CARD

The FIS card provides the necessary inputs and outputs for reliable control of open flare applications. The following section outlines the behavior and intended device connections for each FIS input and output and provides brief configuration instructions and links to the appropriate Connection Diagrams (pg 38).



4.1 4-20mA OUTPUT

4.1.1 DETAILS

ITEM	
Terminals	5 & 6
Name	4-20mA OUT
Type	4-20mA Output

4.1.2 INTENDED FIELD DEVICE CONNECTIONS

FIELD DEVICE	CONFIGURATION REQUIREMENTS	CONNECTION DIAGRAMS
FIS temperature input echo to PLC	5 – CONTROL SETUP > 4-20 Output Mode = Pilot Temp Echo or Main Temp Echo or Aux Temp Echo 5 – CONTROL SETUP > Temp Echo Span Min and Temp Echo Span Max = As desired	4-20mA Output Wiring – Echo
FIS level input echo to PLC	5 – CONTROL SETUP > 4-20 Output Mode = Level Echo	4-20mA Output Wiring – Echo
FIS pressure input echo to PLC	5 - CONTROL SETUP > 4-20 Output Mode = Pressure Echo	4-20mA Output Wiring - Echo

4.1.3 SYSTEM BEHAVIOR

4-20mA OUTPUT MODE SETTING	STATE	OUTPUT
Pilot Temp Echo **Main Temp Echo** **Aux Temp Echo**	Any	Temperature input measurement is echoed out as a 4-20mA signal mapped between the Temp Echo Span Min and Temp Echo Span Max setting values. Input values below the Min Span setting are echoed out as 4mA signals and input values above the Max Span setting are echoed out as 20mA signals.
Level Echo	Any	Level input measurement echoed out as an identical 4-20mA signal
Pressure Echo	Any	Pressure input measurement echoes out as an identical 4-20mA signal

4.2 PROOF OF CLOSURE INPUT

4.2.1 DETAILS

ITEM	
Terminals	7 & 8
Name	PoC
Type	Digital input

4.2.2 INTENDED FIELD DEVICE CONNECTIONS

FIELD DEVICE	CONFIGURATION REQUIREMENTS	CONNECTION DIAGRAMS
Connection to main valve (SSV) proof of closure switch	6 – INPUTS > Proof of Closure = Enabled	Digital Input – Dry Contact Digital Input – Wet Contact

4.2.3 SYSTEM BEHAVIOR

	SCENARIO			
CONFIGURATION DETAILS	SSV OUTPUT STATE	POC INPUT STATE	STATE TRANSITION IF RUNNING	ALERTS
PROOF CLOSURE: ENABLED	De-energized	De-energized	Lockout	POC Input Open Alarm
	Energized	Energized	No effect	POC Still Closed Warning
	De-energized	Energized	No effect	N/A
	Energized	De-energized	No effect	N/A
PROOF CLOSURE: DISABLED	Any	Any	No effect	N/A

4.3 PILOT VALVE OUTPUT

4.3.1 DETAILS

ITEM	
Terminals	9 & 10
Name	Pilot
Type	Powered solenoid output with configurable PWM

4.3.2 INTENDED FIELD DEVICE CONNECTIONS

FIELD DEVICE	CONFIGURATION REQUIREMENTS	CONNECTION DIAGRAMS
Connection to normally closed pilot gas shutoff valve – Peak and hold	4 – SYSTEM SETUP > Pilot Valve PWM = per valve manufacturer recommendations	Solenoid Output – 12V/24V
Connection to normally closed pilot gas shutoff valve – Constant current	4 – SYSTEM SETUP > Pilot Valve PWM = 100%	Solenoid Output – 12V/24V

4.3.3 SYSTEM BEHAVIOR

SYSTEM STATE	PILOT OUTPUT
POWER ON	De-energized
LOCKOUT	De-energized
ALARM	De-energized
READY	De-energized
WAITING	De-energized
MANUAL IGNITION	De-energized
PILOT LIGHT OFF	Energized
PILOT	Energized
MAIN LIGHT OFF	Energized
MAIN LIGHT OFF	Pilot Off Mode = Enabled: De-energized Pilot Off Mode = Disabled: Energized

4.4 SSV1 MAIN VALVE OUTPUT

4.4.1 DETAILS

ITEM	
Terminals	11 & 12
Name	SSV1
Type	Powered solenoid output with configurable PWM

4.4.2 INTENDED FIELD DEVICE CONNECTIONS

FIELD DEVICE	CONFIGURATION REQUIREMENTS	CONNECTION DIAGRAMS
Connection to normally closed main gas shutoff valve – Peak and hold	4 – SYSTEM SETUP > SSV PWM = per valve manufacturer recommendations	Solenoid Output – 12V/24V
Connection to normally closed main gas shutoff valve – Constant current	4 – SYSTEM SETUP > SSV PWM = 100%	Solenoid Output – 12V/24V

4.4.3 SYSTEM BEHAVIOR

SYSTEM STATE	SSV1 OUTPUT
POWER ON	De-energized
LOCKOUT	De-energized
ALARM	De-energized
READY	De-energized
WAITING	De-energized
MANUAL IGNITION	De-energized
PILOT LIGHT OFF	De-energized
PILOT	De-energized
MAIN LIGHT OFF	Energized
MAIN	Energized

4.5 SSV2 MAIN VALVE OUTPUT

4.5.1 DETAILS

ITEM	
Terminals	13 & 14
Name	SSV2
Type	Powered solenoid output with configurable PWM

4.5.2 INTENDED FIELD DEVICE CONNECTIONS

FIELD DEVICE	CONFIGURATION REQUIREMENTS	CONNECTION DIAGRAMS
Connection to normally closed main gas shutoff valve – Peak and hold	4 – SYSTEM SETUP > SSV PWM = per valve manufacturer recommendations	Solenoid Output – 12V/24V
Connection to normally closed main gas shutoff valve – Constant current	4 – SYSTEM SETUP > SSV PWM = 100%	Solenoid Output – 12V/24V

4.5.3 SYSTEM BEHAVIOR

SYSTEM STATE	SSV2 OUTPUT
POWER ON	De-energized
LOCKOUT	De-energized
ALARM	De-energized
READY	De-energized
WAITING	De-energized
MANUAL IGNITION	De-energized
PILOT LIGHT OFF	De-energized
PILOT	De-energized
MAIN LIGHT OFF	Energized
MAIN	Energized

4.6 STATUS

4.6.1 DETAILS

ITEM	
Terminals	15 & 17
Name	STATUS
Type	N.O. dry contact

4.6.2 INTENDED FIELD DEVICE CONNECTIONS

FIELD DEVICE	CONFIGURATION REQUIREMENTS	CONNECTION DIAGRAMS
Connection to site equipment status panel	4 – SYSTEM SETUP > Status Contact Mode = Run Status	Run Status – External DC Source Run Status – FIS Power
Connection to tank pump motor enable via relay	4 – SYSTEM SETUP > Status Contact Mode = Level Control	Run Status – Pump Control

4.6.3 STATUS CONTACT BEHAVIOR

		LEVEL CONTROL MODE	
SYSTEM STATE	RUN STATUS MODE	LEVEL INPUT BELOW LEVEL CONTROL SETPOINT	LEVEL INPUT ABOVE LEVEL CONTROL SETPOINT
POWER ON	OPEN	CLOSED	OPEN
LOCKOUT	OPEN	CLOSED	OPEN
ALARM	OPEN	CLOSED	OPEN
READY	OPEN	CLOSED	OPEN
WAITING	CLOSED	CLOSED	OPEN
MANUAL IGNITION	CLOSED	CLOSED	OPEN
PILOT LIGHT OFF	CLOSED	CLOSED	OPEN
PILOT	CLOSED	CLOSED	OPEN
MAIN LIGHT OFF	CLOSED	CLOSED	OPEN
MAIN	CLOSED	CLOSED	OPEN

4.7 POWER INPUT

4.7.1 DETAILS

ITEM	
Terminals	18 - 22
Name	VIN
Type	12/24V Power Input

4.7.2 INTENDED FIELD DEVICE CONNECTIONS

FIELD DEVICE	CONFIGURATION REQUIREMENTS	CONNECTION DIAGRAMS
Power input connection from 12V Class 2 Power Supply	4 – SYSTEM SETUP > Input Voltage = 12V	Power Input Wiring
Power input connection from 24V Class 2 Power Supply	4 – SYSTEM SETUP > Input Voltage = 24V	Power Input Wiring

4.7.3 SYSTEM BEHAVIOR – 12V MODE

SCENARIO			
SYSTEM VOLTAGE	VOLTAGE RESTART SETTING	STATE TRANSITION IF RUNNING	ALERTS
BELOW 9.5V	Enabled	Waiting	Low Voltage Wait
	Disabled	Lockout	Low Voltage Alarm
BETWEEN 9.5V AND 10.2V	Any	No effect	Low Voltage Warning
BETWEEN 10.2V AND 16.2V	Any	No effect	N/A
BETWEEN 16.2V AND 16.8V	Any	No effect	High Voltage Warning
ABOVE 16.8V	Enabled	Waiting	High Voltage Wait
	Disabled	Lockout	High Voltage Alarm

4.7.4 SYSTEM BEHAVIOR – 24V MODE

SCENARIO			
SYSTEM VOLTAGE	VOLTAGE RESTART	STATE TRANSITION IF RUNNING	ALERTS
BELOW 19.0V	Enabled	Waiting	Low Voltage Wait
	Disabled	Lockout	Low Voltage Alarm
BETWEEN 19.0V AND 20.4V	Any	No effect	Low Voltage Warning
BETWEEN 20.4V AND 32.4V	Any	No effect	N/A
BETWEEN 32.4V AND 33.6V	Any	No effect	High Voltage Warning
ABOVE 33.6V	Enabled	Waiting	High Voltage Wait
	Disabled	Lockout	High Voltage Alarm

4.8 ESD INPUT

4.8.1 DETAILS

ITEM	
Terminals	23 & 24
Name	ESD
Type	Digital input

4.8.2 INTENDED FIELD DEVICE CONNECTIONS

FIELD DEVICE	CONFIGURATION REQUIREMENTS	CONNECTION DIAGRAMS
Connection to external emergency stop push button or PLC	N/A	Digital Input – Dry Contact Digital Input – Wet Contact

4.8.3 SYSTEM BEHAVIOR

ESD INPUT STATE	STATE TRANSITION IF RUNNING	STATE TRANSITION IF STOPPED	ALERTS
DE-ENERGIZED	Lockout	Alarm	ESD Input Open Alarm
ENERGIZED	No effect	No effect	N/A

4.9 START INPUT

4.9.1 DETAILS

ITEM	
Terminals	25 & 26
Name	START
Type	Digital input

4.9.2 INTENDED FIELD DEVICE CONNECTIONS

FIELD DEVICE	CONFIGURATION REQUIREMENTS	CONNECTION DIAGRAMS
Connection to digital start switch or PLC	6 – INPUTS > Start Input = Enabled	Digital Input – Dry Contact Digital Input – Wet Contact

4.9.3 SYSTEM BEHAVIOR

	EVENT			
CONFIGURATION DETAILS	INITIAL SYSTEM STATE	START INPUT STATE	STATE TRANSITION	ALERTS
REMOTE START: ENABLED	Any	Energized	No effect	N/A
	Any Stopped	De-energized	No effect	Start Input Open Wait
	Any Running	De-energized	Waiting	Start Input Open Wait
	Lockout	Energized to de-energized to energized[1]	Ready/Alarm[2]	N/A
	Ready	Energized to de-energized to energized[1]	Startup	N/A
REMOTE START: DISABLED	Any	Any	No effect	N/A

[1]The system registers a double-action Start Input toggle only when it transitions from energized to de-energized to energized within 30 seconds.

[2]The Start Input can be used to acknowledge a lockout message only when the system has performed fewer than 5 remote lockout acknowledgements (i.e., lockout acknowledgements initiated via Modbus or Start Input) within the last 15 minutes. A further attempt to acknowledge a lockout message using the Start Input will be rejected unless it is initiated after the 15-minute window elapses. Lockout messages can always be acknowledged locally using the Ok button.

4.10 TEMPERATURE INPUTS

4.10.1 DETAILS

ITEM	
Terminals & Names	27 & 28: AUX TEMP 29 & 30: PILOT TEMP 31 & 32: MAIN TEMP
Type	Type K thermocouple input

4.10.2 INTENDED FIELD DEVICE CONNECTIONS

INPUT	FIELD DEVICE	CONFIGURATION REQUIREMENTS	CONNECTION DIAGRAMS
PILOT TEMP	Connection to thermocouple for pilot flame detection.	5 - CONTROL SETUP > Pilot Temp Mode = Flame Detect	Temperature Input - Single Type K Thermocouple
	Connection to thermocouple for high temperature shutdown only.	5 - CONTROL SETUP > Pilot Temp Mode = High Temp ESD	
	Connection to thermocouple for display only.	5 - CONTROL SETUP > Pilot Temp Mode = Display Only	
MAIN TEMP	Connection to thermocouple for main flame detection.	5 - CONTROL SETUP > Main Temp Mode = Flame Detect	
	Connection to thermocouple for high temperature shutdown only.	5 - CONTROL SETUP > Main Temp Mode = High Temp ESD	
	Connection to thermocouple for display only.	5 - CONTROL SETUP > Main Temp Mode = Display Only	
	Unused	5 - CONTROL SETUP > Main Temp Mode = Disabled	
AUX TEMP	Connection to thermocouple for pilot flame detection.	5 - CONTROL SETUP > Aux Temp Mode = Pilot Detect	
	Connection to thermocouple for main flame detection.	5 - CONTROL SETUP > Aux Temp Mode = Main Detect	
	Connection to thermocouple for high temperature shutdown only.	5 - CONTROL SETUP > Aux Temp Mode = High Temp ESD	
	Connection to thermocouple for display only.	5 - CONTROL SETUP > Aux Temp Mode = Display Only	
	Unused	5 - CONTROL SETUP > Aux Temp Mode = Disabled	

4.11 PRESSURE INPUT

4.11.1 DETAILS

ITEM	
Terminals	33 & 34
Name	PRESSURE
Type	Configurable digital or 4-20mA input

4.11.2 INTENDED FIELD DEVICE CONNECTIONS

FIELD DEVICE	CONFIGURATION REQUIREMENTS	CONNECTION DIAGRAMS
Digital low-pressure switch	6 – INPUTS > Pressure Type = Digital	Digital Input – Dry Contact Digital Input – Wet Contact
Digital high-pressure switch	Not supported	N/A
4-20mA pressure transmitter	6 – INPUTS > Pressure Type = 4-20	Analog Input – Loop Powered 4-20mA Transmitter Analog Input – Self Powered 4-20mA Transmitter

4.11.3 SYSTEM BEHAVIOR

		SCENARIO			
CONFIGURATION DETAILS		PRESSURE INPUT STATE	SSV OUTPUT STATE	STATE TRANSITION IF RUNNING	ALERTS
TYPE: DIGITAL	Low Pressure Mode: Alarm	De-energized	Any	Lockout	Low Pressure Alarm
	Low Pressure Mode: Wait	De-energized	Any	Waiting	Low Pressure Wait
	Low Pressure Mode: Warning	De-energized	Any	No effect	Low Pressure Warning
	Low Pressure Mode: Main Permissive	De-energized	Any	Pilot [1]	Low Pressure Main Permissive
	Any	Energized	Any	No effect	N/A
TYPE: 4-20	Any	Out of Range	Any	Lockout	Pressure Invalid Alarm
	Any	High Trip	De-energized	No effect	High Pressure Warning
	Any	High Trip	Energized	Lockout	High Pressure Alarm
	Low Pressure Mode: Alarm	Low Trip	Any	Lockout	Low Pressure Alarm
	Low Pressure Mode: Wait	Low Trip	Any	Waiting	Low Pressure Wait
	Low Pressure Mode: Warning	Low Trip	Any	No effect	Low Pressure Warning
	Low Pressure Mode: Main Permissive	Low Trip	Any	Pilot [1]	Low Pressure Main Permissive

[1] *No effect if running in the Waiting state*

4.12 HIGH PRESSURE INPUT

4.12.1 DETAILS

ITEM	
Terminals	35 & 36
Name	HIGH PRESSURE
Type	Digital input

4.12.2 INTENDED FIELD DEVICE CONNECTIONS

FIELD DEVICE	CONFIGURATION REQUIREMENTS	CONNECTION DIAGRAMS
High-pressure switch	6 – INPUTS > High Pressure = Enabled	Digital Input – Dry Contact Digital Input – Wet Contact

4.12.3 SYSTEM BEHAVIOR

CONFIGURATION DETAILS	PRESSURE HIGH INPUT STATE	STATE TRANSITION IF RUNNING	ALERTS
PRESSURE HIGH: ENABLED	De-energized	Lockout	High Pressure Alarm
	Energized	No effect	N/A
PRESSURE HIGH: DISABLED	Any	No effect	N/A

4.13 LEVEL INPUT

4.13.1 DETAILS

ITEM	
Terminals	37 & 38
Name	LEVEL
Type	Configurable digital or 4-20mA input

4.13.2 INTENDED FIELD DEVICE CONNECTIONS

FIELD DEVICE	CONFIGURATION REQUIREMENTS	CONNECTION DIAGRAMS
Level switch	6 – INPUTS > Level Type = Digital	Digital Input – Dry Contact Digital Input – Wet Contact
4-20mA level transmitter	6 – INPUTS > Level Type = 4-20	Analog Input – Loop Powered 4-20mA Transmitter Analog Input – Self Powered 4-20mA Transmitter

4.13.3 SYSTEM BEHAVIOR

CONFIGURATION DETAILS		LEVEL INPUT STATE	STATE TRANSITION IF RUNNING	ALERTS
TYPE: DIGITAL	Digital Mode: Alarm	De-energized	Lockout	Low Level Alarm
	Digital Mode: Wait	De-energized	Waiting	Low Level Wait
	Digital Mode: Any	Energized	No effect	N/A
TYPE: 4-20	Any	Out of Range	Lockout	Level Invalid Alarm
	High Trip Mode: Alarm	High	Lockout	High Level Alarm
	High Trip Mode: Wait	High	Waiting	High Level Wait
	Low Trip Mode: Alarm	Low	Lockout	Low Level Alarm
	Low Trip Mode: Wait	Low	Waiting	Low Level Wait
	Any	Valid Range	No effect	N/A

4.14 IONIZATION FLAME DETECTION

4.14.1 DETAILS

ITEM	
Terminals	39 & 40
Name	ION
Type	Ionization flame detection signal

4.14.2 INTENDED FIELD DEVICE CONNECTIONS

FIELD DEVICE	CONFIGURATION REQUIREMENTS	CONNECTION DIAGRAMS
Connection to Profire ignition coil or pilot flame detection rod per application.	5 - CONTROL SETUP > Ionization Mode = Pilot Only	Single Rod Ignition Wiring Dual Rod Ignition Wiring
Connection to pilot/main flame detection rod	5 - CONTROL SETUP > Ionization Mode = Pilot and Main	Single Rod Ignition Wiring Dual Rod Ignition Wiring
Unused	Disabled	N/A

4.15 IGNITION OUTPUT

4.15.1 DETAILS

ITEM	
Terminals	41 & 42
Name	IGNITION
Type	Powered ignition output

4.15.2 INTENDED FIELD DEVICE CONNECTIONS

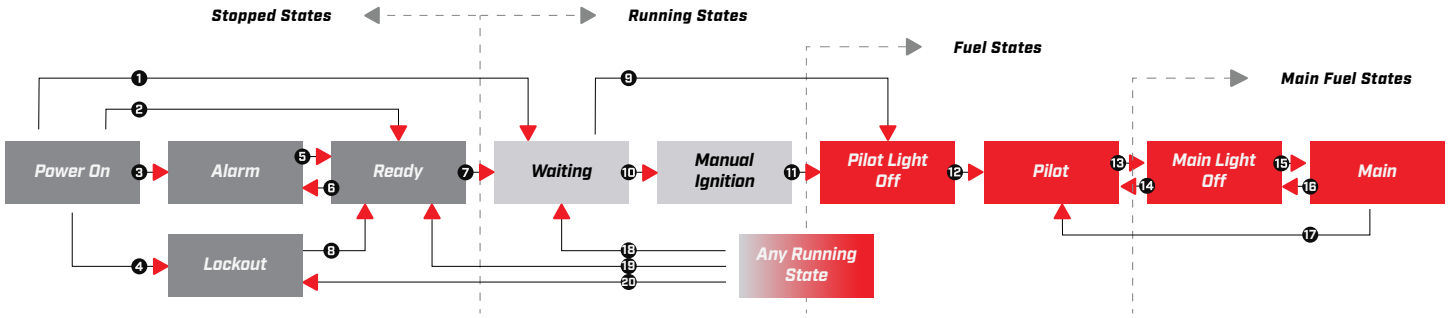
FIELD DEVICE	CONFIGURATION REQUIREMENTS	CONNECTION DIAGRAMS
Connection to Profire ignition coil.	4 - SYSTEM SETUP > Ignition Mode = Coil	Single Rod Ignition Wiring Dual Rod Ignition Wiring
Connection to high energy igniter	4 - SYSTEM SETUP > Ignition Mode = HEI	Single Rod Ignition Wiring Dual Rod Ignition Wiring

4.15.3 SYSTEM BEHAVIOR - COIL OUTPUT

IGNITION OUTPUT				
	SPARK MODE = CONTINUOUS	SPARK MODE = REIGNITION		SPARK MODE = UNTIL FLAME
		NO PILOT FLAME DETECTED	PILOT FLAME DETECTED	
POWER ON	De-energized	De-energized	De-energized	De-energized
LOCKOUT	De-energized	De-energized	De-energized	De-energized
ALARM	De-energized	De-energized	De-energized	De-energized
READY	De-energized	De-energized	De-energized	De-energized
WAITING	De-energized	De-energized	De-energized	De-energized
MANUAL IGNITION	Active	Active	Active	Active
PILOT LIGHT OFF	Active	Active	Active	Active
PILOT	Active	Active	De-energized	De-energized
MAIN LIGHT OFF	Active	Active	De-energized	De-energized
MAIN	Active	Active	De-energized	De-energized

5 OPERATING SEQUENCE

The PF2150-F uses a state-based control scheme to safely control a heating appliance. Each system state has specific entry and exit requirements and output behavior as indicated below



	SAFETY OUTPUTS			
STATE NAME	**COIL**	**PILOT**	**SSV 1**	**SSV 2**
Power On	De-energized	De-energized	De-energized	De-energized
Lockout	De-energized	De-energized	De-energized	De-energized
Alarm	De-energized	De-energized	De-energized	De-energized
Ready	De-energized	De-energized	De-energized	De-energized
Waiting	De-energized	De-energized	De-energized	De-energized
Manual Ignition	Energized	De-energized	De-energized	De-energized
Pilot Light Offf	Energized	Energized	De-energized	De-energized
Pilot	De-energized[1]	Energized	De-energized	De-energized
Main Light Off	De-energized[1]	Energized	Energized	Energized
Main	De-energized[1]	Energized[2]	Energized	Energized

1. Energized when Spark Mode is set to Reigniton with no pilot flame present or Spark Mode is set to Continuous.
2. De-energized when Pilot Off Mode is enabled

	FROM	TO	DESCRIPTION	APPLICABLE MODE
1	Power On	Waiting	System was running at last power down	Auto and Manual
2	Power On	Ready	No alarms present upon power up	Auto and Manual
3	Power On	Alarm	Alarm present upon power up	Auto and Manual
4	Power On	Lockout	Lockout present at last power down	Auto and Manual
5	Alarm	Ready	No alarms present	Auto and Manual
6	Ready	Alarm	Alarm present	Auto and Manual
7	Ready	Waiting	Modbus start command received	Auto and Manual
			Start Input toggled	Auto and Manual
			MODE button then OK button pressed	Auto only
			IGNITE button then OK button pressed	Manual only

(continued on next page)

	FROM	TO	DESCRIPTION	APPLICABLE MODE
8	Lockout	Ready	OK button pressed	Auto and Manual
			Start Input toggled	Auto and Manual
			Modbus acknowledgement command received	Auto and Manual
9	Waiting	Pilot Light Off	No waits present	Auto only
10	Waiting	Manual Ignition	No waits present	Manual only
11	Manual Ignition	Pilot Light Off	MODE button pressed	Manual only
			PILOT button pressed	Manual only
12	Pilot Light Off	Pilot	Pilot flame detected	Manual only
13	Pilot	Main Light Off	Pilot Startup Delay Time has elapsed	Auto only
			MAIN button pressed	Manual only
14	Main Light Off	Pilot	MAIN button pressed	Manual only
			Main permissive present	Auto and Manual
15	Main Light Off	Main	Main flame detected	Auto and Manual
			Main flame detected and PILOT button pressed	Manual only
16	Main	Main Light Off	Pilot Off Mode disabled	Manual only
			Pilot Off Mode enabled and PILOT button pressed	Manual only
17	Main	Pilot	Main flame loss with Pilot Off Mode disabled	Auto only
			Main permissive present	Auto and Manual
18	Manual Ignition	Waiting	N/A	N/A
	Pilot Light Off	Waiting	Wait present	Auto Only
	Pilot	Waiting	Wait present	Auto Only
	Main Light Off	Main Light Off	Pilot flame fail with Auto Relight enabled	Auto Only
	Main Light Off	Waiting	Wait present	Auto Only
19	Manual Ignition	Ready	Wait present	Manual only
	Pilot Light Off	Ready	60s elapsed	Manual only
	Pilot Light Off	Ready	PILOT button pressed	Manual only
	Pilot	Ready	Flame Establishment Time elapsed	Manual only
	Pilot	Ready	PILOT button pressed	Manual only
	Main Light Off	Ready	PILOT button pressed and Pilot Off Mode disabled	Manual only
20	Manual Ignition	Lockout	Alarm present	Manual only
			STOP button pressed	Manual only
			Modbus stop command received	Manual only
	Pilot Light Off		Alarm present	Auto and Manual
			STOP button pressed	Auto and Manual
			Modbus stop command received	Auto and Manual
			Flame Establishment Time elapsed	Auto only
	Pilot	Lockout	Alarm present	Auto and Manual
			STOP button pressed	Auto and Manual
			Modbus stop command received	Auto and Manual
			Pilot flame fail with Auto Relight disabled	Auto only
			Pilot flame fail	Manual only
	Main Light Off	Lockout	Alarm present	Auto and Manual
			STOP button pressed	Auto and Manual
			Modbus stop command received	Auto and Manual
			Pilot flame fail with Auto Relight disabled	Auto only
			Pilot flame fail	Manual only
	Main	Lockout	Alarm present	Auto and Manual
			STOP button pressed	Auto and Manual
			Modbus stop command received	Auto and Manual
			Main flame fail with Auto Relight disabled	Auto only
			Main flame fail	Manual only

6 INSTALLATION

Warning:
Failure to provide a low-impedance path from the burner assembly to the PF2150-F may result in electric shock, product damage, failure to ignite the pilot, or failure to detect flame.

Installers and commissioners of the PF2150-F system must:

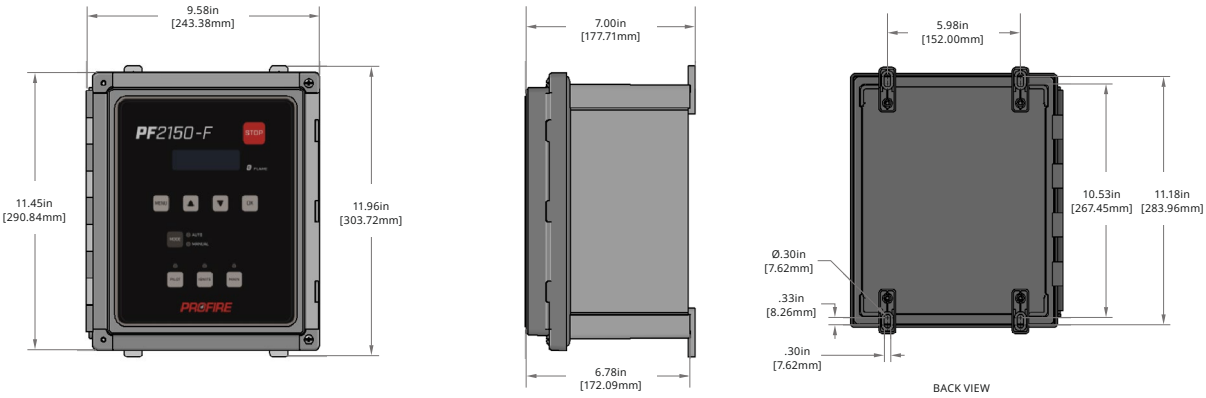
- Understand local codes and how they apply to the installation (for both electrical and mechanical aspects of the installation).
- Understand the electrical and mechanical limitations of the product and how that relates to the installation.
- Understand the safety and operational effects of modifying system settings or wiring.
- Verify all required safety functions prior to completing the commissioning of the appliance.
- Be fluent in the English language (the only language this product supports).
- Be familiar with navigating the product menus and modifying settings.

6.1 MOUNTING CONSIDERATIONS

The enclosure should be mounted:

- Upright in such a way that the screen is clearly visible and the keypad is easy to access. Recommended mounting height is 1.5m (5ft) above ground.
- Near to the appliance being controlled in order to minimize cable run lengths to the valve train (solenoids), burner assembly (ignition coil and flame rod) and thermocouple elements.
- In such a way as to avoid direct sunlight exposure on the screen. Extended UV exposure may compromise viewability.
- Such that the enclosure door can be fully opened during maintenance and commissioning.

6.1.1 PF2150-F ENCLOSURE DIMENSIONS



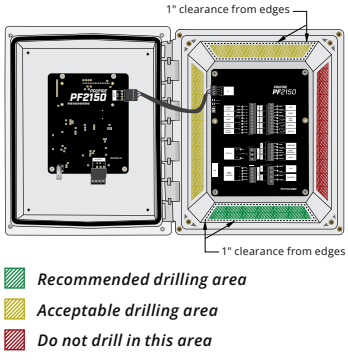
6.1.2 CONDUIT ENTRIES

Conduit entries should be drilled in the bottom of the enclosure while maintaining all of the following:

- 1" clearance from edges
- 2" maximum hole size
- 1/2" minimum hole spacing

All fittings must be Type 4X rated to maintain product Type rating.

Note: The FIS Card should be removed from the enclosure while drilling conduit entries.



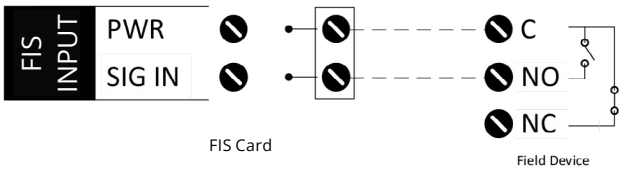
6.2 CONNECTION DIAGRAMS

Caution:
Electrical devices connected to the controller must meet local electrical codes and be within the voltage limits specified in this manual.

Caution:
All field wiring must be properly fused and sized in accordance with local codes.

Caution:
Wires must be installed such that the connection does not rely on the structural integrity of the wire insulation, and that no more than one conductor is terminated in a single terminal.

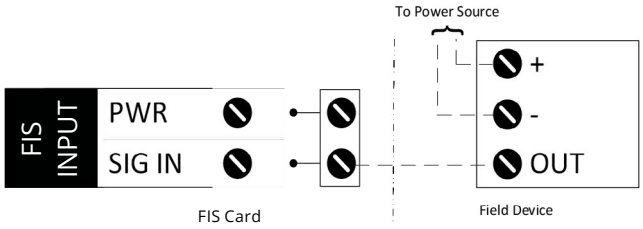
6.2.1 DIGITAL INPUT - DRY CONTACT



Installation Notes:

1. The FIS uses energized-to-run logic for all digital inputs.
2. PWR terminal output matches system voltage input up to 13.5V.

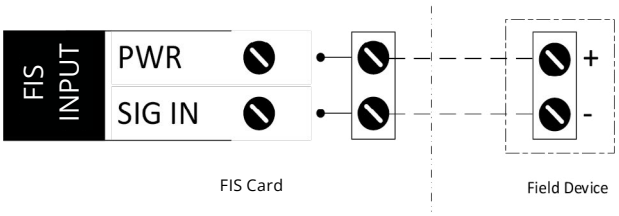
6.2.2 DIGITAL INPUT - WET CONTACT



Installation Notes:

1. The FIS uses energized-to-run logic for all digital inputs.
2. External power source must be Earth grounded.
3. External power source must be referenced about FIS card terminal 18 (VIN-) such that the supplied voltage (1) does not exceed 30V_{DC} with reference to VIN-, and (2) does not drop below -0.5V with reference to VIN-.

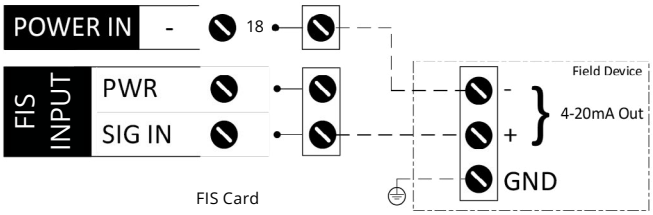
6.2.3 ANALOG INPUT - LOOP POWERED 4-20mA TRANSMITTER



Installation Notes:

1. PWR terminal output matches system voltage input up to 13.5V.
2. Use the following formula to determine the required minimum transmitter operating voltage: $V_{OUT} - V_{DROP}$
   Where V_{OUT} matches system input voltage (VIN) up to a maximum of 13.5V (i.e., VIN = 12V → V_{OUT} = 12V and VIN = 24V → V_{OUT} = 13.5V) and V_{DROP} is the voltage drop at 20mA specified for terminals 34 and 38 in the ratings table of Section 2.7.

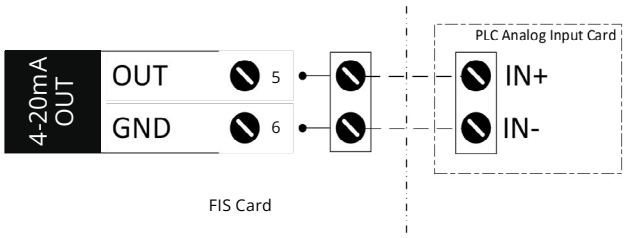
6.2.4 ANALOG INPUT – SELF POWERED 4-20mA TRANSMITTER



Installation Notes:

1. Field Device must be Earth grounded.
2. Power source must be referenced about FIS card terminal 18 (VIN-) such that the supplied voltage (1) does not exceed $30V_{DC}$ with reference to VIN–, and (2) does not drop below -0.5V with reference to VIN-.

6.2.5 4-20MA OUTPUT WIRING – SIGNAL ECHO



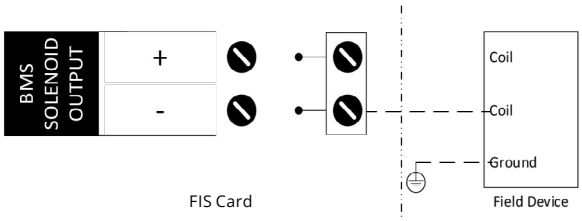
Installation Notes:

1. 4-20mA Input IN – terminal must be run back to FIS Input GND terminal 6 (Local ground) to ensure proper output functionality.

6.2.7 SOLENOID OUTPUT – 12V/24V

Caution:
Do not connect solenoid device minus (-) terminals to ground, as the FIS solenoid output minus (-) terminals are not grounded.

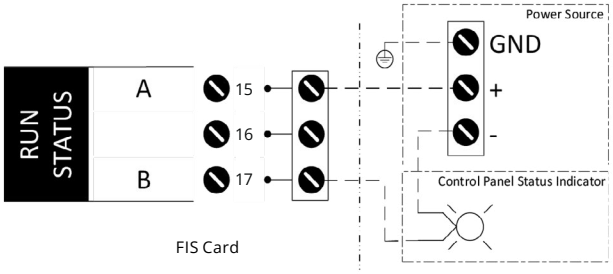
Caution:
Do not jumper solenoid minus terminals together under any circumstance, as this will compromise the safety integrity of the system.



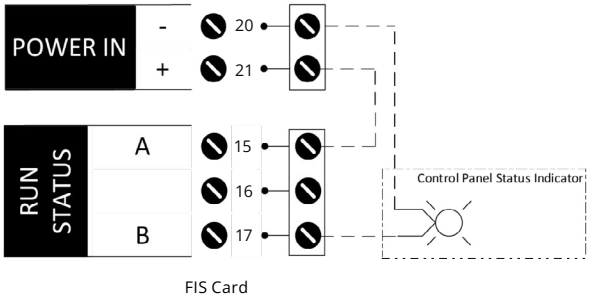
Installation Notes:

1. Solenoid powered outputs are rated to 5A max individually, however care must be taken when using multiple high-powered solenoid so as to not exceed the 8.3A maximum current rating for the product as a whole.
2. Solenoid valve outputs are assumed to be in safe state when de-energized. Normally closed valves must be used such that gas-flow to the burner is stopped when the output is in the de-energized state. Solenoid valve outputs can also be connected to normally open bleed valves when utilizing a double block and bleed configuration.

6.2.8 RUN STATUS – EXTERNAL DC SOURCE

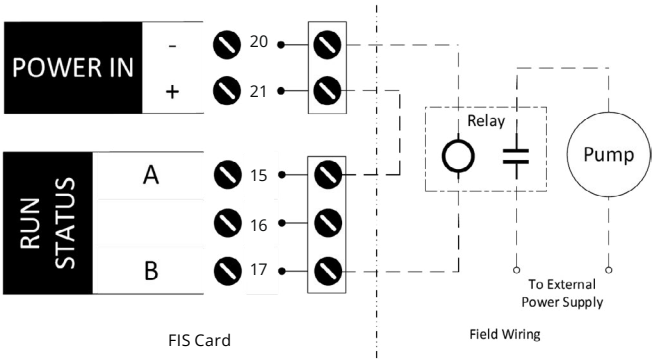


6.2.9 RUN STATUS – FIS POWER



6.2.10 RUN STATUS – PUMP CONTROL

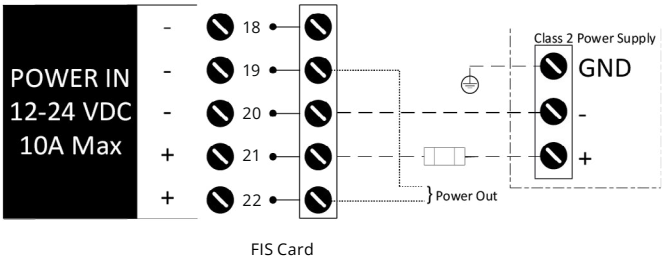
Warning:
120VAC wiring should be installed by a qualified electrician.



Installation Notes:

1. A relay must be used to isolate the Run Status contact from high-transient currents associated with motors and pumps.

6.2.11 POWER INPUT WIRING

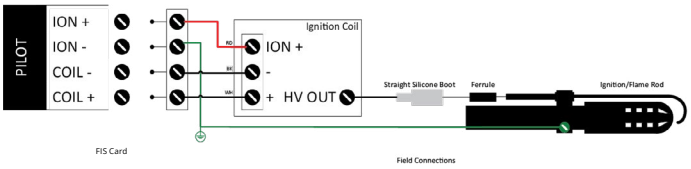


Installation Notes:

1. The PF2150 must be powered from a Class 2 power supply as defined in the Canadian Electrical Code (CSA 22.2 No 1-15) or US National Electrical Code (NFPA 70).

6.2.12 SINGLE ROD IGNITION WIRING

Warning:
Failure to provide a low-impedance path from the burner assembly to the PF2150-F may result in electric shock, product damage, failure to ignite the pilot, or failure to detect flame.

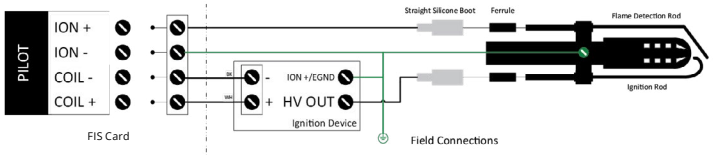


Installation Notes:

1. The wire length between the ignition coil and pilot should be no more than 5m (15ft).
2. For long run lengths of ION+, the connection should be made with 7mm ignition wire to help minimize ground-loading of the flame signal.

6.2.13 DUAL ROD IGNITION WIRING

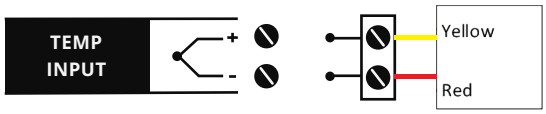
Warning:
Failure to provide a low-impedance path from the burner assembly to the PF2150-F may result in electric shock, product damage, failure to ignite the pilot, or failure to detect flame.



Installation Notes:

1. The wire length between the ignition coil and pilot should be no more than 5m (15ft).
2. For long run lengths of ION+, the connection should be made with 7mm ignition wire to help minimize ground-loading of the flame signal.

6.2.14 TEMPERATURE INPUT – SINGLE TYPE K THERMOCOUPLE

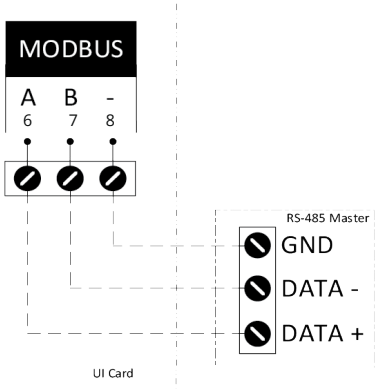


FIS Card

Installation Notes:

1. Thermocouple must be grounded or ungrounded Type K.
2. Thermocouple wire run lengths should be minimized where possible.
3. Thermocouple wires should not be run in the same conduit as high-noise signals (e.g. valve wires, motor wires, etc.)

6.2.15 MODBUS INPUT WIRING



Installation Notes:

1. Modbus wires should not be run in the same conduit as high-noise signals (e.g. valve wires, motor wires, etc.)

7 MAINTENANCE

Warning:
Do not modify any system wiring or handle the electronics while the system is powered.

Caution:
Do not disassemble or modify the cards in any way. The cards are not field reparable and must be sent back to Profire for replacement if damaged.

Caution:
The enclosure door must be securely closed after opening. Improper closure may result in moisture or other environmental damage and may compromise the integrity of the product.

7.1 TOOLS REQUIRED

The following tools are required for maintenance and commissioning:

- Large flat-head or #2 Phillips screwdriver to open and close enclosure.
- 2.5mm and 3.5mm terminal block screwdrivers for securing wiring to card terminal blocks.
- #2 Phillips screwdriver for FIS card mounting.
- 10-32 nut driver for UI card mounting.
- Digital multimeter or process calibrator for troubleshooting.

7.2 RECOMMENDED MAINTENANCE PROCEDURES

A comprehensive plan for routine maintenance should be developed in accordance with local safety codes, application requirements and manufacturer recommendations for all equipment used. The maintenance plan should include, but not be limited to the following recommended maintenance procedures:

1. Check all wiring against site wiring diagram.
2. Check enclosures, boards and fittings for signs of wear and replace as needed.
3. Check for moisture in enclosures and replace or recharge desiccant as needed.
4. Verify functionality of all keypad buttons.
5. Verify UI screen display functionality.
6. Verify accuracy of all settings.
7. Verify card hardware and firmware versions are up to date and compatible.
8. Verify all instrumentation and fuel train components are functional and undamaged.
9. Verify all heater components are functional and undamaged.
10. Verify that all configured interlock trips result in appropriate alert annunciation.
11. Verify calibration of all 4-20mA input devices and temperature input devices
12. Back up all data log and event log files from the USB to an external storage system.

It is expected that the PF2150-F temperature and analog inputs are within the stated accuracy range for the lifetime of the product. Calibration and verification frequency is to be determined in accordance with the manufacturer recommendations for the connected end devices and the applicable local safety codes.

7.3 TRANSPORTATION AND STORAGE CONDITIONS

Transportation of the product shall be in the original product packaging or equivalent. Transportation of cards without enclosure is not recommended and should be done with the utmost care utilizing an Anti-Static/ESD bag.

Storage temperature should be kept within rated operating temperature in a dry area. Avoid moisture buildup inside the enclosure.

7.4 REPAIR AND REPLACEMENT

Profire does not support on-site repairs for cards. For replacement cards contact Profire customer service.

In the event replacement card(s) are used, care must be taken to ensure proper firmware is loaded on both the User Interface and FIS cards. If the User Interface and FIS cards have different software bundles loaded on them, the system will fail to operate correctly and will require a firmware update to match.

FIS cards must be securely fastened into the back of the enclosure with four #10-32 machine screws.

7.5 DECOMMISSIONING

When decommissioning the system, the appliance should be safely shut down (i.e. all safety outputs are turned off and there are no gas leaks on site). Once the appliance is in a safe state, the power should be disconnected from the PF2150-F. All cards should be treated like any other piece of electronics (e.g. be sent to a recycling depot).

7.6 USEFUL LIFE

The useful life of the PF2150-F is 10 years. Prior to the expiry of that period the customer should contact Profire for a suitable replacement.

7.7 MANUFACTURER NOTIFICATION

Any detected failures that compromise the functional safety of the system must be reported to Profire customer service immediately.

8 ALERT CODES & RESPONSE TIMES

The following section lists all alerts that can be annunciated on-screen as well as a brief description of each. Alerts are classified as either alarms, waits, main permissives or warnings and affect system behavior as follows:

- An active alarm prevents the system from being started.
- An active wait prevents the system from energizing fuel valve outputs.
- An active main permissive prevents the system from energizing main-fuel valve outputs.
- An active warning has no effect on system behavior

8.1 ALARMS

ID	NAME	ALARM CONDITION	SET
AL001	POC INPUT OPEN	POC Input is de-energized when SSV1/SSV2 Output are de-energized.	2 s
AL002	ESD INPUT OPEN	ESD Input is de-energized	1 s
AL003	PRESSURE INVALID	4-20 Mode: Pressure Input signal is less than or equal to 3mA or greater than or equal to 20mA. Digital Mode: Pressure Input current is below -0.5mA or above 10mA.	1 s
AL004	LOW PRESSURE	Low Pressure Mode is configured as Alarm and one of the following: 4-20 Mode: Pressure Input signal is less than or equal to configured Pressure Low Trip setting. Digital Mode: Pressure Input in de-energized.	Low Pressure Delay Setting
AL005	4-20 HIGH PRESS	4-20 Mode: Pressure Input signal is greater than or equal to configured Pressure High Trip. setting when the system is in a main fuel state. Digital Mode: This alarm cannot be set.	2 s
AL006	HIGH PRESS OPEN	High Pressure Input is de-energized.	2 s
AL007	PRESSURE CONFIG	Pressure High Trip setting is too close to Pressure Low Trip setting, or Pressure Span Max setting is less than Pressure Span Min setting.	0 s
AL008	LEVEL INVALID	4-20 Mode: Level Input signal is less than or equal to 3mA or greater than or equal to 20mA. Digital Mode: Level Input current is below -0.5mA or above 10mA.	1 s
AL009	LOW LEVEL	4-20 Mode: Level Low Trip Mode is configured as Alarm and Level Input signal is less than or equal to configured Level Low Trip setting. Digital Mode: Level Digital Mode is configured as Alarm and Level Input in de-energized.	Level/Flow Delay Setting
AL010	HIGH LEVEL	4-20 Mode: Level High Trip Mode is configured as Alarm and Level Input signal is greater than or equal to configured Level High Trip setting. Digital Mode: This alarm cannot be set.	Level/Flow Delay Setting
AL011	LEVEL CONFIG	Level High Trip setting is too close to Level Low Trip setting, or Level Span Max setting is less than Level Span Min setting.	0 s
AL012	HIGH PILOT TEMP	Pilot Temp is greater than or equal to configured Pilot Temp High Temp ESD setting.	6 s
AL013	HIGH MAIN TEMP	Main Temp is greater than or equal to configured Main Temp High Temp ESD setting.	6 s
AL014	HIGH AUX TEMP	Aux Temp is greater than or equal to configured Aux Temp High Temp ESD setting.	6 s
AL015	PILOT TEMP OPEN	Pilot Temp Input is open-circuited.	6 s
AL016	PILOTTEMPINVALID	Pilot Temp Input temperature is below -100°C (-148°F) or above 1350°C (2462°F).	6 s
AL017	PILOT TEMP STALE	Hardware fault - contact Profire.	6 s
AL018	MAIN TEMP OPEN	Main Temp Input is open-circuited.	6 s
AL019	MAINTEMPINVALID	Main Temp Input temperature is below -100°C (-148°F) or above 1350°C (2462°F).	6 s
AL020	MAIN TEMP STALE	Hardware fault - contact Profire.	6 s
AL021	AUX TEMP OPEN	Aux Temp Input is open-circuited.	6 s
AL022	AUX TEMP INVALID	Aux Temp Input temperature is below -100°C (-148°F) or above 1350°C (2462°F).	6 s
AL023	AUX TEMP STALE	Hardware fault - contact Profire.	6 s
AL024	PILOTTEMP CONFIG	Flame Detect Mode: Configured Pilot Temp Flame Detect Setpoint is too close to Pilot Temp Low Temp Setpoint High Temp ESD Mode: Configured Pilot Temp High Temp ESD Setpoint is too close to Pilot Temp Low Temp Setpoint	0 s
AL025	MAIN TEMP CONFIG	Flame Detect Mode: Configured Main Temp Flame Detect Setpoint is too close to Main Temp Low Temp Setpoint High Temp ESD Mode: Configured Main Temp High Temp ESD Setpoint is too close to Main Temp Low Temp Setpoint	0 s
AL026	AUX TEMP CONFIG	Flame Detect Mode: Configured Aux Temp Flame Detect Setpoint is too close to Aux Temp Low Temp Setpoint High Temp ESD Mode: Configured Aux Temp High Temp ESD Setpoint is too close to Aux Temp Low Temp Setpoint	0 s
AL027	AMBIENT MISMATCH	Hardware fault - contact Profire.	6 s
AL028	AMBIENT1 INVALID	Hardware fault - contact Profire.	6 s
AL029	AMBIENT2 INVALID	Hardware fault - contact Profire.	6 s
AL030	ION FLAME FAIL	Pilot Detect = Any: Ionization Flame Input was the last flame detection input to detect flame absence. Pilot Detect = All: Ionization Flame Input was the first flame detection input to detect flame absence.	Flame Fail Lockout Time
AL031	PILOT FLAME FAIL	Pilot Detect = Any: Pilot Flame Input was the last flame detection input to detect flame absence. Pilot Detect = All: Pilot Flame Input was the first flame detection input to detect flame absence.	Flame Fail Lockout Time
AL032	MAIN FLAME FAIL	Main Detect = Any: Main Flame Input was the last flame detection input to detect flame absence. Main Detect = All: Main Flame Input was the first flame detection input to detect flame absence.	Flame Fail Lockout Time
AL033	AUX FLAME FAIL	Pilot/Main Detect = Any: Aux Flame Input was the last flame detection input to detect flame absence. Pilot/Main Detect = All: Aux Flame Input was the first flame detection input to detect flame absence.	Flame Fail Lockout Time
AL034	PILOT NEVER LIT	Pilot Light Off State elapsed with no pilot flame detected.	Pilot Flame Establishment Timeout

(continued on next page)

ID	NAME	ALARM CONDITION	SET
AL035	ION+ WIRING	Ionization Flame input signal is too low to reliably detect flame.	3 s
AL036	ADC1 START FAULT	Hardware fault - contact Profire.	2 s
AL037	ADC1 READ FAULT	Hardware fault - contact Profire.	2 s
AL038	ADC1 STOP FAULT	Hardware fault - contact Profire.	2 s
AL039	FLAME VOLTAGE	Hardware fault - contact Profire.	3 s
AL040	LOW VOLTAGE	Voltage Restart is disabled and system input voltage is too low.	2 s
AL041	HIGH VOLTAGE	Voltage Restart is disabled and system input voltage is too high.	2 s
AL042	ADC2 START FAULT	Hardware fault - contact Profire.	2 s
AL043	ADC2 READ FAULT	Hardware fault - contact Profire.	2 s
AL044	ADC2 STOP FAULT	Hardware fault - contact Profire.	2 s
AL045	XCOMPARE FAULT	Hardware fault - contact Profire.	2 s
AL046	USER STOP	System was stopped using Stop Button on the keypad or through a Stop Command received over Modbus.	0 s
AL047	SETTINGS CRC	Settings cannot be verified. Power cycle the FIS.	0 s
AL048	STATE MISMATCH	Hardware fault - contact Profire.	1 s
AL049	PRESSURE I2C	Hardware fault - contact Profire.	2 s
AL050	LEVEL I2C	Hardware fault - contact Profire.	2 s
AL051	ESD IO SHORT	Hardware fault - contact Profire.	5 s
AL052	START IO SHORT	Hardware fault - contact Profire.	5 s
AL053	PILOT IO SHORT	Hardware fault - contact Profire.	5 s
AL054	HIPRESS IO SHORT	Hardware fault - contact Profire.	5 s
AL055	VIN ADC IO SHORT	Hardware fault - contact Profire.	5 s
AL056	POC IO SHORT	Hardware fault - contact Profire.	5 s
AL057	FLASH READ FAULT	Hardware fault - contact Profire.	0 s
AL058	FLSH WRITE FAULT	Hardware fault - contact Profire.	0 s
AL059	DESCRIPTOR FAULT	Hardware fault - contact Profire.	0 s
AL060	DESCR MISMATCH	Hardware fault - contact Profire.	0 s
AL061	PILOT VOLTAGE	Hardware fault - contact Profire.	10 s
AL062	SSV1 VOLTAGE	Hardware fault - contact Profire.	10 s
AL063	SSV2 VOLTAGE	Hardware fault - contact Profire.	10 s
AL064	START INVALID	Negative voltage on SIG IN terminal; check wiring.	2 s
AL065	POC INVALID	Negative voltage on SIG IN terminal; check wiring.	2 s
AL066	ESD INVALID	Negative voltage on SIG IN terminal; check wiring.	2 s
AL067	HI PRESS INVALID	Negative voltage on SIG IN terminal; check wiring.	2 s
AL068	ADC3 START FAULT	Hardware fault - contact Profire.	2 s
AL069	ADC3 READ FAULT	Hardware fault - contact Profire.	2 s
AL070	ADC3 STOP FAULT	Hardware fault - contact Profire.	2 s
AL071	PROCESSOR RESET	Hardware fault - contact Profire.	0 s
AL072	CAL CRC FAILED	Hardware fault - contact Profire.	0 s
AL073	BROWNOUT INVALID	Hardware fault - contact Profire.	0 s
AL074	FLAME DC OPEN	Hardware fault - contact Profire.	3 s
AL075	FACTORY CAL DESC	Hardware fault - contact Profire.	0 s
AL076	SHUTDOWN FAILED	Hardware fault - contact Profire.	0 s
AL077	STATUS CONFIG	Run Status Level Control setting is outside Level Low and High Trip setpoints.	0 s
AL078	UI COMM LOSS	UI Comm Loss setting enabled: UI has lost communication with the FIS. UI Comm Loss setting disabled: Alarm cannot be set	10 s
AL079	STATUS CNFG 4-20	Run Status Mode is configured as Level Control but Level Type is not configured as 4-20.	0 s
AL080	MAIN FLAME REQ	Pilot Off Mode is enabled, but no main flame detection inputs are enabled.	0 s
AL081	ADD PILOT INPUT	There are fewer than 2 pilot flame detection inputs enabled.	0 s

8.2 WAITS

ID	NAME	WAIT CONDITION	SET
WT001	LOW VOLTAGE	Voltage Restart is enabled and system input voltage is too low.	2 s
WT002	HIGH VOLTAGE	Voltage Restart is enabled and system input voltage is too high.	2 s
WT003	LOW PRESSURE	Low Pressure Mode is configured as Wait and one of the following: 4-20 Mode: Pressure Input signal is less than or equal to configured Pressure Low Trip setting. Digital Mode: Pressure Input in de-energized.	Low Pressure Delay Setting
WT004	LOW LEVEL	4-20 Mode: Level Low Trip Mode is configured as Wait and Level Input signal is less than or equal to configured Level Low Trip setting. Digital Mode: Level Digital Mode is configured as Wait and Level Input in de-energized.	Level/Flow Delay Setting
WT005	HIGH LEVEL	4-20 Mode: Level High Trip Mode is configured as Wait and Level Input signal is greater than or equal to configured Level High Trip setting. Digital Mode: This alarm cannot be set.	Level/Flow Delay Setting
WT006	START INPUT OPEN	Start Input is de-energized.	1 s
WT007	HIGH AUX TEMP	Aux temperature is too high.	2 s
WT008	START CONTACT OPEN	Start Input is open.	1 s
WT009	PURGING	The system is purging. Note: The Proof of Closure Input must be energized (if enabled) in order for the purge timer to count down.	N/A

8.3 MAIN PERMISSIVES

ID	NAME	MAIN PERMISSIVE CONDITION	SET
MP001	LOW PRESSURE	Low Pressure Mode is configured as Main Permissive and one of the following: 4-20 Mode: Pressure Input signal is less than or equal to configured Pressure Low Trip setting. Digital Mode: Pressure Input in de-energized.	Low Pressure Delay Setting

8.4 WARNINGS

ID	NAME	WARNING CONDITION	SET
WN001	LOW VOLTAGE	System input voltage is approaching low voltage threshold.	2 s
WN002	HIGH VOLTAGE	System input voltage is approaching high voltage threshold.	2 s
WN003	LOW PILOT TEMP	Pilot Input temperature is below its configured Low Temp Setpoint setting.	2 s
WN004	LOW MAIN TEMP	Main Input temperature is below its configured Low Temp Setpoint setting.	2 s
WN005	LOW AUX TEMP	Aux Input temperature is below its configured Low Temp Setpoint setting.	2 s
WN006	HIGH PRESSURE	4-20 Mode: Pressure Input signal is greater than or equal to configured Pressure High Trip AND system is not in a main fuel state. Digital Mode: This alarm cannot be set.	2 s
WN007	POC STILL CLOSED	POC Input is energized while in a main fuel state.	10 s
WN008	UI/FIS MISMATCH	UI Card and FIS card are not running matching firmware. Perform firmware update.	0 s
WN009	FIS COMM LOSS	UI Card and FIS card have lost communication with each other. Check wiring.	0 s
WN010	HW DESC ERROR	Hardware fault - contact Profire.	0 s
WN011	PV DESC ERROR	Hardware fault - contact Profire.	0 s
WN012	FW DESC ERROR	Hardware fault - contact Profire.	0 s
WN013	BOOT DESC ERROR	Hardware fault - contact Profire.	0 s
WN014	UI DESC ERROR	Hardware fault - contact Profire.	0 s
WN015	PILOT TEMP OPEN	Pilot Temp Input is open-circuited and configured as Display Only.	6 s
WN016	PILOTTEMPINVALID	Pilot Temp Input is configured as Display Only and reading below -100°C (-148°F) or above 1350°C (2462°F).	6 s
WN017	PILOT TEMP STALE	Hardware fault - contact Profire.	6 s
WN018	MAIN TEMP OPEN	Main Temp Input is open-circuited and configured as Display Only.	6 s
WN019	MAINTEMP INVALID	Main Temp Input is configured as Display Only and reading below -100°C (-148°F) or above 1350°C (2462°F).	6 s
WN020	MAIN TEMP STALE	Hardware fault - contact Profire.	6 s
WN021	AUX TEMP OPEN	Aux Temp Input is open-circuited and configured as Display Only.	6 s
WN022	AUX TEMP INVALID	Aux Temp Input is configured as Display Only and reading below -100°C (-148°F) or above 1350°C (2462°F).	6 s
WN023	AUX TEMP STALE	Hardware fault - contact Profire.	6 s
WN024	420MAOUTPUTFAULT	Check 4-20mA Output wiring.	2 s
WN025	LOW PRESSURE	Low Pressure Mode is configured as Warning and one of the following: 4-20 Mode: Pressure Input signal is less than or equal to configured Pressure Low Trip setting. Digital Mode: Pressure Input in de-energized.	Low Pressure Delay Setting
WN026	PILOT FLAME LOST	An enabled pilot flame detection input is detecting flame absence while running	2 s

9 MODBUS CONFIGURATION

9.1 MODBUS COMMANDS

The table below specifies the Modbus RTU commands supported by the PF2150-FMD.

NAME	COMMAND	DESCRIPTION
Read Coil	1 = 0x01	Value is represented by a single bit
Read Discrete Input	2 = 0x02	Value is represented by a single bit
Read Holding Registers	3 = 0x03	Two bytes per register are returned
Read Input Registers	4 = 0x04	Two bytes per register are returned
Write Single Holding Register	6 = 0x06	Two bytes per register must be sent
Write Multiple Holding Registers	16 = 0x10	Two bytes per register must be sent

- *An exception code is returned for any unsupported commands.*
- *An exception code is returned for any request to an invalid register address.*
- *Multiple-register requests return 0 for all invalid registers (rather than returning an exception code) as long as the first register has a valid address.*

9.2 REGISTER DATA FORMAT

The following table specifies the data types supported and indicates how controller status information is represented for each data type:

DATA TYPE	STATUS INFORMATION (HEXADECIMAL)	MODBUS REPRESENTATION		ENDIANNESS
int16/uint16	0x0A0B	0x0A0B in a single 16-bit register		Big-endian
int32/uint32	0x0A0B0C0D	0x0A0B0C0D in two sequential 16-bit registers	0x0A0B in first register	Big-endian
			0x0C0D in second register	
Bitset	0x0000	0x0000 in a single 16-bit register where each binary digit represents separate status information	Bit 0: 0b0000 0000 0000 000**0**	Big-endian
			Bit 1: 0b0000 0000 0000 00**0**0	
			...	
			Bit 14: 0b**0**000 0000 0000 0000	
			Bit 15: 0b**0**000 0000 0000 0000	
Array	0x0A0B0C0D0E0F	0x0F0E0D0C0B0A held in consecutive 16-bit registers	0x0F0E in first register	Little-endian
			0x0D0C in second register	
			0x0B0A in third register	

9.3 LATCHED VS UNLATCHED REGISTERS

Latched registers have the same function as their corresponding unlatched registers, but once set will remain set until the system is stopped and then restarted. All registers are unlatched unless explicitly listed as latched.

9.4 PF2100 BACKWARDS COMPATIBILITY

The PF2150-FMD Modbus register map has been substantially expanded over the PF2100 to include registers for all settings and system status information. Register mapping from the PF2100 has been included as a subset to maintain backwards compatibly for Profire products. These registers are labeled as Legacy PF2100 registers in their descriptions. This allows for PF2150-FMD units to be drop-in replacements for PF2100 units without requiring an update to the Modbus client on most sites. Some register formats from the PF2100 are not supported identically in this map as hardware IO may be different between platforms. It is recommended to leave the Legacy PF2100 unused when possible.

9.5 TEST REGISTERS

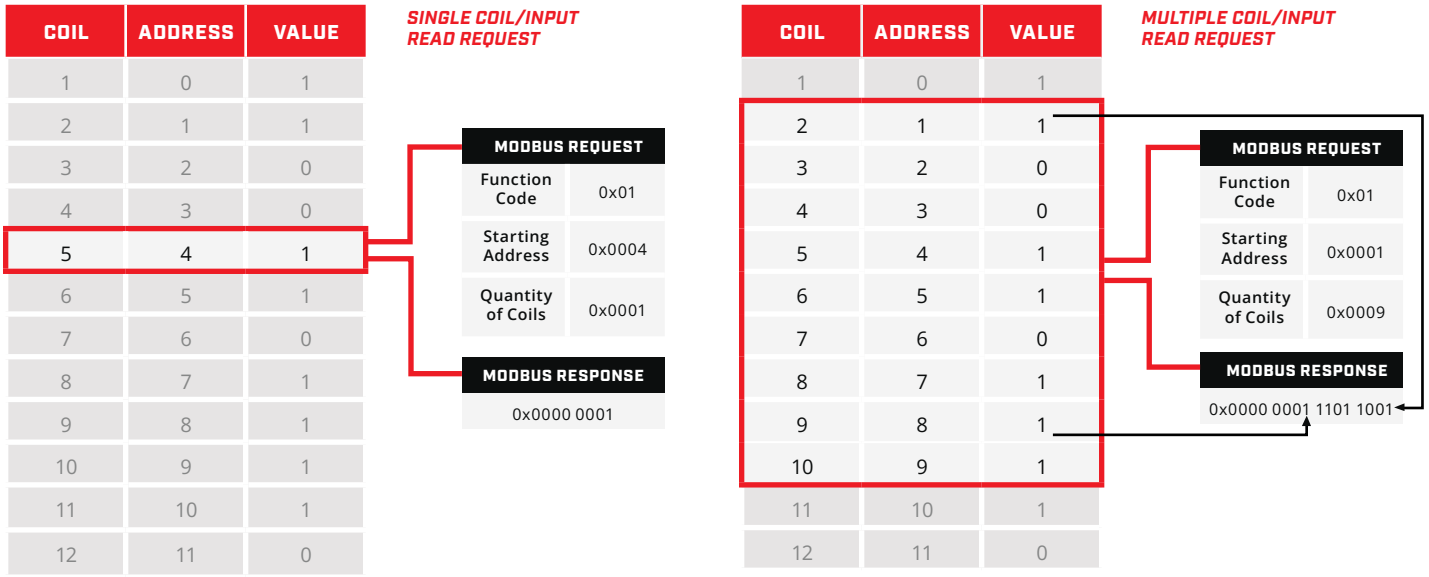
The following registers can be used to test whether the Modbus client device is correctly configured and to confirm that both unsigned and signed values can be read properly.

REGISTER (ADDRESS)	FUNCTION CODE	NAME	TYPE	READ VALUE		
				DECIMAL	HEXADECIMAL	BINARY
123 (122)	Read Only: 0x03 or 0x04	Test Read - Unsigned	uint16	1234	0x04D2	0b0000 0100 1101 0010
124 (123)	Read Only: 0x03 or 0x04	Test Read - Signed	int16	-1234	0xFB2E	0b1111 1011 0010 1110

9.6 MODBUS REGISTER MAP

9.6.1 READ ONLY COILS & DISCRETE INPUTS [FUNCTION CODE 0X01 OR 0X02]

Reading a single coil or discrete input returns a single byte holding the requested value in its least significant bit and reading multiple coils or discrete inputs returns a bit packed vector containing the requested values. Only requested values are returned (all other bits are set to 0) as indicated in the diagrams below:



COIL/INPUT (ADDRESS)	NAME	0	1
1 (0)	Run *Legacy PF2100 Register	System not in a running state	System in a running state
2 (1)	Pilot *Legacy PF2100 Register	Pilot output de-energized	Pilot output energized
3 (2)	SSV1 *Legacy PF2100 Register	SSV1 output de-energized	SSV1 output energized
4 (3)	SSV2 *Legacy PF2100 Register	SSV2 output de-energized	SSV2 output energized
17 (16)	Level Input *Legacy PF2100 Register	Closed	Open
18 (17)	Main Solenoid Feedback *Legacy PF2100 Register	No voltage at SSV1 output or SSV2 output	Voltage at SSV1 output or SSV2 output
19 (18)	Pilot Solenoid Feedback *Legacy PF2100 Register	No voltage at Pilot output	Voltage at Pilot output
20 (19)	High Pressure Input *Legacy PF2100 Register	Closed	Open
21 (20)	Proof of Closure *Legacy PF2100 Register	Closed	Open
22 (21)	ESD Input *Legacy PF2100 Register	Closed	Open
23 (22)	Start Input *Legacy PF2100 Register	Closed	Open
24 (23)	Low Pressure *Legacy PF2100 Register	Closed	Open
25 (24)	Flame Detected *Legacy PF2100 Register	Flame absent	Flame present
26 (25)	Flame Test Fail *Legacy PF2100 Register	Alarms AL035 and AL039 not set	Either alarm AL035 or AL039 set
27 (26)	Unit Failure *Legacy PF2100 Register	No hardware fault alarms present	Any hardware fault alarm present

COIL/INPUT (ADDRESS)	NAME	0	1
28 (27)	Low or High Voltage *Legacy PF2100 Register	Alarms AL040 and AL041 not set	Either alarm AL040 or AL041 set
29 (28)	High Temp Alarm *Legacy PF2100 Register	Alarms AL012, AL013, and AL014 not set	Any of AL012, AL013, or AL014 set
30 (29)	4-20 Alarm *Legacy PF2100 Register	No 4-20 mA Pressure or Level alarms set	Any 4-20 mA Pressure or Level alarm set
33 (32)	Level Input (Latched) *Legacy PF2100 Register	Latched version of Level Input register above.	
34 (33)	Main Solenoid Feedback (Latched) *Legacy PF2100 Register	Latched version of Main Solenoid Feedback register above.	
35 (34)	Pilot Solenoid Feedback (Latched) *Legacy PF2100 Register	Latched version of Pilot Solenoid Feedback register above.	
36 (35)	High Pressure Input (Latched) *Legacy PF2100 Register	Latched version of High Pressure Input register above.	
37 (36)	Proof of Closure (Latched) *Legacy PF2100 Register	Latched version of Proof of Closure register above.	
38 (37)	ESD Input (Latched) *Legacy PF2100 Register	Latched version of ESD Input register above.	
39 (38)	Start Input (Latched) *Legacy PF2100 Register	Latched version of Start Input register above.	
40 (39)	Low Pressure (Latched) *Legacy PF2100 Register	Latched version of Low Pressure register above.	
41 (40)	Flame Detected (Latched) *Legacy PF2100 Register	Latched version of Flame Detected register above.	
42 (41)	Flame Test Fail (Latched) *Legacy PF2100 Register	Latched version of Flame Test Fail register above.	
43 (42)	Unit Failure (Latched) *Legacy PF2100 Register	Latched version of Unit Failure register above.	
44 (43)	Low or High Voltage (Latched) *Legacy PF2100 Register	Latched version of Low or High Voltage register above.	
45 (44)	High Temp Alarm (Latched) *Legacy PF2100 Register	Latched version of High Temp Alarm register above.	
46 (45)	4-20 Alarm (Latched) *Legacy PF2100 Register	Latched version of 4-20 Alarm register above.	
102 (101)	AL001 POC INPUT OPEN alarm	Alarm not set	Alarm set
103 (102)	AL002 ESD INPUT OPEN alarm	Alarm not set	Alarm set
104 (103)	AL003 PRESSURE INVALID alarm	Alarm not set	Alarm set
105 (104)	AL004 LOW PRESSURE alarm	Alarm not set	Alarm set
106 (105)	AL005 4-20 HIGH PRESS alarm	Alarm not set	Alarm set[1]
107 (106)	AL006 HIGH PRESS OPEN alarm	Alarm not set	Alarm set
108 (107)	AL007 PRESSURE CONFIG alarm	Alarm not set	Alarm set
109 (108)	AL008 LEVEL INVALID alarm	Alarm not set	Alarm set
110 (109)	AL009 LOW LEVEL alarm	Alarm not set	Alarm set
111 (110)	AL010 HIGH LEVEL alarm	Alarm not set	Alarm set
112 (111)	AL011 LEVEL CONFIG alarm	Alarm not set	Alarm set
113 (112)	AL012 HIGH PILOT TEMP alarm	Alarm not set	Alarm set
114 (113)	AL013 HIGH MAIN TEMP alarm	Alarm not set	Alarm set
115 (114)	AL014 HIGH AUX TEMP alarm	Alarm not set	Alarm set
116 (115)	AL015 PILOT TEMP OPEN alarm	Alarm not set	Alarm set
117 (116)	AL016 PILOTTEMPINVALID alarm	Alarm not set	Alarm set
118 (117)	AL017 PILOT TEMP STALE alarm	Alarm not set	Alarm set
119 (118)	AL018 MAIN TEMP OPEN alarm	Alarm not set	Alarm set
120 (119)	AL019 MAINTEMPINVALID alarm	Alarm not set	Alarm set

COIL/INPUT (ADDRESS)	NAME	0	1
121 (120)	AL020 MAIN TEMP STALE alarm	Alarm not set	Alarm set
122 (121)	AL021 AUX TEMP OPEN alarm	Alarm not set	Alarm set
123 (122)	AL022 AUX TEMP INVALID alarm	Alarm not set	Alarm set
124 (123)	AL023 AUX TEMP STALE alarm	Alarm not set	Alarm set
125 (124)	AL024 PILOTTEMP CONFIG alarm	Alarm not set	Alarm set
126 (125)	AL025 MAIN TEMP CONFIG alarm	Alarm not set	Alarm set
127 (126)	AL026 AUX TEMP CONFIG alarm	Alarm not set	Alarm set
128 (127)	AL027 AMBIENT MISMATCH alarm	Alarm not set	Alarm set
129 (128)	AL028 AMBIENT1 INVALID alarm	Alarm not set	Alarm set
130 (129)	AL029 AMBIENT2 INVALID alarm	Alarm not set	Alarm set
131 (130)	AL030 ION FLAME FAIL alarm	Alarm not set	Alarm set[1]
132 (131)	AL031 PILOT FLAME FAIL alarm	Alarm not set	Alarm set[1]
133 (132)	AL032 MAIN FLAME FAIL alarm	Alarm not set	Alarm set[1]
134 (133)	AL033 AUX FLAME FAIL alarm	Alarm not set	Alarm set[1]
135 (134)	AL034 PILOT NEVER LIT alarm	Alarm not set	Alarm set[1]
136 (135)	AL035 ION+ WIRING alarm	Alarm not set	Alarm set
137 (136)	AL036 ADC1 START FAULT alarm	Alarm not set	Alarm set
138 (137)	AL037 ADC1 READ FAULT alarm	Alarm not set	Alarm set
139 (138)	AL038 ADC1 STOP FAULT alarm	Alarm not set	Alarm set
140 (139)	AL039 FLAME VOLTAGE alarm	Alarm not set	Alarm set
141 (140)	AL040 LOW VOLTAGE alarm	Alarm not set	Alarm set
142 (141)	AL041 HIGH VOLTAGE alarm	Alarm not set	Alarm set
143 (142)	AL042 ADC2 START FAULT alarm	Alarm not set	Alarm set
144 (143)	AL043 ADC2 READ FAULT alarm	Alarm not set	Alarm set
145 (144)	AL044 ADC2 STOP FAULT alarm	Alarm not set	Alarm set
146 (145)	AL045 XCOMPARE FAULT alarm	Alarm not set	Alarm set
147 (146)	AL046 USER STOP alarm	Alarm not set	Alarm set[1]
148 (147)	AL047 SETTINGS CRC alarm	Alarm not set	Alarm set
149 (148)	AL048 STATE MISMATCH alarm	Alarm not set	Alarm set[1]
150 (149)	AL049 PRESSURE I2C alarm	Alarm not set	Alarm set
151 (150)	AL050 LEVEL I2C alarm	Alarm not set	Alarm set
152 (151)	AL051 ESD IO SHORT alarm	Alarm not set	Alarm set
153 (152)	AL052 START IO SHORT alarm	Alarm not set	Alarm set
154 (153)	AL053 PILOT IO SHORT alarm	Alarm not set	Alarm set
155 (154)	AL054 HIPRESS IO SHORT alarm	Alarm not set	Alarm set
156 (155)	AL055 VIN ADC IO SHORT alarm	Alarm not set	Alarm set
157 (156)	AL056 POC IO SHORT alarm	Alarm not set	Alarm set
158 (157)	AL057 FLASH READ FAULT alarm	Alarm not set	Alarm set[1]
159 (158)	AL058 FLSH WRITE FAULT alarm	Alarm not set	Alarm set[1]
160 (159)	AL059 DESCRIPTOR FAULT alarm	Alarm not set	Alarm set

COIL/INPUT (ADDRESS)	NAME	0	1
161 (160)	AL060 DESCR MISMATCH alarm	Alarm not set	Alarm set
162 (161)	AL061 PILOT VOLTAGE alarm	Alarm not set	Alarm set
163 (162)	AL062 SSV1 VOLTAGE alarm	Alarm not set	Alarm set
164 (163)	AL063 SSV2 VOLTAGE alarm	Alarm not set	Alarm set
165 (164)	AL064 START INVALID alarm	Alarm not set	Alarm set
166 (165)	AL065 POC INVALID alarm	Alarm not set	Alarm set
167 (166)	AL066 ESD INVALID alarm	Alarm not set	Alarm set
168 (167)	AL067 HI PRESS INVALID alarm	Alarm not set	Alarm set
169 (168)	AL068 ADC3 START FAULT alarm	Alarm not set	Alarm set
170 (169)	AL069 ADC3 READ FAULT alarm	Alarm not set	Alarm set
171 (170)	AL070 ADC3 STOP FAULT alarm	Alarm not set	Alarm set
172 (171)	AL071 PROCESSOR RESET alarm	Alarm not set	Alarm set[1]
173 (172)	AL072 CAL CRC FAILED alarm	Alarm not set	Alarm set[1]
174 (173)	AL073 BROWNOUT INVALID alarm	Alarm not set	Alarm set[1]
175 (174)	AL074 FLAME DC OPEN alarm	Alarm not set	Alarm set
176 (175)	AL075 FACTORY CAL DESC alarm	Alarm not set	Alarm set
177 (176)	AL076 SHUTDOWN FAILED alarm	Alarm not set	Alarm set[1]
178 (177)	AL077 STATUS CONFIG alarm	Alarm not set	Alarm set
179 (178)	AL078 UI COMM LOSS alarm	Alarm not set	Alarm set
180 (179)	AL079 STATUS CNFG 4-20 alarm	Alarm not set	Alarm set
181 (180)	AL080 MAIN FLAME REQ alarm	Alarm not set	Alarm set
182 (181)	AL081 ADD PILOT DETECT alarm	Alarm not set	Alarm set
502 (501)	WT001 LOW VOLTAGE wait	Wait not set	Wait set
503 (502)	WT002 HIGH VOLTAGE wait	Wait not set	Wait set
504 (503)	WT003 LOW PRESSURE wait	Wait not set	Wait set
505 (504)	WT004 LOW LEVEL wait	Wait not set	Wait set
506 (505)	WT005 HIGH LEVEL wait	Wait not set	Wait set
507 (506)	WT006 START INPUT OPEN wait	Wait not set	Wait set
602 (601)	WN001 LOW VOLTAGE warning	Warning not set	Warning set
603 (602)	WN002 HIGH VOLTAGE warning	Warning not set	Warning set
604 (603)	WN003 LOW PILOT TEMP warning	Warning not set	Warning set
605 (604)	WN004 LOW MAIN TEMP warning	Warning not set	Warning set
606 (605)	WN005 LOW AUX TEMP warning	Warning not set	Warning set
607 (606)	WN006 HIGH PRESSURE warning	Warning not set	Warning set
608 (607)	WN007 POC STILL CLOSED warning	Warning not set	Warning set
609 (608)	WN008 UI/FIS MISMATCH warning	Warning not set	Warning set
610 (609)	WN009 FIS COMM LOSS warning	Warning not set	Warning set
611 (610)	WN010 HW DESC ERROR warning	Warning not set	Warning set
612 (611)	WN011 PV DESC ERROR warning	Warning not set	Warning set

COIL/INPUT (ADDRESS)	NAME	0	1
613 (612)	WN012 FW DESC ERROR warning	Warning not set	Warning set
614 (613)	WN013 BOOT DESC ERROR warning	Warning not set	Warning set
615 (614)	WN014 UI DESC ERROR warning	Warning not set	Warning set
616 (615)	WN015 PILOT TEMP OPEN warning	Warning not set	Warning set
617 (616)	WN016 PILOTTEMPINVALID warning	Warning not set	Warning set
618 (617)	WN017 PILOT TEMP STALE warning	Warning not set	Warning set
619 (618)	WN018 MAIN TEMP OPEN warning	Warning not set	Warning set
620 (619)	WN019 MAINTEMP INVALID warning	Warning not set	Warning set
621 (620)	WN020 MAIN TEMP STALE warning	Warning not set	Warning set
622 (621)	WN021 AUX TEMP OPEN warning	Warning not set	Warning set
623 (622)	WN022 AUX TEMP INVALID warning	Warning not set	Warning set
624 (623)	WN023 AUX TEMP STALE warning	Warning not set	Warning set
625 (624)	WN024 420MAOUTPUTFAULT warning	Warning not set	Warning set
626 (625)	WN025 LOW PRESSURE warning	Warning not set	Warning set
627 (626)	WN026 PILOT FLAME LOST warning	Warning not set	Warning set
702 (701)	MP001 LOW PRESSURE main permissive	Main permissive not set	Main permissive set
812 (811)	Pressure High	Open	Closed
821 (820)	Pilot	De-energized	Energized
823 (822)	SSV 1	De-energized	Energized
824 (823)	SSV 2	De-energized	Energized

[1]This is a shutdown-only alarm which clears immediately once set. When the system is in the Lockout state, refer to Shutdown Code Register 3004 (Function Code: 0x03 or 0x04, Address: 3003) to determine the last alarm present while the system was running.

9.6.2 INPUT/HOLDING REGISTERS [READ: 0x03, 0x04 WRITE: 0x06, 0x10]

The Input Registers are duplicated in the corresponding Holding Registers for convenience and to maintain compatibility with some PLCs.

Use the Read Input Register command (0x04) to read the Input Registers.

Use the Read Holding Registers command (0x03) to read the Holding Registers.

Use the Write Single Register command (0x06) or the Write Multiple Registers command (0x10) to write the Holding Registers.

The following diagrams provide read and write examples for various register types.

16-BIT REGISTER READ REQUEST

REGISTER	ADDRESS	TYPE	VALUE
1	0	16 bit	0xAABB
2	1	16 bit	0x1234
3	2	32 bit	0x1F2E
4	3		0xFEDC
5	4	Any*	0x00EE
...	...	...	...
57	56	Any*	0xC1D1
58	57	Array	0x3CD4
59	58	Array	0xF423
60	59	Any	0xABCD

MODBUS REQUEST	
Function Code	0x03 or 0x04
Starting Address	0x0001
Quantity of Registers	0x0001

MODBUS RESPONSE
0x1234

32-BIT REGISTER READ REQUEST

REGISTER	ADDRESS	TYPE	VALUE
1	0	16 bit	0xAABB
2	1	16 bit	0x1234
3	2	32 bit	0x1F2E
4	3		0xFEDC
5	4	Any*	0x00EE
...	...	...	...
57	56	Any*	0xC1D1
58	57	Array	0x3CD4
59	58	Array	0xF423
60	59	Any	0xABCD

MODBUS REQUEST	
Function Code	0x03 or 0x04
Starting Address	0x0002
Quantity of Registers	0x0002

MODBUS RESPONSE
0x1F2E FEDC

MULTIPLE REGISTER READ REQUEST

REGISTER	ADDRESS	TYPE	VALUE
1	0	16 bit	0xAABB
2	1	16 bit	0x1234
3	2	32 bit	0x1F2E
4	3		0xFEDC
5	4	Any*	0x00EE
...	...	...	...
57	56	Any*	0xC1D1
58	57	Array	0x3CD4
59	58	Array	0xF423
60	59	Any	0xABCD

*Except Array

MODBUS REQUEST	
Function Code	0x03 or 0x04
Starting Address	0x0004
Quantity of Registers	0x0035 (0d53)

MODBUS RESPONSE
0x00EE...C1D1

ARRAY REGISTER READ REQUEST

REGISTER	ADDRESS	TYPE	VALUE
1	0	16 bit	0xAABB
2	1	16 bit	0x1234
3	2	32 bit	0x1F2E
4	3		0xFEDC
5	4	Any*	0x00EE
...	...	...	...
57	56	Any*	0xC1D1
58	57	Array	0x3CD4
59	58	Array	0xF423
60	59	Any	0xABCD

MODBUS REQUEST	
Function Code	0x03 or 0x04
Starting Address	0x0039 (0d57)
Quantity of Registers	0x0002

MODBUS RESPONSE
0xD43C 23F4

REGISTER	ADDRESS	TYPE	VALUE
1	0	16 bit	0x1234
2	1	16 bit	0x0000
3	2	16 bit	0x0000

MODBUS REQUEST	
Function Code	0x06
Starting Address	0x0000
Register Value	0x1234

REGISTER	ADDRESS	TYPE	VALUE
1	0	16 bit	0x1234
2	1	16 bit	0x1F2E
3	2	16 bit	0x0000

MODBUS REQUEST	
Function Code	0x10
Starting Address	0x0000
Register Value	0x1234 1F2E

REGISTER [ADDRESS]	FUNCTION CODE	NAME	TYPE	X10	RANGE
1 (0)	Read Only: 0x03 or 0x04	Run and Valve Status Bits *Legacy PF2100 Register	Bitset		0b0001: Running 0b0010: Pilot Output Energized 0b0100: SSV1 Output Energized 0b1000: SSV2 Output Energized
2 (1)	Read Only: 0x03 or 0x04	Input Status and Flags *Legacy PF2100 Register	Bitset		0b0000 0001: Level Input energized 0b0000 0010: Voltage present at SSV1/2 Output 0b0000 0100: Voltage present at Pilot Output 0b0000 1000: High Pressure Input energized 0b0001 0000: POC Input energized 0b0010 0000: ESD Input energized 0b0100 0000: Start Input energized 0b1000 0000: Pressure Input energized
3 (2)	Read Only: 0x03 or 0x04	Main Temp Input Measurement *Legacy PF2100 Register	int16		-50°C to 1350°C (Celsius Only)
4 (3)	Read Only: 0x03 or 0x04	Pilot Temp Input Measurement *Legacy PF2100 Register	int16		-50°C to 1350°C (Celsius Only)
5 (4)	Read Only: 0x03 or 0x04	Aux Temp Input Measurement *Legacy PF2100 Register	int16		-50°C to 1350°C (Celsius Only)
7 (6)	Read Only: 0x03 or 0x04	Input Status and Flags (Latched) *Legacy PF2100 Register	Bitset		0b0000 0001: Level Input energized (latched) 0b0000 0010: Voltage present at SSV1/2 Output (latched) 0b0000 0100: Voltage present at Pilot Output (latched) 0b0000 1000: High Pressure Input energized (latched) 0b0001 0000: POC Input energized (latched) 0b0010 0000: ESD Input energized (latched) 0b0100 0000: Start Input energized (latched) 0b1000 0000: Pressure Input energized (latched)
9 (8)	Read Only: 0x03 or 0x04	Pilot Temp Flame Detect Setpoint *Legacy PF2100 Register	uint16		0°C to 1350°C (Celsius Only)
10 (9)	Read Only: 0x03 or 0x04	Pilot Temp Low Temp Setpoint *Legacy PF2100 Register	uint16		0°C to 1350°C (Celsius Only)
15 (14)	Read: 0x03 or 0x04	Modbus Communication Error	uint16		0 = UI and FIS are communicating, 1 = UI and FIS are not communicating.
16 (15)	Read: 0x03 or 0x04	Modbus Communication Error Counter	uint16		0 - 65535 seconds since communication loss
100 (99)	Read: 0x03 or 0x04 Write: 0x06 or 0x10	Start/Stop	uint16		Read 0 = Command accepted Write 1234 = Start system Write 4321 = Stop system
102 (101)	Read: 0x03 or 0x04 Write: 0x06 or 0x10	Pilot Temp Flame Detect Setpoint Change Request *Legacy PF2100 Register	uint16		0°C to 1350°C (Celsius Only)
103 (102)	Read: 0x03 or 0x04 Write: 0x06 or 0x10	Pilot Temp Low Temp Setpoint Change Request *Legacy PF2100 Register	uint16		0°C to 1350°C (Celsius Only)
110 (109)	Read: 0x03 or 0x04 Write: 0x06 or 0x10	UI Clock Second	uint16		0 to 59 seconds

REGISTER [ADDRESS]	FUNCTION CODE	NAME	TYPE	X10	RANGE
111 (110)	Read: 0x03 or 0x04 Write: 0x06 or 0x10	UI Clock Minute	uint16		0 to 59 minutes
112 (111)	Read: 0x03 or 0x04 Write: 0x06 or 0x10	UI Clock Hour	uint16		0 to 23 hours
113 (112)	Read: 0x03 or 0x04 Write: 0x06 or 0x10	UI Clock Day	uint16		1 to 31 days
114 (113)	Read: 0x03 or 0x04 Write: 0x06 or 0x10	UI Clock Month	uint16		1 to 12 months
115 (114)	Read: 0x03 or 0x04 Write: 0x06 or 0x10	UI Clock Years	uint16		2000 to 2099 years
143 (142)	Read: 0x03 or 0x04 Write: 0x06 or 0x10	Acknowledge Shutdown	uint16		0 = No effect 1 = Acknowledge lockout
1002 (1001)	Read Only: 0x03 or 0x04	Pilot Temp Mode	uint16		0 = Flame Detect 1 = High Temp ESD 2 = Display Only
1004 (1003)	Read Only: 0x03 or 0x04	Pilot Temp High Temp Setpoint	int16		-40°F to 2462°F -40°C to 1350°C
1005 (1004)	Read: 0x03 or 0x04 Write: 0x06 or 0x10	Pilot Temp Flame Detect Setpoint	int16		-40°F to 2462°F -40°C to 1350°C
1008 (1007)	Read: 0x03 or 0x04 Write: 0x06 or 0x10	Pilot Temp Low Temp Setpoint	int16		-40°F to 2462°F -40°C to 1350°C
1009 (1008)	Read: 0x03 or 0x04 Write: 0x06 or 0x10	Pilot Temp Deadband	uint16		0°F to 180°F 0°C to 100°C
1011 (1010)	Read Only: 0x03 or 0x04	Main Temp Mode	uint16		0 = Disabled 1 = Flame Detect 2 = High Temp ESD 3 = Display Only
1012 (1011)	Read Only: 0x03 or 0x04	Main Temp High Temp Setpoint	int16		-40°F to 2462°F -40°C to 1350°C
1013 (1012)	Read: 0x03 or 0x04 Write: 0x06 or 0x10	Main Temp Flame Detect Setpoint	int16		-40°F to 2462°F -40°C to 1350°C
1016 (1015)	Read: 0x03 or 0x04 Write: 0x06 or 0x10	Main Temp Low Temp Setpoint	int16		-40°F to 2462°F -40°C to 1350°C
1017 (1016)	Read: 0x03 or 0x04 Write: 0x06 or 0x10	Main Temp Deadband	uint16		0°F to 180°F 0°C to 100°C
1022 (1021)	Read Only: 0x03 or 0x04	Aux Temp Mode	uint16		0 = Disabled 1 = Pilot Flame Detect 2 = Main Flame Detect 3 = High Temp ESD 4 = Display Only
1024 (1023)	Read Only: 0x03 or 0x04	Aux Temp High Temp Setpoint	int16		-40°F to 2462°F -40°C to 1350°C
1025 (1024)	Read: 0x03 or 0x04 Write: 0x06 or 0x10	Aux Temp Flame Detect Setpoint	int16		-40°F to 2462°F -40°C to 1350°C
1028 (1027)	Read: 0x03 or 0x04 Write: 0x06 or 0x10	Aux Temp Low Temp Setpoint	int16		-40°F to 2462°F -40°C to 1350°C

REGISTER [ADDRESS]	FUNCTION CODE	NAME	TYPE	X10	RANGE
1029 (1028)	Read: 0x03 or 0x04 Write: 0x06 or 0x10	Aux Temp Deadband	uint16		0°F to 180°F 0°C to 100°C
1032 (1031)	Read Only: 0x03 or 0x04	POC Input	uint16		0 = Disabled 1 = Enabled
1033 (1032)	Read Only: 0x03 or 0x04	Start Input	uint16		0 = Disabled 1 = Enabled
1034 (1033)	Read Only: 0x03 or 0x04	Pressure Input	uint16		0 = Disabled 1 = Digital 2 = 4-20
1035 (1034)	Read Only: 0x03 or 0x04	Pressure Span Min MSB	int32	x10	0 to 145,040 (0 psi to 14,504 psi) 0 to 1,000,000 (0 kPa to 100,000 kPa)
1036 (1035)	Read Only: 0x03 or 0x04	Pressure Span Min LSB			
1037 (1036)	Read Only: 0x03 or 0x04	Pressure Span Max MSB	int32	x10	0 to 145,040 (0 psi to 14,504 psi) 0 to 1,000,000 (0 kPa to 100,000 kPa)
1038 (1037)	Read Only: 0x03 or 0x04	Pressure Span Max LSB			
1039 (1038)	Read Only: 0x03 or 0x04	Pressure Low Trip MSB	int32	x10	0 to Span Max in configured pressure units multiplied by 10
1040 (1039)	Read Only: 0x03 or 0x04	Pressure Low Trip LSB			
1041 (1040)	Read Only: 0x03 or 0x04	Pressure High Trip MSB	int32	x10	0 to Span Max in configured pressure units multiplied by 10
1042 (1041)	Read Only: 0x03 or 0x04	Pressure High Trip LSB			
1043 (1042)	Read Only: 0x03 or 0x04	Pressure Deadband	uint16	x10	0 to 6.25% of span in configured pressure units multipled by 10
1044 (1043)	Read Only: 0x03 or 0x04	Low Pressure Delay	uint16		2 to 20 seconds
1045 (1044)	Read Only: 0x03 or 0x04	Low Pressure Mode	uint16		0 = Alarm 1 = Wait 2 = Warning 3 = Main Permissive
1047 (1046)	Read Only: 0x03 or 0x04	High Pressure Input	uint16		0 = Disabled 1 = Enabled
1048 (1047)	Read Only: 0x03 or 0x04	Level Input	uint16		0 = Disabled 1 = Digital 2 = 4-20
1049 (1048)	Read Only: 0x03 or 0x04	Level Digital Mode	uint16		0 = Alarm 1 = Wait
1050 (1049)	Read Only: 0x03 or 0x04	Level Low Trip Mode	uint16		0 = Alarm 1 = Wait
1051 (1050)	Read Only: 0x03 or 0x04	Level High Trip Mode	uint16		0 = Alarm 1 = Wait

REGISTER (ADDRESS)	FUNCTION CODE	NAME	TYPE	X10	RANGE
1052 (1051)	Read Only: 0x03 or 0x04	Level Span Min MSB	int32	x10	0 to 26,417,200 (0 to 2,641,720 gal) 0 to 100,000,000 (0 to 10,000,000 L)
1053 (1052)	Read Only: 0x03 or 0x04	Level Span Min LSB			
1054 (1053)	Read Only: 0x03 or 0x04	Level Span Max MSB	int32	x10	0 to 26,417,200 (0 to 2,641,720 gal) 0 to 100,000,000 (0 to 10,000,000 L)
1055 (1054)	Read Only: 0x03 or 0x04	Level Span Max LSB			
1056 (1055)	Read Only: 0x03 or 0x04	Level Low Trip MSB	int32	x10	0 to Span Max in configured level units multiplied by 10
1057 (1056)	Read Only: 0x03 or 0x04	Level Low Trip LSB			
1058 (1057)	Read Only: 0x03 or 0x04	Level High Trip MSB	int32	x10	0 to Span Max in configured level units multiplied by 10
1059 (1058)	Read Only: 0x03 or 0x04	Level High Trip LSB			
1060 (1059)	Read Only: 0x03 or 0x04	Level Deadband	uint16	x10	0 to 6.25% of span in configured level units multipled by 10
1061 (1060)	Read Only: 0x03 or 0x04	Level Delay	uint16		2 to 20 seconds
1094 (1093)	Read Only: 0x03 or 0x04	Status Contact Mode	uint16		0 = Run Status
					1 = Level Control
1095 (1094)	Read Only: 0x03 or 0x04	4-20mA Output Mode	uint16		0 = Disabled
					1 = Pilot Temp Echo
					2 = Main Temp Echo
					3 = Aux Temp Echo
					4 = Pressure Echo
					5 = Level Echo
1097 (1096)	Read Only: 0x03 or 0x04	Temp Echo Span Min	int16		-148°F to 2462°F -100°C to 1350°C
1098 (1097)	Read Only: 0x03 or 0x04	Temp Echo Span Max	int16		-148°F to 2462°F -100°C to 1350°C
1101 (1100)	Read Only: 0x03 or 0x04	Pilot Valve PWM	uint16		1 to 100%
1102 (1101)	Read Only: 0x03 or 0x04	SSV PWM	uint16		1 to 100%
1103 (1102)	Read Only: 0x03 or 0x04	Ionization Flame Detect	uint16		0 = Disabled
					1 = Pilot Only
					2 = Pilot and Main
1104 (1103)	Read Only: 0x03 or 0x04	Pilot Flame Detect	uint16		0 = All
					1 = Any
1105 (1104)	Read Only: 0x03 or 0x04	Pilot Flame Failure Lockout Time	uint16		0 to 7200 seconds
1106 (1105)	Read Only: 0x03 or 0x04	Spark Mode	uint16		0 = Until Flame
					1 = Reignition
					2 = Continuous

REGISTER [ADDRESS]	FUNCTION CODE	NAME	TYPE	X10	RANGE
1107 (1106)	Read Only: 0x03 or 0x04	Spark Interval	uint16		8 to 60 seconds
1108 (1107)	Read Only: 0x03 or 0x04	Lockout on Main Flame Fail	uint16		0 = Disabled 1 = Enabled
1109 (1108)	Read Only: 0x03 or 0x04	Main Flame Failure Lockout Time	uint16		0 to 7200 seconds
1110 (1109)	Read Only: 0x03 or 0x04	Main Flame Detect	uint16		0 = All 1 = Any
1120 (1119)	Read Only: 0x03 or 0x04	Pilot Off Mode	uint16		0 = Disabled 1 = Enabled
1122 (1121)	Read Only: 0x03 or 0x04	Auto Relight	uint16		0 = Disabled 1 = Enabled
1123 (1122)	Read Only: 0x03 or 0x04	Ignition Mode	uint16		0 = Coil 1 = HEI
1125 (1124)	Read Only: 0x03 or 0x04	Pilot Startup Delay Time	uint16		0 to 600 seconds
1126 (1125)	Read Only: 0x03 or 0x04	Pilot Flame Establishment Timeout	uint16		0 to 900 seconds
1127 (1126)	Read Only: 0x03 or 0x04	System Voltage	uint16		0 = 12V 1 = 24V
1128 (1127)	Read Only: 0x03 or 0x04	Voltage Restart	uint16		0 = Disabled 1 = Enabled
1129 (1128)	Read Only: 0x03 or 0x04	L1 Password Enable	uint16		0 = Disabled 1 = Enabled
1131 (1130)	Read Only: 0x03 or 0x04	Server Address	uint16		1 to 247
1132 (1131)	Read Only: 0x03 or 0x04	Baud Rate	uint16		0 = 9600 1 = 19200
1133 (1132)	Read Only: 0x03 or 0x04	Stop Bits	uint16		0 = 1 1 = 2
1134 (1133)	Read Only: 0x03 or 0x04	Parity	uint16		0 = None 1 = Odd 2 = Even
1136 (1135)	Read Only: 0x03 or 0x04	Modbus Enable	uint16		0 = Disabled 1 = Enabled
1137 (1136)	Read Only: 0x03 or 0x04	Temperature Units	uint16		0 = Celsius 1 = Fahrenheit

REGISTER [ADDRESS]	FUNCTION CODE	NAME	TYPE	X10	RANGE
1138 (1137)	Read Only: 0x03 or 0x04	Pressure Units	uint16		0 = kPa
					1 = psi
					2 = inch wc
					3 = oz/in2
					4 = kg/cm2
					5 = Percent
					6 = Milliamps
1139 (1138)	Read Only: 0x03 or 0x04	Level Units	uint16		0 = Litres
					1 = m3
					2 = US Gallons
					3 = bbl
					4 = ft3
					5 = Percent
					6 = Milliamps
1144 (1143)	Read Only: 0x03 or 0x04	Level Control Setpoint	int32	x10	0 to Span Max in configured level units multiplied by 10
1151 (1150)	Read Only: 0x03 or 0x04	Location - last 2 characters in reverse order	unit16		Example: Location is configured as "Profire PF2150-F" 462D (F-)
1152 (1151)	Read Only: 0x03 or 0x04	Location - last 2 characters			3035 (05)
1153 (1152)	Read Only: 0x03 or 0x04	Location - last 2 characters			3132 (12)
1154 (1153)	Read Only: 0x03 or 0x04	Location - last 2 characters			4650 (FP)
1155 (1154)	Read Only: 0x03 or 0x04	Location - last 2 characters			2065 (e)
1156 (1155)	Read Only: 0x03 or 0x04	Location - last 2 characters			7269 (ri)
1157 (1156)	Read Only: 0x03 or 0x04	Location - last 2 characters			666F (fo)
1158 (1157)	Read Only: 0x03 or 0x04	Location - last 2 characters in reverse order			7250 (rP)
3001 (3000)	Read Only: 0x03 or 0x04	Controller State	int16		-1 = Invalid
					0 = Lockout
					1 = Alarm
					2 = Power On
					3 = Ready
					4 = Confirm Start
					5 = Waiting
					6 = Manual Ignition
					7 = Pilot Light Off
					8 = Pilot
					9 = Main Light Off
					10 = Main

REGISTER [ADDRESS]	FUNCTION CODE	NAME	TYPE	X10	RANGE
3004 (3003)	Read Only: 0x03 or 0x04	Shutdown Code	uint16		0 = No shutdown present XXX = Alarm number (AL**XXX**) that caused the shutdown
3006 (3005)	Read Only: 0x03 or 0x04	State Timer	uint16		Current state timer in seconds
3501 (3500)	Read Only: 0x03 or 0x04	System Voltage Measurement	int16	x10	System input voltage measurement in volts multiples by 10
3502 (3501)	Read Only: 0x03 or 0x04	Authentication Level	uint16		0 = None 1 = Remote 2 = Level 1 Password 3 = Level 2 Password
3510 (3509)	Read Only: 0x03 or 0x04	Region Code	uint16		Expected: 0x0001
3511 (3510)	Read Only: 0x03 or 0x04	Bundle Version	uint32		0x**0A**0B0C0D: Product Variant 0x0A**0B**0C0D: Major 0x0A0B**0C**0D: Minor 0x0A0B0C**0D**: Release number
3513 (3512)	Read Only: 0x03 or 0x04	Firmware Version	uint32		0x**0A**0B0C0D: Major 0x0A**0B**0C0D: Minor 0x0A0B**0C**0D: Release number high byte 0x0A0B0C**0D**: Release number low byte
3515 (3514)	Read Only: 0x03 or 0x04	Bootloader Version	uint32		0x**0A**0B0C0D: Major 0x0A**0B**0C0D: Minor 0x0A0B**0C**0D: Release number high byte 0x0A0B0C**0D**: Release number low byte
3517 (3516)	Read Only: 0x03 or 0x04	BOM Version	uint32		0x**0A**0B0C0D: Major 0x0A**0B**0C0D: Minor 0x0A0B**0C**0D: Release number high byte 0x0A0B0C**0D**: Release number low byte
3519 (3518)	Read Only: 0x03 or 0x04	FIS Card Serial Number Byte 0 and 1	Array		e.g., S/N: 0A0B 0C0D **0E0F** Register read: 0x0F0E *Note that the byte order is reversed between the serial number and the register read.
3520 (3519)	Read Only: 0x03 or 0x04	FIS Card Serial Number Byte 2 and 3	Array		e.g., S/N: 0A0B **0C0D** 0E0F Register read: 0x0D0C *Note that the byte order is reversed between the serial number and the register read.
3521 (3520)	Read Only: 0x03 or 0x04	FIS Card Serial Number Byte 4 and 5	Array		e.g., S/N: **0A0B** 0C0D 0E0F Register read: 0x0B0A *Note that the byte order is reversed between the serial number and the register read.
3522 (3521)	Read Only: 0x03 or 0x04	Manufacture Date	uint32		0x**0A**0B0C0D: N/A 0x0A**0B**0C0D: Year - 2000 0x0A0B**0C**0D: Month 0x0A0B0C**0D**: Day

REGISTER (ADDRESS)	FUNCTION CODE	NAME	TYPE	X10	RANGE
3524 (3523)	Read Only: 0x03 or 0x04	Manufacture Test Date	uint32		0x**0A**0B0C0D: N/A
					0x0A**0B**0C0D: Year - 2000
					0x0A0B**0C**0D: Month
					0x0A0B0C**0D**: Day
3526 (3525)	Read Only: 0x03 or 0x04	PFN Version	uint32		0x**0A**0B0C0D: Major
					0x0A**0B**0C0D: Minor
					0x0A0B**0C**0D: Release number high byte
					0x0A0B0C**0D**: Release number low byte
3605 (3604)	Read Only: 0x03 or 0x04	Pilot Temp	int16	x10	-1480 - 24620 (-148°F to 2462°F) -1000 - 13500 (-100°C to 1350°C)
3606 (3605)	Read Only: 0x03 or 0x04	Main Temp	int16	x10	-1480 - 24620 (-148°F to 2462°F) -1000 - 13500 (-100°C to 1350°C)
3607 (3606)	Read Only: 0x03 or 0x04	Aux Temp	int16	x10	-1480 - 24620 (-148°F to 2462°F) -1000 - 13500 (-100°C to 1350°C)
3609 (3608)	Read Only: 0x03 or 0x04	Ambient Temp 1	int16	x10	-1480 - 24620 (-148°F to 2462°F) -1000 - 13500 (-100°C to 1350°C)
3610 (3609)	Read Only: 0x03 or 0x04	Ambient Temp 2	int16	x10	-1480 - 24620 (-148°F to 2462°F) -1000 - 13500 (-100°C to 1350°C)
3611 (3610)	Read Only: 0x03 or 0x04	Pilot Temp Faults	Bitset		0b0000 0001: Pilot Temp Input Open Alarm
					0b0000 00**1**0: N/A
					0b0000 0**1**00: N/A
					0b0000 **1**000: Pilot Temp Input Out of Range Alarm
					0b000**1** 0000: Pilot Temp Input Stale Data Alarm
3612 (3611)	Read Only: 0x03 or 0x04	Main Temp Faults	Bitset		0b0000 000**1**: Main Temp Input Open Alarm
					0b0000 00**1**0: N/A
					0b0000 0**1**00: N/A
					0b0000 **1**000: Main Temp Input Out of Range Alarm
					0b000**1** 0000: Main Temp Input Stale Data Alarm
3613 (3612)	Read Only: 0x03 or 0x04	Aux Temp Faults	Bitset		0b0000 000**1**: Aux Temp Input Open Alarm
					0b0000 00**1**0: N/A
					0b0000 0**1**00: N/A
					0b0000 **1**000: Aux Temp Input Out of Range Alarm
					0b000**1** 0000: Aux Temp Input Stale Data Alarm
3614 (3613)	Read Only: 0x03 or 0x04	Ambient Temp 1 Faults	Bitset		0b0000 **1**000: Ambient Temp 1 Out of Range Alarm
					0b000**1** 0000: Ambient Temp 1 Stale Data Alarm
3615 (3614)	Read Only: 0x03 or 0x04	Ambient Temp 2 Faults	Bitset		0b0000 **1**000: Ambient Temp 2 Out of Range Alarm
					0b000**1** 0000: Ambient Temp 2 Stale Data Alarm
3672 (3671)	Read Only: 0x03 or 0x04	Pilot Flame Status	uint16		0 = Not enough pilot flame detection inputs detecting flame
					1 = Pilot flame detection requirements satisfied

REGISTER [ADDRESS]	FUNCTION CODE	NAME	TYPE	X10	RANGE
3673 (3672)	Read Only: 0x03 or 0x04	Pilot Temp Flame Status	uint16		0 = Flame absent on Pilot Temp Input
					1 = Flame present on Pilot Temp Input
3674 (3673)	Read Only: 0x03 or 0x04	Main Temp Flame Status	uint16		0 = Flame absent on Main Temp Input
					1 = Flame present on Main Temp Input
3675 (3674)	Read Only: 0x03 or 0x04	Flame Faults	Bitset		0b0000 000**1**: Ion+ Wiring Fault
					0b0000 00**1**0: N/A
					0b0000 0**1**00: Flame Voltage Fault
					0b0000 **1**000: N/A
					0b000**1** 0000: Flame DC Input Open Fault
3676 (3675)	Read Only: 0x03 or 0x04	Aux Temp Flame Status	uint16		0 = Flame absent on Aux Temp Input
					1 = Flame present on Aux Temp Input
3677 (3676)	Read Only: 0x03 or 0x04	Ionization Flame Status	uint16		0 = Flame absent on Ionization Flame Input
					1 = Flame present on Ionization Flame Input
3678 (3677)	Read Only: 0x03 or 0x04	Main Flame Status	uint16		0 = Not enough main flame detection inputs detecting flame
					1 = Main flame detection requirements satisfied
3685 (3684)	Read Only: 0x03 or 0x04	Interlock Input Contact Status	Bitset		0b0000 0000 000**1**: POC Input energized
					0b0000 0000 00**1**0: ESD Input energized
					0b0000 0000 0**1**00: Start Input energized
					0b0000 0000 **1**000: Pressure Input energized
					0b0000 000**1** 0000: N/A
					0b0000 00**1**0 0000: Level Input energized
					0b0000 0**1**00 0000: N/A
					0b0000 **1**000 0000: N/A
					0b000**1** 0000 0000: N/A
					0b00**1**0 0000 0000: N/A
					0b0**1**00 0000 0000: High Pressure Input energized
3698 (3697)	Read Only: 0x03 or 0x04	Diagnostic ESD Voltage	int16		ESD Input voltage multiplied by 10
3699 (3698)	Read Only: 0x03 or 0x04	Diagnostic Start Voltage	int16		Start Input voltage multiplied by 10
3700 (3699)	Read Only: 0x03 or 0x04	Diagnostic POC Voltage	int16		POC Input voltage multiplied by 10
3701 (3700)	Read Only: 0x03 or 0x04	4-20 Level MSB	int32	x10	4-20mA Level Input measurement (in configured level units) multiplied by 10
3702 (3701)	Read Only: 0x03 or 0x04	4-20 Level LSB			
3703 (3702)	Read Only: 0x03 or 0x04	4-20 Pressure MSB	int32	x10	4-20mA Pressure Input measurement (in configured pressure units) multiplied by 10
3704 (3703)	Read Only: 0x03 or 0x04	4-20 Pressure LSB			
3705 (3704)	Read Only: 0x03 or 0x04	Diagnostic High Pressure Voltage	int16		High Pressure Input voltage multiplied by 10

REGISTER [ADDRESS]	FUNCTION CODE	NAME	TYPE	X10	RANGE
3715 (3714)	Read Only: 0x03 or 0x04	I2C Bus Faults	Bitset		0b0001: Pressure Communication fault
					0b0010: N/A
					0b0100: Level Communication fault
3720 (3719)	Read Only: 0x03 or 0x04	ADC Faults	Bitset		0b0000 0000 0001: ADC1 Start fault
					0b0000 0000 0010: ADC1 Read fault
					0b0000 0000 0100: ADC1 Stop fault
					0b0000 0000 1000: ADC2 Start fault
					0b0000 0001 0000: ADC2 Read fault
					0b0000 0010 0000: ADC2 Stop fault
					0b0000 0100 0000: ADC3 Start fault
					0b0000 1000 0000: ADC3 Read fault
					0b0001 0000 0000: ADC3 Stop fault
3725 (3724)	Read Only: 0x03 or 0x04	Valve Driver Status	Bitset		0b0001: Pilot Output energized
					0b0010: N/A
					0b0100: SSV1 Output energized
3730 (3729)	Read Only: 0x03 or 0x04	Status Contact State	uint16		0 = De-energized
					1 = Energized
3737 (3736)	Read Only: 0x03 or 0x04	4-20mA Output Percent	uint16		0 to 100%
3742 (3741)	Read Only: 0x03 or 0x04	Pilot Voltage	int16	x10	Pilot Output voltage multiplied by 10
3746 (3745)	Read Only: 0x03 or 0x04	SSV 1 Voltage	int16	x10	SSV1 Output voltage multiplied by 10
3749 (3748)	Read Only: 0x03 or 0x04	SSV 2 Voltage	int16	x10	SSV2 Output voltage multiplied by 10
3754 (3753)	Read Only: 0x03 or 0x04	Ionization Flame DC High Voltage	int16		Ionization Flame Input DC high voltage in millivolts
3755 (3754)	Read Only: 0x03 or 0x04	Ionization Flame DC Low Voltage	int16		Ionization Flame Input DC low voltage in millivolts
3756 (3755)	Read Only: 0x03 or 0x04	Ionization AC Voltage	int16		Ionization Flame Input AC voltage in millivolts
3771 (3770)	Read Only: 0x03 or 0x04	Ionization Flame Fail Count	uint16		0 to 65536
3773 (3772)	Read Only: 0x03 or 0x04	Ionization Flame Strength	int16		Ionization Flame Input flame strength in millivolts
3774 (3773)	Read Only: 0x03 or 0x04	System Mode	uint16		0 = Manual Mode
					1 = Auto Mode
3775 (3774)	Read Only: 0x03 or 0x04	Pilot Temp Flame Fail Count	uint16		0 to 65536
3777 (3776)	Read Only: 0x03 or 0x04	Main Temp Flame Fail Count	uint16		0 to 65536
3779 (3778)	Read Only: 0x03 or 0x04	Aux Temp Flame Fail Count	uint16		0 to 65536
3780 (3779)	Read Only: 0x03 or 0x04	Hardware Product Variant	uint16		Expected: 0x0009

9.7 MODBUS TROUBLESHOOTING

The following section outlines some common issues with Modbus configuration and installation.

PROBLEM	PROPOSED SOLUTIONS
Device not responding	• Ensure configuration parameters match between the client device and the PF2150-FMD. • Ensure RS-485 lines are connected properly – The A wire connects to A or D- and the B wire connects to B or D+. • Ensure the PF2150-FMD Modbus Enable setting is set to “Enabled”. • Ensure a signal ground wire is connected between the client and server device. • Raise the response timeout on the client device. • Toggle the PF2150-FMD Modbus Termination setting and retry. A termination resistor can cause the client device to be incorrectly biased in some cases. • Confirm that the client device has internal pullup and pulldown termination on the data lines as some devices require external biasing resistors to be installed.
CRC Errors	• Ensure configuration parameters match between the client device and the PF2150-FMD. • Ensure there is no noise on the line caused by external equipment or long run lengths. • Ensure RS-485 lines are connected properly – The A wire connects to A or D- and the B wire connects to B or D+.
Data returned is always 0	• Ensure the PF2150-FMD Modbus Enable setting is set to “Enabled”. • Ensure the UI is communicating with the FIS. See Communication Loss registers (Function Code: 0x03, 0x04, Address: 14 and 15). • Ensure register address is correct.
BMS shuts down when writing setpoints	• Ensure Modbus writes are correctly formatted. • Ensure client device is configured to write in the correct units for each register. • Ensure that setpoint writes are not causing configuration alarms on the PF2150-FMD (e.g., the system will go to Lockout if the Process Setpoint is written to be higher than its configured High Temperature Setpoint). Refer to the Product Manual for additional details.
BMS will not start when Start command sent via Modbus	• Ensure the correct value is being written to the Start/Stop register (Function code 0x06 or 0x10, Address: 99) • Ensure that no active alarms are present on the PF2150-FMD and all on-screen lockout messages have been acknowledged at the UI or with the Acknowledge Shutdown register (Function code 0x06 or 0x10, Address: 142)
Read values don’t make sense	• Ensure that the client device is configured to read values in the units configured on the PF2150-FMD. • Ensure that the client device is configured to apply a 0.1 multiplication factor for any registers that are marked with a “10x” in the Register Map above.
Read values are not matching expected results	• Ensure that client device is configured with the correct data type for each register. Use the Test Registers to verify configuration. • Ensure register address is correct.

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