PF2100 INSTALLATION GUIDE REV 2.5

BURNER MANAGEMENT SYSTEM

IMPORTANT SAFETY INFORMATION

THIS EQUIPMENT IS SUITABLE FOR USE IN CLASS 1, DIVISION 2, GROUPS ABCD OR NON-HAZARDOUS LOCATIONS ONLY.

WARNING: EXPLOSION HAZARD
DO NOT DISCONNECT WHILE CIRCUIT IS LIVE UNLESS AREA IS KNOWN TO BE NON-HAZARDOUS OR EQUIVALENT

WARNING: EXPLOSION HAZARD
SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS 1, DIVISION 2

DO NOT SERVICE UNLESS AREA IS KNOWN TO BE NON-HAZARDOUS

DO NOT OPEN WHEN ENERGIZED

INSTALLATION & USE MUST CONFORM TO THE DIRECTIONS IN THIS MANUAL

SYSTEM MUST BE PROPERLY CONNECTED TO EARTH-GROUND FOR EFFECTIVE OPERATION OF FLAME DETECTION CIRCUITRY

ELECTRICAL DEVICES CONNECTED TO THE CONTROLLER MUST MEET CERTAIN ELECTRICAL STANDARDS AND BE WITHIN VOLTAGE LIMITS

REPLACEMENT FUSES MUST BE CERAMIC AND OF CORRECT RATING

AVOID UNAUTHORIZED REPLACEMENT OF THE FUSE

FOR ANY QUESTIONS PLEASE VISIT OR CALL US
WWW.PROFIREENERGY.COM | 1.855.PRO.FIRE

HW & FW VERSIONING

This version of the manual was written for use with PF2100 systems that have the following hardware and firmware versions.

ITEM	*HW VERSION*	*FW VERSION*
Door Card	v1.71	1.8.206
Terminal Card	v2.2	1.8.206
4-20mA Card	v3.0	4.1
Modbus Card	v2.0	4.3

System hardware and firmware versions can be found printed on separate labels inside of the enclosure on each circuit board.

Please refer to the Profire Energy Inc. website for the latest documentation.

APPROVALS

CSA C22.2 No. 199, 3rd Edition
ANSI Z21.20, 15th Edition
UL 372, 6th Edition

Class I, Zone 2,
AEx, nA IIC, T4, IP66
Ex nA IIC T4 IP66

C US
#248705

CSA C22.2 No. 0-M91
CSA C22.2 No. 0.4-04
CSA C22.2 No. 94-91
CSA C22.2 No. 213-M1987
CSA E60079-0:2007
CSA C22.2 No. 60079-15:12
ANSI-ISA-12.12.01-2007
UL No. 60079-0, Ed. 6
UL No. 60079-15, Ed. 4

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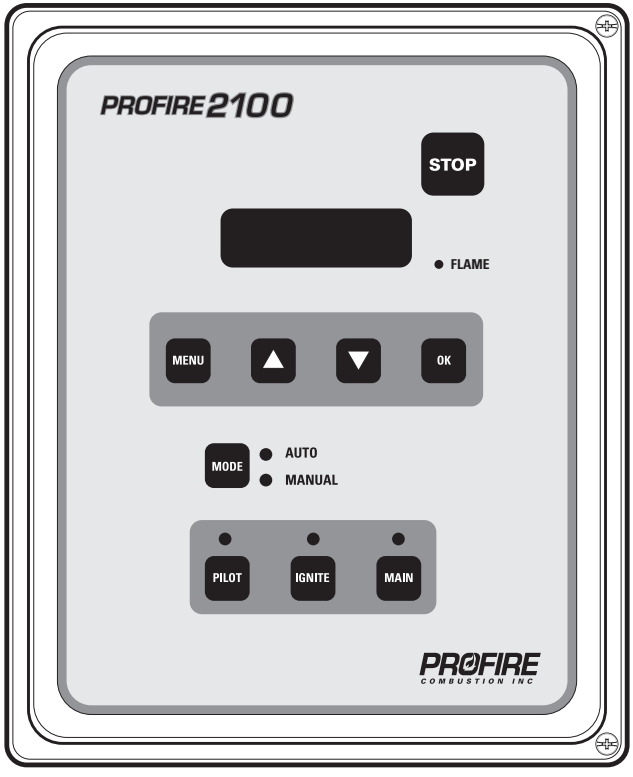
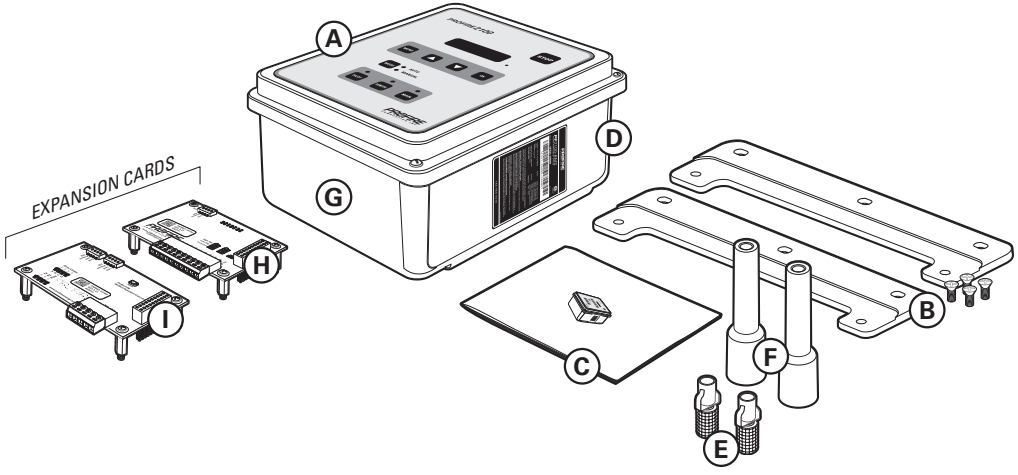
1 | Introduction

The PF2100 BMS (Burner Management System) is an electronic control and monitoring system designed for use on a wide array of natural draft burner industrial applications. It provides electronic pilot ignition, flame detection, temperature control, and remote monitoring. In addition to being an extremely useful tool, it improves safety by preventing the flame from being lit under unsafe conditions.



1.1 | Included Components

CODE	DESCRIPTION	E0000	E0400	E0M00	E04M0	EC000	EC400	ECM00	EC4M0
A	PF2100	•	•	•	•	•	•	•	•
B	Mounting Brackets & Screws	•	•	•	•	•	•	•	•
C	Instruction Manual (If Requested*)	*	*	*	*	*	*	*	*
D	Internal Coil					•	•	•	•
E	Ferrules (2)					•	•	•	•
F	Straight Silicone Boots (2)					•	•	•	•
G	Ignition Cable (20ft)					•	•	•	•
H	4-20mA Expansion Card		•		•		•		•
I	Modbus Expansion Card			•	•			•	•



1.2 | Technical Specifications

TEMPERATURE RATINGS	MIN	MAX
Operating Range	-40˚C (-40˚F)	+55˚C (+130˚F)
Storage Range	-40˚C (-40˚F)	+80˚C (176˚F)

POWER CONSUMPTION	12V	24V
Controller only, display ON	2.6 W	2.9 W
Controller only, display OFF	1.1 W	1.2 W
Maximum Total Current Draw	5 A	5 A
Maximum Continuous Current*	4.5 V	4.5 V
Ignition Voltage (Internal Coil)	Up to 20 kV	Up to 40 kV

TERMINAL BLOCKS	VALUE
Maximum Wire Gauge	12 AWG

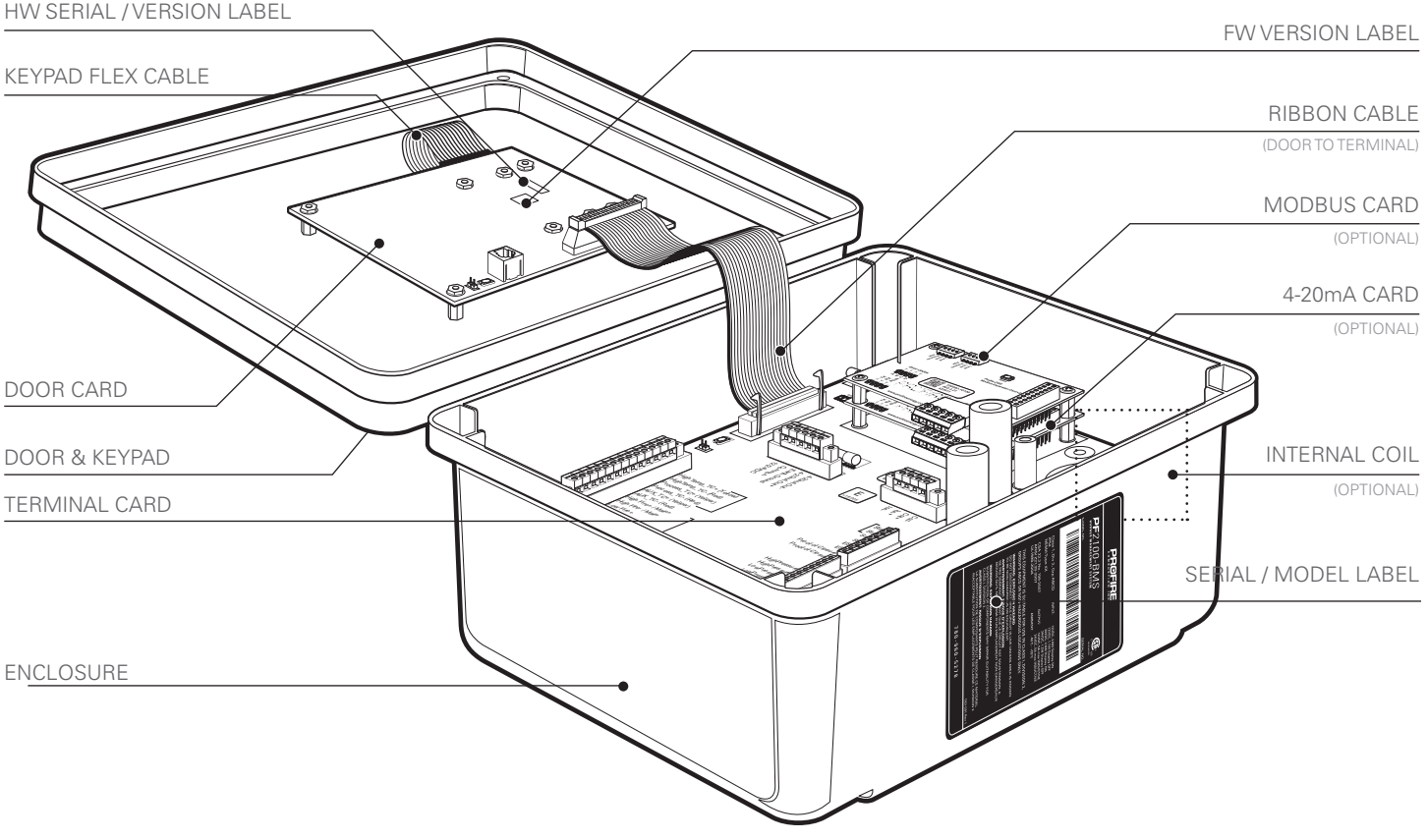
STATUS CONTACT	VALUE
Type	Dry
MAX Voltage	40VDC
MAX Continuous Current	250mA
Impedance (When Closed)	15Ω

PHYSICAL DIMENSIONS	VALUE
Width, Height, Depth	30.9 cm x 23.4 cm x 13.4 cm [12.15 in x9.23 in x5.28 in]

WEIGHT	VALUE
E0000 Model	4.0lbs / 1.8kg
E0400 Model	4.5lbs / 2.0kg
E0M00 Model	4.5lbs / 2.0kg
EC000 Model	6.0lbs / 2.6kg

*All valves combined @100% duty cycle

1.3 | System Diagram



1.4 | Terminal Card Descriptions

This table provides connection details and a brief description of each terminal.

TERMINAL	EXPECTED CONNECTIONS	DESCRIPTION
12/24VDC	Input power from a DC source	Input power 10VDC- 28VDC, 5A MAX
Common	Ground back to DC source	Internally connected to EGND
EGND	Earth Ground	
4-20mA Out +	Proportional Valve positive terminal or PLC 4-20mA positive input	This output can be used for either Proportional Valve Control or echoing the Process Temperature to a PLC. A resistance of 120Ω to 250Ω is expected.
4-20mA Out -	Ground return for the 4-20mA output	
HighTemp_TC + **(YELLOW)**	High Temp Thermocouple positive lead	**"TYPE K"** thermocouple must be connected between the "+" and "-" terminals and must not be electrically connected to ground. An uninterrupted connection using **"TYPE K"** thermocouple wire is required for an accurate reading.
HighTemp_TC - **(RED)**	High Temp Thermocouple negative lead	
Process_TC + **(YELLOW)**	Process Thermocouple positive lead	
Process_TC - **(RED)**	Process Thermocouple negative lead	
AUX_TC + (**YELLOW)**	Aux Thermocouple positive lead	
AUX_TC - **(RED)**	Aux Thermocouple negative lead	
High Fire/Main +	High Fire / Main Valve positive terminal	Solenoid valves must be connected between the "+" and "-" terminals. The negative terminal is not directly connected to ground so a common return wire for the High Fire, Low Fire and Pilot valves cannot be used. The total maximum continuous current for all valves is 4.5A. $[I_{HighFireValve} + I_{LowFireValve} + I_{PilotValve}] < 4.5A$ If the Valve PWM settings are set lower, the total peak load of all valves may be higher. For example, for 20% duty cycle, a total peak load of up to 9A may be possible.
High Fire/Main -	High Fire / Main Valve negative terminal. Do not connect to ground.	
Low Fire +	Low Fire Valve positive terminal	
Low Fire -	Low Fire Valve negative terminal. Do not connect to ground.	
Pilot +	Pilot Valve positve terminal	
Pilot -	Pilot Valve negative terminal. Do not connect to ground.	

TERMINAL	EXPECTED CONNECTIONS	DESCRIPTION
Ion +	Flame Detection positive input. Connect to flame rod or external coil Ion terminal (depending on configuration)	A Kanthal rod should be placed directly in the pilot flame and connected to this input. The pilot assembly must be grounded for the flame detection to function properly. Input is protected from high voltage and can be connected in series with the high voltage terminals of an external ignition coil, allowing a single flame-rod to be used for both ignition and flame detection. A 65VAC signal is applied to the flame rod. The source impedance is very high so there is no danger of sparking.
Ion -	Flame Detection negative input. Connect to ground screw on pilot assembly or burner housing.	Ground return for flame detection.
Coil +	Driver for the low voltage primary of the ignition coil.	The primary of the ignition coil should be connected to this terminal. The 12/24VDC input power will be applied for 1 ms and turned off for 50 ms while sparking. This output is protected by a 250mA thermal fuse.
Coil -	Ground return for the ignition coil.	
Status +	Connect to PLC positive input contact or other alarm device.	The status "+" and "-" contacts will be closed when the system is running and opened when the system is shutdown. Dry contact output to indicate system status to an external device. ie. PLC. Note that the contacts are DC only and are not internally connected to power or ground. 40VDC, 250mA, 15Ω
Status -	Connect to PLC negative input contact or other alarm device.	

TERMINAL	EXPECTED CONNECTIONS	DESCRIPTION
Start +	Remote start input from an external device. ie. PLC.	Dry contact switch is expected. The input is internally pulled up to 9VDC via a 3.75kΩ resistance. Jumper "+" and "-" if not used.
Start -	Ground	All input contacts can use a single common ground return if desired.
ESD +	External Shutdown input, typically plant ESD loop.	
ESD -	Ground	
Proof of Closure +	Proof of Closure from main valve(s).	
Proof of Closure -	Ground	
High Pressure +	Input from a mechanical High Pressure switch.	
High Pressure -	Ground	
Low Pressure +	Input from a mechanical Low Pressure switch.	
Low Pressure -	Ground	
Level +	Input from a float-switch mounted in the bath.	Dry contact switch is expected. The input is internally pulled up to 9VDC via a 3.75kΩ resistance. Jumper "+" and "-" if not used.
Level -	Ground	All input contacts can use a single common ground return if desired.

2 | Installation

The PF2100 can be used with many different systems. Before you begin installation, identify which system the BMS will be used to control. In addition to this document, Profire has several Quick Start Guides available describing common installation scenarios. These can be found at www.profireenergy.com.

The steps provided here are general and can help you to identify questions that need to be answered to complete the installation process. If you are new to the PF2100, you should read this whole section and follow the instructions closely.

STEPS

1. Review all installation warnings
2. Install the system
3. Connect the required wiring including Power, Valves, Thermocouples, and Ignition Coil / Flame Detection wiring
4. Connect any additional wiring as required for your specific application. Commonly used lines include the Status Contact, Dry Contact Inputs, 4-20mA Temperature Output, and Expansion Cards

To know which options are required, you should consult the engineer or technician who designed the site. You should also be familiar with the local electrical and gas code for the site.

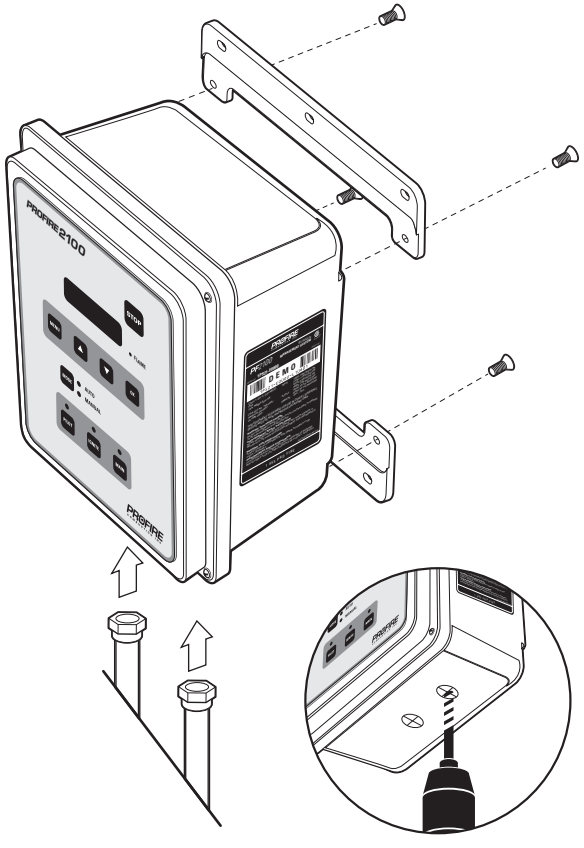
2.1 | Installation Warnings

Before installing the PF2100, please review the following list of warnings. Failure to consider these warnings may result in death, electrocution, property damage, product damage, and/or government fines.

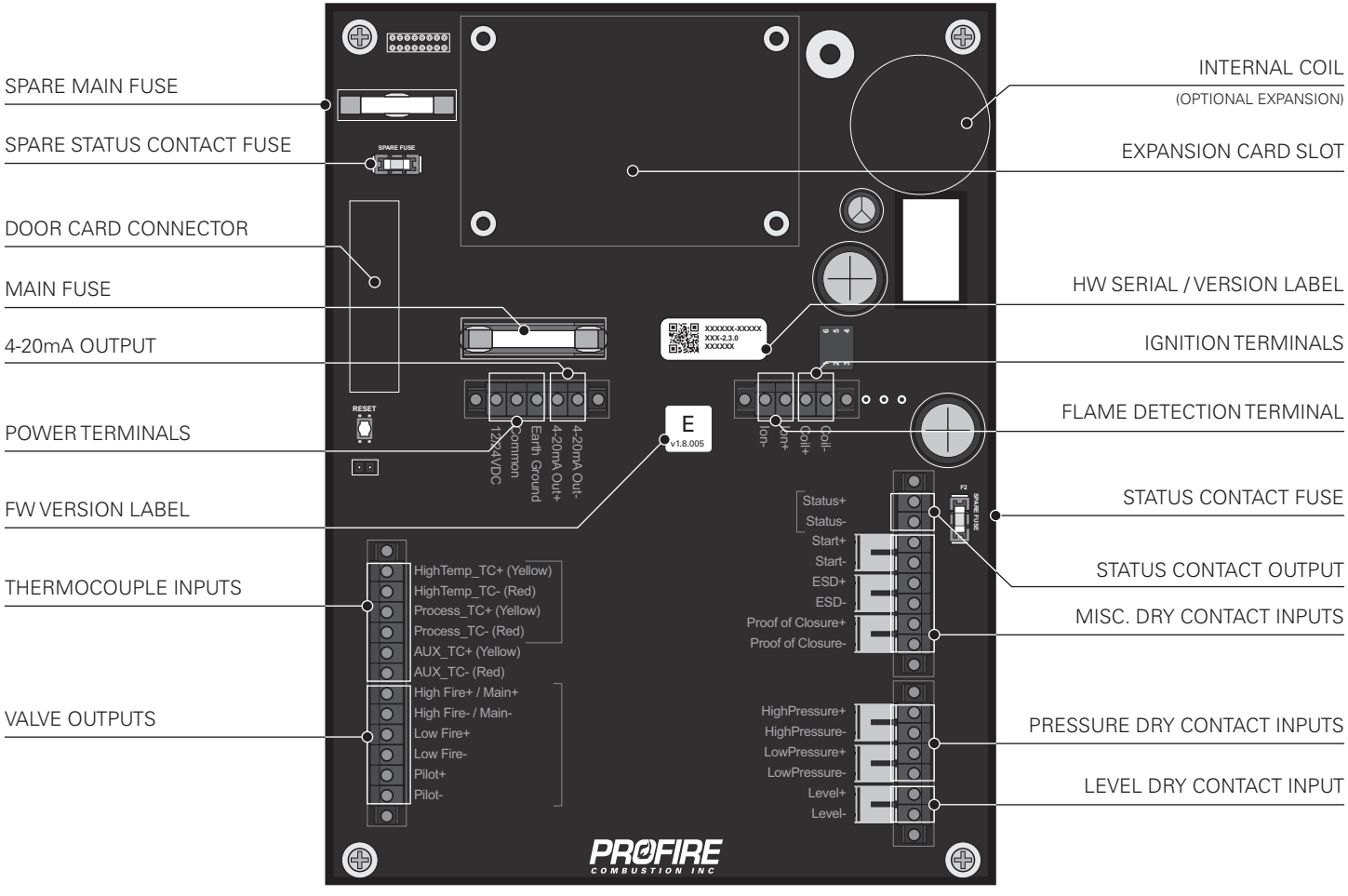
1. The PF2100 is not intended for use on burners greater than 12.5 MMBtuh. It is against code in many locations.
2. To use the PF2100 on burners greater than 5 MMBtuh, it is recommended that the low fire feature with two safety shutoff valves be used. At least one of these valves should use Proof of Closure. This is required in many locations.
3. Failure to properly ground the pilot assembly back to the PF2100's Ion terminal may result in accidental electrocution, product damage, or simply failure to ignite the pilot.
4. The PF2100 generates 20kV- 40kV at its high voltage output terminal which can cause cardiac arrest. Do not touch or place any object near the ignition coil's high voltage terminal or connected ignition wire while the product is operating. Even without making physical contact with the terminal, it is possible to draw a spark from several inches away, especially if the pilot bracket is not properly grounded.
5. Never leave the PF2100 running unattended without the door screws securely tightened down. This is to prevent moisture from getting inside of the enclosure and damaging the product. Moisture damage to the internal circuitry is not covered by the product warranty if the door has been left open.
6. All conduit ports drilled into the PF2100 enclosure must be CSA/NEMA Type 4 rated and be sealed in order to maintain the Type 4 rating.

2.2 | Mounting Instructions

1. Remove the included bag of components taped to the mounting brackets.
2. Determine the best location for conduit attachment, on the bottom of the enclosure.
3. Install grommets or conduit ports as required.
4. Securely mount the enclosure to a pole, structure or building as indicated by the site engineer or technician.



2.3 | Terminal Card Diagram



2.4 | Wiring

The wiring in this section is required for all PF2100 installations. Skipping or performing any steps in this section incorrectly will result in the PF2100 not functioning properly.

POWER

The PF2100 can be powered from 12VDC or 24VDC. The maximum current that the PF2100 can safely handle without blowing the main fuse is 5A. The system on its own draws about 100mA. The rest of the current is used by additional hardware such as valves. Make sure that you select a power supply that is rated appropriately for the total amount of current that will be consumed by all devices attached to it.

WIRING STEPS

1. Wire the Common terminal to the negative terminal of the power supply.
2. Wire the Earth Ground terminal to the shield of all conduit ports installed in the enclosure.
3. Connect the Earth Ground terminal to an actual earth ground connection.
4. Wire the 12/24VDC terminal to the positive terminal of the power supply.

VALVES

There are four valve control outputs on the PF2100: Pilot, Low Fire, 4-20mA Output, and High Fire/Main.

WIRING STEPS

1. Wire the Pilot valve to the Pilot +/- terminals.
2. Wire the Main valve to the High Fire / Main +/- terminals.
3. If Low Fire is required in your application, do one of the following:
    - Wire the Low Fire valve to the Low Fire +/- terminals
    - If you want to use a proportional valve, wire the valve to the 4-20mA Out +/- terminals

4. Make sure that each valve has a separate return wire. Multiple valves sharing common return wires will not function properly.
5. Connect valve EGND wires to Earth Ground.

NOTES

It is possible to connect multiple valves to the same control output. If you do this, make sure that the configuration you are using meets local codes and also does not exceed the total current rating of the PF2100.

The negative valve control wires are NOT connected directly to ground. This means you cannot use a common return wire for all valves.

THERMOCOUPLES

The High Temp and Process thermocouple inputs are mandatory and must be connected to a Dual Element thermocouple. The Auxiliary thermocouple is only needed when a second process temperature (such as the outlet temperature on a line heater) must be monitored. Otherwise, the Auxiliary thermocouple terminals can be left unconnected. Please note that **Type-k thermocouple wire and connectors** should be used exclusively.

WIRING STEPS

1. Connect a Dual Element, Type-k thermocouple to the Process and High Temp thermocouple inputs.
2. If needed, connect a single Type-k thermocouple to the AUX thermocouple input.
3. Make sure that all connections are made using Type-k thermocouple wire and connectors.

NOTE | all thermocouples must be:

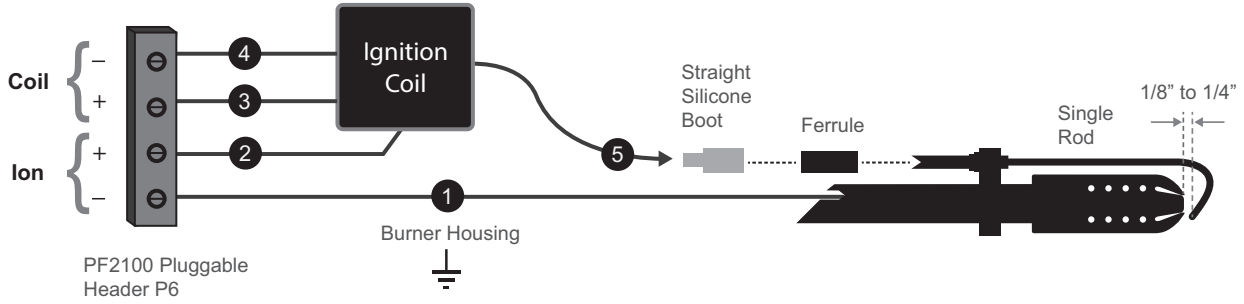
- Isolated from ground
- Isolated from power
- Type-k thermocouples
- Connected with 20 AWG or larger Type-k extension wire
- Placed a safe distance from high voltage lines and shielded when necessary.

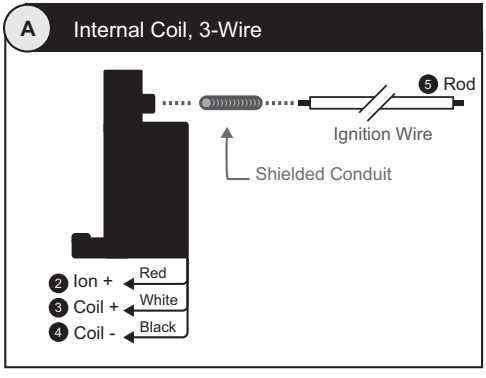
COIL OPTIONS

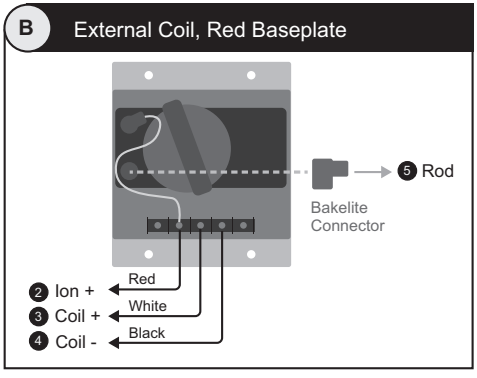
The PF2100 system can be connected to an external coil or can come with a built-in internal coil. The wiring changes based on which coil is being used and whether the system is using one rod or two with the nozzle.

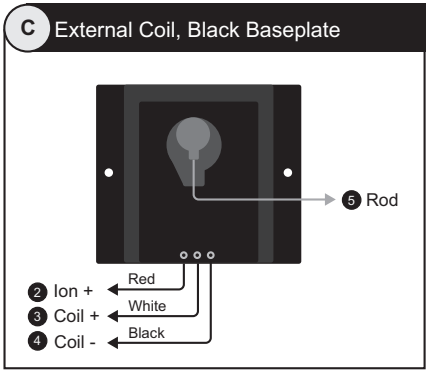
An optional additional rod may also be used if flame anchoring is a problem. In order for flame detection to work properly, the flame must be in physical contact with both the flame detection rod and the grounded pilot nozzle. This allows a current path from the flame detection rod, through the flame, to ground. When the nozzle velocity is high, the flame may not make contact with the nozzle. This situation is referred to as "poor flame anchoring". To resolve this situation, another grounded Kanthal rod can be placed further in front of the nozzle so that it catches the flame.

SINGLE ROD COIL WIRING





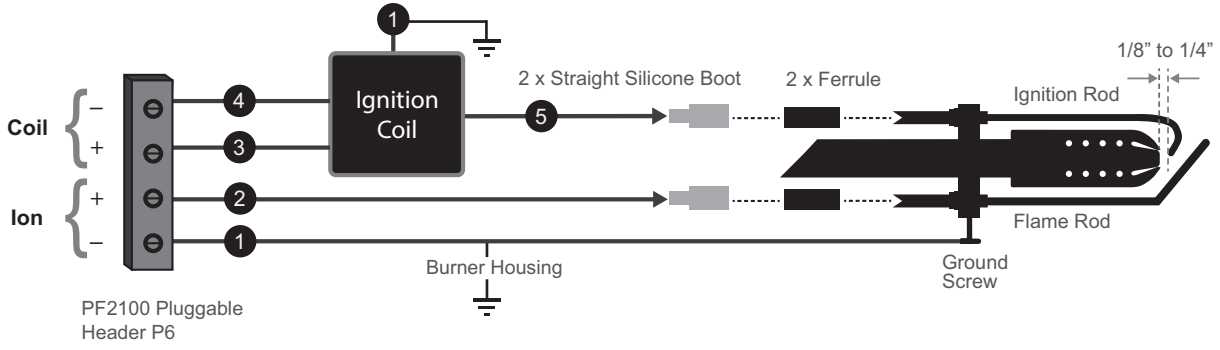


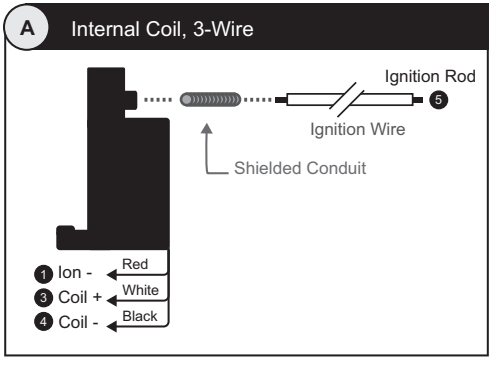


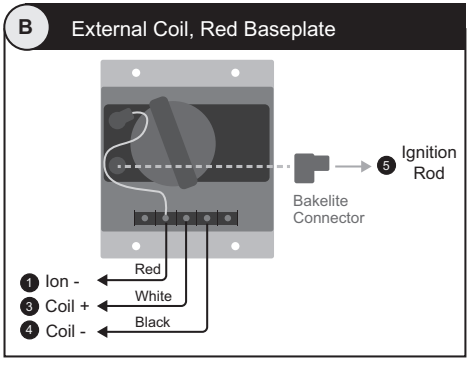
WIRING STEPS

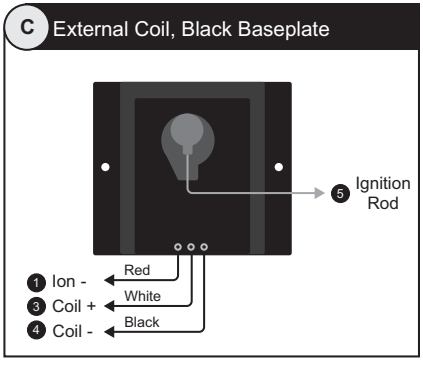
1. Connect the PF2100's Ion- terminal to the Burner Housing. Using a multimeter, verify that the Burner Housing and the Pilot Nozzle are both strongly connected to earth ground. If not, you may need to run an additional wire between the Burner Housing and the Pilot Assembly ground screw. In general, you should use 7mm Ignition Wire but 16 AWG may be acceptable for runs less than 8m (25 feet) total. Do not exceed 15m (50 feet) total. Avoid running this wire through metal conduit if possible as this will limit the length of wire that will work.
2. Connect the PF2100's Ion+ terminal to the Ignition Coil. Use 16 AWG if extra wire is needed.
3. Connect the PF2100's Coil+ terminal to the Ignition Coil. Use 16 AWG if extra wire is needed.
4. Connect the PF2100's Coil- terminal to the Ignition Coil. Use 16 AWG if extra wire is needed.
5. Connect the Kanthal Rod to the Ignition Coil. Use the included Ferrule and Straight Silicone Boot to ensure that the connection is robust. Always use 7mm Ignition Wire and do not exceed 5m (15 feet). Avoid running this wire through metal conduit if possible as this will limit the length of wire that will work.
    - For Coils A and C: Strip ¼" from the ignition wire, insert into the high voltage terminal on the coil, tighten set screw on the top of the coil, and replace the rubber cap over the set screw.
    - For Coil B: Strip ¼" from the ignition wire, insert into the 90 degree bakelite connector, tighten the screw in the bakelite connector, and click the connector onto the high voltage terminal post on the coil.
6. Adjust the Rod positioning (bend it if necessary) so that there is a 1/8 to 1/4" gap between the rod and the front of the pilot nozzle.

DUAL ROD COIL WIRING









WIRING STEPS

1. Connect the PF2100's Ion- terminal to the Ignition Coil and to the Burner Housing. Using a multimeter, verify that the Burner Housing and the Pilot Nozzle are both strongly connected to earth ground. If not, you may need to run an additional wire between the Burner Housing and the Pilot Assembly ground screw. In general, you should use 7mm Ignition Wire but 16 AWG may be acceptable for runs less than 8m (25 feet) total. Do not exceed 15m (50 feet) total. Avoid running this wire through metal conduit if possible as this will limit the length of wire that will work.
2. Connect the PF2100's Ion+ terminal to the Kanthal Flame Rod. Use one of the included Ferrules and one of the Straight Silicone Boots to ensure that the connection is robust. Always use 7mm Ignition Wire and do not exceed 5m (15 feet). Avoid running this wire through metal conduit if possible as this will limit the length of wire that will work.
3. Connect the PF2100's Coil+ terminal to the Ignition Coil. Use 16 AWG if extra wire is needed.
4. Connect the PF2100's Coil- terminal to the Ignition Coil. Use 16 AWG if extra wire is needed.
5. Connect the Kanthal Ignition Rod to the Ignition Coil. Use the other included Ferrule and Straight Silicone Boot to ensure that the connection is robust. Always use 7mm Ignition Wire and do not exceed 5m (15 feet). Avoid running this wire through metal conduit if possible as this will limit the length of wire that will work.
    - For Coils A and C: Strip ¼" from the ignition wire, insert into the high voltage terminal on the coil, tighten set screw on the top of the coil, and replace the rubber cap over the set screw.
    - For Coil B: Strip ¼" from the ignition wire, insert into the 90 degree bakelite connector, tighten the screw in the bakelite connector, and click the connector onto the high voltage terminal post on the coil.
6. Adjust the Ignition Rod positioning (bend it if necessary) so that there is a 1/8 to 1/4" gap between the rod and the front of the pilot nozzle.
7. Adjust the Flame Rod positioning (bend it if necessary) so that 2 to 3" of the rod will be inside the pilot flame. Take care to ensure that the Flame Rod is not directly behind the Ignition Rod to prevent flame shadowing (a condition where the flame parts behind the Ignition Rod and does not actually make contact with the Flame Rod).

COIL WIRE LENGTH LIMITATIONS

Distance Between 2100 and Pilot*	Wire Size	Hardware Version
0 to 10 feet	14 to 16 Gauge	V 1.7 Terminal Card
10 to 25 feet	7mm Ignition Wire	V 1.7 Terminal Card
25 to 60 feet	7mm Ignition Wire	V 2.4 Terminal Card

*For single rod installations, the distance is defined as the length 2 plus 5 as shown in the Single Rod Coil Wiring Diagram. Note that wire 5 should be no longer than 10 ft. For dual rod installations, the distance is defined as the length 2 as shown in the Dual Rod Coil Wiring diagram.

3 | User Interface & Settings

The user interface has keys, indicator lights, and a display screen for the software interface (including things such as menus and status screens).

3.1 | User Interface

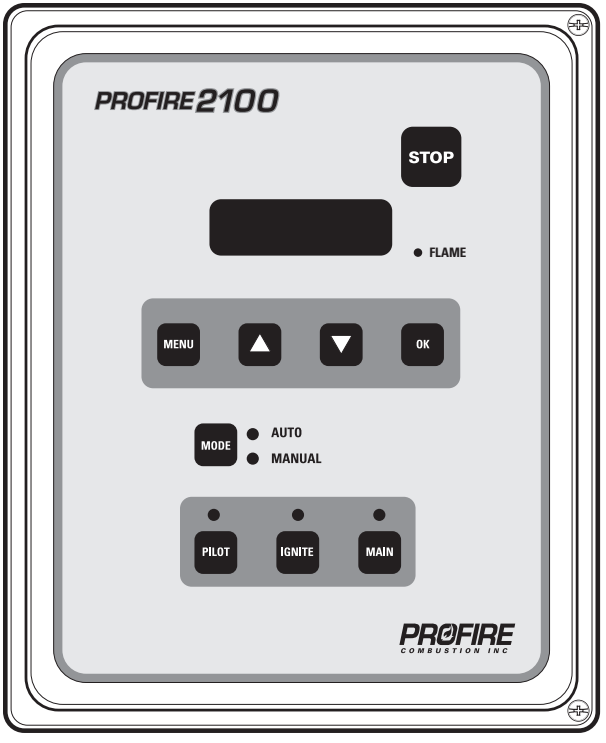
The physical interface consists of three parts:

1. An illuminated display
2. Indicator lights
3. A keypad

DISPLAY

The screen on the PF2100 displays two lines of text which are used to show system status, warnings, alarms, prompts, and menus. It is illuminated for ease of reading in both bright sunlight and darkness.

When the system first powers on, the display will show the system name and firmware version for a few seconds, after this it will show the Home Screen.



INDICATOR LIGHTS

FLAME LIGHT
Indicates that the system is detecting the pilot flame.

AUTO LIGHT
Indicates that the system is running in Auto Mode.

MANUAL LIGHT
Indicates that the system is running in Manual mode.

PILOT LIGHT
Indicates that the pilot valve is open.

IGNITE LIGHT
Indicates that the system is sparking to ignite the pilot.

MAIN LIGHT
Indicates that the main valve is open.

KEYS

STOP KEY
Used to stop the system immediately. (Turns off the burner.)

MENU KEY
Used to navigate through the menu.

UP KEY
Used to adjust a setting upwards and to scroll up through lists.

DOWN KEY
Used to adjust a setting downwards and to scroll down through lists.

OK KEY
Used to enter a menu, acknowledge a prompt, save an edited setting, or return to the home screen.

MODE KEY
Used to toggle between Manual and Auto Modes of operation.

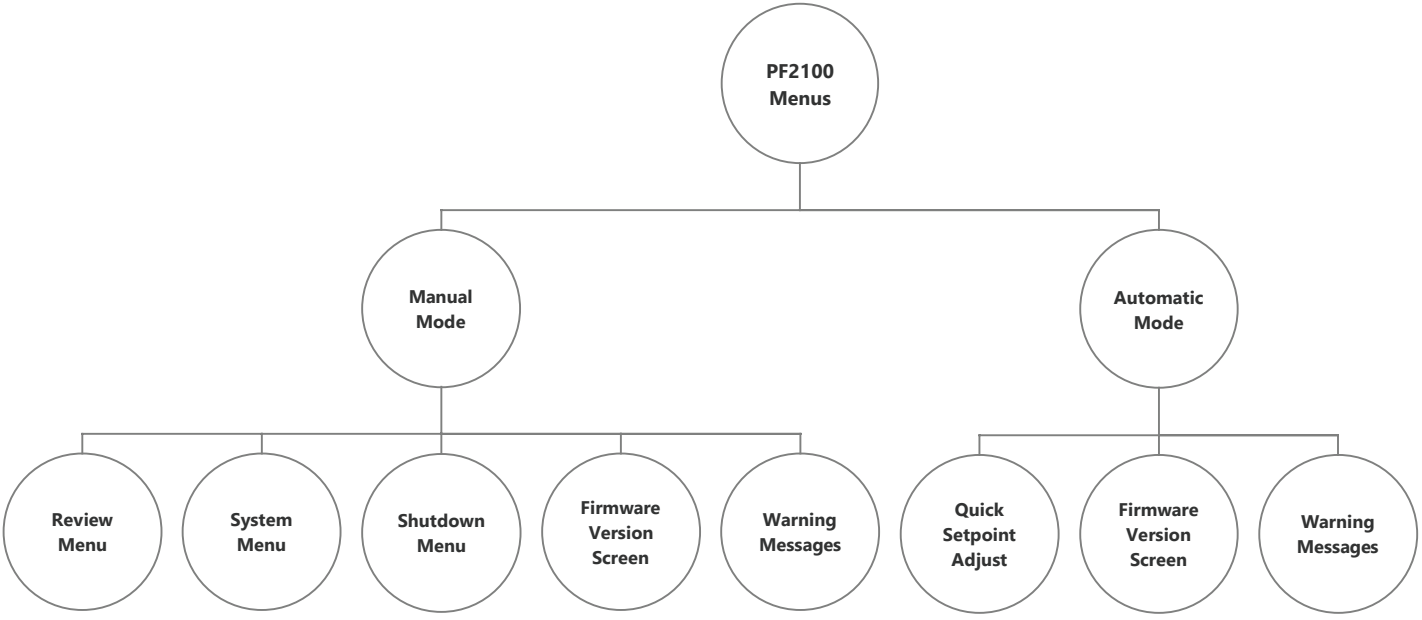
PILOT KEY
Used in Manual Mode to test the pilot valve.

IGNITE KEY
Used in Manual Mode to test the ignition circuit.

MAIN KEY
Used in Manual Mode to test the main valve.

3.2 | Menu Navigation

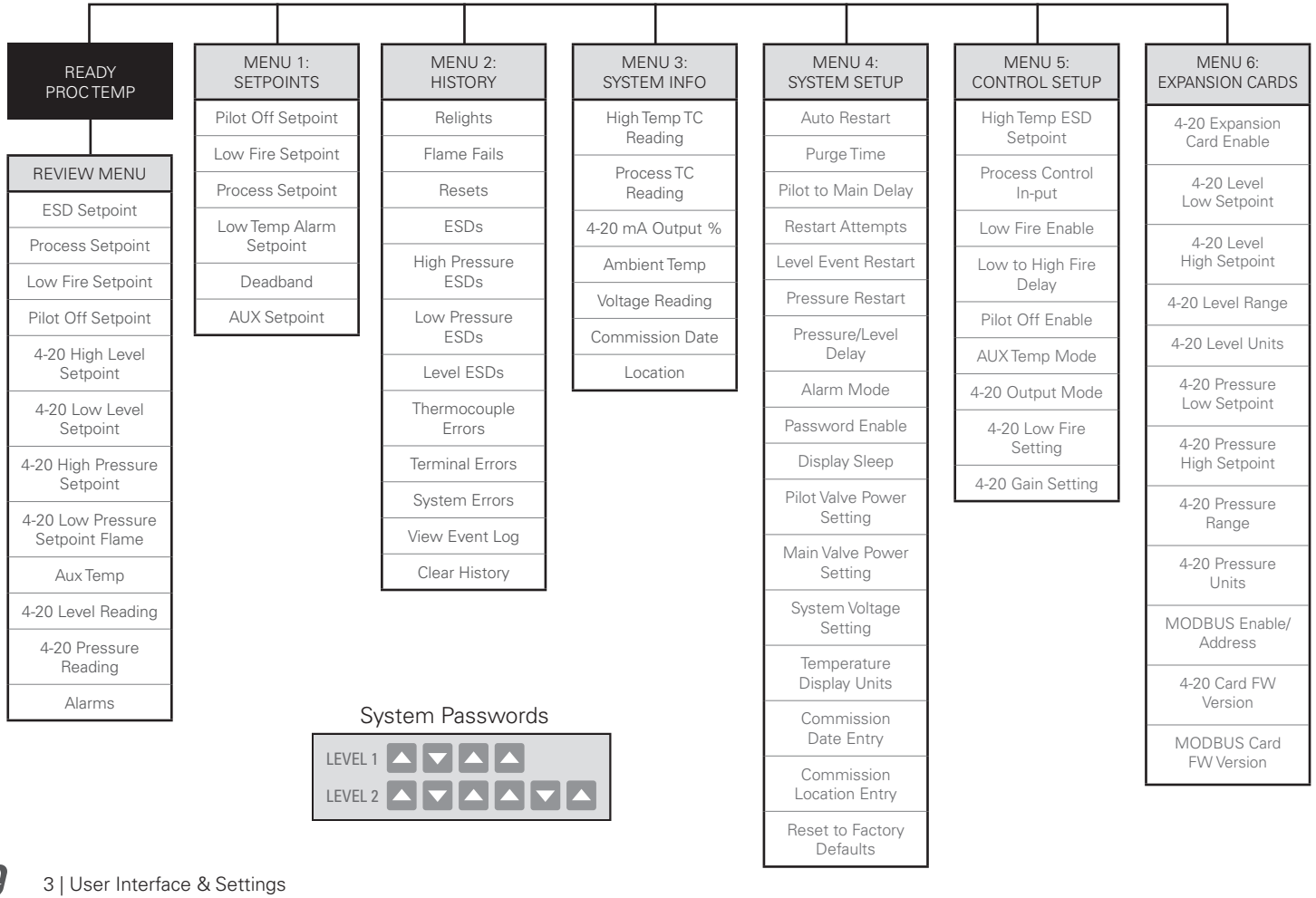
The software user interface is shown on the PF2100 display. While the system is powered, the state of the system is displayed on the screen. The user can also change settings via this interface. Below is a diagram showing the various types of information that can be accessed through the interface. The default system screen at startup and when idling is the Home Screen. Most items are accessed through the Home Screen but some can be accessed from anywhere in the interface.



Certain settings can be viewed only in Manual Mode or only in Auto Mode.

3.3 | Menu Map

For a complete description of each item, please refer to the menu definitions section. The debug functions are not shown here; if needed they are located in the calibration section of the manual.



SETPOINTS (MENU 1)

This menu is used to adjust the Process Control Setpoints.

MENU MAP	ON SCREEN	BRIEF DESCRIPTION	RANGE	DEFAULT SETTING	CUSTOM SETTINGS
Pilot Off Setpoint	Pilot Off Setpnt	Adjusts the temperature at which the Pilot Valve will turn off when Pilot Off is enabled.	1 to 1349˚C 34 to 2460˚F	85˚C 185˚F	
Low Fire Setpoint	Low Fire Setpnt	Adjusts the temperature at which the Low Fire Valve will turn off when Low Fire is enabled.	2 to 1349˚C 36 to 2460˚F	Hidden, 85˚C 185˚F	
Process Setpoint	Proc Setpnt	Adjusts the temperature at which the High Fire/Main Valve will turn off	1 to 1349˚C 34 to 2460˚F	80˚C 176˚F	
Low Temp Alarm Setpoint	Low Temp Alarm Setpnt	Adjusts the temperature where the Status Contact will close, if enabled.	Disabled, 1 to 1349˚C 34 to 2460˚F	Disabled	
Deadband	Deadband	Adjusts the Deadband. Used with the Process Setpoint and sometimes Low Fire and Aux Setpoints.	1 to 150˚C 1 to 240˚F	2˚C 3˚F	
Aux Setpoint	AUX Setpnt	Adjusts the Auxiliary Setpoint.	0 to 1350˚C 32 to 2462˚F	Hidden, 20˚C 68˚F	
PID–Proportional Band	PID PB:	Expressed in Percent. This is inversely proportional to the PID controller's proportional gain.	0.0 to 999.9%	10.0%	
PID–Integral	PID I:	Expressed in Minutes per Reset. This is the amount of time required for the PID integral term to yield the same output as the proportional term.	0.0 to 999.9 min/rst	4.0 min/rst	
PID–Derivative	PID D:	Expressed in Minutes. This causes the PID to compensate based on the changing error. Disabled by default.	0.0 to 999.9 min	0.0 min	

HISTORY (MENU 2)

This menu contains event counters and the event log. For a detailed list of these options, please refer to the product manual.

SYSTEM INFO (MENU 3)

This menu contains diagnostic information about the system. For a detailed list of these options, please refer to the product manual.

SYSTEM SETUP (MENU 4)

This menu contains various optional system settings. It cannot be accessed while the PF2100 is running.

MENU MAP	ON SCREEN	BRIEF DESCRIPTION	RANGE	DEFAULT SETTING	CUSTOM SETTINGS
Auto Restart	Auto Restart	Enables system to restart from a power failure, low pressure, or high voltage event.	On/Off	Off	
Purge Time	Purge Time	Adjusts the time from all valves closed to Pilot relight attempts.	10- 900 sec	30 sec	
Pilot to Main Delay	Pilot to Main Delay	Adjusts the time from Pilot proven to Main Valve opening.	5- 600 sec	15 sec	
Restart Attempts	Restart Attempts	Adjusts the number of Restart Attempts after an unexpected flame failure before a shutdown.	0- 3	3	
Level Event Restart	Level Event Restart	Enables recovery from a Low Level event.	On/Off	Off	
Pressure Restart	Pressure Restart	Enables automatic restarts after a low pressure event. Can be set to always restart or conditionally using Main Control. Main Control sets the system to only restart when the pressure is above the low setpoint and below the low setpoint minus the deadband.	Disabled, Enabled, Main Control	Disabled	

MENU MAP	ON SCREEN	BRIEF DESCRIPTION	RANGE	DEFAULT SETTING	CUSTOM SETTINGS
Pressure/Level Delay	PRS/LVL Delay	Pressure and Level shutdown delay.	On/Off	Off	
Alarm Mode	Alarm Mode	Adjusts the behaviour of Status Contact relative to Start Contact.	Alm when Off, No Alm When Off	No Alm when Off	
Password Enable	Password	Enable Password Protection (Menu 1-3)	On/Off	Off	
Display Sleep	Display Sleep	Enable Sleep Mode for the Display	Never, After 10 Min	Never	
Pilot Valve Power Setting	Pilot Solenoid PWM	Adjusts the Pilot Valve PWM duty cycle.	Off, 80%, 60%, 40%, 20%	60%	
Main Valve Power Setting	Main Solenoid PWM	Adjusts the Main Valve PWM duty cycle.	Off, 80%, 60%, 40%, 20%	60%	
System Voltage Setting	System Voltage	Configures the expected input voltage for the system.	12V, 24V	12V	
Temperature Display Units	Temp Units	Configures the temperature units displayed by the system.	Fahrenheit, Celsius	Celsius	
Commission Date Entry	Commission Date	Set the date that the system was commissioned.	DD-MMM-YYYY	01-JUN-2012	
Commission Location Entry	Commission Loc	Set the install location of the system. 14 Characters Max.	A-Z, 0-9,-./		
Reset to Factory Defaults	Restore Factory Defaults	Restore all settings to the factory default.	Yes/No	No	

CONTROL SETUP (MENU 5)

This menu contains various optional Process Control settings. It cannot be accessed while the PF2100 is running.

MENU MAP	ON SCREEN	BRIEF DESCRIPTION	RANGE	DEFAULT SETTING	CUSTOM SETTINGS
High Temp ESD Setpoint	High Temp ESD Setpoint	Adjusts the High Temperature shutdown setpoint.	2 to 1350˚C 36 to 2462˚F	90˚C 194˚F	
Process Control Input	Process Control	Configure the thermocouple used as the Process Temperature.	Process TC, AUX TC	Process TC	
Low Fire Enable	Low Fire	Enables Low Fire feature and setpoint.	Disabled, on at Proc Setpnt, on at Low Fire Setpnt	Disabled	
Low to High Fire Delay	Low to High Fire Delay	Adjusts the time from Low Fire Valve opening to High Fire Valve opening, when Low Fire is enabled.	30- 600 sec	Hidden, 30 sec	
Pilot Off Enable	Pilot Off	Enables Pilot Off feature and setpoint.	Disabled, Enabled	Enabled	
Aux Temp Mode	AUX Temp Mode	Configures how the Auxiliary Thermocouple is used.	Disabled, Display Only, Temp Main Ctl, Temp ESD	Disabled	
4-20 Output Mode	4-20 Out Mode	Configures 4-20 Output mode.	Valve Control 1 Valve Control 2, Temp Output	Valve Control 1	
4-20 Low Fire Setting	4-20 Out Lo Fire Setting	Sets the minimum output for the 4-20mA Output when used for Valve Control.	0 to 70%	40%	
4-20 Gain Setting	4-20 Out Cntrl Gain	Sets the adjustment speed of the control loop for the 4-20mA Output when used for Valve Control.	0.1 to 1%/s	0.5%/s	

EXPANSION CARDS (MENU 6)

This menu contains settings relating to expansion cards.

MENU MAP	ON SCREEN	BRIEF DESCRIPTION	RANGE	DEFAULT SETTING	CUSTOM SETTINGS
4-20 Input Card Enable	4-20 Input Card Enabled	Enable the 4-20mA Expansion Card and setpoints.	No/Yes	No	
4-20 Level Units	4-20 LVL Units	Adjusts the display units for the 4-20mA Level Input.	%, m3, BBL, GAL,L	Hidden, m3	
4-20 Level Range	4-20 LVL Range	Adjusts Max Level of the tank.	0-10000	Hidden, 120m3	
4-20 Level Zero Offset	4-20 LVL Zero Offset	Adjusts the level reading corresponding to a 4mA input.	0 to Low Setpoint	0	
4-20 Level Low Setpoint	4-20 LVL Low Setpnt	Adjusts 4-20 Low Level trip point.	0-Max Volume	Hidden, 60m3	
4-20 Level High Setpoint	4-20 LVL High Setpnt	Adjusts 4-20 High Level trip point.	0-Max Volume	Hidden, 117m3	
4-20 Pressure Units	4-20 PRS Units	Adjusts the display units for the 4-20mA Pressure Input.	PSI, kPa, inWC, cmWC, ksc	Hidden, PSI	
4-20 Pressure Range	4-20 PRS Range	Adjusts Max pressure of the fuel train.	0-2000	Hidden, 30.0 PSI	
4-20 Pressure Low Setpoint	4-20 PRS Low Setpnt	Adjusts 4-20 Low Pressure trip point.	0-High Setpoint	Hidden, 3.0 PSI	
4-20 Pressure High Setpoint	4-20 PRS High Setpnt	Adjusts 4-20 High Pressure trip point.	Low setpoint -Max Pressure	Hidden, 25.0 PSI	
MODBUS Enable/Address	Modbus Card	Enable control and address for the Modbus Expansion Card.	Disabled, 1-128	Disabled	
4-20 Card FW Version	4-20 FW	Display Expansion Card FW version.	N/A	N/A	
MODBUS Card FW Version	MBUS FW	Display Expansion Card FW version.	N/A	N/A	

REVIEW MENU

This menu allows various commonly needed system settings and status parameters to be reviewed while the system is running.

MENU MAP	ON SCREEN	BRIEF DESCRIPTION	RANGE	DEFAULT SETTING	CUSTOM SETTINGS
ESD Setpoint	ESD Setpnt	Temp at which system will shutdown.			
Process Setpoint	ProcSetpnt	Temp at which High Fire / Main Valve will turn off.			
Low Fire Setpoint	LF Setpnt	Temp at which Low Fire Valve will turn off if Low Fire is enabled.			
Pilot Off Setpoint	Pilot off	Temp at which Pilot Valve will turn off if Pilot is enabled.			
4-20 High Level Setpoint	HLV	Level at which 4-20mA Output contacts will toggle.			
4-20 Low Level Setpoint	LLV	Level below which the system will shutdown or wait if Level Event Restart is enabled.			
4-20 High Pressure Setpoint	HPR	Pressure above which the system will shutdown after Main.			
4-20 Low Pressure Setpoint	LPR	Pressure below which the system will shutdown or wait if Auto Restart is enabled.			
Flame	Flame	Current Flame Quality.			
Aux Temp	AUX Temp	Current Aux Temp reading.			
4-20 Level Reading	LVL	Current 4-20mA Level input reading.			
4-20 Pressure Reading	PRS	Current 4-20mA Pressure input reading.			

MENU MAP	ON SCREEN	BRIEF DESCRIPTION	RANGE	DEFAULT SETTING	CUSTOM SETTINGS
TC Debug Screen	DH=ww TH=xx TP=yy TA=zz	Shows the current readings of all temperature sensors simultaneously always in degrees celsius regardless of the display unit setting. DH=Door Card High Temp Thermocouple TH=Terminal Card, High Temp Thermocouple TP=Terminal Card Process Thermocouple TA=Terminal Card Ambient Thermocouple			
Alarms	Alarms	Lists up to 3 simultaneous alarm codes if any are present.			

3.4 | System Operation

This section includes information about how to start and stop the system, how to review key system settings, how to adjust setpoints while the system is running, and how to check the system firmware versions.

STARTING THE SYSTEM

There are five different ways to start the system:

AUTO MODE OPTION

The system is set to Manual Mode by default. Setting the system to Auto Mode is the most common way to start the system.

1. Make sure the system is stopped, all alarms are clear, and the Home Screen displays "Ready".
2. Press the Mode Key. A confirmation prompt will show on the Display.
3. Press the OK Key to confirm that you want to start the system.

This changes the system to Auto Mode. Based on the defined system settings, the system will automatically restart from faults. The system will take over turning the valves on and off according to the system settings and the current Process Temperature.

SYSTEM TEST AND START OPTION

This method is used during the initial installation when testing the pilot valve, main valve, ignition circuit, and flame detection circuitry in a slow sequence.

1. Make sure the system is set to Manual Mode and is stopped with all alarms clear. The Home Screen should display "Ready".
2. Press and hold the Pilot Key to open the Pilot Valve. Listen for the Pilot Valve to click open and let the gas through. Continue to hold the Pilot Key and press and hold the Ignite Key to begin sparking. Check the Pilot Nozzle for sparks and flame. If you cannot see the Pilot Nozzle, listen for the sound of sparking and try to determine if it is coming from the ignition rod.
3. Release the Ignite Key and check that the display shows a Flame Quality of 100%.
4. After about 5 seconds, the display will show "Pilot On" if the Pilot lit successfully.
5. Press the Main Key to open the Main Valve. The system will count down the Pilot-to-Main Delay and then open the Main Valve if the Process Temperature is within the expected range.
6. The system will take over turning the valves on and off according to the system settings and the current Process Temperature.

7. Press the Mode Key to switch the system into Auto Mode. This allows the system to automatically restart from faults specified in the system settings.

If any of these checks fail, consult the troubleshooting section of this guide.

AUTOMATIC RESTARTS

If the Auto Restart feature is enabled, the system will attempt to automatically start after a power failure. This will only succeed if all alarms are clear.

START CONTACT OPTION

The Start Contact option can be used to start the system from a remote switch located elsewhere on the site or through a PLC output contact.

1. If there are any Shutdown Messages showing on the display, open the Start Contact and then close it again to acknowledge those messages.
2. Open the Start Contact and then close it again to remotely start the system in Auto Mode. This will only work if all alarms are clear.

MODBUS CARD OPTION (IF INSTALLED)

This method can be used to start the system via a remote device over a Modbus RTU network.

1. Have the remote device write "1234" to the 40100 register to place the system into Auto Mode.
2. Set the remote device to poll the 40100 register and wait for it to clear to zero. This indicates that the system has processed the command.
3. Set the remote device to poll the 10001 register and wait for it to change to 1. This indicates that the system is running.

STOPPING THE SYSTEM

There are five different ways to stop the system:

STOP KEY OPTION

This is the most common way to stop the system.

1. Press the Stop key. The system will stop immediately.

AUTO KEY OPTION

This method of stopping the system is used during the initial installation when testing the pilot valve, main valve, ignition circuit, and flame detection circuitry in a slow sequence.

1. Press the Mode Key to switch the system into Manual Mode. This prevents the system from automatically restarting from faults specified in the system settings.
2. Press the Main Key to close the Main Valve and disable process control.
3. Press the Pilot Key to close the Pilot Valve and stop the system.

START CONTACT STOP

The system can be stopped us the same remote switch or PLC output as with starting the system using the Start Contact input.

1. Open the Start Contact and leave it open. The system will stop immediately.

SHUTDOWN CONDITIONS

Whenever any shutdown condition is present, the system will stop and and stay stopped until the condition is removed and the fault is acknowledged. Shutdown condition examples include the Process Temperature rising above the High Temp ESD Setpoint, the High Pressure Contact Opening, the ESD Contact Opening, etc. Many conditions can cause shutdowns. Some conditions will only trigger a shutdown if it is enabled in the system settings. See the fault chart in this guide for more details.

MODBUS CARD OPTION (IF INSTALLED)

This method can be used to stop the system using a remote device over a Modbus RTU network.

1. Have the remote device write “4321” to the 40100 register to stop the system.
2. Set the remote device to poll the 40100 register and wait for it to clear to zero. This indicates that the system has processed the command.
3. Set the remote device to poll the 10001 register and wait for it to change to 0. This indicates that the system has stopped.

ADJUST SETTINGS & REVIEW STATUS

There are four ways to check and adjust system settings and view the system status:

HOME SCREEN

The Home Screen is accessible at any time by pressing and holding the OK Key for 3 seconds.

Manual Mode:
The Home Screen displays the System State and the Process Temperature.

Auto Mode:
The Home Screen displays the Process Setpoint and the Process Temperature.

QUICK SETPOINT ADJUST (AUTO MODE ONLY)

This feature allows some Process Setpoints to be adjusted as a group even when the system is running. Affected setpoints are the Low Fire Setpoint (if enabled), the Process Setpoint, and the Pilot Off Setpoint (if enabled). These Process Setpoints can be adjusted directly from the Home Screen using the Up and Down Keys. The adjustments are limited by the maximum ranges of the Process Setpoints. Any changes made take effect immediately. This feature is protected by the L1 Password when password protection is enabled in Menu 4.

REVIEW MENU (MANUAL MODE ONLY)

The Review Menu is a diagnostic menu used to check key setpoints and view real time system measurements such as temperature, pressure, and level. To access it, press the Up or Down Key while on the Home Screen.

SYSTEM MENUS

Menus 1, 4, 5, and 6 are used for checking and adjusting settings. Menus 2 and 3 show diagnostic values. Menu 7 is used for calibration and is hidden by default. The System Menus are accessed by pressing the Menu Key from the Home Screen while in Manual Mode. Some menus are not accessible while the system is running.

Menu 3 contains some system status information not found elsewhere in the menu system. Refer to the Menu Map table for more details.

When the system is stopped, all settings can be checked and adjusted. When the system is running, only some settings may be checked or adjusted. The following table illustrates the circumstances under which various settings can be checked and adjusted. For more information about the menu system and the user interface, see the Menu Map section.

MODE	*HOME SCREEN*	*QUICK SETPOINT CHANGE AVAILABLE*	*REVIEW MENU AVAILABLE*	*SYSTEM MENUS AVAILABLE*
Manual Mode, System Stopped	System State Process Temperature	No	Yes	1-6 (and sometimes 7)
Manual Mode, System Running	System State Process Temperature	No	Yes	1-3
Auto Mode, System Running	Process Setpoint Process Temperature	Yes	No	None

4 | Troubleshooting

This section is designed to help you troubleshoot the PF2100. A list of common issues and solutions, reference tables containing Shutdown Messages, Alarm Codes, and Warning Messages, and step-by-step guides for troubleshooting specific issues are included in this section.

If you are having trouble with your PF2100 System, please consult the following resources in this order:

1. Consult this section for solutions to see if one matches your needs.
2. Consult the support section of our website at www.profireenergy.com.
3. Contact us on our support line at 1-855-PRO-FIRE (776-3473).

4.1 | Common Issues & Solutions

The following list of issues is grouped by general symptoms.

EXPANSION CARDS

CANNOT WRITE SETPOINTS VIA MODBUS

1. Check that the system has the latest firmware. Firmware older than v1.8.005 did not support this feature.
2. Check that the Modbus Card has the latest firmware. Firmware older than v4.0 did not support this feature.

FLAME DETECTION

SYSTEM HAS VISIBLE FLAME BUT CANNOT DETECT IT

1. The flame rod, pilot assembly and the gap between them should be fully engulfed in flame. If not, adjust the rod positioning.
2. Check that the flame detection wiring does not exceed the recommended maximum length.
3. Check that the Ion+ wire is securely connected as per the appropriate wiring diagram.
4. Check that the ground connection between the PF2100 and the pilot assembly is secure.
5. Put the PF2100 into Manual Mode and use the Review Menu to check the flame quality level.
6. Consult the instructions in the Flame Detection

Troubleshooting Guide for further details on Flame Detection.

SHUTDOWN

SYSTEM SHUTS DOWN WITH A HIGH/LOW VOLTAGE MESSAGE SHUTDOWN

1. Make sure that the system voltage setting matches the power supply's nominal voltage.
2. Check that the system has the latest firmware. Firmware older than v1.8.005 was prone to shutdown on transient voltage spikes and dips.
3. Make sure that some other load is not causing the supply to drop periodically. Remove other devices from the supply or if that is not an option, monitor the supply voltage with a data logger.
4. Make sure the power supply is rated appropriately for the valves and other peripheral devices attached to the PF2100.

SYSTEM SHUTS DOWN ON HIGH TEMPERATURE ESD

1. Check that the HT ESD setpoint is not set too close to the operating temperature of the system. Measurement accuracy and process control overshoot can cause the system to shutdown if they are too close.

SYSTEM SHUTS DOWN ON AN OPEN TC ERROR

1. Check the thermocouple connections inside the PF2100. Note that both the Process and High Temp thermocouples are required.
2. Check for breaks in the thermocouple wiring.

SYSTEM SHUTS DOWN ON TCS NOT BEING EQUAL

1. Press the Up and Down arrows together.
2. Press the Up arrow until you get to a screen with 4 temperature readings, DH, TH, TP and TA.
3. If the TH and TP readings are close but DH is different, follow these steps:
   - Go to the calibration menu.
   - Step through the menu to Cal High Temp = xxxC.
   - Press the Up arrow once.
   - Press OK.
   - Go back to the screen with the temperature readings and make sure the issue is corrected.

SOLAR POWER

SOLAR OUTPUT VOLTAGE IS 12V WHEN 24V IS EXPECTED

1. Check solar panel wiring. They should be wired in parallel rather than in series.

EXPECTED BATTERY LIFE IS NOT ACHIEVED

1. The PF2100 is not set up by default to use low power valves with a PWM setting of 20%.
2. The PF2100 is not set up to put the display to sleep when not in use.
3. The solar panel is undersized.
4. The solar panel is shaded or not located in full sun.

THE BATTERY IS NOT BEING CHARGED AT ALL

1. Check the Solar Charger for damage or defective parts. Look

for flashing error codes on the controller's LEDs.

2. The solar panel is undersized.
3. The solar panel is shaded or not located in full sun.
4. The battery is defective.

SOLENOIDS

VALVES ARE NOT OPENING

1. Check if the positive and negative wires are reversed.
2. Make sure that each valve has a separate negative return wire connected to the correct terminal. A common ground wire cannot be used and will not work.
3. Check if the proper PWM setting is used for each valve.
4. Check if the valve voltage ratings match the system voltage (12V or 24V).

SYSTEM SHUTS DOWN WITH TERMINAL CARD COMMAND REFUSED, MASTER POWER, SOLENOID FEEDBACK.

1. Check the solenoid wiring to make sure that no wires are crossed and that separate return wires are used for each valve.

STATUS CONTACT

STATUS CONTACT OPENS BUT SYSTEM CONTINUES TO RUN

1. Check that the system has the latest firmware. Some firmware versions older than v1.8.005 had a bug that might lead to this under certain circumstances. If you can't update your firmware immediately, repositioning the flame rod so that it is more fully immersed in the flame can lessen the occurrence of this issue.

STATUS CONTACT REMAINS CLOSED EVEN WHEN THE SYSTEM IS STOPPED

1. The status contacts are polarity sensitive. Try reversing the Status+ and Status- wires.

STATUS CONTACT NEVER CLOSES

1. The current or voltage ratings on the status contact may have been exceeded. Verify that you are not exceeding these ratings. If the ratings were exceeded, check the terminal Card HW version to determine the appropriate solution.
    - v1.6: Replace the Terminal Card.
    - v1.7: Replace the Status Contact Fuse on the Terminal Card.

THERMOCOUPLES

THERMOCOUPLE READINGS ARE BOUNCING

1. Verify that the Valve PWM Settings are correct for the valves being used. Using incorrect settings for a valve can result in more noise than necessary. The lowest noise will result when the PWM setting is set to 20% for low power valves and 100% for regular valves.
2. Verify that proper system grounding is in place. Especially check that all solenoids are connected to earth ground.

THERMOCOUPLE READINGS ARE INCORRECT

1. Check if the thermocouple wiring polarity is reversed. Yellow should be connected to positive, and red to negative.

2. Check that no thermocouple pairs are crossed (ie, positive from one TC paired with negative from another TC).
3. Make sure that only Type-k thermocouple wire and connectors are used. Even small sections of other types of wire can significantly disrupt the measurement.
4. If a head connection is used, verify that none of the above wiring issues exist there either.
5. Check if the thermocouple is defective by trying a different thermocouple that is known to be good or by connecting the suspect thermocouple to a process calibrator.
6. Check that the PF2100 is in proper calibration using a process calibrator. If not, recalibrate the system.

4.2 | Shutdown Messages

The following is a list of messages that may flash on the PF2100 display after the system has shutdown. Typically, the word "SHUTDOWN" in large text will flash alternately with one of the messages below. These messages indicate the reason that the system last shutdown and can be cleared by pressing the OK key (except where noted). Use the table below to determine the meaning of these messages. This table is organized alphabetically.

ON SCREEN	DESCRIPTION	POSSIBLE SOLUTIONS
Ambient Temps Not Equal	The Ambient Temperature read by the Door Card does not match the one reported by the Terminal Card.	The door card and terminal card are different temperatures. Check to see if one board is being heated by an external source such as direct sun on the door or being mounted on a hot tank.
Aux High Temp	Aux Temp Mode is set to "Temp ESD" and the Auxiliary Temperature exceeded the High Temp ESD Setpoint.	Verify proper settings and check for issues outside the system.
Aux Thermocouple Error	The Auxiliary Thermocouple is open.	Check wiring.
Comparison Setpoints	One of the Setpoints in the Door Card does not match the corresponding value in the Terminal Card.	Reset system to factory defaults.
Comparison: C_byte x y	The Door Card's internal control byte (x) did not match the Terminal Card's internal status byte (y).	Remove solenoid wires; if the problem is resolved check the solenoid wiring. If the problem remains the same, the boards or ribbon cable may need to be replaced.
Comparison: ESD DC:xxx TC:xxx	The Door Card and Terminal Card do not agree on the state of the ESD Contact." xxx" will be either "ON" or "OFF".	Remove ESD wires and jumper the terminals, if the problem is resolved check the wiring. If the problem remains the boards or ribbon cable may need to be replaced.
Comparison: LVL DC:xxx TC:xxx	The Door Card and Terminal Card do not agree on the state of the Level Contact. "xxx" will be either "ON" or "OFF".	Remove ESD wires and jumper the terminals, if the problem is resolved check the wiring. If the problem remains the boards or ribbon cable may need to be replaced.

ON SCREEN	DESCRIPTION	POSSIBLE SOLUTIONS
Comparison: MAN DC:xxx TC:xxx	The Door Card and Terminal Card do not agree on the state of the Main Valve Output. "xxx" will be either "ON" or "OFF".	Remove solenoid wires; if the problem is resolved check the solenoid wiring. If the problem remains the same, the boards or ribbon cable may need to be replaced.
Comparison: PLT DC:xxx TC:xxx	The Door Card and Terminal Card do not agree on the state of the Pilot Valve Output. "xxx" will be either "ON" or "OFF".	Remove solenoid wires; if the problem is resolved check the solenoid wiring. If the problem remains the same, the boards or ribbon cable may need to be replaced.
Comparison: PoC DC:xxx TC:xxx	The Door Card and Terminal Card do not agree on the state of the Proof of Closure Contact. "xxx" will be either "ON" or "OFF".	Remove ESD wires and jumper the terminals, if the problem is resolved check the wiring. If the problem remains the boards or ribbon cable may need to be replaced.
Comparison: PRH DC:xxx TC:xxx	The Door Card and Terminal Card do not agree on the state of the High Pressure Contact. "xxx" will be either "ON" or "OFF".	Remove ESD wires and jumper the terminals, if the problem is resolved check the wiring. If the problem remains the boards or ribbon cable may need to be replaced.
Comparison: PRL DC:xxx TC:xxx	The Door Card and Terminal Card do not agree on the state of the Low Pressure Contact. "xxx" will be either "ON" or "OFF".	Remove ESD wires and jumper the terminals, if the problem is resolved check the wiring. If the problem remains the boards or ribbon cable may need to be replaced.
Comparison: STRT DC:xxx TC:xxx	The Door Card and Terminal Card do not agree on the state of the Start Contact. "xxx" will be either "ON" or "OFF".	Remove ESD wires and jumper the terminals, if the problem is resolved check the wiring. If the problem remains the boards or ribbon cable may need to be replaced.
Control Error	The Internal Control State is not valid.	One of the boards will likely need to be replaced.
DC MSP430 No Communications	The TC430 Temperature chip on the Door Card is not responding.	Faulty Door Card
EEPROM Error	The EEPROM settings are corrupted.	Faulty Door Card

ON SCREEN	DESCRIPTION	POSSIBLE SOLUTIONS
ESD Input	The ESD Input was open while the system was running or attempting to start.	Check wiring.
Expansion Card Error / 4-20 Exp Card: 4-20 Level Low	The 4-20mA Level Input was below the Level Low Setpoint while the system was running with the Level Event Restart feature disabled.	Verify proper settings and check for issues outside the system.
Expansion Card Error / 4-20 Exp Card: 4-20 Level Open	The 4-20mA Level Input is open (reading below ~ 3.75mA)	Check wiring.
Expansion Card Error / 4-20 Exp Card: 4-20 PRS High	The 4-20mA Pressure Input was above the Pressure High Setpoint while the system was running with the Main Valve open.	Verify proper settings and check for issues outside the system.
Expansion Card Error / 4-20 Exp Card: 4-20 PRS Low	The 4-20mA Pressure Input was below the Pressure Low Setpoint while the system was running with the Auto Restart feature disabled.	Verify proper settings and check for issues outside the system.
Expansion Card Error / 4-20 Exp Card: 4-20 PRS Open	The 4-20mA Pressure Input is open (reading below ~ 3.75mA)	Check wiring.
Expansion Card Error / 4-20 Exp Card: Card Fail	The 4-20mA Expansion Card is not responding.	This may indicate that the card is not installed correctly or that the feature is enabled when the card is not present.
Expansion Card Error / Modbus Card: Card Fail	The Modbus Expansion Card is not responding.	This may indicate that the card is not installed correctly or that the feature is enabled when the card is not present.
Flame detected before start	Flame was detected prior to the system igniting the pilot.	This may indicate a leaky valve, inadequate purge time, or a faulty Terminal Card.
Flame Fail	The system failed to ignite the pilot within the allocated number of retry attempts.	See the Flame Detection Troubleshooting section.

ON SCREEN	DESCRIPTION	POSSIBLE SOLUTIONS
Flame Rod Test Error / Adjust Flame Rod Position	The Flame Rod or associated wiring may be shorted to ground thus preventing it from properly detecting flame.	If the error shows up immediately and does not allow you to start the system, remove the 4 pin terminal block to the ignition coil and try starting again. If you can start the system, there is a wiring problem. If you cannot start the system, one of the boards or the ribbon cable may be faulty. If the system runs for a while and then shuts down with this error after a random amount of time, the problem is that the flickering of the flame is lining up with the internal self test. Usually moving the rod more into the flame will resolve this issue.
High Pressure	The High Pressure Contact remained open for more than 2s after the main valve opened. This error can also be triggered by the 4-20 Input Card if the Pressure reading remains above the 4-20 Pressure High Setpoint for 2s after the main valve opened.	Verify proper settings and check for issues outside the system.
High Temp	The Process Temperature rose above the High Temp ESD Setpoint.	Verify proper settings and check for issues outside the system.
High Temp Setpoint Mismatch	The Door Card and Terminal Card do not agree on the value of the High Temp ESD Setpoint.	Reset to factory defaults.
High Voltage xx.x Volts	The system voltage remained above the High Voltage Alarm point for 20s or more and Auto Restart is disabled. "xx.x" is the voltage reading at the point in time when the shutdown occurred.	Verify proper settings and check for issues outside the system.
HT Thermocouple Error	The High Temp Thermocouple is open.	Check wiring.
Ignite Key Stuck	The Ignite Key was held for more than 30s while in manual mode.	Check for mechanical failure of the key.
Key Stuck Error / xxxx	One of the keypad keys was stuck at System Startup. The particular key stuck will be displayed in place of xxxx and will be one of the following: DOWN, IGN, MAIN, MODE, OK, PLT, MENU, STOP, UP	This may indicate a defective keypad. This error must be resolved in order to continue using the system.

ON SCREEN	DESCRIPTION	POSSIBLE SOLUTIONS
Level Input	The Level Contact is open and "Level Event Restart" is set to "Off". This error can also be triggered by the 4-20 Input Card if the Level reading is below the 4-20 Level Low Setpoint and "Level Event Restart" is set to "Off".	Verify proper settings and check for issues outside the system.
Low Pressure	The Low Pressure Contact is open and "Auto Restart" is set to "Off". This error can also be triggered by the 4-20 Input Card if the Pressure reading is below the 4-20 Pressure Low Setpoint and "Auto Restart" is set to "Off".	Verify proper settings and check for issues outside the system.
Low Voltage xx.x Volts	The system voltage remained below the Low Voltage Alarm point for 20s or more and "Auto Restart" is set to "Off". "xx.x" is the voltage reading at the point in time when the shutdown occurred.	Verify proper settings and check for issues outside the system.
Master Power Error	The Master Power switch to the powered valve outputs was in the wrong state.	Remove all valve wires and run the system. If the problem resolves, there is a wiring issue with the solenoids. If the problem remains, the Terminal Card is likely damaged. Check the solenoid connections for shorts to ground or across the terminals before installing a new board.
Modbus Card: Shutdown	The system shut down because a remote shutdown command was received via Modbus.	Check the data being sent through the Modbus connection.
Modbus Card: Shutdown / Remote Cmd Error	The system received an undefined command from the Modbus Expansion Card.	Check the data being sent through the Modbus connection.
Pilot Key Stuck	The Pilot Key was held for more than 30s while in manual mode.	Check for mechanical failure of the key.
Pro Thermocouple Error	The Process Thermocouple is open or shorted.	Check wiring.
Proof of Closure / Should be Closed	The Proof of Closure Contact was detected to be Open when it was not expected to be.	This may indicate a faulty valve or wiring.
Purge Values Mismatch	The Door Card and Terminal Card do not agree on the value of the Purge Time Setting.	Reset to factory defaults.
Run CRC Error	Main Program Memory CRC Error	Reset to factory defaults.

ON SCREEN	DESCRIPTION	POSSIBLE SOLUTIONS
Solenoid Feedback Error / Check Solenoid Wiring	The solenoids were observed to have a state opposite to the one being driven by the PF2100.	Remove all valve wires and run the system. If the problem resolves, there is a wiring issue with the solenoids. If the problem remains, the Terminal Card is likely damaged. Check the solenoid connections for shorts to ground or across the terminals before installing a new board.
System Error	Illegal Process Control or Display State	Reset to factory defaults.
Terminal Card Ambient Fail	The Terminal Card could not measure the ambient temperature. The Door Card failed to detect this.	Reset to factory defaults. Likely a faulty terminal card.
Terminal Card Command Refused	The Terminal Card received a valid command from the Door Card but the command was refused because it would result in an invalid or unsafe state. The Door Card failed to detect this.	Remove all valve wires and run the system. If the problem resolves, there is a wiring issue with the solenoids. If the problem remains, the Terminal Card is likely damaged.
Terminal Card Communication	The Terminal Card is not communicating with the Door Card. This may indicate a faulty ribbon cable or incompatible firmware. The Door Card failed to detect this.	Make sure the ribbon cable is properly installed. Likely a fault with door, ribbon or terminal.
Terminal Card High TC Grounded	The Terminal Card detected that the High Temp Thermocouple was shorted to ground. The Door Card failed to detect this.	Check for continuity from the high temp TC to ground. If there is no connection remove the thermocouple and replace it with a jumper. If the problem persists it is likely a door or terminal card fault.
Terminal Card High Temp Alarm	The Terminal Card detected that the High Temp Thermocouple exceeded the High Temp ESD Setpoint. The Door Card failed to detect this.	Check for continuity from the high temp TC to ground. If there is no connection remove the thermocouple and replace it with a jumper. If the problem persists it is likely a door or terminal card fault.
Terminal Card Reciprocal Comp	The Terminal Card detected that the Door Card status or High Temp ESD Setpoint did not match. The Door Card failed to detect this.	Reset to factory defaults. Remove all wires but power, install default jumpers. If the problem persists there is likely a problem with the one of the boards.

ON SCREEN	DESCRIPTION	POSSIBLE SOLUTIONS
Terminal Card Shutdown Detect	The Terminal Card detected an alarm condition. The Door Card failed to detect this.	Reset to factory defaults. Remove all wires except power; install default jumpers. If the problem persists there is likely a problem with the one of the boards.
Terminal Card Voltage Sense	The Terminal Card detected that the system voltage was outside of allowable limits. The Door Card failed to detect this.	Reset to factory defaults. Remove all wires except power; install default jumpers. If the problem persists there is likely a problem with the one of the boards.
Thermocouples Not Equal / Check Wiring	The High Temp and Process Thermocouples are reading temperatures that are too far apart. This may indicate a failed thermocouple or improper wiring.	Check thermocouple readings with dry block or process calibrator.
User Stop	The user pressed the Stop key on the keypad.	

4.3 | Alarm Codes

The following is a list of alarm codes that may show on the Alarm screen of the PF2100 display. These codes indicate a persistent problem that must be cleared before the system can be restarted. Use the table below to determine the meaning of these codes.

ON SCREEN	DESCRIPTION	POSSIBLE SOLUTIONS
4-20Lvl	The 4-20 Input Card's Level Input is reading a value below the 4-20 Level Low Setpoint and "Level Event Restart" is set to "Off".	Verify proper settings and check for issues outside the system.
4-20Prs	The 4-20 Input Card's Pressure Input is reading a value below the 4-20 Pressure Low Setpoint and "Auto Restart" is set to "Off".	Verify proper settings and check for issues outside the system.
AuxTC	The system is in a mode that requires the Aux Thermocouple and the Aux Thermocouple is open or otherwise wired incorrectly.	Check wiring.
DC_TC	The TC430 temperature sensor on the Door Card is not responding.	
ESD_Inp	The ESD Contact is Open.	Check wiring.

ON SCREEN	DESCRIPTION	POSSIBLE SOLUTIONS
FlmTest	There is a problem with the Flame Detection wiring or circuitry.	Check wiring.
PoC_Inp	The Proof of Closure contact is open.	Check wiring.
HiVolt	The system voltage is above the High Voltage Alarm point.	Verify proper settings and check for issues outside the system.
HT_ESD	The Process Temperature is above the High Temp ESD Setpoint.	Verify proper settings and check for issues outside the system.
HT_TC	The High Temp Thermocouple is open or otherwise wired incorrectly.	Check wiring.
LoVolt	The system voltage is below the Low Voltage Alarm point.	Verify proper settings and check for issues outside the system.
LowPrs	The Low Pressure Contact is Open or the 4-20mA Expansion Card's Pressure Input is reading a value below the 4-20 Pressure Low Setpoint. In either case, "Auto Restart" is set to "Off".	Verify proper settings and check wiring.
Lvl_Inp	The Low Level Contact is Open or the 4-20mA Expansion Card's Level Input is reading a value below the 4-20 Level Low Setpoint. In either case, "Level Event Restart" is set to "Off".	Verify proper settings and check wiring.
MbusErr	The Modbus Card is not responding.	This may indicate that it is not installed correctly or that it is enabled when not present at all.
ProcTC	The Process Thermocouple is open or otherwise wired incorrectly.	Check wiring.
RemShut	Modbus Shutdown Command Received	Check the data being sent through the Modbus connection.
Sys_Err	System Error – The Terminal Card is not communicating with the Door Card.	This may indicate a faulty ribbon cable or incompatible firmware.
TC_MM	The High Temp and Process Thermocouples are reading temperatures that are too far apart. This may indicate a failed thermocouple, improper wiring, or a damaged Door or Terminal Card.	Check thermocouple readings with dry block or process calibrator.
Val_MM	The Door and Terminal Card's setpoints do not match.	Reset to factory defaults.

4.4 | Warning Messages

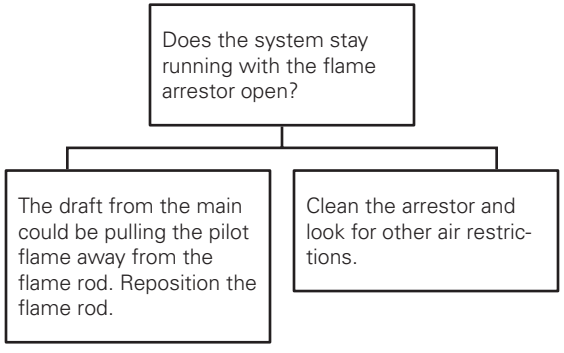
The following is a list of warning messages that may flash periodically on the PF2100 display. These messages indicate a problem that may be developing or a condition from which the system may automatically restart once cleared. Use the table below to determine the meaning of these messages.

ON SCREEN	DESCRIPTION
Check all settings / Other settings have changed	A major process control setting was changed and the process control setpoints were reset to factory defaults. This includes the High Temp ESD Setpoint, the Pilot Off Setpoint, the Low Fire Setpoint, the Process Setpoint, the Low Temp Alarm Setpoint, the Deadband setting, and the Aux Setpoint.
HI Volt Warning	The system voltage is getting close to the High Voltage Alarm threshold and may stop or shutdown soon.
High Prs Warning	The High Pressure Contact is open or the 4-20 Pressure Input is above the 4-20 Pressure High Setpoint. The contact must be closed shortly after the main valve opens and the 4-20 Pressure is below the setpoint or the system will shutdown.
LO Volt Warning	The system voltage is getting close to the Low Voltage Alarm threshold and may stop or shutdown soon.
Low Temp Alarm	The process temperature is below the Low Temp Alarm Setpoint and the Status Contact is Open.
Unit restarted from LVL event	The system has recently restarted from a Level event. Press OK to clear this message.
Unit restarted from PRS event	The system has recently restarted from a Low Pressure event. Press OK to clear this message.
Unit restarted from VLT event	The system has recently restarted from a Low or High Voltage event. Press OK to clear this message.
Waiting: 420 LVL	The system will automatically restart once the 4-20 Input Card's Level Input rises above the Low Setpoint.
Waiting: 420 PRS	The system will automatically restart once the 4-20 Input Card's Pressure Input drops below the High Setpoint.
Waiting: HiVolt	The system will automatically restart once the system voltage falls below the High Voltage Alarm Threshold.
Waiting: LoVolt	The system will automatically restart once the system voltage rises above the Low Voltage Alarm Threshold.
Waiting: Low PRS	The system will automatically restart once the Low Pressure Contact is closed.
Waiting: LVL	The system will automatically restart once the Level Contact is closed.
Waiting:STRT Inp	The system will automatically restart once the Start Contact is closed.

4.5 | Flame Detection Troubleshooting Guide

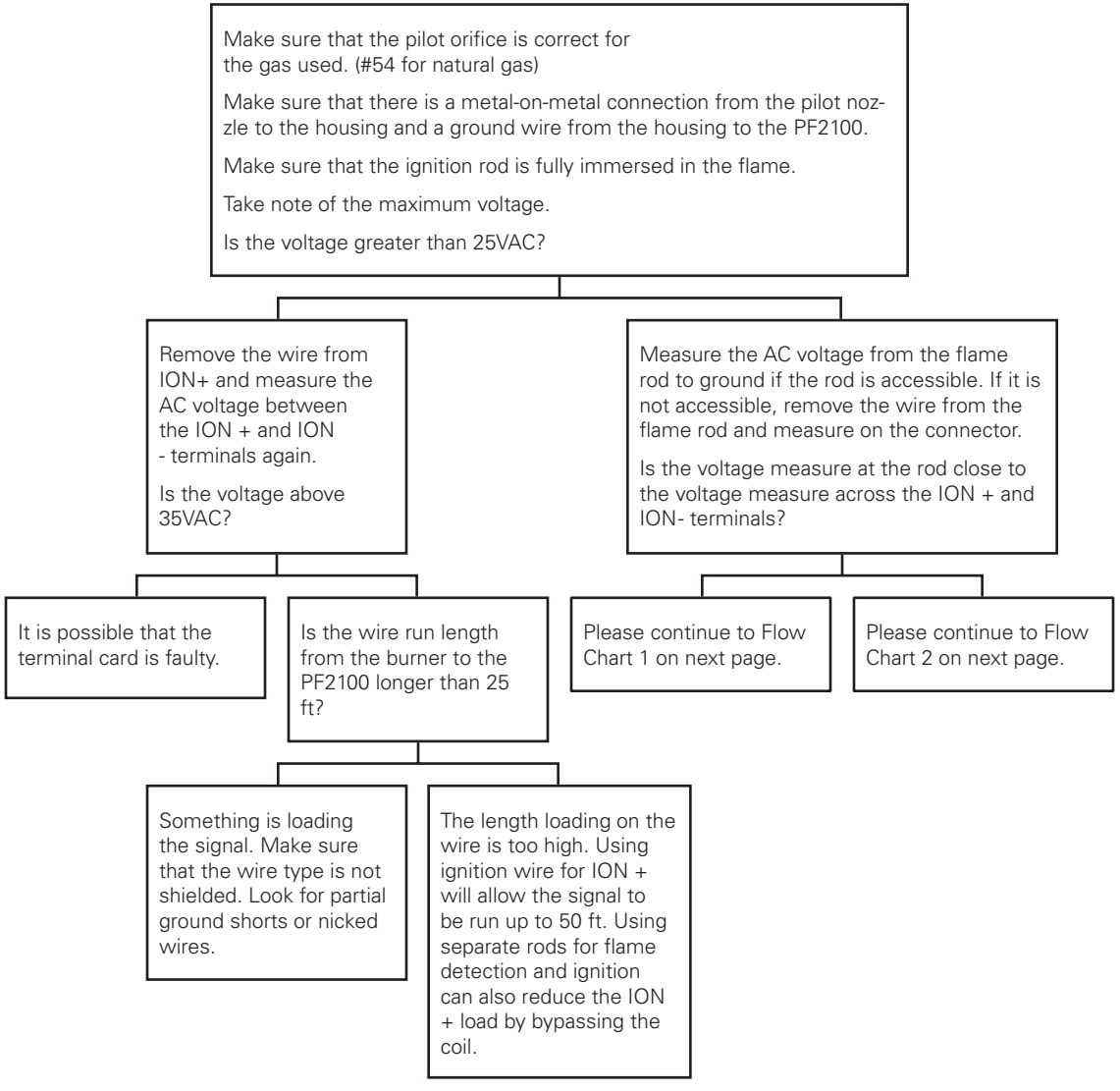
System is not detecting flame.

The flame quality drops from 100% (pilot) when the main comes on.

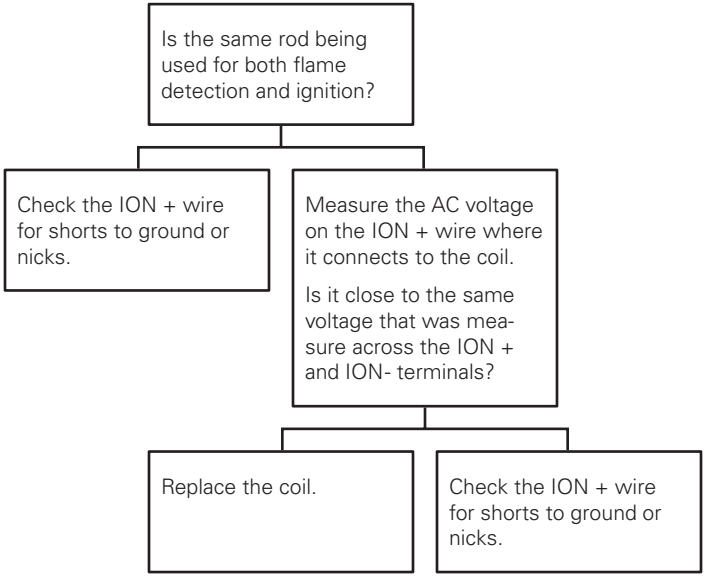


Flame quality remains 100% (pilot) when the main comes on. Continue to next page. –>

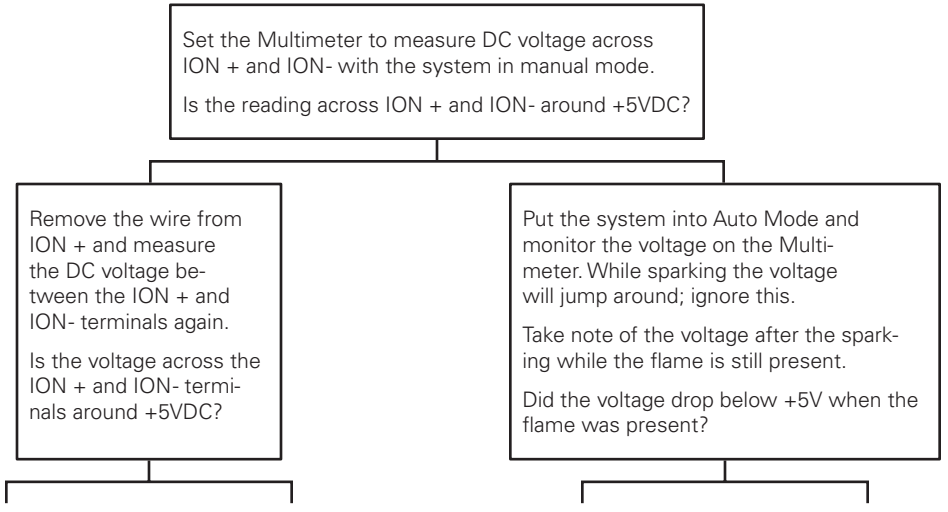
Flame quality remains 100% (pilot) when the main comes on.

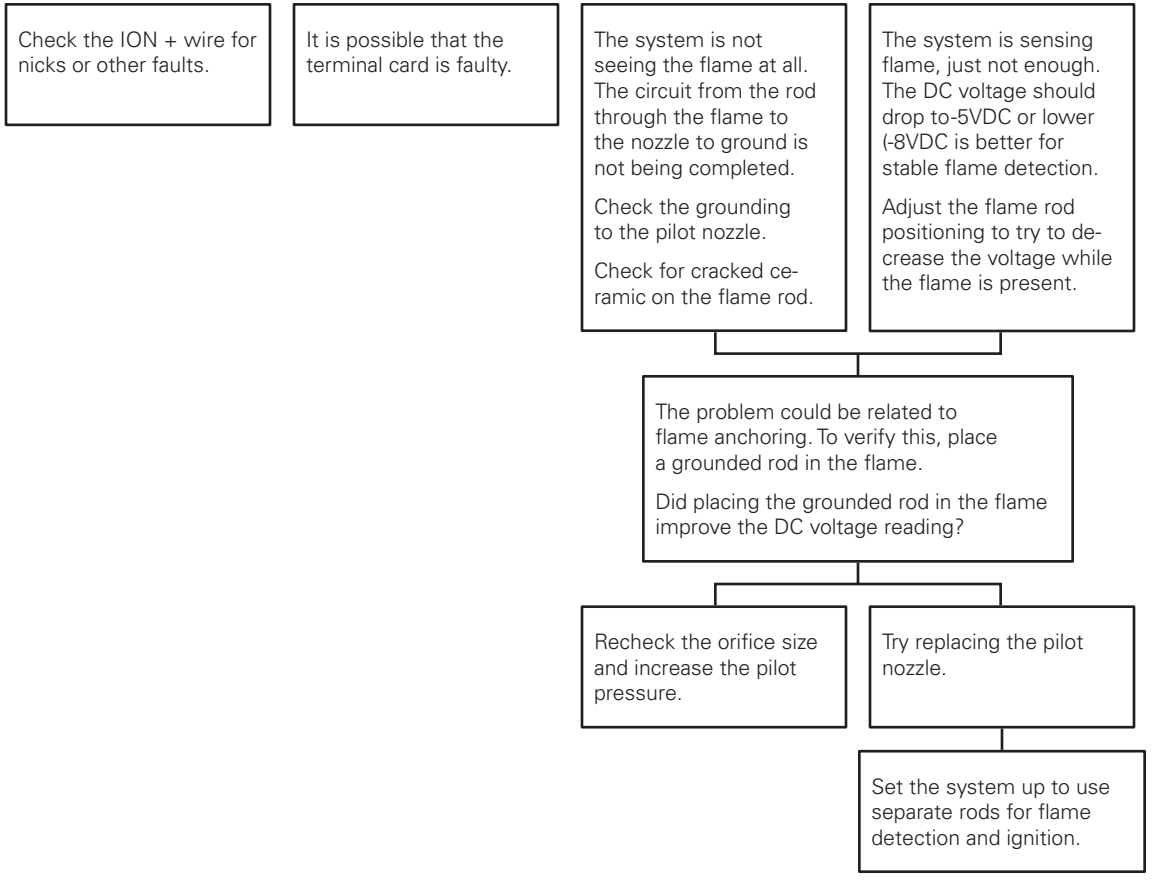


Flow Chart 1



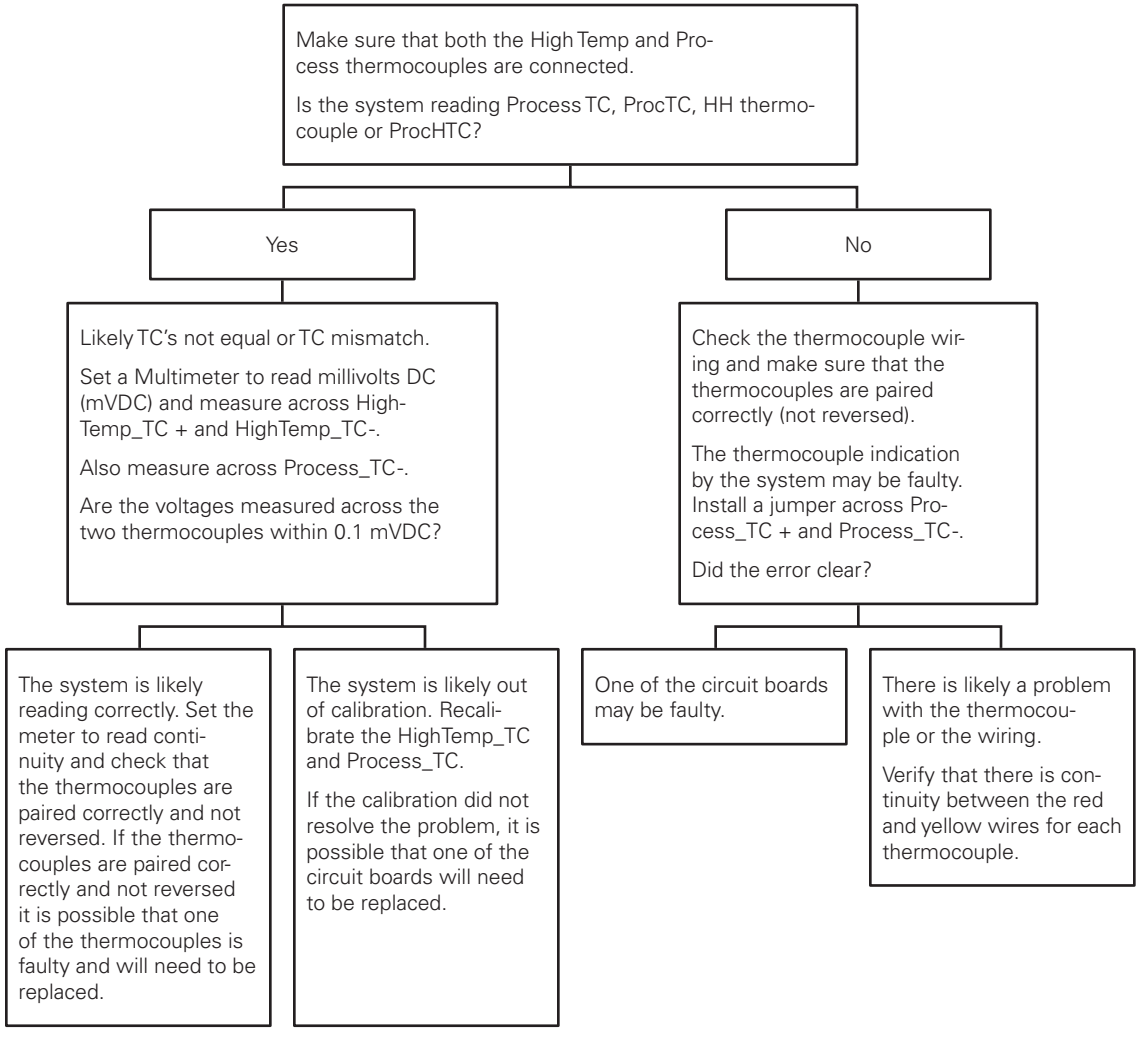
Flow Chart 2




Check the ION + wire for nicks or other faults.
It is possible that the terminal card is faulty.
The system is not seeing the flame at all. The circuit from the rod through the flame to the nozzle to ground is not being completed.
Check the grounding to the pilot nozzle.
Check for cracked ceramic on the flame rod.
The system is sensing flame, just not enough. The DC voltage should drop to-5VDC or lower (-8VDC is better for stable flame detection.
Adjust the flame rod positioning to try to decrease the voltage while the flame is present.
The problem could be related to flame anchoring. To verify this, place a grounded rod in the flame.
Did placing the grounded rod in the flame improve the DC voltage reading?
Recheck the orifice size and increase the pilot pressure.
Try replacing the pilot nozzle.
Set the system up to use separate rods for flame detection and ignition.

4.6 | Thermocouple Troubleshooting Guide

Problem with Thermocouples.



5 | Appendix A: PID Tuning

The PF2100's default PID settings should result in good temperature control in most common heater applications. If the temperature control is unstable or if a faster control response is needed, this procedure can be followed to adjust the PID settings. This procedure does not cover all scenarios for adjusting PID Controllers but provides some general guidelines. Note that this procedure involves some tuning and may require a significant amount of time to follow.

Tune the Proportional Band Setting

1. Start with the Proportional Band Setting set to a large value such as 500% and with the Integral and Derivative settings set to their default values (4.0min/rst and 0.0min respectively).
2. Make a small step change (such as 5%) to the Process Setpoint and monitor the resulting temperature change.
3. Repeat decreasing the Proportional Band Setting in 50% steps until a Process Setpoint change results in overshoot of the Process Setpoint or until oscillation results.
4. Increase the Proportional Band Setting until overshoot and oscillation no longer occur.

Tune the Integral Setting

1. Set the Integral setting to 10min/rst.
2. Make a small change to the Process Setpoint and monitor the temperature change.
3. Repeat decreasing the Integral in ½ minute steps until a Process Setpoint change results in overshoot of the Process Setpoint or until oscillation results.
4. Increase the Integral Setting until stable.

Tune the Derivative Setting

If there is noise on the thermocouple inputs, using the Derivative Setting can dampen the effects of the Proportional and Integral Settings. For this reason, the Derivative Setting can usually be left set at zero unless a very fast response is needed. If required, follow this tuning procedure:

1. Set the Derivative Setting to 10 minutes.
2. Decrease the Derivative Setting until a small Process Setpoint change results in a fast response with some oscillation.
3. Increase the Derivative Setting until the oscillation in response to a Process Setpoint change is dampened.

6 | Appendix B: Field Calibration

It is possible to field calibrate the thermocouples, the 4-20mA Output, and the two 4-20mA Inputs on the 4-20mA Expansion Card. In general, it should not be necessary to do this in the field because the system has already been calibrated at the factory. However, there are circumstances where this may be necessary such as if the door or terminal card was replaced in the field or if the system is very old and has drifted out of calibration. Before recalibrating the system, it is strongly recommended that you explore all other possible solutions first. For example, verify that system settings are correct and that the devices attached to the system are calibrated correctly. If it is deemed necessary to proceed with recalibrating the PF2100, follow the procedures below carefully. Failure to perform the calibration correctly may result in worse performance than if the system had been left alone.

The PF2100 uses a two-point calibration system to provide readings with greater accuracy than a single-point offset calibration. The first point compensates for any fixed offset in the system and the second point defines the slope. If the calibration fails for any reason, there is an option in the calibration menu to clear all calibration data.

CALIBRATING THE THERMOCOUPLES

For thermocouples, the first calibration point is zero volts which corresponds to the ambient temperature of the terminal block where the thermocouple plugs into the Terminal Card. The second calibration point is referenced to a known temperature that is well above the ambient temperature. This temperature is typically the hottest temperature at which the system will operate but should not be higher than 1350˚C and should not be lower than ambient + 20˚C.

1. Make sure that the system is stopped.
2. Remove the 3 pairs of thermocouple wires (High Temp, Process, and Aux) from the P8 Pluggable Header on the Terminal Card.
3. Short each pair of thermocouple inputs individually using a jumper or short piece of copper wire (ie, short HT+ to HT-, short Proc+ to Proc-, and short Aux+ to Aux-).
4. Press the UP and Down keys simultaneously to unlock the Calibration Menu (Menu 7) which is normally hidden.
5. Press the Menu Key repeatedly until Menu 7 is shown.
6. Press OK. If prompted, enter the L2 Password: △ ▽ △ △ ▽ △ OK
7. "Cal Proc TC Zero" will show on the display.
8. Press OK and the message "Calibrating Wait…" will appear on the display for about 5 seconds. Afterwards, the message "Parameter Saved" will show on the display briefly.

9. Press the Menu key to go to the next item.
10. Repeat steps 8 and 9 for the "Cal HiTemp TC Zero" and "Cal Aux TC Zero" menu items.
11. Reconnect the 3 pairs of thermocouple wires (High Temp, Process, and Aux) to the P8 Pluggable Header on the Terminal Card.
12. Set the High Temp, Process, and Aux thermocouples to a known reference temperature using a dry block or other calibrated reference. The reference temperature should be at least 20˚C above the ambient temperature and preferably close to the maximum planned operating temperature.
13. "Cal Proc TC Span" will show on the display.
14. Use the Up and Down keys to adjust the temperature displayed on the PF2100 to match the temperature being applied to the thermocouple. Note that multiple key presses may be required before the temperature value on the display changes. This is because each key press is adjusting a fractional multiplication factor internal to the system.
15. Press OK and the message "Parameter Saved" will show on the display briefly.
16. Press the Menu key to go to the next item.
17. Repeat steps 14-16 for the "Cal HiTemp TC Span" and "Cal Aux TC Span" menu items.
18. Press and hold the OK key for 3 seconds until the message "Password Logout" is displayed on the screen. The Calibration Menu is now hidden again.

CALIBRATING THE 4-20MA OUTPUT

For the 4-20mA Output, the first calibration point is 4mA and the second calibration point is 20mA. You will need a current meter capable of measuring current to 0.1mA accuracy.

1. Make sure that the system is stopped.
2. Connect a current meter in series with the 4-20mA Output.
3. Set the current meter to a range setting that covers both 4mA and 20mA.
4. Press the UP and Down Keys simultaneously to unlock the Calibration Menu (Menu 7) which is normally hidden.
5. Press the Menu key repeatedly until Menu 7 is shown.
6. Press OK. If prompted, enter the L2 Password: △ ▽ △ △ ▽ △ OK
7. Press the Menu key repeatedly until "Cal 4-20 Out Zero" is shown on the display.
8. Use the Up and Down keys to adjust the output current until the current meter reads 4.0mA.
9. Press OK and the message "Parameter Saved" will show on the display briefly.
10. Press the Menu key repeatedly until "Cal 4-20 Out Span" is shown on the display.

11. Use the Up and Down keys to adjust the output current until the current meter reads 20.0mA.
12. Press OK and the message "Parameter Saved" will show on the display briefly.
13. Press and hold the OK key for 3 seconds until the message "Password Logout" is displayed on the screen. The Calibration Menu is now hidden again.

CALIBRATING THE 4-20MA INPUTS

For the 4-20mA Input, the first calibration point is 4mA and the second calibration point is 20mA. You will need a handheld process calibrator such as the Fluke 725.

1. Make sure that the system is stopped.
2. Make sure the card is installed and enabled in menu 6. The LVL and PRS DIP switches must also be enabled on the card.
3. Press the UP and DOWN Keys.
4. Press the Menu Key repeatedly until Menu 7 is shown.
5. Press OK. If prompted, enter the L2 Password: △ ▽ △ △ ▽ △ OK
6. Connect the process calibrator's negative lead to the ground pin on the 4-20mA Input Card.
7. Calibrate the Level Zero:
   - Press the Menu Key repeatedly until "4-20 Level Zero Calibration = No" is shown on the display.
   - Use the Up or Down key to select "Yes" and begin the calibration process. The display will now read "Apply 4mA then press OK".
   - Disconnect any wiring connected to the Level input and instead attach the process calibrator's positive lead in its place.
   - Turn on the process calibrator and set it to source a current of 4mA (0%).
   - Press the OK key and the message "Calibrating Wait…" will appear for several seconds followed by the message "Parameter Set" after the calibration has successfully completed.
8. Calibrate the Level Input's Span point:
   - Press the Menu key repeatedly until "Calibrate 4-20 LVL Span?" is shown on the display.
   - Use the Up or Down key to select "Yes" and begin the calibration process. The display will now read "Apply 20mA then press OK".
   - Set the process calibrator to source a current of 20mA (100%).
   - Press the OK key and the message "Calibrating Wait…" will appear for several seconds followed by the message "Parameter Set" after the calibration has successfully completed.

- Disconnect the process calibrator from the Level input and reconnect any wiring that was removed from it previously.

9. Calibrate the Pressure Input's Zero point:
    - Press the Menu Key repeatedly until "Calibrate 4-20 PRS Zero?" is shown on the display.
    - Use the Up or Down key to select "Yes" and begin the calibration process. The display will now read "Apply 4mA then press OK".
    - Disconnect any wiring connected to the Pressure input and instead attach the process calibrator's positive lead in its place.
    - Turn on the process calibrator and set it to source a current of 4mA (0%).
    - Press the OK key and the message "Calibrating Wait…" will appear for several seconds followed by the message "Parameter Set" after the calibration has successfully completed.
10. Calibrate the Pressure Input's Span point:
    - Press the Menu Key repeatedly until "Calibrate 4-20 PRS Span?" is shown on the display.
    - Use the Up or Down key to select "Yes" and begin the calibration process. The display will now read "Apply 20mA then press OK".
    - Set the process calibrator to source a current of 20mA (100%).
    - Press the OK key and the message "Calibrating Wait…" will appear for several seconds followed by the message "Parameter Set" after the calibration has successfully completed.
    - Disconnect the process calibrator from the Pressure input and reconnect any wiring that was removed from it previously.
11. Disconnect the process calibrator's negative lead from the ground pin on the 4-20mA Input Card.

RESETTING CALIBRATION DATA

If you want to reset the calibration settings to default, use the "Cal Data" option at the end of Menu 7.

This process resets the following calibrations to defaults:

1. Calibration of the Thermocouples
2. Calibration of the 4-20mA Output
3. Calibration of the 4-20mA Intput

1. Make sure that the system is stopped.
2. Press the Up and Down Keys simultaneously to unlock the Calibration Menu (Menu 7) which is normally hidden.
3. Press the Menu key repeatedly until Menu 7 is shown.
4. Press OK. If prompted, enter the L2 Password: △ ▽ △ △ ▽ △ OK
5. Press the Menu key repeatedly until "Cal Data" is shown on the display
6. Use the Up or Down keys to select "Yes".
7. Press OK and the message "Parameter Saved" will show on the display briefly.
8. Press and hold the OK key for 3 seconds until the message "Password Logout" is displayed on the screen. The Calibration Menu is now hidden again.

CALIBRATION (MENU 7)

This menu is used to adjust the calibration of thermocouples, 4-20mA Output, and 4-20mA Expansion Card inputs. This menu is hidden by default.

MENU MAP	ON SCREEN	BRIEF DESCRIPTION	RANGE	DEFAULT SETTING	CUSTOM SETTINGS
Cal Process TC Zero	Cal Proc TC Zero?	Calibrate Process Thermocouple zero point by shorting the Input	N/A	N/A	
Cal High Temp TC Zero	Cal HiTemp TC Zero?	Calibrate High Temp Thermocouple zero point by shorting the Input	N/A	N/A	
Cal Aux TC Zero	Cal AUX TC Zero?	Calibrate Aux Thermocouple zero point by shorting the Input	N/A	N/A	
Cal Process TC Span	Cal Proc TC Span: xxC	Calibrate Process Thermocouple span point by applying a calibrated reference then adjust the on screen value	N/A	N/A	
Cal High Temp TC Span	Cal HiTemp TC Span: xxC	Calibrate High Temp Thermocouple span point by applying a calibrated reference then adjust the on screen value	N/A	N/A	
Cal Aux TC Span	Cal AUX TC Span: xxC	Calibrate Aux Thermocouple span point by applying a calibrated reference then adjust the on screen value	N/A	N/A	
Cal 4-20 Level Zero	Calibrate 4-20 LVL Zero?	Calibrate 4-20mA Level Input zero point by applying a calibrated 4mA reference	N/A	N/A	
Cal 4-20 Level Span	Calibrate 4-20 LVL Span?	Calibrate 4-20mA Level Input span point by applying a calibrated 20mA reference	N/A	N/A	
Cal 4-20 Pressure Zero	Calibrate 4-20 PRS Zero?	Calibrate 4-20mA Pressure Input zero point by applying a calibrated 4mA reference	N/A	N/A	
Cal 4-20 Pressure Span	Calibrate 4-20 PRS Span?	Calibrate 4-20mA Pressure Input span point by applying a calibrated 20mA reference	N/A	N/A	
Cal 4-20 Out Zero	Cal 4-20 Out Zero: x	Calibrate 4-20mA Output zero point by adjusting until a multimeter reads 4mA	N/A	N/A	
Cal 4-20 Out Span	Cal 4-20 Out Span: x	Calibrate 4-20mA Output zero point by adjusting until a multimeter reads 20mA	N/A	N/A	

MENU MAP	ON SCREEN	BRIEF DESCRIPTION	RANGE	DEFAULT SETTING	CUSTOM SETTINGS
Display TC Zero Factors	Cal Factors Zero w x y z	Thermocouple zero point calibration factors for Debug	N/A	N/A	
Display TC Span Factors	Cal Factors Span w x y z	Thermocouple span point calibration factors for Debug	N/A	N/A	
Display 4-20 PRS Factors	4-20 PRS Factors Z=x S=y	4-20mA Pressure zero point and span point calibration factors for Debug	N/A	N/A	
Display 4-20 LVL Factors	4-20 LVL Factors Z=x S=y	4-20mA Level zero point and span point calibration factors for Debug	N/A	N/A	
Clear Cal	Clear All Cal Capital Data?	Restore all calibration factors to 0	Yes/No	No	

7 | Appendix C: Resetting to Defaults

The system settings can all be reset to factory defaults by following these instructions:

1. Make sure that the system is stopped.
2. Navigate to the "Reset to Factory Defaults" menu item at the bottom of Menu 4.
3. Use the Arrow keys to change the setting to "Yes" and then press the OK key.
4. The system will display "Parameter Saved" and will then reboot.

   After rebooting, the system will display the message "CONFIGURATION RESET TO DEFAULT" alternating with "Check Settings and Setpoints."
5. Press the OK key to acknowledge this warning.

This process only resets the user settings back to factory defaults and does not affect the calibration settings. To reset the calibration settings to defaults, refer to the Field Calibration section.

Note that older versions of firmware did reset both the user settings and the calibration settings to defaults.

Also note that all settings are stored on the Door Card. If the Door Card is replaced for any reason, the settings will need to be re-entered and calibration may need to be performed.

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