

 | **PF1300F USER MANUAL** *REV 1.0.0*
FLARE IGNITION SYSTEM

WARNINGS

WARNING: EXPLOSION HAZARD

DO NOT INSTALL ON ENCLOSED BURNERS OR FIRE TUBES

DO NOT DISCONNECT WHILE CIRCUIT IS LIVE UNLESS AREA IS KNOWN TO BE NON-HAZARDOUS

BATTERIES MUST ONLY BE CHANGED IN AN AREA KNOWN TO BE NON-HAZARDOUS

SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS 1, DIVISION 2

REPLACEMENT FUSES MUST BE CERAMIC

AVERTISSEMENT: RISQUE D'EXPLOSION

NE PAS INSTALLER DE BRÛLEURS FERMÉS OU TUBES D'INCENDIE

NE PAS DEBRANCHER TANT QUE LE CIRCUIT EST SOUS TENSION, À MOINS QU'IL NE S'AGISSE D'UN EMPLACEMENT NON DANGEREUX

BATTERIES NE DOIT ÊTRE CHANGÉ DANS UNE RÉGION CONNUE COMME NON DANGEREUX

SUBSTITUTION DE COMPOSANTS PEUT PORTER ATTEINTE LES QUALIFICATIONS POUR CLASSE 1, DIVISION 2

FUSIBLES DE REMPLACEMENT DOIVENT ÊTRE CÉRAMIQUES

HW & FW VERSIONING

This version of the manual was written for use with PF1300F systems that have the following hardware and firmware versions.

- HW v2.3.0
- FW v2.3.0

System hardware and firmware versions can be found printed on separate labels inside of the enclosure on the circuit board. (Section 2.4)

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

APPROVALS

SC000 Class I, Div 2, Grp ABCD, T4A
CSA Type 4

SCB00 Class I, Div 2, Grp ABCD, T5
CSA Type 4



FOR ANY QUESTIONS PLEASE CALL 1 855 PRO FIRE (1 855 776 3473) OR VISIT WWW.PROFIREENERGY.COM

1	Overview	1
1.1	Available Models	3
1.2	Included Components	4
1.3	Optional Components	5
1.4	External Diagram	6
1.5	Internal Diagram	7
1.6	Installation Types	8
1.7	Regulatory Requirements	8
2	Installation	9
2.1	Installation Warnings	12
2.2	Mounting Locations	13
2.3	Mounting Instructions	14
2.4	Circuit Board & Solar Charge Controller Diagram	15
2.5	Circuit Board Terminal Descriptions	16
2.6	Solar Charge Controller Terminal Descriptions	17
2.7	Required Wiring	17
2.7.1	SC000 System Wiring	18-19
2.7.2	SCB00 System Wiring	20-21
2.8	Optional Wiring	22
2.8.1	Status Contact	22
2.8.2	SC000 ESD Switch	23
2.8.3	SCB00 ESD Switch	24
3	User Interface & Settings	25
3.1	User Interface	27
3.1.1	Keypad Diagram	28
3.1.2	Keys	29

3.1.3	Indicator Lights.....	30
3.1.4	Debug LEDs.....	31
3.2	Settings.....	32-33
3.3	Operating the System.....	34
3.3.1	Starting the System.....	34
3.3.2	Stopping the System.....	35
3.3.3	LED Indicator Light Test.....	36
3.3.4	Viewing Firmware Versions.....	37-38
4	Modes & Behaviour.....	39
4.1	Mode Descriptions.....	41
4.2	State Diagrams.....	41
4.2.1	Manual Mode.....	42
4.2.2	On Demand Mode.....	43
4.2.3	Continuous Mode.....	44
4.2.4	Test Mode.....	45
4.3	Process Control Behaviour.....	46
4.3.1	Manual Mode.....	46
4.3.2	On Demand Mode.....	47
4.3.3	Continuous Mode.....	48
4.3.4	Test Mode.....	49
4.4	Timing Accuracy.....	50
5	Troubleshooting.....	51
5.1	Common Issues & Solutions.....	53-54
5.2	Flame Detection Troubleshooting Guide.....	55-56
	Technical Specs.....	57

The PF1300F FIS (Flare Ignition System) is an electronic control and monitoring system designed for use with Flare Stacks. It's purpose is to ensure that the flare is always lit, which facilitates compliance with the latest environmental regulations. This eliminates the need to manually light the flare, providing convenience and improving operator safety. The system also includes a dry status contact which enables remote monitoring of the flare status, reducing the number of times a person must physically visit a site.

1.1 Available Models

The PF1300F is available in two configurations:

BASE MODEL and **BATTERY MODEL**.

The Base model is designed for 12/24VDC operation whenever power is available on site.

The Battery model includes a 12V/9Ah battery and solar charge controller intended for use with a 12V solar panel (sold separately).

BASE MODEL

SC000 Base Model

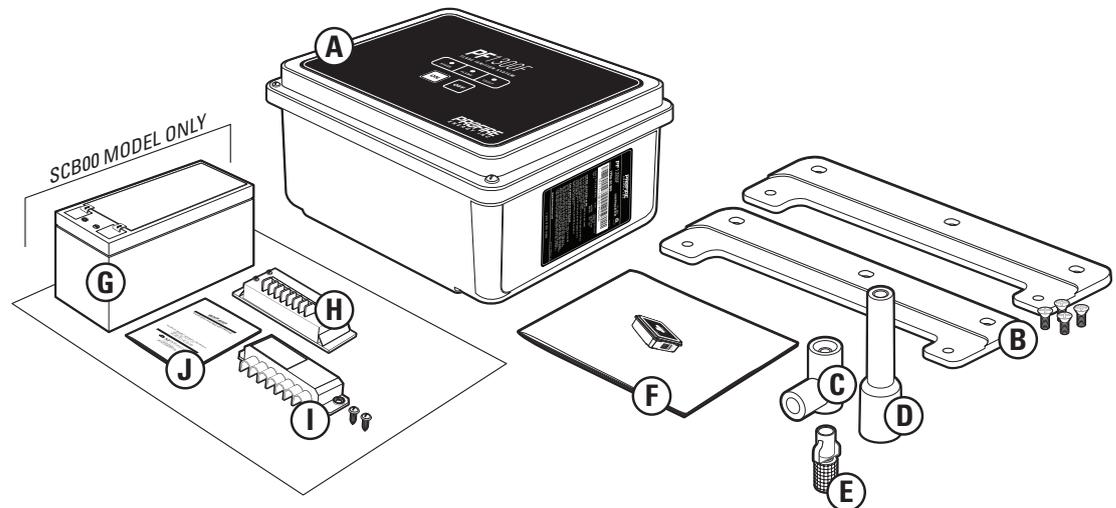
BATTERY MODEL

SCB00 Battery Model

1.2 Included Components

The PF1300F comes packaged with the following. If any components (varies across models) are missing, contact Profire immediately.

CODE	DESCRIPTION	SC000	SCB00	
A	PF1300F	•	•	
B	Mounting Brackets and Screws	•	•	
C	90 Degree Bakelite Connector	•	•	
D	Straight Silicone Boot	•	•	
E	Brass Ferrule	•	•	
F	Instruction Manual	•	•	
G	12V/9Ah Battery (pre-installed)		•	
H	Solar Charge Controller (pre-installed)		•	
I	Solar Charge Controller Terminal Cover and Screws		•	
J	Solar Charge Controller Manual		•	



1.3 Optional Components

The following components may be required to install the PF1300F but are not included with the system. Profire offers some of these components for sale individually and also in various kits.

Please contact Profire Sales for further information.

1. MOUNTING HARDWARE

- Channel Bar
- Conduit Port
- Liquid Tight Port
- Rubber Grommet

2. WIRE

- Ignition Wire

3. RODS AND CONNECTORS

- Kanthal Ignition Rods (Various Lengths)

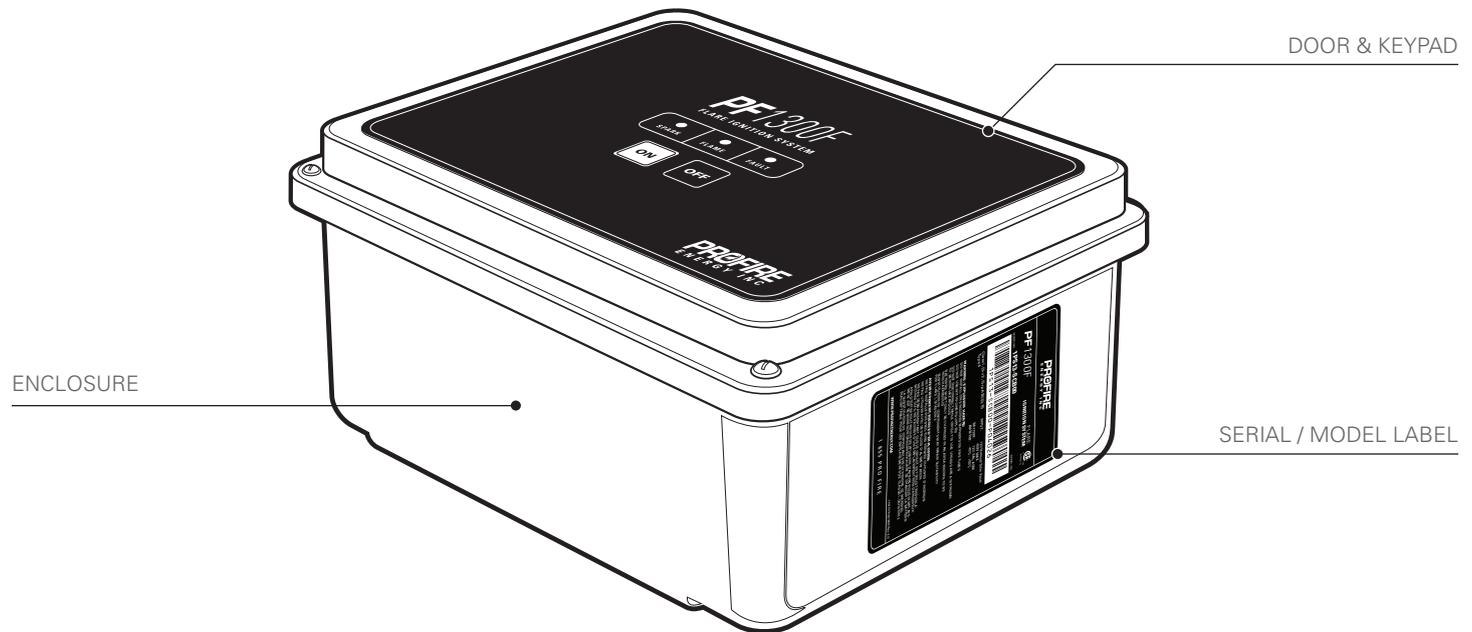
4. PILOT ASSEMBLY

- Nozzle
- Brackets

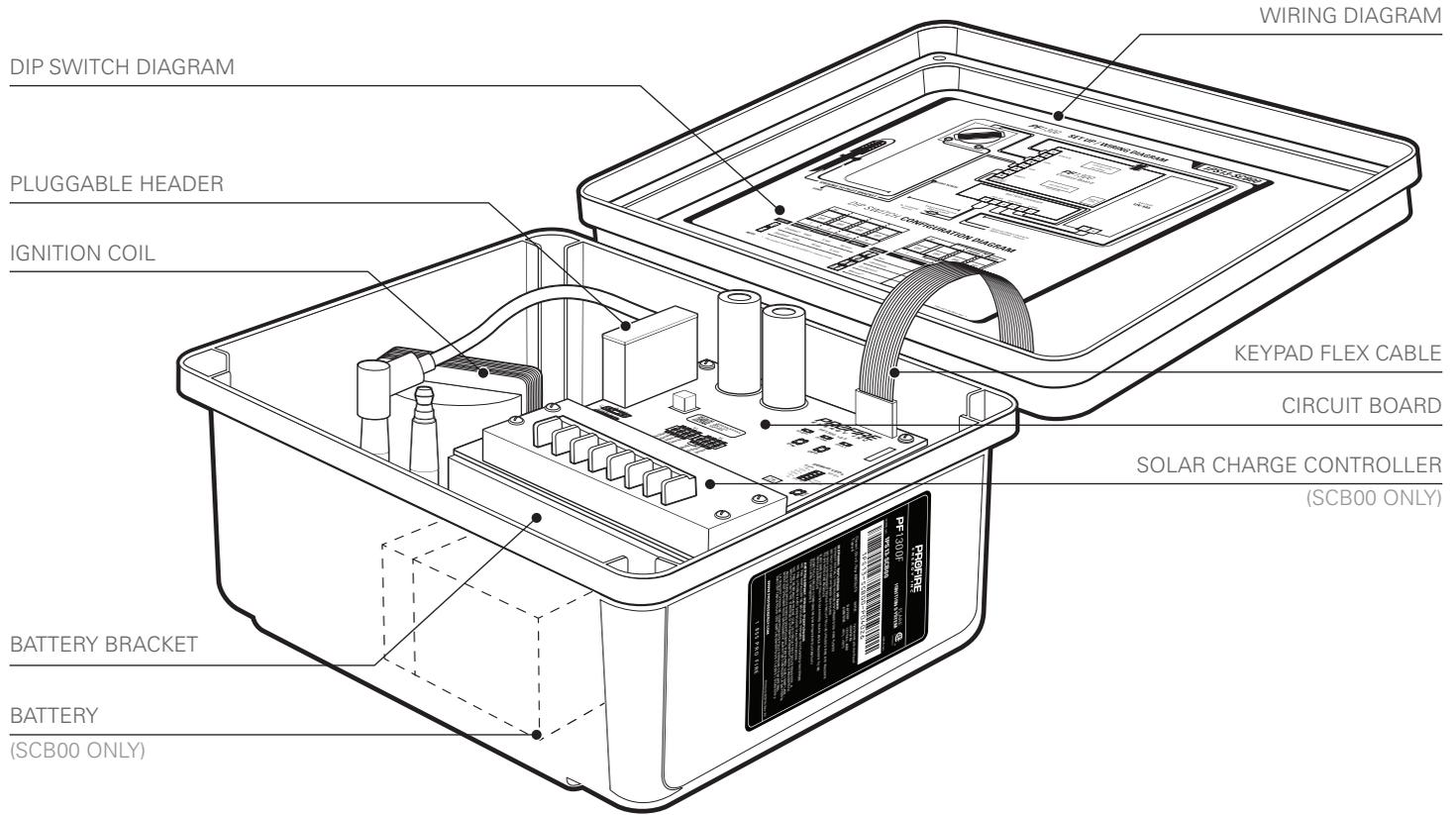
5. POWER & AUTONOMY

- Power Supply
- Solar Panel

1.4 External Diagram



1.5 Internal Diagram



1.6 Installation Types

The PF1300F is designed for use only on Flare stacks. It should not be used to control an enclosed burner or fire tube as this is usually against code and would pose a safety risk.

1.7 Regulatory Requirements

The PF1300F is certified for use in Class I, Division 2, Group ABCD locations. Certain modes of operation or wiring options may be against code in some locations.

Profire makes no assertion as to the suitability of a particular component for a given application. It is up to the customer to examine the local codes and safety requirements to determine if the PF1300F and any other associated components sold by Profire are suitable for use in a given application.

NORTH AMERICA

The PF1300F is certified for use in Canada, USA, and Mexico.

OTHER

Consult local codes and safety regulations to determine if the PF1300F can be used in your jurisdiction.

This section includes the steps that should typically be followed when installing a PF1300F system in the field. If you are new to the PF1300F, you should read this section in its entirety and follow these instructions closely.

STEPS

1. Review Installation Warnings
2. Choose a Mounting Location
3. Mount the System
4. Get Familiar with the Circuit Board
5. Connect the Required Wiring including Power, and Ignition Coil / Flame Detection wiring
6. Connect the optional wiring including the Status Contact and the ESD switch.

The steps provided here are general and will help you to identify questions that need to be answered to complete the installation properly. You should also consult your local electrical and gas code before attempting any installation.

2.1 Installation Warnings

Before installing the PF1300F, please review the following list of warnings. Failure to observe these may result in death, electrocution, property damage, product damage, and/or government fines.

ALL MODELS

1. The PF1300F is NOT intended for use on enclosed burners or fire tubes as it may pose a safety risk and may be against code in some jurisdictions. For these applications, please consider using our PF2100 system.
2. The PF1300F is NOT designed to control a pilot or main solenoid. The PF1300F is NOT CSA B149 compliant. If you require automatic electronic control of a valve train, please consider using our PF2100 system.
3. Failure to properly ground the pilot assembly back to the PF1300F's EGND screw may result in accidental electrocution, product damage, or simply failure to ignite the pilot.
4. The PF1300F generates 20kV- 40kV at its high voltage output terminal which can cause burns or 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 PF1300F running unattended without the door screws securely tightened down. This is to prevent moisture from penetrating 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.

BATTERY MODELS

6. Never store or ship the unit with the battery connected. Disconnect the battery's negative wire from the charge controller and cover the fork connector with electrical tape or some other insulator that will prevent it from shorting to other components. Failure to observe this warning may result in accidental electrocution, fire, product damage, or simply a dead battery.
7. Never operate the unit with the zener diode removed from across the load terminals of the charge controller as this may lead to failure.
8. Never power these from any DC power supply or from a solar panel rated for more than 12V nominal (40W). This may lead to failure of the charge controller.
9. Be careful not to damage the temperature sensor on the charge controller. It is delicate and if damaged, the charge controller will not function.

2.2 Mounting Locations

The PF1300F should be mounted at the base of the Flare Stack or in another location that is both safe and easily accessible. The recommended mounting height is 1.5m (5ft) above the ground or platform that the operator will be standing on.

Please consider the following when choosing an install location:

1. ACCESSIBILITY

The operator should be able to easily access the system to observe its operation and to adjust settings. The system should not be mounted facing the sun to make it easier to observe the LED indicators on the front panel.

2. SECURITY

In some situations, it may be desirable to mount the system in a location that is not accessible to the general public to prevent accidental and intentional tampering.

3. OPERATOR SAFETY

The system should not be mounted in a dangerous location such as close to the top of the flare stack where an operator might be placed in undue danger.

4. PERFORMANCE

Choose a mounting location that will allow ground and ignition wires to be kept as short as possible. This will ensure the best ignition and flame detection.

5. PRODUCT PROTECTION

To protect the system from being damaged, it should not be mounted:

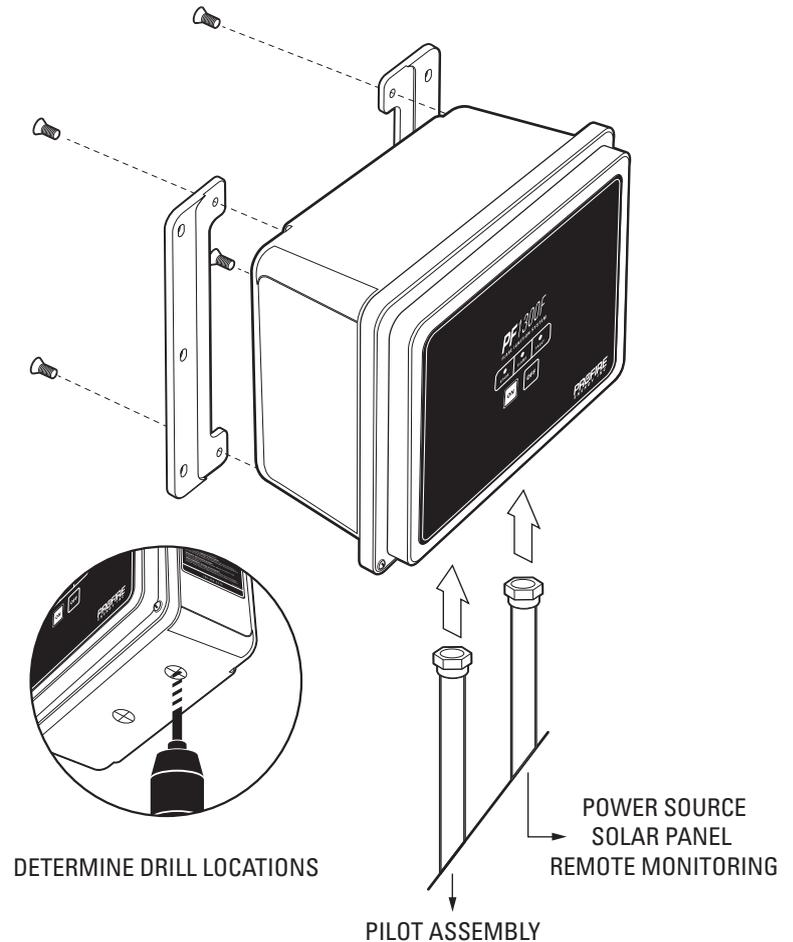
- a. Where chemicals may splatter or bubble over from the flare onto the system. Chemicals on the keypad may interfere with an operator's ability to control the product or view the LED indicators.
- b. Near the top of the flare where excessive heat may damage the product. Refer to the maximum operating temperature listed in this document.
- c. To anything that may tip over due to wind or snow. For example, a pole that is not set properly into the ground or a tripod that is not secured with anchor bolts or guy wires.
- d. In locations that may be prone to flooding.

2.3 Mounting Instructions

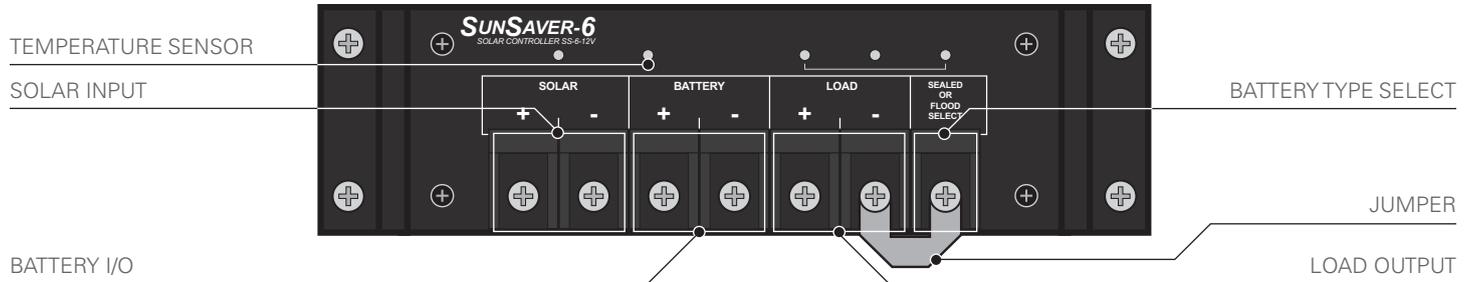
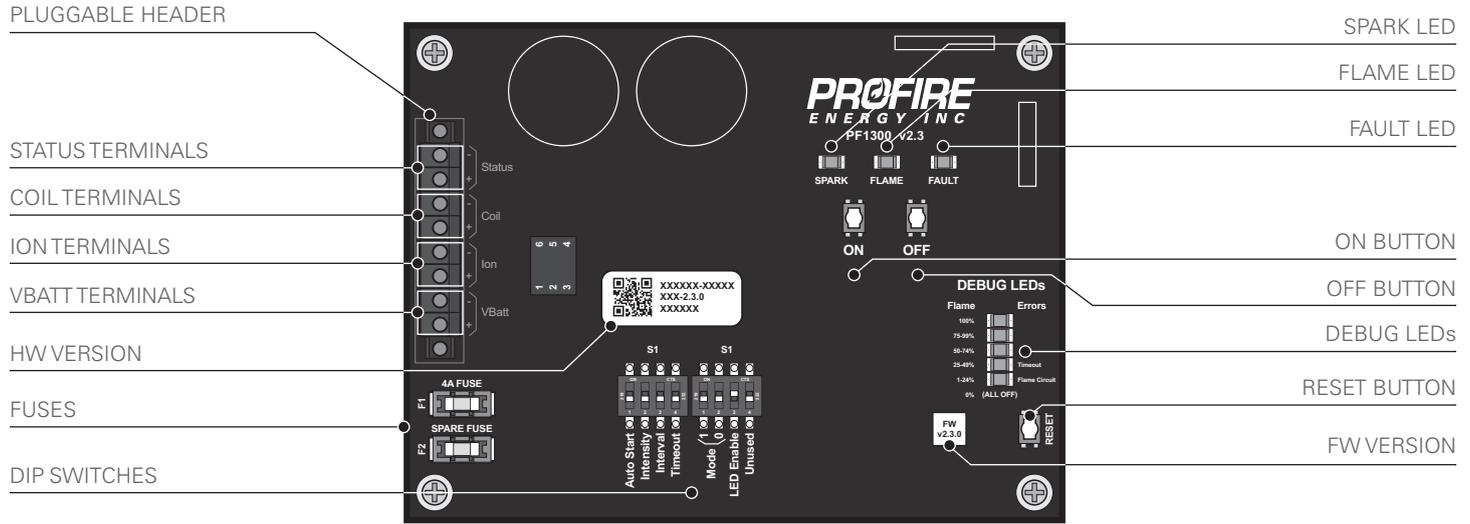
1. Remove and open the included bag of components taped to the mounting brackets.
2. Attach the two mounting brackets to the back of the PF1300F enclosure using the 4 screws.
3. Determine the best location to drill holes in the product enclosure for the wires to enter. At least two holes are recommended for the following:
 - Wiring that will go to the pilot assembly
 - Wiring that will go to the power source and status contacts.

It is recommended that these holes be drilled on the bottom of the enclosure (as shown).

4. Install grommets or conduit ports as required.
5. Securely mount the enclosure to either a pole, structure, or building which satisfies the location requirements previously listed in section 2.2 (Mounting Locations).



2.4 Circuit Board & Solar Charge Controller Diagram



Solar Charge Controller only included with SCB00 model

2.5 Circuit Board Terminal Descriptions

This table provides a brief description of each terminal and references to further detail.

TERMINAL	EXPECTED CONNECTIONS	DESCRIPTION	SECTION 
Status -	Connect to PLC negative input contact or other alarm device.	This is a dry contact output used to indicate system status to an external device (eg. a PLC). The contacts will be closed when the system is running and opened when the system is shutdown. Note that the contacts are not internally connected to power or ground.	2.8.1
Status +	Connect to PLC positive input contact or other alarm device.		
		200V (Peak AC or DC), 150mA, 5Ω	
Coil -	Ground return for the ignition coil. Connect to ignition coil primary black wire.	The primary of the ignition coil should be connected to these terminals. DC pulses will be applied while sparking. This output is protected by a 250mA thermal fuse.	2.7.1, 2.7.2
Coil +	Driver for the low voltage primary of the ignition coil. Connect to ignition coil primary red wire.		
Ion -	Flame Detection negative input. Connect to ground screw on the PF1300F and also to the ground screw on the pilot assembly.	These terminals are used for flame detection. Place a Kanthal rod directly in the pilot flame and connect it to the ignition coil's right high voltage terminal. The PF1300F will apply a 65VAC signal to the flame rod. These inputs are protected from high voltage allowing them to be connected in series with the high voltage terminals of the ignition coil. This enables a single flame rod to be used for both ignition and flame detection. The pilot assembly must be grounded for the flame detection to function properly.	2.7.1, 2.7.2
Ion +	Flame Detection positive input. Connect to ignition coil's left high voltage terminal.		
VBatt-	Ground back to DC source	These terminals are used to power the system. Apply input power in the range of 12- 24VDC, 4A MAX. Should connect to the solar charge controller's load output terminals on the SCB00 model.	2.7.1, 2.7.2
VBatt +	Input power from a DC source		
		This input is protected by a 4A fuse.	

2.6 Solar Charge Controller Terminal Descriptions

This table provides a brief description of each terminal and references to further detail. This is only applicable to the SCB00 model.

TERMINAL	EXPECTED CONNECTIONS	DESCRIPTION	SECTION
Solar +	12V Solar Panel positive terminal	Only a 12V nominal Solar Panel (40W MAX) should be used.	2.7.2
Solar -	12V Solar Panel negative terminal		
Battery +	Battery positive terminal	These terminals are used to draw power from and to charge the integrated battery.	2.7.2
Battery -	Battery negative terminal		
Load +	Circuit Board VBatt positive terminal	These terminals are used to supply power to the PF1300F circuit board.	2.7.2
Load -	Circuit Board VBatt negative terminal	A protection diode must also be installed across these terminals to protect the controller from back EMF from the load.	
Sealed or Flooded Select	Jumper to load negative terminal	This jumper is used to select the battery type and should always be installed because the included battery is sealed.	2.7.2

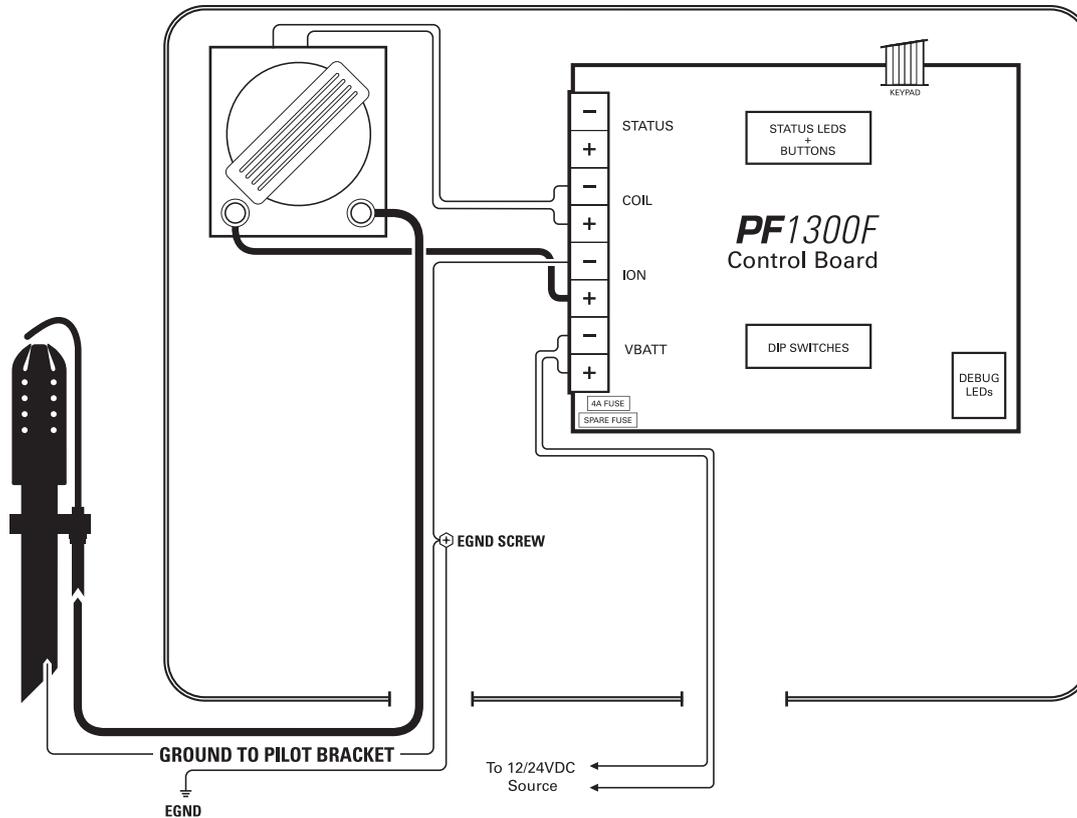
2.7 Required Wiring

The wiring in this section of the document is required for all PF1300F installations. Skipping or performing any steps in this section incorrectly will likely result in the PF1300F not functioning properly.

Choose the wiring steps that apply to your model.

2.7.1 SC000 System Wiring

This wiring diagram can also be found printed on the inside of the PF1300F door panel (SC000).



2.7.1 SC000 System Wiring Continued...

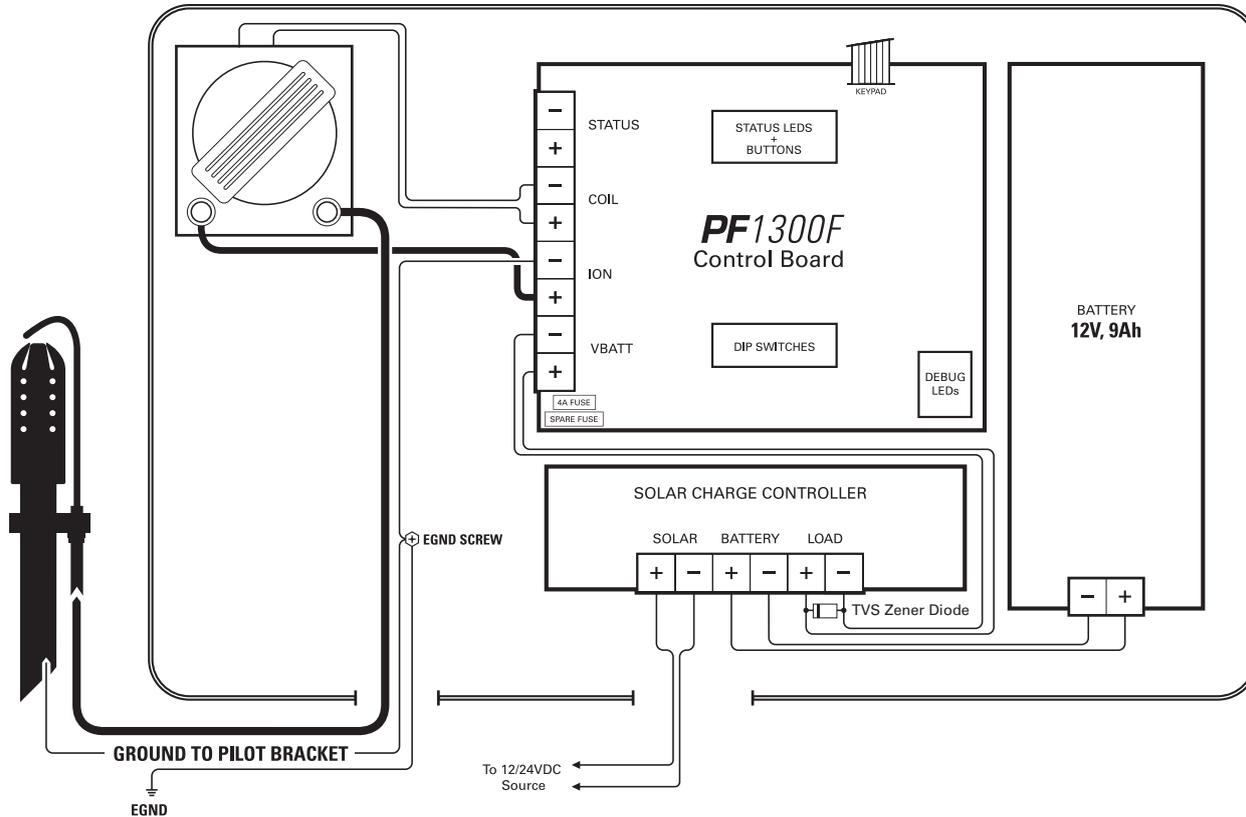
These instructions detail the correct wiring of a PF1300F base model.

Use 16 AWG or larger diameter wire for all connections unless otherwise noted.

1. Feed the 7mm diameter ignition wire through the grommet and into the PF1300F enclosure.
2. Attach the included 90 degree bakelite connector to the end of the ignition wire that is inside of the enclosure.
3. Connect the bakelite connector to the right terminal of the ignition coil.
4. Slide a straight silicone boot over the other end of the ignition wire and then connect the ferrule to it.
5. Attach the ferrule to the Kanthal ignition/flame detection rod.
6. Slide the silicone boot over the ferrule.
7. Feed two ground wires up through the grommet next to the ignition wire.
8. Crimp fork connectors to both ground wires and attach them to the EGND screw below the ignition coil.
9. Outside of the enclosure, connect one ground wire to the pilot assembly and the other to earth ground.
10. Feed a pair of power wires into the enclosure through the conduit port and attach them to the VBatt + and- terminals on the pluggable header.
11. Outside of the enclosure, attach the power wires to a 12VDC or 24VDC power source. For more info, see the technical specifications at the back of this document.

2.7.2 SCB00 System Wiring

This wiring diagram can also be found printed on the inside of the PF1300F door panel (SCB00).



2.7.2 SCB00 System Wiring Continued...

These instructions detail the correct wiring of a PF1300F system with an integrated battery and solar charge controller.

Use 16 AWG or larger diameter wire for all connections unless otherwise noted.

1. Feed the 7mm diameter ignition wire through the grommet and into the PF1300F enclosure.
2. Attach the included 90 degree bakelite connector to the end of the ignition wire that is inside of the enclosure.
3. Connect the bakelite connector to the right terminal of the ignition coil.
4. Slide a straight silicone boot over the other end of the ignition wire and then connect the ferrule to it.
5. Attach the ferrule to the Kanthal ignition/flame detection rod.
6. Slide the silicone boot over the ferrule.
7. Feed two ground wires up through the grommet next to the ignition wire.
8. Crimp fork connectors to both ground wires and attach them to the EGND screw below the ignition coil.
9. Outside of the enclosure, connect one ground wire to the pilot assembly and the other to earth ground.
10. Feed a pair of power wires into the enclosure through the conduit port and attach them to the Solar + and- terminals on the solar charge controller.
11. Outside of the enclosure, attach the power wires to a 12V (40W Max) solar panel. Note that the charge controller is not designed to be used with DC power supplies or with solar panels larger than 12V nominal.
12. Locate the black wire attached to the negative terminal of the battery and remove the insulating cover from the fork connector. It is taped to the top of the solar charge controller at the factory.
13. Attach the negative battery wire to the Battery- terminal on the solar charge controller.

2.8 Optional Wiring

The wiring in this section of the document is optional. This includes the status contact and ESD switch. Note that the wiring of the ESD switch differs depending on model.

2.8.1 Status Contact

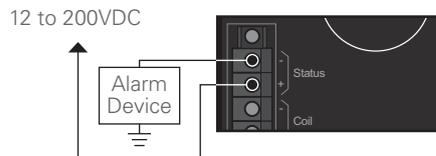
The status contact is a solid state relay wired as a dry contact which means that it does not source any power. A maximum of 200V (Peak AC or DC) at 150mA can be run through the contact safely.

The status contact can be used to control a remote alarm. The status contact is initially open when the system is unpowered or not running. When the system is running, the behavior of the contact varies depending on the mode selected. In general, it is closed when flame is detected and open after flame has been absent for the duration of the timeout. For detailed behaviour, refer to the charts in section 4.3.

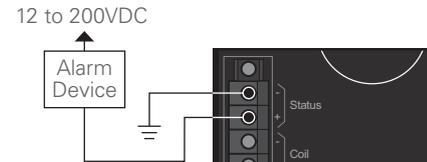
To wire the status contact, follow these steps:

1. Feed a pair of wires in through the conduit port and connect them to the Status + and- terminals on the pluggable header.
2. Outside of the enclosure, connect the status wires to a PLC or an alarm as shown in one of the examples below.

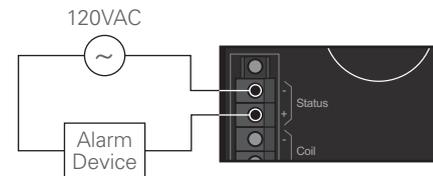
EXAMPLE 1: DC LOAD ON NEGATIVE TERMINAL



EXAMPLE 2: DC LOAD ON POSITIVE TERMINAL



EXAMPLE 3: AC



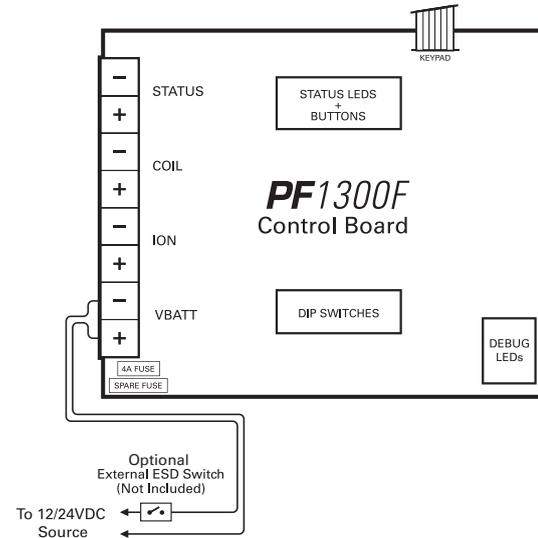
2.8.2 SC000 ESD Switch

If desired, an Emergency Shutdown Switch can be attached to the PF1300F. The wiring for this switch will vary slightly depending on model.

These instructions describe how to correctly wire an ESD switch to a PF1300F model SC000.

1. Cut the negative power wire outside of the enclosure and install an ESD (Emergency Shutdown) switch.

Note that if it is desired to connect the PF1300F to a plant ESD loop, a relay must be used.

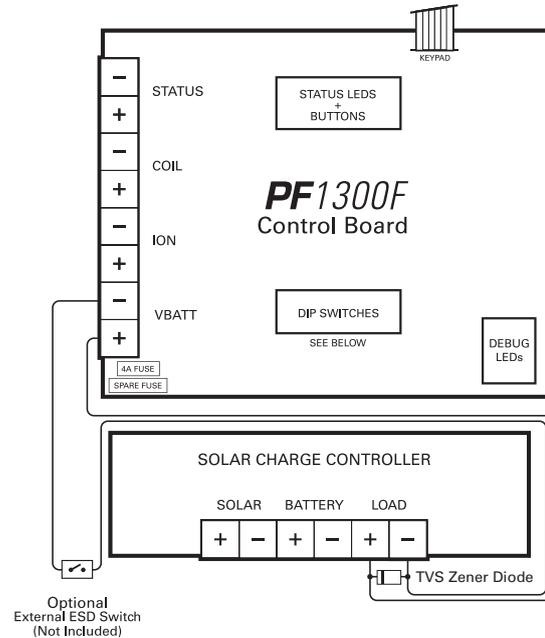


2.8.3 SCB00 ESD Switch

These instructions describe how to correctly wire an ESD switch to a PF1300F model SCB00.

1. Remove the wire connected between the solar charge controller's Load- terminal and the VBatt- terminal of the pluggable header.
2. Ensure that the zener diode remains connected across the load + /- terminals of the solar charge controller.
3. Run two more wires into the enclosure through the conduit port.
4. Attach one of the new wires to the VBatt- terminal of the pluggable header and the other to the Load- wire of the solar charge controller.
5. Outside the enclosure, attach the ESD wires to an ESD switch.

Note that if it is desired to connect the PF1300F to a plant ESD loop, a relay must be used.



This section of the manual is organized into three sub-sections. The first deals with the user interface. The next sub-section contains detailed information about the settings that can be adjusted. The final sub-section contains instructions on how to operate the system.

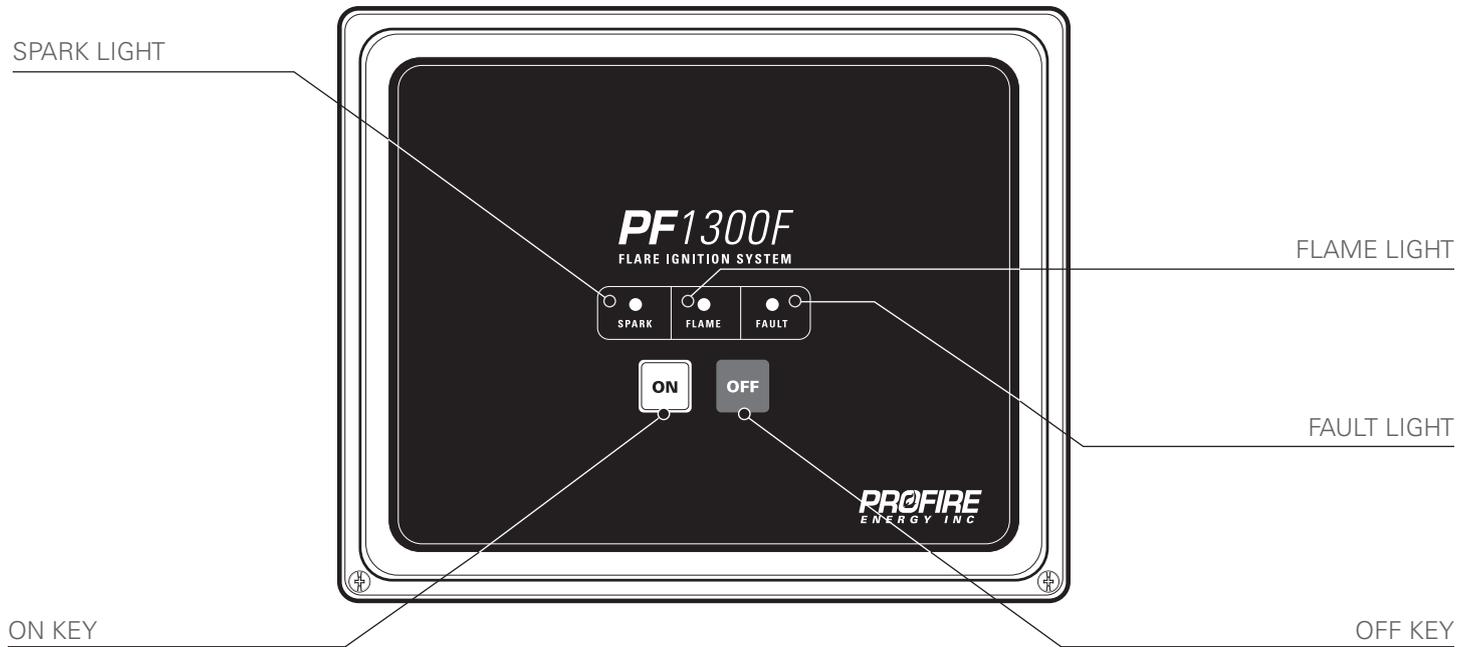
3.1 User Interface

The user interface consists of three parts:

1. A Keypad
2. Indicator lights
3. DIP Switches

The following sub-sections describe each of these in detail.

3.1.1 Keypad Diagram



3.1.2 Keys

There are two keys on the keypad that are used to operate the PF1300F:

- ON
- OFF

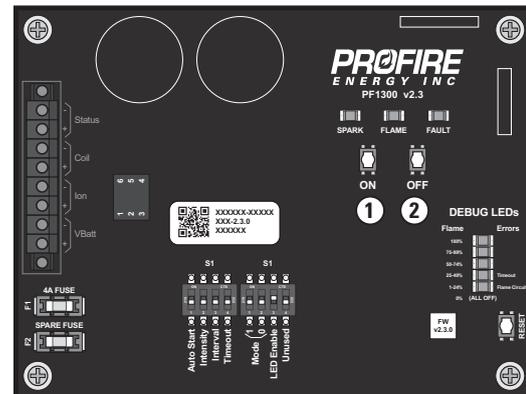
For convenience during installation and debugging, these keys are also duplicated on the circuit board inside of the enclosure.

ON KEY ①

The ON key is used to start or restart the system.

OFF KEY ②

The OFF key is used to stop the system.



3.1.3 Indicator Lights

There are three indicator lights on the keypad that are used to show the status of the PF1300F.

- SPARK
- FLAME
- FAULT

For convenience during installation and debugging, these LEDs are also duplicated on the circuit board inside of the enclosure. These duplicate LEDs are disabled by default to conserve power.

To turn them on, use the “LED Enable” DIP switch.

SPARK LED ①

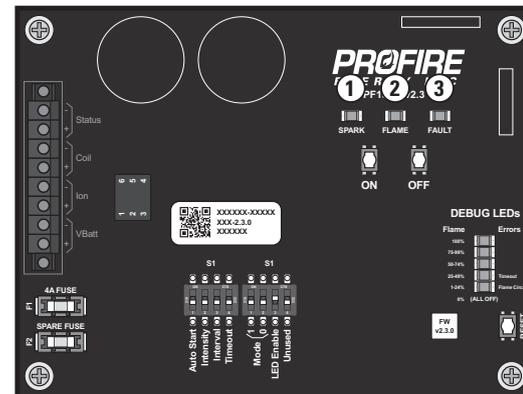
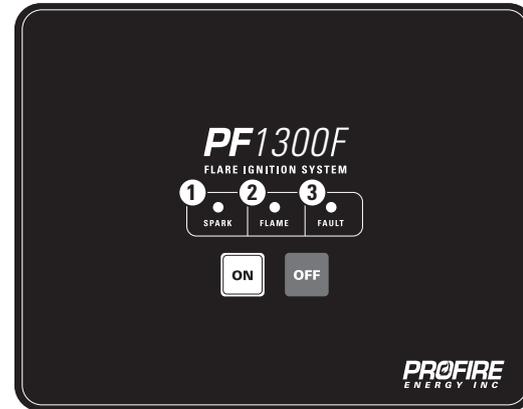
The Spark LED will pulse approximately once per second to indicate that the system is running. When the system is sparking, the Spark LED will pulse rapidly.

FLAME LED ②

The Flame LED will turn on when the system has detected that flame is present. In the normal operating modes, the Flame LED is time averaged over a few seconds to prevent the LED from flickering when wind is present. In the test mode, the Flame LED is not averaged.

FAULT LED ③

The Fault LED will turn on when the flame has been continuously absent for the entire timeout period. It will also turn on if a problem with the flame detection circuit is discovered.



3.1.4 Debug LEDs

The debug LEDs are located on the circuit board (inside the enclosure). They only function when the “LED Enable” DIP switch **①** is in the ON position. This is done to conserve power when they are not needed.

- When the system is off, the Debug LEDs will be too.
- When the system is on, the Debug LEDs are used to indicate one of two things listed below:
 - Flame Quality
 - Error

FLAME QUALITY **②**

When the PF1300F is on and running, the Debug LEDs will show the flame quality as a bar graph. The more LEDs lit, the better the quality. The Flame LEDs on the keypad and the circuit board will both turn on when the quality is above 50% (3 bars or more).

- 5 LEDs on = 100%
- 4 LEDs on = 75-99%
- 3 LEDs on = 50-74%
- 2 LEDs on = 25-49%
- 1 LED on = 1-24%
- No LEDs on = 0%

ERROR **③**

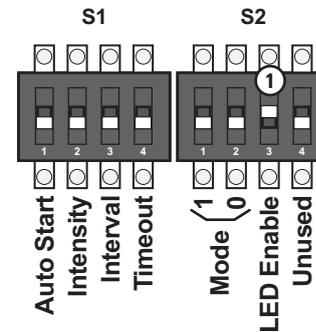
When the PF1300F is in the Fault state, the Debug LEDs will show the reason for the fault using one of the error LEDs. The reasons are listed below.

Timeout **④**

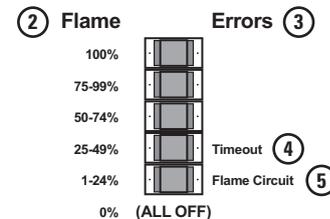
The flame went out and could not be relit before the timeout expired.

Flame Circuit **⑤**

The system detected a problem with the flame detection circuit. This usually indicates a faulty circuit board.

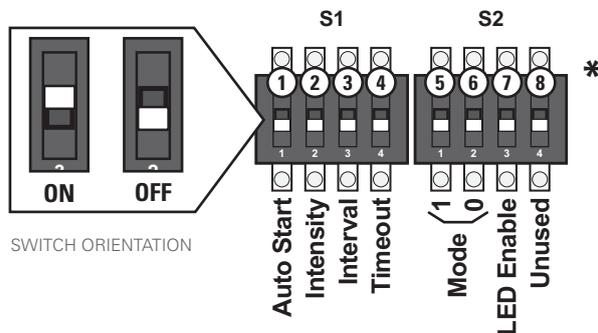


DEBUG LEDs



3.2 Settings

The PF1300F can be configured by using the DIP switches on the circuit board inside of the enclosure. Listed below are the features configured by these DIP switches. For your convenience, a summary of the DIP switch settings is also provided on the inside of the PF1300F door panel. Changing DIP switch settings while the system is running may cause it to enter the OFF state. Simply restart the system by pressing the ON key if this occurs.



* Default setting(s)

AUTO START ①

If this DIP switch is set to ON, the system will automatically start running when power is applied. Auto Start will not work in Manual or Test mode.

- ON Auto Start is enabled
- * OFF Auto Start is disabled

INTENSITY ②

Spark intensity can be selected between low and high.

With low intensity selected, the system will generate a cooler spark for 1 second during ignition. This mode provides the lowest possible power consumption. This mode is preferred for the SCB00 model where battery life is a concern.

With high intensity selected, the system will generate a hotter spark for 2 seconds during ignition. This mode can be used if the pilot gas is wet, the flame rod is dirty, the spark gap is too large, or the ignition wire is too long. This mode is not recommended on 24V systems as it may prematurely wear the circuit components.

- ON High Intensity (Power), 2 seconds
- * OFF Low Intensity (Power), 1 second

INTERVAL ③

The Interval is the time between ignition attempts when running in On Demand or Continuous mode. There are two options:

- ON 5 seconds
- * OFF 10 seconds

TIMEOUT ④

The timeout determines when the fault LED will turn on and the status contacts will open. The behaviour varies between modes:

- In Manual and On Demand mode, the system will stop running when the timeout expires.
- In Manual and Test mode, the timeout DIP switch is ignored. The setting is fixed at 5 seconds and 0 seconds respectively.
- In On Demand and Continuous mode, the timeout is user selectable between 5 minutes and 60 minutes



ON 60 minutes



*** OFF** 5 minutes

MODE ⑤ ⑥

There are three operational modes and one test mode that can be selected using the DIP switches. This is the only setting that requires two DIP switches to adjust.

Further detail on these modes can be found in section 4.

The selectable modes are:



*** OFF, OFF** Manual Mode

The system will only spark while the ON button is being held down.

This mode will NOT automatically relight the flare.



OFF, ON On Demand Mode

The system will spark periodically whenever flame is not detected. It will stop sparking after the selected timeout expires.



ON, OFF Continuous Mode

The system will spark periodically regardless of whether flame is being detected.

The status contacts will open after the selected timeout expires but the system will not stop running and sparking.



ON ON Test Mode

Similar to the manual mode except that after the ON button is released, the system will enter a continuous flame detection mode which is useful for debugging the flame detection circuit wiring.

LED ENABLE ⑦

When this switch is set ON, the LEDs on the circuit board inside the PF1300F enclosure will be enabled. This includes the Spark, Flame, Fault, and Debug LEDs.

The LEDs on the keypad are always enabled, regardless of this setting.



ON Circuit Board + Keypad LEDs enabled



*** OFF** Keypad LEDs enabled

UNUSED ⑧

This switch is ignored by the current firmware version and should be left in the OFF position



ON Unused



*** OFF** Unused

3.3 Operating the System

This section of the manual describes how to operate the system including how to start and stop it in various ways, test the LEDs, and how to check the system firmware version.

3.3.1 Starting the System

If there is an external ESD switch installed on the system, it must be turned on so that power will be applied to the PF1300F.

If the Auto Start DIP switch is set to the OFF position, when power is first applied to the PF1300F it will enter the low power OFF state. In this state all LEDs are off.

Press one of the On keys to start the system running.

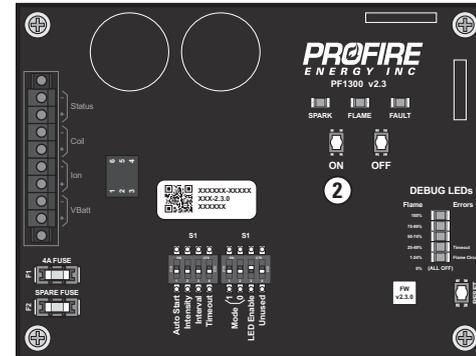
There are two On keys which perform the same function:

- 1 Keypad (outside of enclosure)
- 2 Circuit Board (inside of enclosure)

If the Auto Start DIP switch is set to the ON position, (On Demand or Continuous Mode only) the system will begin running immediately without the need to press one of the On keys.

If the system is stopped with the Fault LED on, pressing either On key will cause the system to restart.

Pressing the On key while the system is already running will cause the system to restart. When it restarts, it will immediately begin to spark. The timeout counter will also be reset.



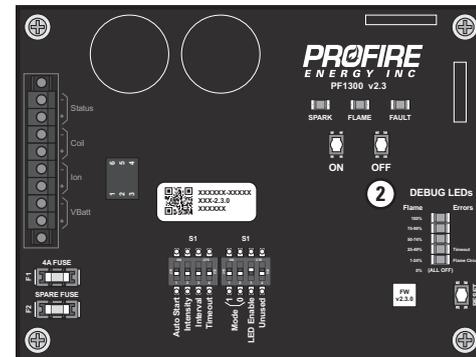
3.3.2 Stopping the System

If there is an external ESD switch installed on the system, it can be used to stop the system by cutting its power.

There are two Off keys which perform the same function:

- 1 Keypad (outside of enclosure)
- 2 Circuit Board (inside of enclosure)

Pressing one of the Off keys will also stop the system. When an Off key is pressed, all LEDs will turn off and the system will enter a low power state. This is true whether the system was previously running or stopped with the Fault LED on.



3.3.4 Viewing Firmware Versions Continued...

The LED pattern can be decoded into a firmware version. The digits are encoded in binary on the debug LED's. The Spark, Flame, and Fault LED's are used to indicate which part of the firmware version number is being shown. When written out, the three parts are separated by periods (Eg: 2.3.0 where the first part is "2", the second part is "3" and the third part is "0") Note that multiple digits may be shown per part. If this is the case, they will be separated by a brief pause with all LED's off.

PART AND DIGIT DECODING

	FIRST PART	SECOND PART	THIRD PART
PART	Spark	ON	
	Flame		ON
	Fault		ON

	MODE	0	1	2	3	4	5	6	7	8	9
DIGIT	D23									ON	ON
	D22					ON	ON	ON	ON		
	D21			ON	ON			ON	ON		
	D20		ON		ON		ON		ON		ON

EXAMPLE FIRMWARE VERSION DECODING

This table shows how firmware version v2.3.0 would be encoded.

	LED	PATTERN 1	PATTERN 2	PATTERN 3		
PART	Spark	ON				
	Flame		ON			
	Fault			ON		
DIGIT	D23					
	D22					
	D21		ON	ON		
	D20			ON		
	Firmware Version	2	.	3	.	0

This section of the manual describes the behaviour of the PF1300F when various features are enabled vs disabled. Simplified state diagrams are provided and discussed to give a high level understanding of how the system works. Detailed behaviour descriptions are also provided including process charts to illustrate the behaviour. These are provided for each of the four available modes. Note that all timing is nominal and may vary across systems and with temperature.

4.1 Mode Descriptions

There are three operational modes and one test mode that can be selected using the DIP switches. The following chart describes the differences between these modes.

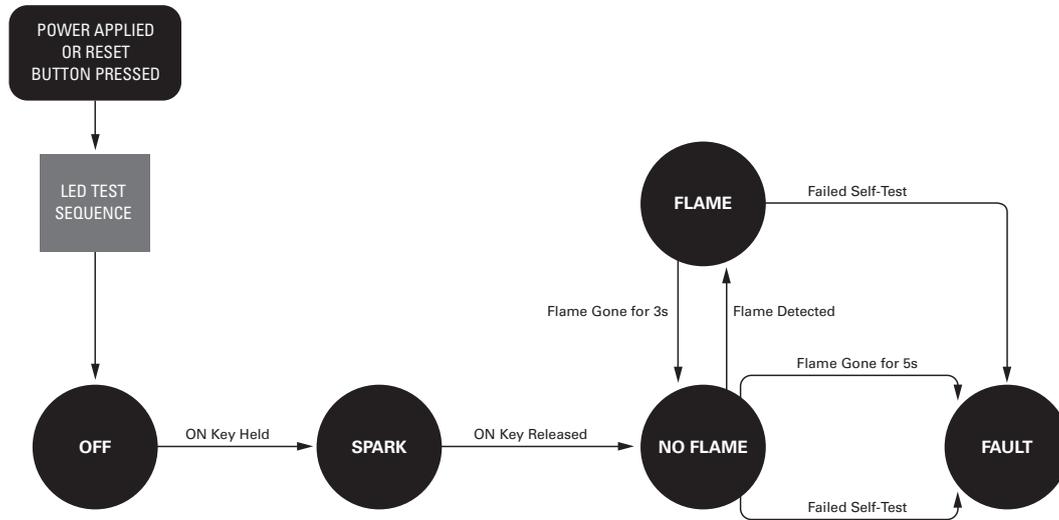
FEATURE	MANUAL MODE	ON DEMAND MODE	CONTINUOUS MODE	TEST MODE
Auto Start	No	User Selectable (Yes/No)	User Selectable (Yes/No)	No
Auto Relight	No	Yes	Yes	No
Auto Stop After Timeout	Yes	Yes	No	No
Timeout (Status Open Delay)	5 Sec	User Selectable (5/60 min)	User Selectable (5/60 min)	0 sec
Status Closed on Start	Yes	No	No	No
Flame LED Off Delay	3 sec	3 sec	3 sec	0 sec
Power *	0.36W Typical	0.36W Typical	0.50W Typical	0.52W Typical

* 12V Power Supply, Low Intensity Spark, and a 10 second interval. For On Demand Mode, it is assumed that the flare blows out once every hour.

4.2 State Diagrams

The following diagrams illustrate the various states that the PF1300F goes through when the system is powered on or manually started. There are diagrams provided for each mode.

4.2.1 Manual Mode



* DIP SWITCH SETTING

In this mode, the system will spark continuously as long as the On key continues to be held down and will not spark again after this. When the On key is released, the system will immediately close the Status Contact and begin checking for flame. The timeout is fixed at 5 seconds in this mode.

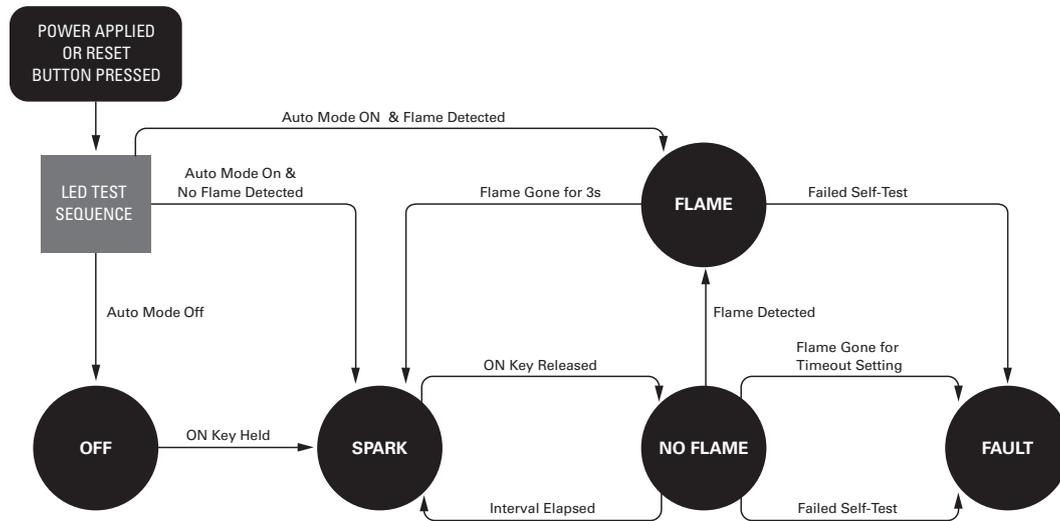
If flame is not detected within 5 seconds, the system will open the Status Contact, turn on the Fault LED, and stop running.

If flame is detected, the Flame LED will turn on. If flame is subsequently lost for a period greater than or equal to 3s, the Flame LED will turn OFF. If flame continues to be lost for a total of 5s, the system will stop running.

In other words, manual mode will not automatically try to relight the flame. It must be manually relit by pressing the On key again. The system can be used in this mode to monitor the flame and sound a remote alarm when it goes out.

*This mode is the default setting

4.2.2 On Demand Mode



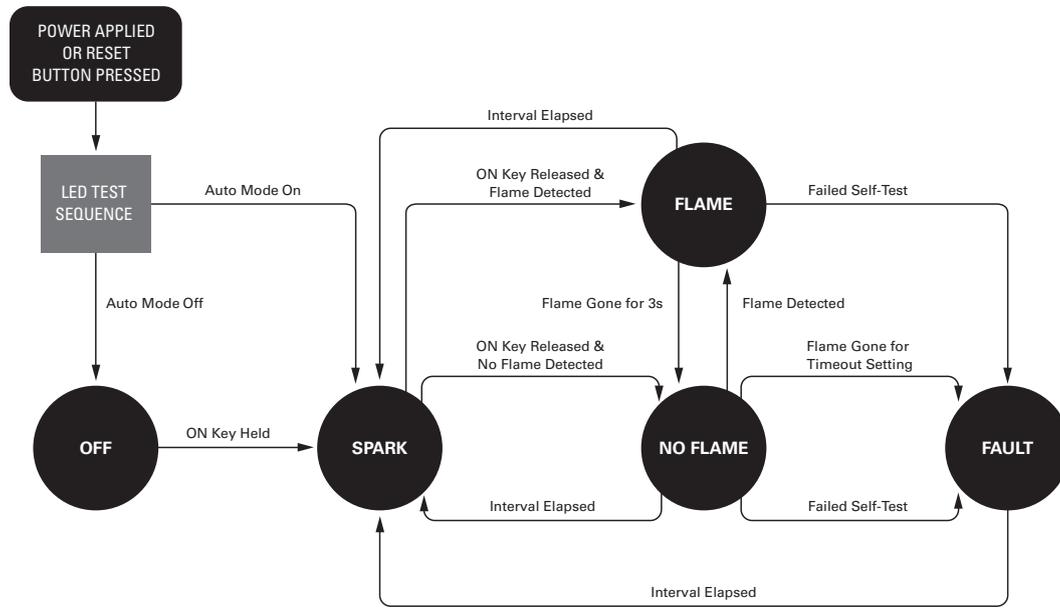
DIP SWITCH SETTING

In this mode, the system will spark only if flame is not detected. When the ON key is released, the system will check for flame, not closing the Status Contact until flame is detected.

The Flame LED will only turn off if flame is absent for 3s or more. When the Flame LED turns off, the system will begin sparking at the selected intensity and selected interval. The timeout counter will also begin counting down from the selected setting.

If flame is not detected again before the timeout expires, the system will open the Status Contact, turn on the Fault LED, and stop running. After this, the system must be manually restarted by pressing the ON key again (or cycling the power if Auto Start is enabled).

4.2.3 Continuous Mode



DIP SWITCH SETTING

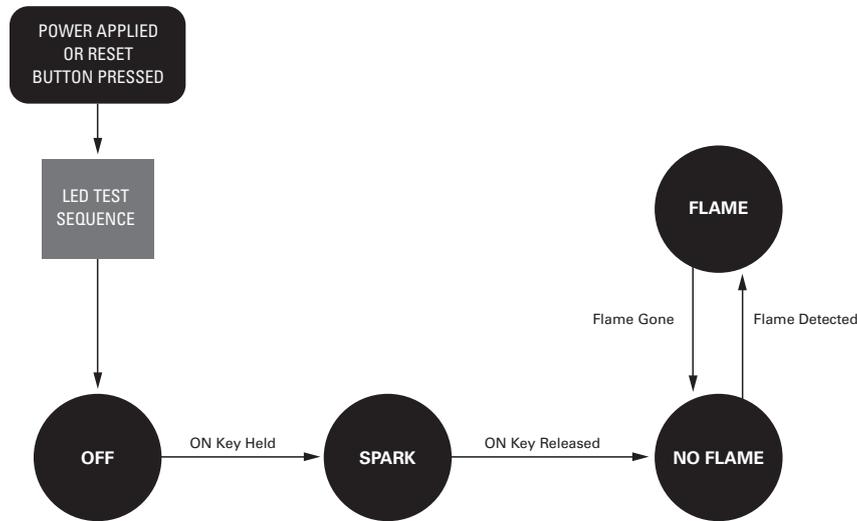
In this mode, the system will spark continuously on the interval selected by the user regardless of whether flame is being detected. Once flame has been detected, the system will close the Status Contact and turn on the Flame LED.

The Flame LED will only turn off if flame is absent for 3s or more. When the Flame LED turns off, the system will begin counting down from the timeout setting that was selected by the user.

If flame is not detected again before the timeout expires, the system will open the Status Contact and turn on the Fault LED. It will not, however, shutdown.

If flame is subsequently detected again, the Flame LED will come back on and the Status Contact will close again. In other words, this mode will spark and detect flame continuously until the Off key is pressed or power is disconnected.

4.2.4 Test Mode



DIP SWITCH SETTING

In this mode, the system will spark continuously as long as the On key continues to be held down. When the On key is released, the system will immediately enter a test mode. The Spark and Fault LEDs will both flash simultaneously on a 1 second interval to emphasize that this is a test mode.

The Flame LED will turn on when flame is present and the Status Contact will close.

If flame goes away, the Flame LED will immediately turn off and the Status Contact will immediately open. The system will never shutdown unless the OFF key is pressed or power is disconnected.

Refer to section 5 (Troubleshooting) for further details on how to use Test mode for Flame Detection Troubleshooting.

4.3 Process Control Behaviour

This section illustrates the behaviour of the process control algorithm in response to real-world situations. Timing is approximate.

4.3.1 Manual Mode

In this mode, the system only sparks once when the ON key is pressed. If the flare blows out, the system will shutdown after 5 seconds and will not automatically relight.

CHART

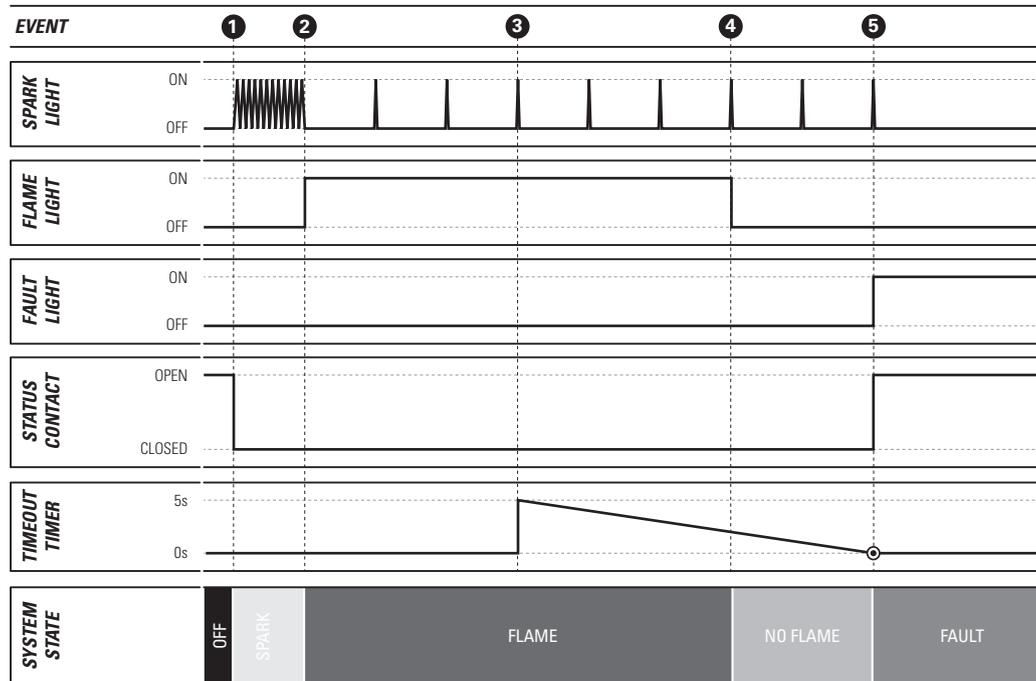


CHART EVENTS

- 1 ON key pressed, system starts sparking.
- 2 ON key released, system stops sparking, system detects flame, Flame Light turns on, Spark Light will blink once per second to indicate that the system is running.
- 3 Flare blows out, Timeout Timer begins counting down 5 seconds.
- 4 Flare has been out for 3 seconds. Flame Light turns off.
- 5 Flare has been out for 5 seconds (timeout Timer expires), Fault Light turns on, Status Contact opens, system stops running.

4.3.2 On Demand Mode

In this mode, the system will spark on the specified interval whenever the flame is out. It will shut down if the flame remains out for the entire timeout period. In this example, the timeout period is 5 minutes and the interval is 5 seconds.

CHART

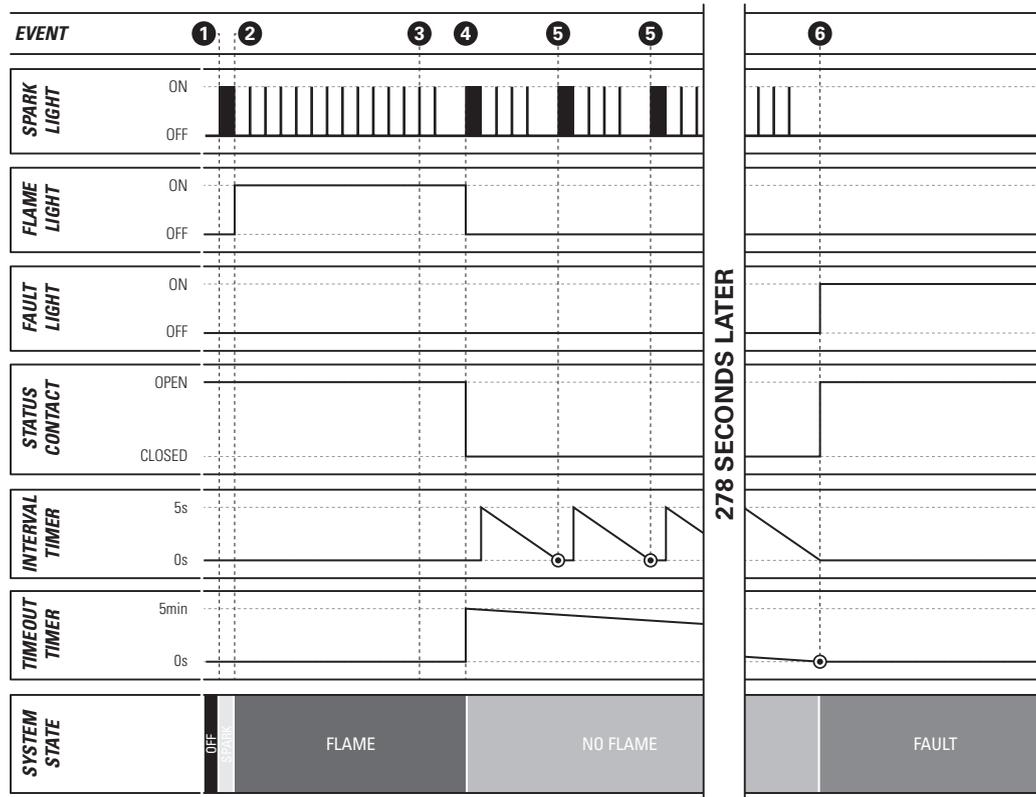


CHART EVENTS

- 1 ON Key pressed, system starts sparking.
- 2 ON Key released, system stops sparking, system detects flame, Flame Light turns on, Spark Light will blink once per second to indicate that the system is running.
- 3 Flare blows out.
- 4 Flare has been out for 3 seconds, Flame Light turns off, system sparks, Timeout Timer begins counting down 5 minutes, and Interval Timer begins counting down 5 seconds.
- 5 Interval Timer expires, system sparks and then the Interval Timer begins counting down 5 seconds again.
- 6 Timeout Timer expires, the flare is still out, system shuts down with the Fault Light on and the Status Contact open.

4.3.3 Continuous Mode

In this mode, the system will always spark on the specified interval, even when flame is present. It will NOT shutdown if the flame remains out for the entire timeout period, but it will open the Status Contact and turn on the Fault LED. In this example, the timeout period is 5 minutes and the interval is 5 seconds.

CHART

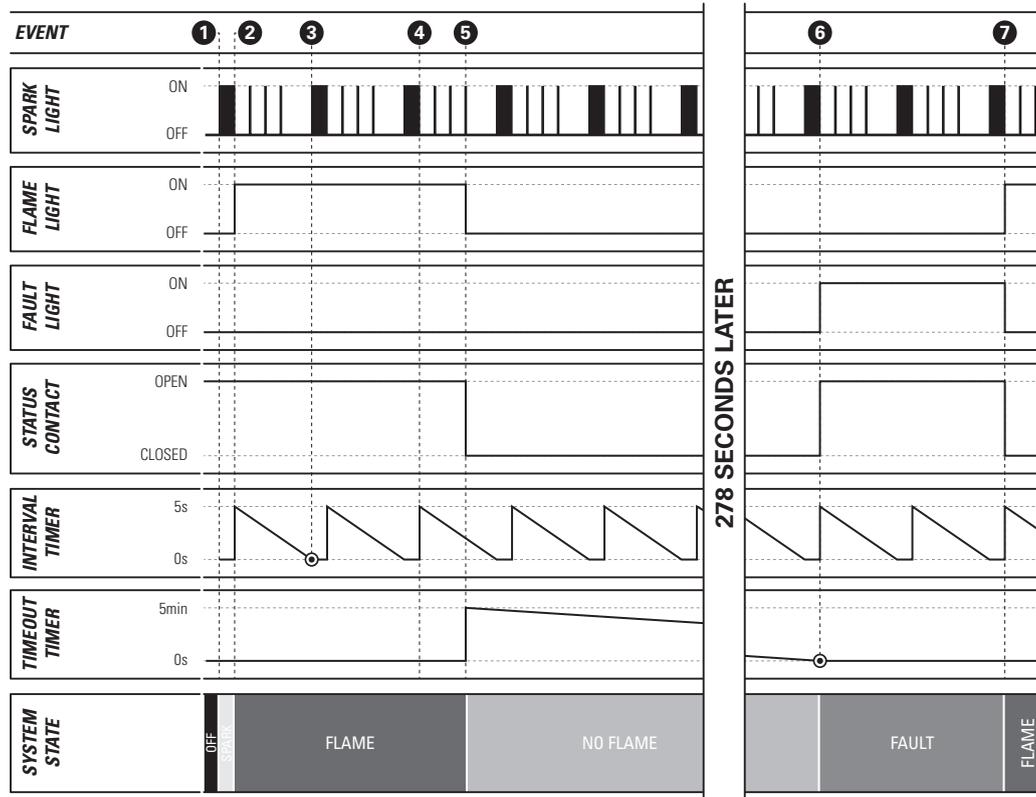


CHART EVENTS

- 1 ON Key pressed, system starts sparking.
- 2 ON Key released, system stops sparking, system detects flame, Flame Light turns on, Interval Timer begins counting down 5 seconds, Spark Light will blink once per second to indicate that the system is running.
- 3 Interval Timer expires, system sparks and then the Interval Timer begins counting down 5 seconds again. This repeats continuously while the system is running.
- 4 Flare blows out.
- 5 Flare has been out for 3 seconds, Flame Light turns off, Timeout Timer begins counting down 5 minutes.
- 6 Timeout Timer expires, the flare is still out. Fault Light turns on and the Status Contact opens, System continues running.
- 7 Flame returns, Fault Light turns off, and Status Contact closes.

4.3.4 Test Mode

In this mode, the Spark and Fault Lights will blink simultaneously to indicate that this is a test mode. The system will only spark while the ON Key is held and then never again. The Flame Light and Status Contact will immediately follow the flame quality to allow the operator to adjust rod positioning, grounding, etc

CHART

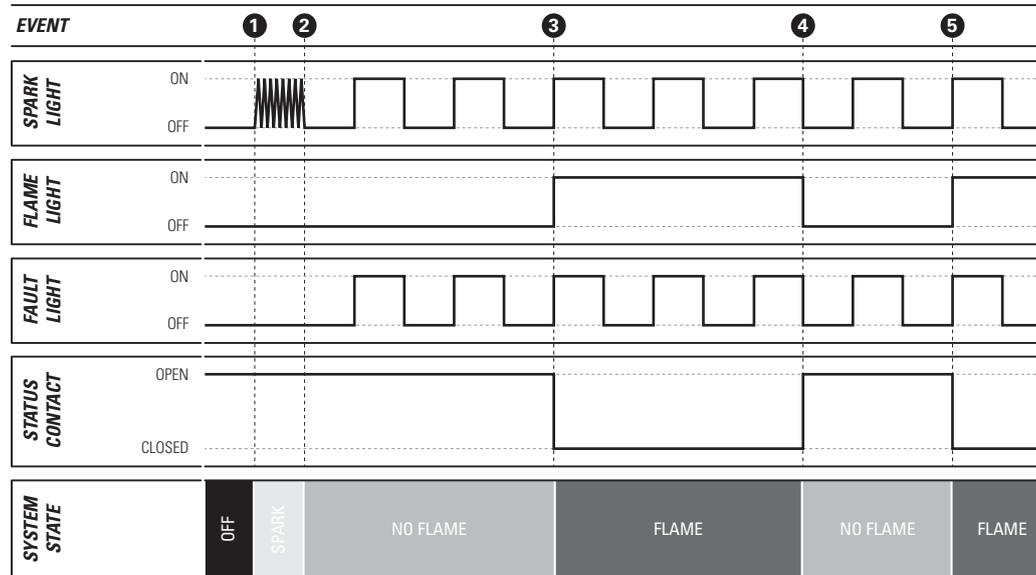


CHART EVENTS

- 1 ON Key pressed, system starts sparking.
- 2 ON Key released, system stops sparking, system does NOT detect flame, Flame Light remains off, Spark and Fault Lights begin blinking to indicate test mode.
- 3 Operator adjusts flame and position to be better positioned in the flame, Flame Light turns on, Status Contact closes.
- 4 Operator adjusts flame rod position to be out of flame, Flame Light turns off, and Status Contact opens.
- 5 Operator fixes flame rod position again, Flame Light turns on, Status Contact closes.

4.4 Timing Accuracy

The PF1300F does not use a precision clock source. As such, the accuracy of all timing parameters for the PF1300F are fairly loose. The timing may vary from the nominal values as shown in the table below. This variance may occur from unit to unit and also over temperature.

NOMINAL VALUE	20°C (68°F)		-40°C (40°F)		-80°C (176°F)	
	MIN	MAX	MIN	MAX	MIN	MAX
5 sec Interval	4.7 sec	5.6 sec	3.8 sec	7.3 sec		
10 sec Interval	9.3 sec	11.1 sec	7.5 sec	14.6 sec		
5 min Timeout	4.7 min	5.6 min	3.8 min	7.3 min		
60 min Timeout	56.1 min	66.7 min	45.2 min	87.7 min		

This section of the manual is designed to aid you in troubleshooting the PF1300F. It begins with a list of Common Issues and Solutions. This section concludes with a step-by-step guide for troubleshooting issues with Flame Detection.

If you are having trouble with your PF1300F System, please consult the following resources in this order:

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

5.1 Common Issues & Solutions

The following is a list of issues with corresponding possible solutions.

1. SYSTEM SPARKS IN THE ENCLOSURE INSTEAD OF ON THE PILOT ASSEMBLY

- Check that the ignition wire is properly connected to the ignition coil and to the ignition rod.
- Check that the spark gap between the Kanthal ignition rod and the pilot assembly is no bigger than 1/4".
- Check that the pilot assembly is properly grounded back to the system's EGND screw.

2. SYSTEM DOES NOT SPARK AT ALL

- If no lights turn on when the ON key is pressed, check the fuse and install the spare if necessary.

- Check that the system is getting enough power. Anything below 12V may not be sufficient to generate a spark.
- Check mode settings. You may be in On Demand mode when you want Continuous mode.
- Check that the pluggable header is seated correctly.
- Check that the Coil+/- wires are attached correctly to the pluggable header and also to the bottom of the ignition coil.
- The ignition coil or circuit board may be damaged. Contact Profire to arrange for a repair/replacement.

3. SYSTEM HAS VISIBLE FLAME BUT CAN'T DETECT IT

- a. The flame rod, pilot assembly and the gap between them should be fully engulfed in flame. If not, adjust the rod positioning and/or decrease pilot gas pressure.
- b. Check that the Ion+ wire is securely attached from the pluggable header to the left terminal on the ignition coil.
- c. Check the ground connection to the pilot assembly.
- d. Flip up the LED Enable DIP switch and check the Debug LEDs to determine the flame quality level.
- e. Consult the instructions in the section 5.2 (Flame Detection Troubleshooting Guide) for further details on Flame Detection.

4. FAULT LIGHT IS ON

The Fault Light will turn on for one of two reasons. The flame is absent for the timeout period, or the system failed its self-test.

To determine which reason is the case, set the LED Enable DIP switch to ON and observe the status of the Debug LEDs.

For more details, please consult section 3.1.4 (Debug LEDs).

5. FLAME CIRCUIT DEBUG LIGHT IS ON

The flame detection circuit failed its self-test. Try the following:

- a. Check wiring for shorts to power or ground.
- b. Check for faulty circuit board.

6. TIMEOUT DEBUG LIGHT IS ON

The system failed to ignite and/or detect flame before the timeout elapsed. Try the following:

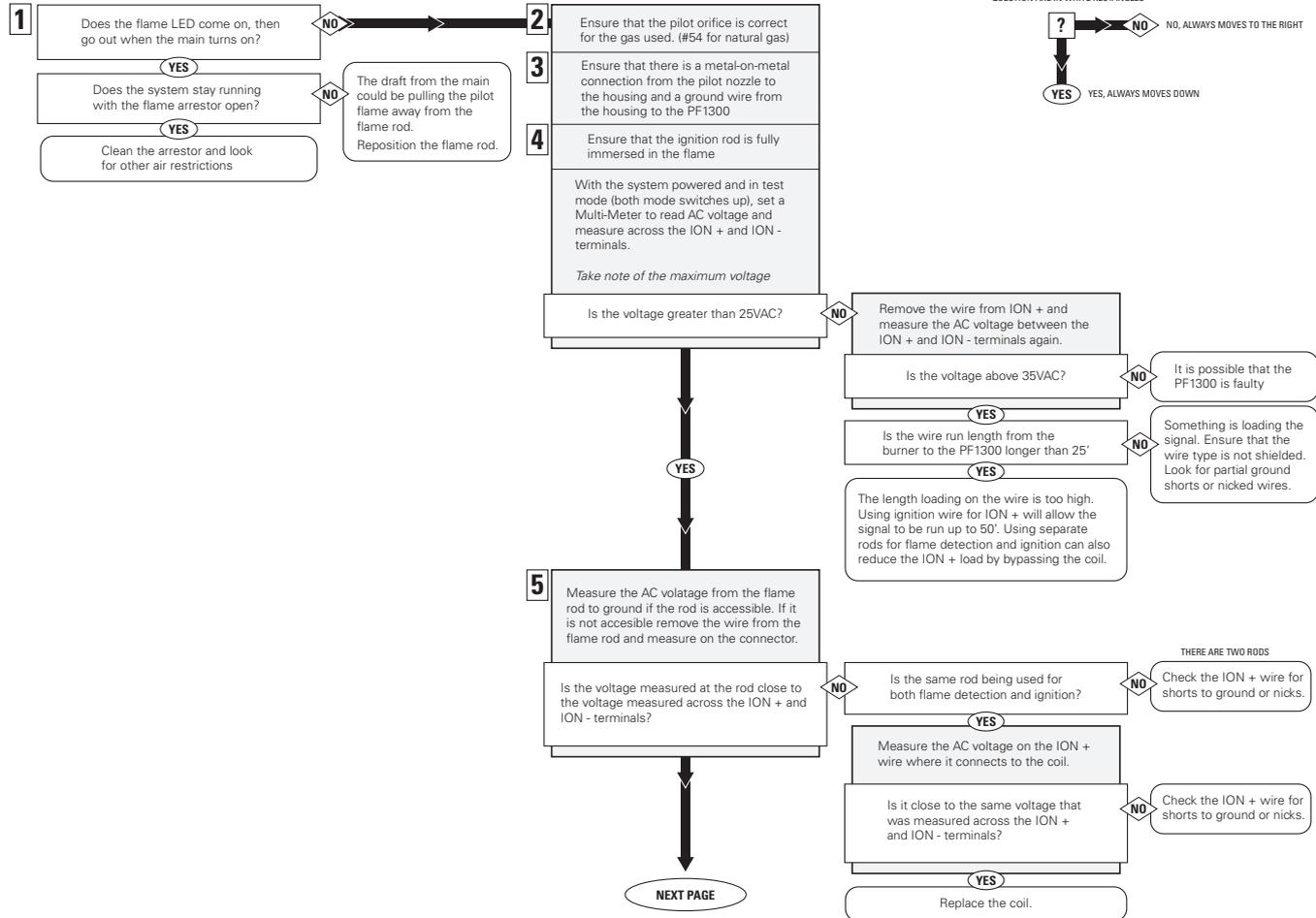
- a. Check wiring for shorts to power or ground.
- b. Check pilot assembly ground wiring.
- c. Check pilot gas flow.
- d. Check rod positioning.
- e. Consider increasing the timeout setting.
- f. Try suggested solutions to issue 3 to verify that the system can properly detect flame.

7. STATUS CONTACT NOT WORKING

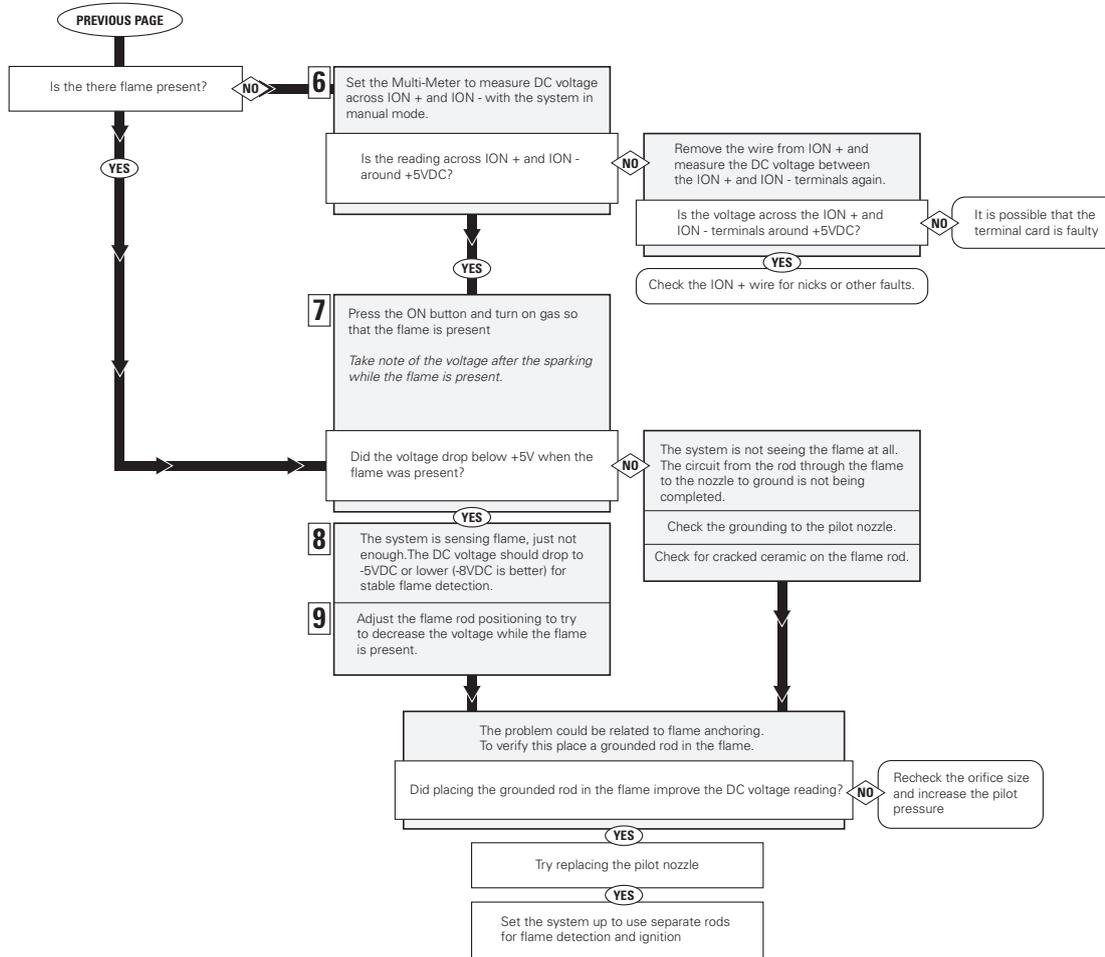
- a. Check for errors in wiring. It is a dry contact and does not source power.
- b. Ensure that the max voltage and current ratings are not exceeded. If so, the circuit board may be damaged. Contact Profire to arrange for a repair/replacement.

5.2 Flame Detection Troubleshooting Guide

System is not detecting flame.



5.2 Flame Detection Troubleshooting Guide Continued...



GENERAL FEATURES

- Single-rod ignition and flame detection
- User configurable spark intensity
- User configurable spark interval
- User configurable timeouts
- Status contact for remote notification of flame failure
- Flame Light provides a visual indication of flame presence
- 3 user selectable operating modes:
 - Manual
 - On Demand
 - Continuous
- Test mode and Debug LEDs help fine tune flame rod positioning during installation
- 12/24VDC operation **
- Weather proof NEMA 4X enclosure
- Integrated battery and solar charge controller *
- Low power consumption for up to 2 weeks of battery life *

* SCB00 MODEL ONLY

** SC000 MODEL ONLY

TECHNICAL SPECIFICATIONS

TEMPERATURE RATINGS		MIN	MAX
Operating Range (SC000)		-40°C (-40°F)	+80°C (+176°F)
Operating Range (SCB00)		-40°C (-40°F)	+50°C (+122°F)
Storage Range (SC000)		-40°C (-40°F)	+85°C (+185°F)
Storage Range (SCB00)		-40°C (-40°F)	+60°C (+140°F)
POWER SUPPLY REQUIREMENTS		VALUE	
Base Model (SC000)		12/24 VDC	
Battery Model (SCB00)		12V Solar Panel (40W MAX)	
POWER CONSUMPTION		12VDC	24VDC
Average Current (When not Sparking)		30 mA	30 mA
Peak Current (When Sparking)		4 A	4 A
Average Current (When Off)		3 mA	3 mA
Ignition Voltage		up to 20 kV	up to 40 kV
TERMINAL BLOCKS		VALUE	
Maximum Wire Gauge		12 AWG	
STATUS CONTACT		VALUE	
Type		Dry	
MAX Voltage		200V (Peak AC or DC)	
MAX Continuous Current		150 mA	
Impedance (When Closed)		5Ω	
PHYSICAL DIMENSIONS		VALUE	
Width		30.9 cm (12.15 in)	
Height		23.4 cm (9.23 in)	
Depth		13.4 cm (5.28 in)	
WEIGHT		VALUE	
SC000 Model		3.2 kg (7.0 lbs)	
SCB00 Model		6.0 kg (13.5 lbs)	

TECHNICAL SPECIFICATIONS CONT.

BATTERY SPECS (SCB00)	VALUE
Voltage	12 V
Capacity	9 Ah
Type	Sealed Lead Acid
Replacement P/N	PowerSonic PS-1290-F2
Self Discharge* @ 5°C (41°F)	18 months
Self Discharge* @ 20°C (68°F)	6 months
Self Discharge* @ 40°C (104°F)	2 months
AUTONOMY (SCB00)**	VALUE
Manual/On Demand Mode	12 days
Continuous Mode, Low Intensity ***	9 days
Continuous Mode, High Intensity ***	2 days
Fault State	75 days
Off State	112 days
FUSE	VALUE
Rating	4 A / 125VDC, Fast Blow
Replacement Part Number	Littelfuse 0453004
DIODE (SCB00)	VALUE
Replacement Part Number	On Semi SA24ARLG

* Down to 80% of Max Capacity

** Assumes operation @ 25C

*** Assumes interval = 10 s



www.profireenergy.com
© 2013 PROFIRE