PROFIRE

PF2200 - DB

INSTALLATION AND OPERATION GUIDE

DOC-001112
v3.0

PROFIRE

WELCOME TO PROFIRE!

Congratulations on your purchase of the PF2200 BMS Controller! We are thrilled that you have chosen Profire to deliver the most user-friendly, dependable, and secure burner management and combustion control solutions for your heating application — and that's just the beginning!

For 20+ years we have been dedicated to designing products for thermal appliances used across several industrial applications. Through the expertise of our engineering team and our extensive field experience, we continuously strive to develop performance-driven solutions tailored to meet your objectives and goals. Our products and services include:

- **Certified & Approved BMS Controllers**
- **Performance-Driven Fuel Trains**
- **High Efficiency Burners**
- **Commissioning and Training**
- **Preventative Maintenance**
- **Solution Enhancements**
- **And so much more!**

Natural draft, forced draft, multi-pilot, multi-burner, you name it, our experts are ready to help. ***Reach out and let's get started today!***

IMPORTANT SAFETY INFORMATION

WARNING – EXPLOSION HAZARD. DO NOT DISCONNECT WHILE THE CIRCUIT IS LIVE OR UNLESS THE AREA IS FREE OF IGNITIBLE CONCENTRATIONS.
WARNING – EXPLOSION HAZARD. DO NOT REMOVE OR REPLACE FUSES UNLESS POWER HAS BEEN DISCONNECTED OR THE AREA IS FREE OF IGNITIBLE CONCENTRATIONS.

AVERTISSEMENT – RISQUE D'EXPLOSION. NE PAS DÉBRANCHER PENDANT QUE LE CIRCUIT EST SOUS TENSION OU À MOINS QUE L'EMPLACEMENT NE SOIT EXEMPT DE CONCENTRATIONS INFLAMMABLES.
AVERTISSEMENT – RISQUE D'EXPLOSION. NE PAS RETIRER NI REMPLACER LES FUSIBLES NI À MOINS QUE L'ALIMENTATION N'AIT ÉTÉ COUPÉE OU QUE L'EMPLACEMENT NE SOIT EXEMPT DE CONCENTRATIONS INFLAMMABLES.

APPROVALS AND RATINGS

The PF2200-DB is certified to the following standards:

SIL 2 Capable
IEC 61508: 2010 Parts 1-7
Approved for use in a 1oo1 deployment configuration

Electrical Burner Control System
UL 60730-2-5/ ANSI Z21.20-2014 • CSA C22.2 No. 60730-2-5
UL 121201 • CSA-C22.2 No. 213

The PF2200-DB is approved for use in hazardous locations:
Class I Div 2 Group A, B, C & D, T4A
Class I, Zone 2, Group IIC – US Only
Ambient Temperate Range: -40°C to +55°C
Input Voltage: 12/24VDC, 10A max
Power input must be supplied by a Class 2 power source.

Type 4X
CSA C22.2 No. 94.1:15 • CSA C22.2 No. 94.2:15, Ed. 2
UL 50:15, Ed. 13 • UL 50E:15, Ed. 2

IP66
CSA-C22.2 No. 60529:16

OVERVIEW

This document provides a brief overview of the installation requirements, user interface features, operating sequence, and functionality of the PF2200-DB BMS controller.

Additional documentation for released PF2200 Firmware versions is available at ***profireenergy.com***. Refer to the applicable documentation for your installed firmware version. Some documents available on the website are:

ACCESS PF2200-DB DOCUMENTATION

- "Product Manual" - Includes timing parameters; operating sequence; electrical contact ratings; and detailed installation, commissioning, and maintenance instructions.
- "Modbus Configuration Guide" - Describes registers and other programming information.
- "Software Release Notes" - Describes software change history.
- "Firmware Update Guide" - Describes how to perform a firmware update.
- "Certificates of Compliance" - Lists certification ratings and standards.

INTRODUCTION

PF2200-DB BMS CONTROLLER

The PF2200-DB Burner Management System is an automated safety controller designed to monitor and control industrial heating processes that utilize dual burner natural draft appliances. It provides for safe burner ignition, ionization flame detection, temperature control and peripheral input device monitoring.

The user interface provides real-time system status and state information as well as detailed alert annunciation, advanced diagnostics and data logging. The system has been optimized for power consumption to be utilized in a variety of applications and can be monitored remotely.

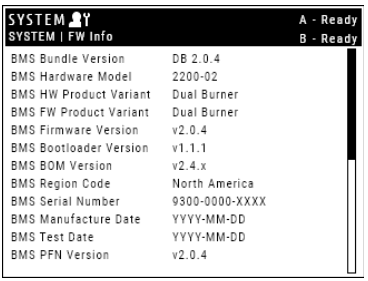
APPLICABLE HARDWARE AND FIRMWARE VERSIONS

Refer to the controller's Information Screen *(System > Firmware > Info)* to find the hardware and firmware versions of your system. This document is applicable for the following hardware and firmware versions:

PF2200-DB Firmware Version: DB 2.0.4

BMS Card Hardware Version v2.4.x

UI Card Hardware Version v3.3.x



INSTALLATION

All PF2200 systems must be installed in compliance with local safety codes.

All installers and commissioners of the PF2200 system must:

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

The enclosure should be mounted:

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

Refer to the installation section of the Product Manual available on Profire's website for additional instructions.

CONTROLLER INTERFACE

SCREENS

The PF2200-DB controller consists of 3 main screens:

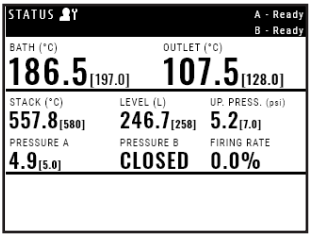
1. **STATUS SCREEN** – Always-on display that shows real-time input device readings, controller state and alerts.

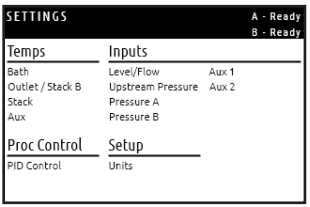
   ALERT TYPES DISPLAYED IN THE ALERTS PANE OF THE STATUS SCREEN:

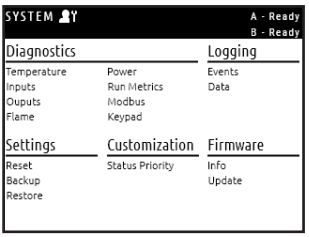
   - **Alarm** - Prevents the system from entering any running state.
   - **Wait** – Prevents the system from entering any fuel state.
   - **Main Permissive** – Prevents the system from entering any main fuel state.
   - **Warning** – Displayed on screen only - does not affect system state.

2. **SETTINGS SCREEN** – Screen containing all the configuration settings required to set up the system

3. **SYSTEM SCREEN** – Screen containing tools for data logging and settings backup as well as a suite of diagnostic information for troubleshooting







BUTTONS AND FUNCTIONS

BUTTONS	FUNCTIONS
START	Start the system **OR** Start individual burners from the Ready state.
STOP	Stop the system or individual burners while running*
	Return to previous screen from an on-screen menu
	Cycle through Status, Settings, and System screens
	Display keypad functionality help screen
	Switch to Commissioner Mode to see all available settings **OR** Switch to Operator Mode to see only essential settings and setpoints
	Navigate Menus and highlight items
OK	Select highlighted item **OR** Open settings adjustment dialog when highlighting numeric settings
	Change Status screen display mode **OR** Make incremental changes to numeric settings **OR** Scroll Event Log by full page

If user shut-down is a required safety function, the ESD input or External Ignition Switch must be used instead of the Stop button.

KEY SETTINGS

TEMPERATURE SETTINGS

NAME	DEFAULT	RANGE	DESCRIPTION
HIGH TEMP SETPOINT	90 °C	-40 °C - 1350 °C	Temperature threshold at which the system shuts down.
	194 °F	-40 °F - 2462 °F	
High Temp Setpoint must be greater than Pilot Off Setpoint *If Type setting is set to RTD, High Temp Setpoint must be less than 850 °C (1562 °F)*			
PILOT OFF SETPOINT	85 °C	-40 °C - 1350 °C	Temperature threshold at which the system turns off the pilot valve(s).
	185 °F	-40 °F - 2462 °F	
Pilot Off Setpoint must be greater than Main Off Setpoint and less than High Temp Setpoint			
MAIN OFF SETPOINT	85 °C	-40 °C - 1350 °C	Temperature threshold at which the system turns off the main valve(s).
	185 °F	-40 °F - 2462 °F	
Main Off Setpoint must be greater than Process Setpoint and less than Pilot Off Setpoint			
PROCESS SETPOINT	80 °C	-40 °C - 1350 °C	Temperature that the system attempts to maintain when in Process Control mode.
	176 °F	-40 °F - 2462 °F	
Process Setpoint must be greater than Low Temp Setpoint and less than Main Off Setpoint			
STANDBY SETPOINT	70 °C	-40 °C - 1350 °C	Minimum Bath temperature the system attempts to maintain while in Bath Standby Mode.
	158 °F	-40 °F - 2462 °F	
Settings > Process Control > Configuration > Bath Standby Mode must be enabled *Settings > Process Control > Configuration > Process Control Mode must be set to On/Off Control* *Standby Setpoint must be more than 1 degree lower than the Process Setpoint*			
LOW TEMP SETPOINT	0 °C	-40 °C - 1350 °C	Temperature threshold at which, if not exceeded, the system warns the user.
	32 °F	-40 °F - 2462 °F	
Low Temp Setpoint must be less than Process Setpoint			
DEADBAND	2 °C	0 °C - 100 °C	The deadband prevents bouncing between states when the input reading is close to the corresponding setpoint.
	3.6 °F	0 °F - 180 °F	

INPUT SETTINGS

NAME	DEFAULT	RANGE	DESCRIPTION
4-20 LOW TRIP SETPOINT	12 mA	4 mA - 20 mA	Input threshold at which the system will initiate a low-trip event in accordance with the 4-20 Low Trip Mode setting.
Type must be set to 4-20			
4-20 HIGH TRIP SETPOINT	19.6 mA	4 mA - 20 mA	Input threshold at which the system will initiate a high-trip event in accordance with the 4-20 High Trip Mode setting.
Type must bet set to 4-20			
4-20 DEADBAND	0.2 mA	0 mA - 1 mA* * Aux In 1/2 Deadband maximum is 16mA	The deadband prevents bouncing between states when the input reading is close to the corresponding trip point.
To clear a low trip, input must be greater than 4-20 Low Trip plus deadband. *To clear a high trip, input must be less than 4-20 High Trip minus deadband.*			

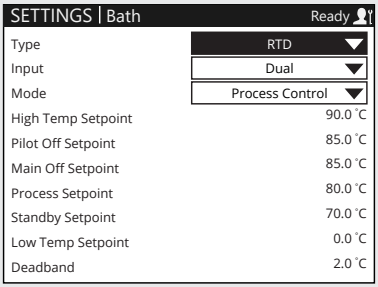
PROCESS CONTROL SETTINGS

NAME	DEFAULT	RANGE	DESCRIPTION
RAMP TIME	10 sec	0 sec - 255 sec	The time it takes the system to ramp from the minimum firing rate to 100% upon entry into the Process Control state after cold startup.

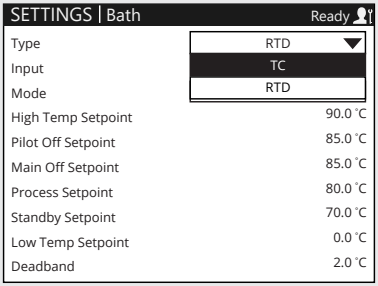
SETTINGS MODIFICATION

DROP DOWN MENU SETTINGS

ACCEPTED CHANGE METHOD



OK

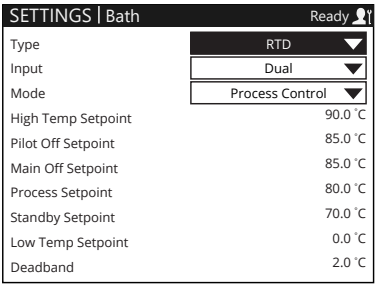


+ − ▼ ▲ *CHANGE VALUE*

OK *ACCEPT*

CANCEL

QUICK SETTING ADJUSTMENT METHOD

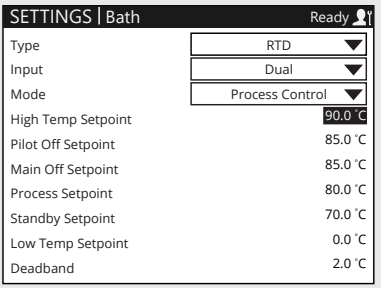


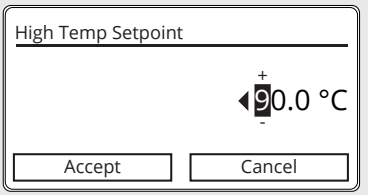
+ − *CHANGE VALUE*

NOTE: Settings modifications made using the Quick Settings Adjustment Method take effect immediately.

NUMERIC SETTINGS

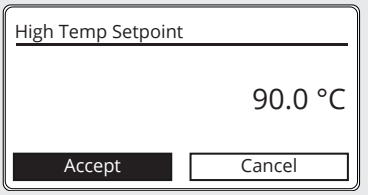
ACCEPTED CHANGE METHOD





ADD/SELECT DIGIT

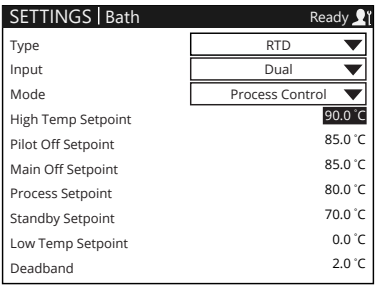
CHANGE DIGIT VALUE



ACCEPT

CANCEL

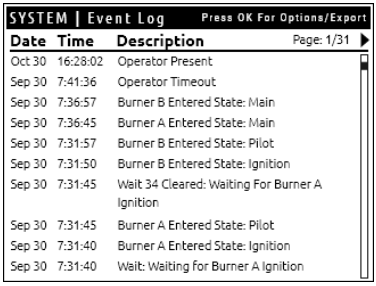
QUICK SETTING ADJUSTMENT METHOD



CHANGE VALUE

NOTE: Settings modifications made using the Quick Settings Adjustment Method take effect immediately.

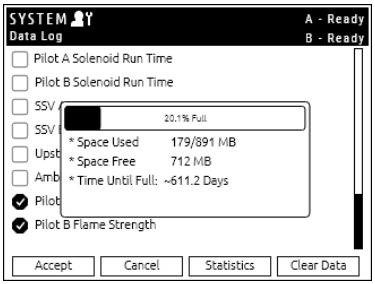
SYSTEM TOOLS



THE EVENT LOG SCREEN

[SYSTEM > LOGGING > EVENTS]

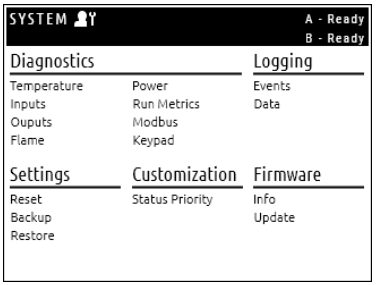
Displays a full history of system events for reference and troubleshooting. Events are continuously recorded to the USB storage device when inserted.



THE DATA LOGGING TOOL

[SYSTEM > LOGGING > DATA]

Logs input/output readings for up to 8 user selectable pieces of system information to the USB storage device. The data is logged in 15 second intervals and saved to the USB storage device regularly.



THE PF2200-DB DIAGNOSTIC MENUS

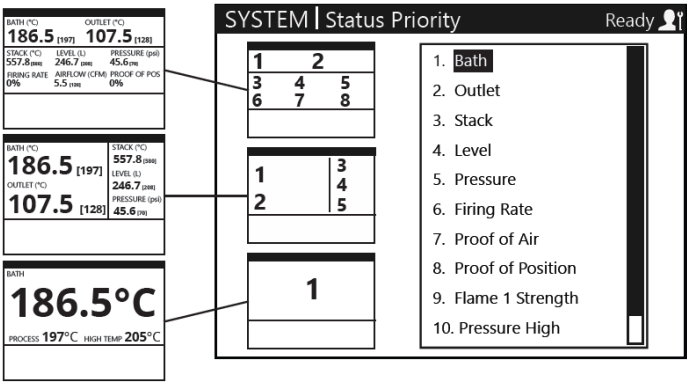
[SYSTEM > DIAGNOSTICS]

Contain useful real-time system input and output measurements, run metrics and useful troubleshooting information.

THE STATUS PRIORITY TOOL

[SYSTEM > CUSTOMIZATION > STATUS PRIORITY]

Allows configuration of the items displayed on the main Status screen. Use ▲ and ▼ to select a status element and + and − to move it up or down the priority list.



OPERATING SEQUENCE

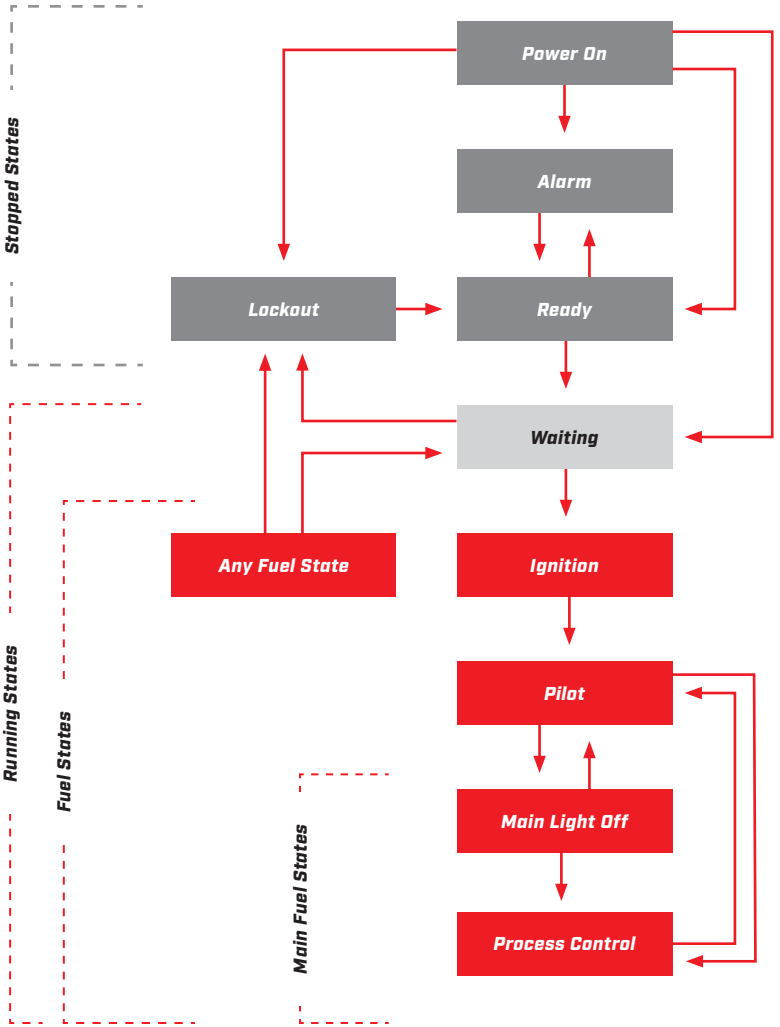
The PF2200-DB utilizes a state-based control scheme to safely monitor and control each burner individually. Each system state has specific entry and exit requirements and defined output behavior.

NOTE: The current system state is always displayed in the Status Bar located at the top of the User Interface screen.

STATE TABLE

STATE NAME	STOPPED STATE	RUNNING STATE	FUEL STATE	MAIN STATE	COIL OUTPUT	PILOT OUTPUT	SSV OUTPUT
Power On	Yes	No	No	No	De-energized	De-energized	De-energized
Alarm	Yes	No	No	No	De-energized	De-energized	De-energized
Ready	Yes	No	No	No	De-energized	De-energized	De-energized
Lockout	Yes	No	No	No	De-energized	De-energized	De-energized
Waiting	No	Yes	No	No	De-energized	De-energized	De-energized
Ignition	No	Yes	Yes	No	Energized	Energized	De-energized
Pilot	No	Yes	Yes	No	De-energized	Energized	De-energized
Main Light Off – Requesting Light Off	No	Yes	Yes	Yes	De-energized	Energized	De-energized
Main Light Off – Main Delay	No	Yes	Yes	Yes	De-energized	Energized	Energized
Process Control	No	Yes	Yes	Yes	De-energized	Energized	Energized

STATE DIAGRAM



For further information on the operating sequence, please refer to the Product Manual specific to your FW version, available on Profire's website.

STATUS LED BEHAVIOR

BURNER A STATE	BURNER B STATE	CONDITION	BEHAVIOR
Power On	Power On	Any	Green-Amber-Red
Alarm	Alarm	Any	Slow blinking Red
Ready	Ready	Any	Solid Red
Lockout	Any running state	Any	Fast Flashing Red
Any stopped state	Lockout	Any	
Lockout	Any running state	Any	Fast alternating Green and Red
Any running state	Lockout	Any	
Any running state	Alarm	Any	Slow alternating Green and Red
Alarm	Any running state	Any	
Any running state	Ready	Any	Slow alternating Green and Amber
Ready	Any running state	Any	
Any running state	Any running state	No waits present [1] No warnings present	Solid Green
		Wait present [1] No warnings present	Slow blinking Green
		Wait present [1] Warning present	Slow blinking Amber
		No waits present [1] Warning present	Solid Amber

[1] With the exception of Waiting on High Process Temp.

TROUBLESHOOTING

PROBLEM		PROPOSED SOLUTIONS
System has visible flame but cannot detect	1.	Ensure pilot assembly, flame rod, and the gap between are fully engulfed in flame. If not, adjust rod position
	2.	Ensure flame detection wiring does not exceed the recommended maximum length
	3.	Ensure burner assembly has a low impedance path to chassis ground
	4.	For longer run lengths, ensure ignition cable is used to avoid ground-loading
Card is unresponsive or BMS card will not communicate with User Interface card	1.	Ensure the Status LEDs for both cards are functioning. If status LED is not functioning, cycle power (if safe to do so) and check again.
	2.	Check the wiring between the BMS card and the User Interface Card.
	3.	Ensure that the firmware versions of the BMS card and UI card are matching.
Ignition transformer "clicks" but no visible spark	1.	Ensure all wires in the ignition path are properly terminated and that there is a low impedance path from the primary-windings to the BMS card as well as the secondary-windings to the ignition rod.
	2.	Ensure the gap between the ignition rod and the burner housing is between 2mm and 8mm
Solenoids are not turning on, or turning on then over time turn off	1.	Ensure the solenoid is wired correctly and to the appropriate terminals. To ensure proper solenoid wiring, a multi-meter in OHM mode can be used to measure the resistance between the + and – terminal of the associated output. Note: this measurement should be done with the BMS card powered off. If properly wired, the multi-meter should read a resistance of the solenoid coil plus the run length (i.e. if the multimeter reads open, there is likely a problem with wiring).
	2.	Ensure the PWM setting is correct for the appropriate solenoid. If using a peak-and-hold solenoid, the appropriate PWM setting can be found in the solenoid data sheet. Typically add a margin of 5-10% to allow for temperature variance. If using a non-peak-and-hold solenoid, ensure the PWM setting is set to 100%.
Digital input will not energize	1.	Ensure the input is properly wired. In the case of a dry contact, ensure the PWR terminal is connected and is sourcing the correct voltage.
	2.	Ensure adequate amount of wetting current is being applied to the contact. Run a current meter in series with the digital input switch to verify the current applied. If the wetting current is not adequate, the digital input either has too high of an impedance or the wiring has been compromised.

SERVICE YOU CAN COUNT ON

Empowering Your Business with Enhanced Solutions and Exceptional Support

Together with our Trusted Partners, we've curated a comprehensive suite of services tailored to meet your evolving needs. From determining your exact requirements to ensuring smooth operations for years to come, you can rely on Profire and our partners for prompt and dependable support. These services include:

- **Consulting** – We offer on-site analysis to evaluate your application, equipment, safety, and code compliances. Our experts will develop a performance-based, cost-effective solution for your application.

- **Installation** – The Profire team and our qualified partners can expertly guide you through the installation process to ensure optimal efficiency of your new Profire solutions. From testing and verifying shutdown setpoints to fine-tuning burners and secondary air controls, our skilled technicians will ensure the seamless and safe operations of your Profire products.

- **Startup and Commissioning** – We provide functionality and shutdown testing, ensure your controller and burner are properly tuned for combustion efficiency, and offer on-site operator training. This is all finalized with an assessment report that outlines everything you need to know about your burner management system.

- **Preventative Maintenance** – We offer a flexible 12-Point service inspection that can be tailored to your specific appliance requirements — including on-site service or safety checks. By scheduling regular maintenance, you will enhance the longevity of your equipment, decrease emissions, reduce downtime, and achieve cost savings.

- **Technical Support** – We provide 24/7 phone support, as well as on-site equipment servicing throughout the U.S. and Canada. Whether you need help troubleshooting, a step-by-step walk through to update the latest firmware, or questions regarding warranty, we are here to help.

At Profire, we understand the importance of having reliable, expert support when you need it. ***Contact us today to get started!***

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