PF2200-DB

OPERATOR GUIDE

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v2.0

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PF2200-DB OPERATOR GUIDE

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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.

This document provides a brief overview of the interface, operating sequence and functionality of the PF2200-DB BMS controller. Refer to the PF2200-DB Product Manual on the Profire website at profireenergy.com for detailed descriptions of the inputs, outputs and operating sequence as well as installation, maintenance and commissioning instructions. This document is applicable for the following hardware and firmware versions:

APPLICABLE HARDWARE AND FIRMWARE VERSIONS

This document is applicable for the following hardware and firmware versions:

PF2200-DB Firmware Version: DB 1.1.0

BMS Card Hardware Version V2.3.X

UI Card Hardware Version V3.2.X

SYSTEM
SYSTEM | FW Info
A - Ready
B - Ready

BMS Bundle Version	DB 1.1.0
BMS Hardware Model	2200-02
BMS Product Variant	Dual Burner
BMS Firmware Version	v1.0.3
BMS Bootloader Version	v1.1.1
BMS BOM Version	v2.3.0
BMS Region Code	North America
BMS Serial Number	93000-0000-xxxx
BMS Manufacture Date	YYYY-MM-DD
BMS Test Date	YYYY-MM-DD
BMS PFN Version	v1.0.3

Refer to the controller's Information Screen *(System > Firmware > Info)* to find the hardware and firmware versions of your system.

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

Class I Div 2 Group A, B, C & D, T4A (Class I, Zone 2, Group IIC – US Only)

UL 121201 • CSA-C22.2 No. 213

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

CONTROLLER INTERFACE

THE PF2200-DB CONTROLLER CONSISTS OF 3 MAIN SCREENS:

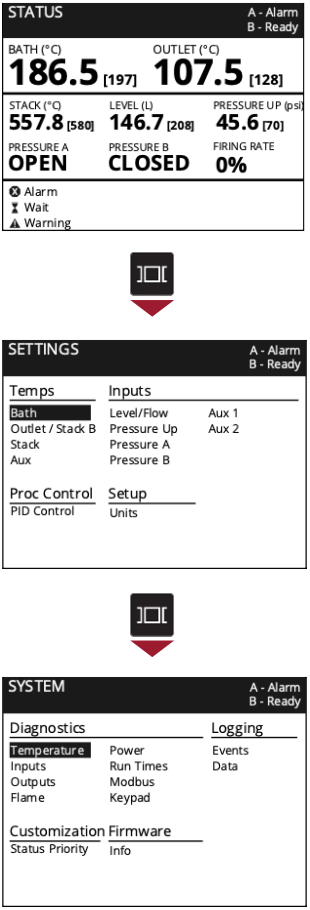
1. **STATUS SCREEN** – Always-on display that shows real-time input device readings, burner states and alerts.

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

   - Alarm - Prevents a burner from entering any running state.
   - Wait – Prevents a burner from entering any fuel state.
   - Main Permissive – Prevents a burner from entering any main fuel state.
   - Warning – Displayed on screen only - does not affect burner 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	FUNCTIONS
START	Start the system **OR** Start individual burners from the Ready state.
STOP	Stop the system or individual burners while running. * If user shut-down is a required safety function, the ESD input or External Ignition Switch must be used instead of the Stop button.
	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
	Select highlighted item
	Change Status screen display mode Make incremental changes to numeric settings **OR** Scroll Event Log by full page

TEMPERATURE SETTINGS

NAME	DEFAULT	RANGE	DESCRIPTION
HIGH TEMP SETPOINT	90 °C	0 °C - 1350 °C	Temperature threshold at which the system shuts down.
	194 °F	32 °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	0 °C - 1350 °C	Temperature threshold at which the system turns off the pilot valve(s).
	185 °F	32 °F - 2462 °F	
Pilot Off Setpoint must be greater than Main Off Setpoint and less than High Temp Setpoint			
MAIN OFF SETPOINT	85 °C	0 °C - 1350 °C	Temperature threshold at which the system turns off the main valve(s).
	185 °F	32 °F - 2462 °F	
Main Off Setpoint must be greater than Process Setpoint and less than Pilot Off Setpoint			
PROCESS SETPOINT	80 °C	0 °C - 1350 °C	Temperature that the system attempts to maintain when in Process Control mode.
	176 °F	32 °F - 2462 °F	
Process Setpoint must be greater than Low Temp Setpoint and less than Main Off Setpoint			
LOW TEMP SETPOINT	0 °C	0 °C - 1350 °C	Temperature threshold at which, if not exceeded, the system warns the user.
	32 °F	32 °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 SET-POINT	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 maximums are 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.			

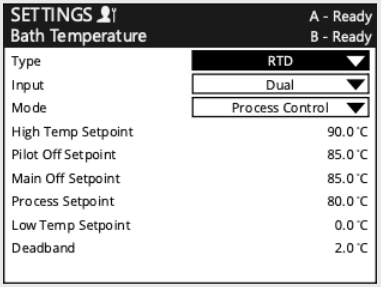
PROCESS CONTROL SETTINGS

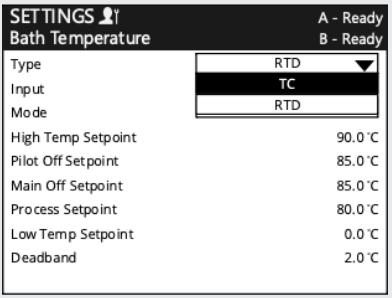
NAME	DEFAULT	RANGE	DESCRIPTION
RAMP TIME	10 sec	0 sec - 255 sec	Once the system enters process control state after light off delay it will slowly ramp to the requested firing rate over this time.

SETTINGS MODIFICATION

DROP DOWN MENU SETTINGS

ACCEPTED CHANGE METHOD



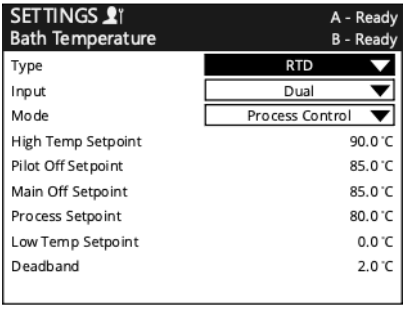


CHANGE VALUE

ACCEPT

CANCEL

QUICK SETTING ADJUSTMENT METHOD



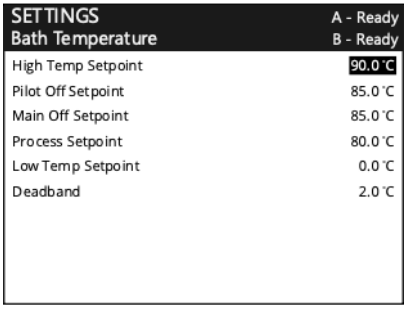
CHANGE VALUE

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

SETTINGS MODIFICATION

NUMERIC SETTINGS

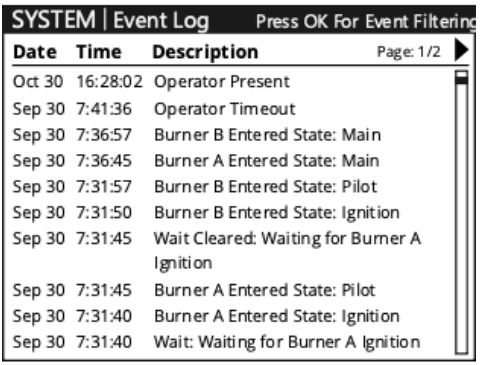
QUICK SETTING ADJUSTMENT METHOD



CHANGE VALUE

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

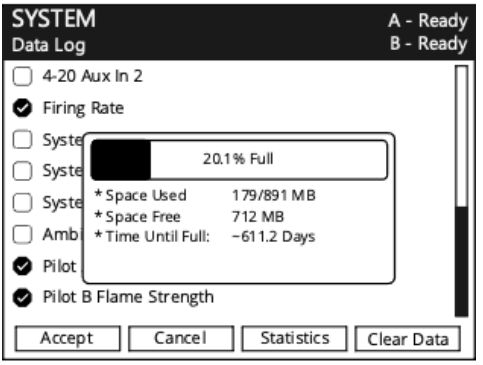
SYSTEM TOOLS



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.

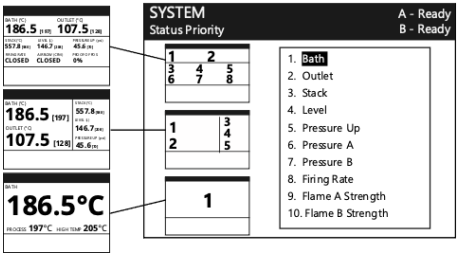


THE DATA LOGGING TOOL

(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.

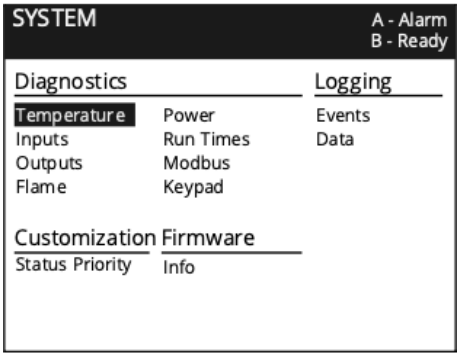
SYSTEM TOOLS



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.



THE PF2200-DB DIAGNOSTIC MENUS

(SYSTEM > DIAGNOSTICS)

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

OPERATING SEQUENCE

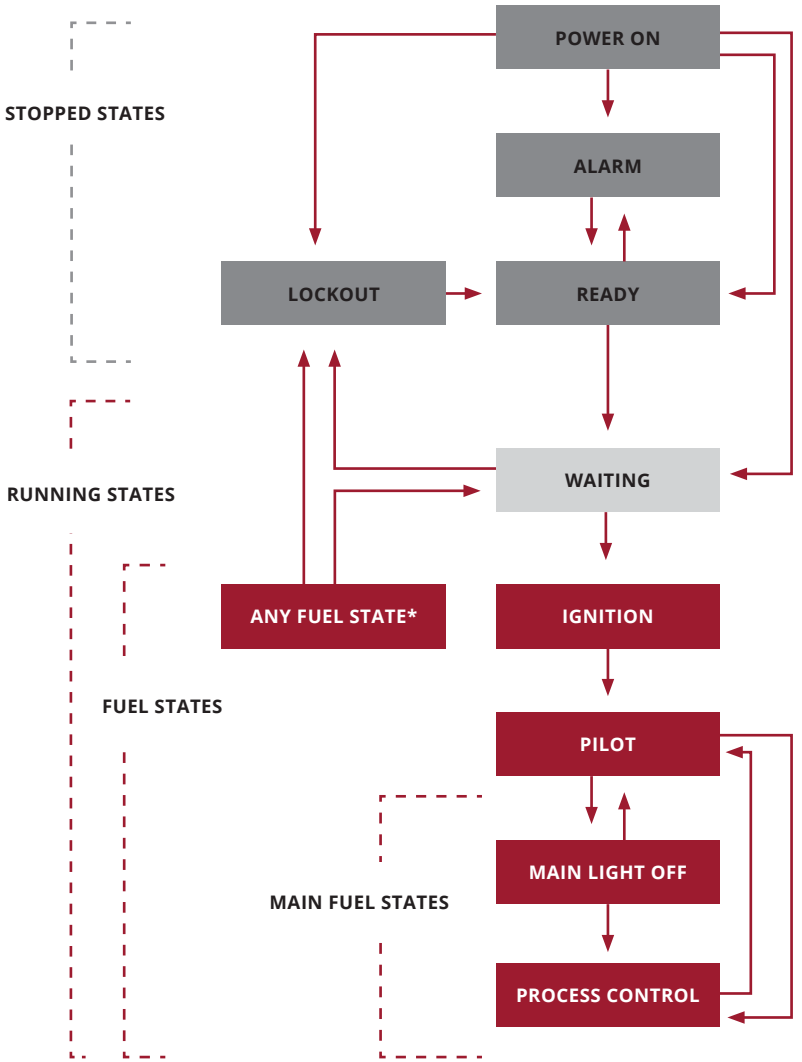
The PF2200-DB utilizes a state-based control scheme to safely monitor and control each burner individually. Each system state has specific entry and exit requirements and defined output behavior.

NOTE: The current state of each burner is always displayed in the Status Bar 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



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 stopped 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 Ion- terminal of BMS
	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.

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