PROFIRE

PF2150-EMD

MODBUS CONFIGURATION GUIDE

v1.0

PROFIRE

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1. CONFIGURATION

This document outlines configuration details for communicating with the PF2150-EMD over Modbus and is applicable for the following hardware and firmware versions:

BMS CARD HARDWIRE VERSION	UI CARD HARDWARE VERSION	PF2150-EMD FIRMWARE VERSION
v1.2	v1.1	E 1.3.1

1.1 PF2150-EMD MODBUS CONFIGURATION SETTINGS

Navigate to Menu 7 – Modbus on the PF2150 User Interface to configure the following settings:

NAME	DEFAULT	OPTIONS	DESCRIPTION
Modbus Enable	Disabled	Disabled	Disables the Modbus port on the PF2150-EMD User Interface Card.
		Enabled	Enables the PF2150-EMD as a Modbus server device. PF2150-EMD cannot be configured as a Modbus client device
Server Address	1	1 - 247	Specifies the Modbus server address of the PF2150-EMD. Ensure that the address is not used by any other devices on the Modbus line.
Baud Rate	9600	9600	Configures the Modbus communication parameters used by the PF2150-EMD. All settings must match client device configuration. *Baud rate should be set to 9600 for long or noisy runs.
		19200	
Stop Bits	1	1	
		2	
Parity	None	None	
		Odd	
		Even	
Modbus Termination	Disabled	Disabled	Enables or disables a 100 Ω termination resistor across the A and B signal lines. This should be enabled if this device is the last drop on the Modbus line.
		Enabled	

1.2 MODBUS CLIENT CONFIGURATION REQUIREMENTS

Ensure Modbus client device is configured as follows:

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

1.3 TROUBLESHOOTING

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

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

1.4 MODBUS COMMANDS

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

NAME	COMMAND	DESCRIPTION
Read Input Registers	4 = 0x04	Two bytes per register are returned
Read Coil	1 = 0x01	Value is represented by a single bit
Read Holding Registers	3 = 0x03	Two bytes per register are returned
Read Discrete Input	2 = 0x02	Value is represented by a single bit
Write Multiple Holding Registers	16 = 0x10	Two bytes per register must be sent
Write Single Holding Register	6 = 0x06	Two bytes per register must be sent
Write Multiple Coils	15 = 0x0F	NOT SUPPORTED
Write Single Coil	5 = 0x05	NOT SUPPORTED

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

1.5 REGISTER ADDRESS VS REGISTER OFFSET

Some Modbus configuration software requires the 5-digit Register Address to be entered while other software uses the 1-to-4-digit Register Offset. Consult the Modbus client device manufacturer documentation to determine which is required.
The Modbus Register Map displays both the address and the offset for each register.

1.6 REGISTER DATA FORMAT

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

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

1.7 LATCHED VS UNLATCHED REGISTERS

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

1.8 SYSTEM UNITS

Settings and status registers are represented in their respective display units as configured on the UI unless indicated otherwise.

1.9 PF2100 BACKWARDS COMPATIBILITY

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

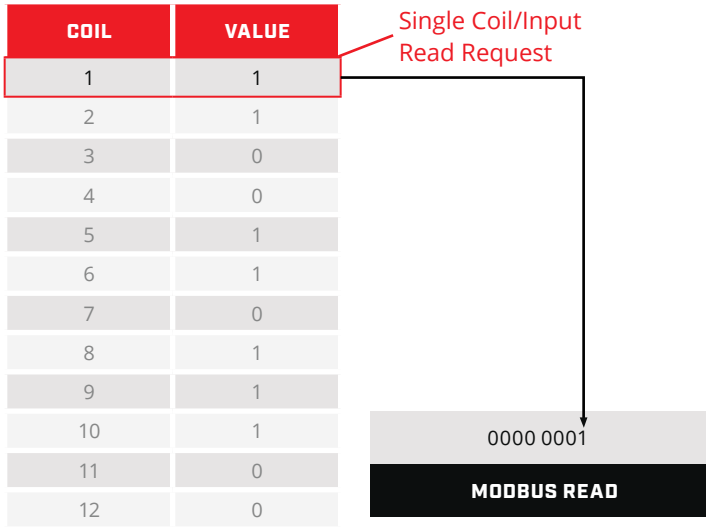
1.10 COMMUNICATION LOSS

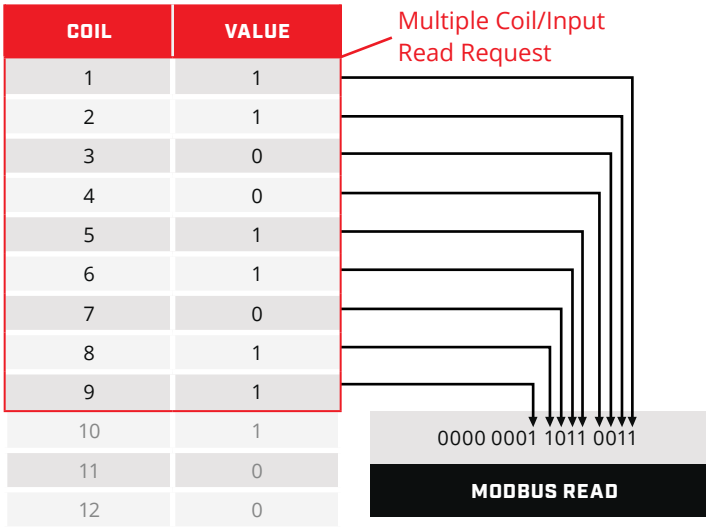
The PF2150-EMD UI card communicates with the BMS card via a proprietary communication protocol called PFN. Modbus data is transferred from the BMS card to the user interface over the PFN link. When the user interface loses communication with the BMS card all Modbus registers return a value of 0 except for the Modbus Communication Error registers (30015/40015) and the Modbus Communication Error registers (30016/40016).

2. MODBUS REGISTER MAP

2.1 READ ONLY COILS & DISCRETE INPUTS [FUNCTION CODE 0x01 OR 0x02]

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





ADDRESS (OFFSET)		NAME	0	1
1	(0)	Run *Legacy PF2100 Register	System not in a running state	System in a running state
2	(1)	Pilot *Legacy PF2100 Register	Pilot output de-energized	Pilot output energized
3	(2)	Stage 1 (low fire) *Legacy PF2100 Register	SSV1 output de-energized	SSV1 output energized
4	(3)	Stage 2 (high fire) *Legacy PF2100 Register	SSV2 output de-energized	SSV2 output energized
17	(16)	Level Input *Legacy PF2100 Register	Closed	Open
18	(17)	Main Solenoid Feedback *Legacy PF2100 Register	No voltage at SSV1 output or SSV2 output	Voltage at SSV1 output or SSV2 output
19	(18)	Pilot Solenoid Feedback *Legacy PF2100 Register	No voltage at Pilot output	Voltage at Pilot output
20	(19)	High Pressure Input *Legacy PF2100 Register	Closed	Open
21	(20)	Proof of Closure *Legacy PF2100 Register	Closed	Open
22	(21)	ESD Input *Legacy PF2100 Register	Closed	Open
23	(22)	Start Input *Legacy PF2100 Register	Closed	Open
24	(23)	Low Pressure *Legacy PF2100 Register	Closed	Open
25	(24)	Flame Detected *Legacy PF2100 Register	Flame absent	Flame present

26	(25)	Flame Test Fail *Legacy PF2100 Register	Alarms AL032 and AL036 not set	Either alarm AL032 or AL036 set
27	(26)	Unit Failure *Legacy PF2100 Register	No hardware fault alarms present	Any hardware fault alarm present
28	(27)	Low or High Voltage *Legacy PF2100 Register	Alarms AL037 and AL038 not set	Either alarm AL037 or AL038 set
29	(28)	High Temp Alarm *Legacy PF2100 Register	Alarms AL012 and AL021 not set	Either alarm AL012 or AL021 set
30	(29)	4-20 Alarm *Legacy PF2100 Register	No 4-20 mA Pressure or Level alarms set	Any 4-20 mA Pressure or Level alarm set
33	(32)	Level Input (Latched) *Legacy PF2100 Register	Latched version of Level Input register above.	
34	(33)	Main Solenoid Feedback (Latched) *Legacy PF2100 Register	Latched version of Main Solenoid Feedback register above.	
35	(34)	Pilot Solenoid Feedback (Latched) *Legacy PF2100 Register	Latched version of Pilot Solenoid Feedback register above.	
36	(35)	High Pressure Input (Latched) *Legacy PF2100 Register	Latched version of High Pressure Input register above.	
37	(36)	Proof of Closure (Latched) *Legacy PF2100 Register	Latched version of Proof of Closure register above.	
38	(37)	ESD Input (Latched) *Legacy PF2100 Register	Latched version of ESD Input register above.	
39	(38)	Start Input (Latched) *Legacy PF2100 Register	Latched version of Start Input register above.	
40	(39)	Low Pressure (Latched) *Legacy PF2100 Register	Latched version of Low Pressure register above.	
41	(40)	Flame Detected (Latched) *Legacy PF2100 Register	Latched version of Flame Detected register above.	
42	(41)	Flame Test Fail (Latched) *Legacy PF2100 Register	Latched version of Flame Test Fail register above.	
43	(42)	Unit Failure (Latched) *Legacy PF2100 Register	Latched version of Unit Failure register above.	
44	(43)	Low or High Voltage (Latched) *Legacy PF2100 Register	Latched version of Low or High Voltage register above.	
45	(44)	High Temp Alarm (Latched) *Legacy PF2100 Register	Latched version of High Temp Alarm register above.	
46	(45)	4-20 Alarm (Latched) *Legacy PF2100 Register	Latched version of 4-20 Alarm register above.	
101 to 357	(100 to 356)	Alarm AL000 to AL256	Alarm not set	Alarm set
501 to 565	(500 to 564)	Wait WT000 to WT064	Wait not set	Wait set
601 to 665	(600 to 664)	Warning WN000 to WN064	Warning not set	Warning set
701 to 765	(700 to 764)	Main Permissive MP000 to MP064	Main Permissive not set	Main Permissive set
801	(800)	Proof of Closure	Open	Closed
802	(801)	ESD	Open	Closed
803	(802)	Start	Open	Closed
804	(803)	Pressure Low	Open	Closed
806	(805)	Level	Open	Closed
812	(811)	Pressure High	Open	Closed
821	(820)	Pilot	De-energized	Energized
823	(822)	SSV 1	De-energized	Energized
824	(823)	SSV 2	De-energized	Energized

961	(960)	Flame Ion+ Wiring Fault	Alarm AL032 not set	Alarm AL032 set
963	(962)	Flame Voltage Fault	Alarm AL036 not set	Alarm AL036 set
965	(964)	Flame DC Input Open Fault	Alarm AL073 not set	Alarm AL073 set
1021	(1020)	Pressure Communication Bus Fault	Alarm not set	Alarm set
1023	(1022)	Level Communication Bus Fault	Alarm not set	Alarm set
1041	(1040)	ADC1 Start Internal Board Fault	Alarm AL033 not set	Alarm AL033 set
1042	(1041)	ADC1 Read Internal Board Fault	Alarm AL034 not set	Alarm AL034 set
1043	(1042)	ADC1Stop Internal Board Fault	Alarm AL035 not set	Alarm AL035 set
1044	(1043)	ADC2 Start Internal Board Fault	Alarm AL039 not set	Alarm AL039 set
1045	(1044)	ADC2 Read Internal Board Fault	Alarm AL040 not set	Alarm AL040 set
1046	(1045)	ADC2 Stop Internal Board Fault	Alarm AL041 not set	Alarm AL041 set
1047	(1046)	ADC3 Start Internal Board Fault	Alarm AL066 not set	Alarm AL066 set
1048	(1047)	ADC3 Read Internal Board Fault	Alarm AL067 not set	Alarm AL067 set
1049	(1048)	ADC3 Stop Internal Board Fault	Alarm AL068 not set	Alarm AL068 set
1063	(1062)	TCV Output Fault Warning	Warning WN017 not set	Warning WN017 set

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

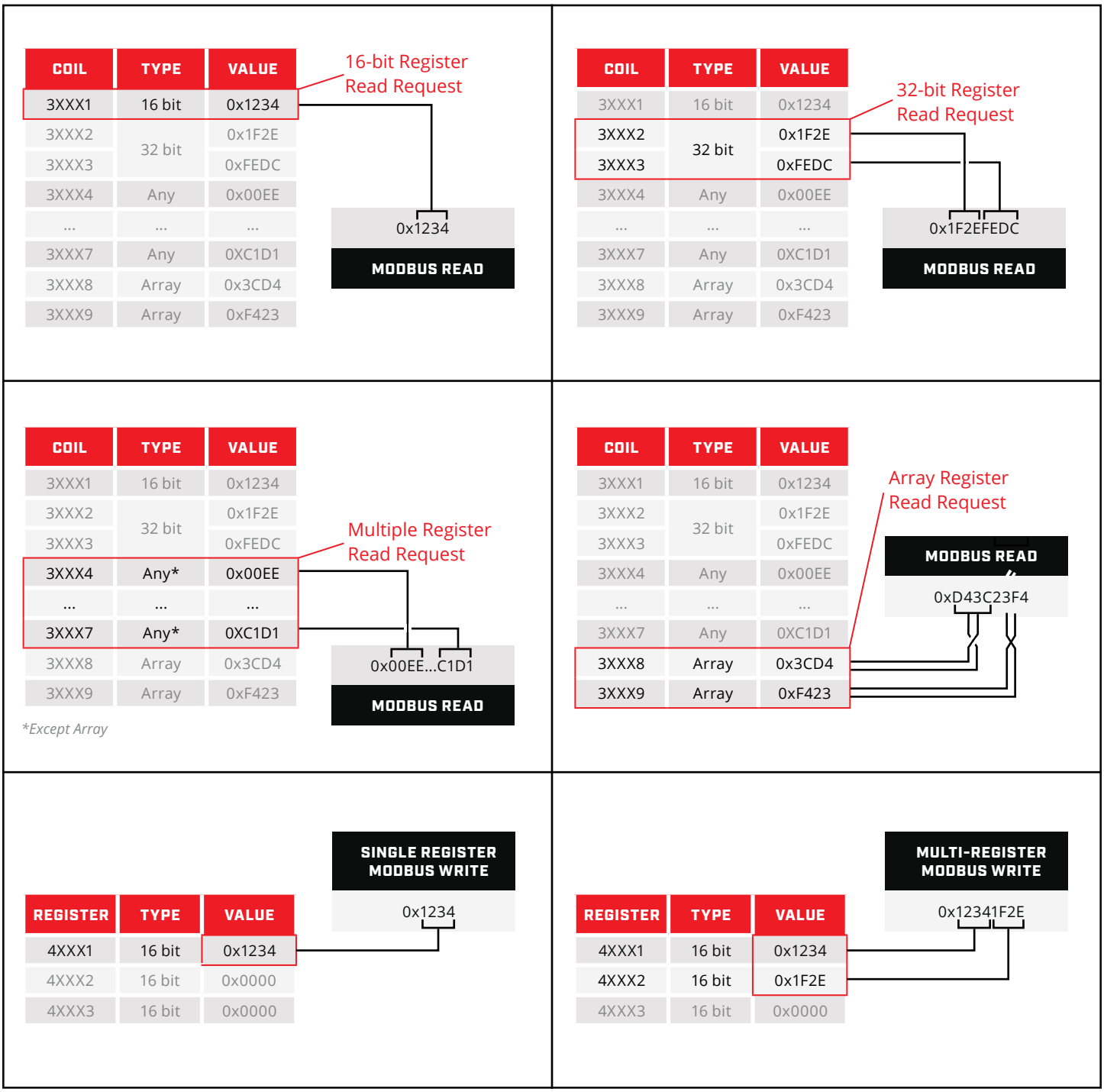
The Input Registers (300xx) are duplicated in the corresponding Holding Registers (400xx) for convenience and to maintain compatibility with some PLCs.

Use the Read Input Register command (0x04) to read the Input Registers (300xx).

Use the Read Holding Registers command (0x03) to read the Holding Registers (400xx).

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

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



2.2.1 TEST REGISTERS

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

ADDRESS (OFFSET)		READ/WRITE	NAME	TYPE	READ VALUE		
					DECIMAL	HEXADECIMAL	BINARY
30123/40123	(122)	Read Only	Test Read - Unsigned	uint16	1234	0x04D2	0b0000 0100 1101 0010
30124/40124	(123)	Read Only	Test Read - Signed	int16	-1234	0xFB2E	0b1111 1011 0010 1110

2.2.2 BMS SETTINGS AND FUNCTIONS

ADDRESS (OFFSET)		READ/WRITE	NAME	TYPE	10X	RANGE
30008/40008	(7)	Read Only	Process Setpoint *Legacy PF2100 Register	uint16		0°C to 1350°C *Celsius Only
30009/40009	(8)	Read Only	Main Off Setpoint *Legacy PF2100 Register	uint16		0°C to 1350°C *Celsius Only
30010/40010	(9)	Read Only	Pilot Off Setpoint *Legacy PF2100 Register	uint16		0°C to 1350°C *Celsius Only
30100/40100	(99)	R/W	Start/Stop	uint16		Read 0 = Command Accepted Write 1234 = Start system Write 4321 = Stop System
30101/40101	()	R/W	Process Setpoint Change Request *Legacy PF2100 Register	uint16		0 - 1350°C *Celsius Only
30102/40102	(101)	R/W	Main Off Setpoint Change Request *Legacy PF2100 Register	uint16		0 - 1350°C *Celsius Only
30103/40103	(102)	R/W	Pilot Off Setpoint Change Request *Legacy PF2100 Register	uint16		0 - 1350°C *Celsius Only
30110/40110	(109)	R/W	UI Clock Seconds	uint16		0 – 59 seconds
30111/40111	(110)	R/W	UI Clock Minutes	uint16		0 – 59 minutes
30112/40112	(111)	R/W	UI Clock Hour	uint16		0 – 23 hours
30113/40113	(112)	R/W	UI Clock Day	uint16		1 – 31 days
30114/40114	(113)	R/W	UI Clock Month	uint16		1 – 12 months
30115/40115	(114)	R/W	UI Clock Year	uint16		2000 – 2099 years
30143/40143	(142)	R/W	Clear Shutdown Code	uint16		0 = No effect 1 = Acknowledge Lockout
31002/41002	(1)	Read Only	Bath Mode	uint16		0 = Process Control 1 = High Temp ESD
31003/41003	(2)	Read Only	Bath Input	uint16		0 = Dual 1 = Single
31004/41004	(3)	Read Only	Bath High Temp Setpoint	int16		-40 - 1350 °C (-40 - 2462 °F)
31005/41005	(4)	R/W	Bath Pilot Off Setpoint	int16		-40 - 1350 °C (-40 - 2462 °F)
* Write must be above the Bath Main Off Setpoint and more than 1 degree below the Bath High Temp Setpoint. Writing a value outside these bounds while running will cause a configuration error alarm and the system will shut down.						
31006/41006	(5)	R/W	Bath Main Off Setpoint	int16		-40 - 1350 °C (-40 - 2462 °F)
* Write must be more than 1 degree above the Bath Process Setpoint and below the Bath Pilot Off Setpoint. Writing a value outside these bounds while running will cause a configuration error alarm and the system will shut down.						
31007/41007	(6)	R/W	Bath Process Setpoint	int16		-40 - 1350 °C (-40 - 2462 °F)
* Write must be above the Bath Low Temp Setpoint and Standby Setpoint and must be at least 1 degree below the Bath Main Off Setpoint. Writing a value outside these bounds while running will cause a configuration error alarm and the system will shut down.						

31008/41008	(7)	Read Only	Bath Low Temp Setpoint	int16		-40 - 1350 °C (-40 - 2462 °F)
31009/41009	(8)	R/W	Bath Deadband	uint16		0 - °C (32 - 212 °F)
31011/41011	(1010)	Read Only	Aux Temp Mode	uint16		0 = Disabled
						1 = Process Control
						2 = High Temp ESD
						3 = Display Only
31012/41012	(1011)	Read Only	Aux Temp High Temp Setpoint	int16		-40 - 1350 °C (-40 - 2462 °F)
31013/41013	(1012)	R/W	Aux Temp Pilot Off Setpoint	int16		-40 - 1350 °C (-40 - 2462 °F)
* Write must be above the Aux Temp Main Off Setpoint and more than 1 degree below the Aux Temp High Temp Setpoint. Writing a value outside these bounds while running will cause a configuration error alarm and the system will shut down.						
31014/41014	(1013)	R/W	Aux Temp Main Off Setpoint	int16		-40 - 1350 °C (-40 - 2462 °F)
* Write must be more than 1 degree above the Aux Temp Process Setpoint and below the Aux Temp Pilot Off Setpoint. Writing a value outside these bounds while running will cause a configuration error alarm and the system will shut down.						
31015/41015	(1014)	R/W	Aux Temp Process Setpoint	int16		-40 - 1350 °C (-40 - 2462 °F)
* Write must be above the Aux Temp Low Temp Setpoint and must be at least 1 degree below the Aux Temp Main Off Setpoint. Writing a value outside these bounds while running will cause a configuration error alarm and the system will shut down.						
31016/41016	(1015)	Read Only	Aux Temp Low Temp Setpoint	int16		-40 - 1350 °C (-40 - 2462 °F)
31017/41017	(1016)	R/W	Aux Temp Deadband	uint16		0 - °C (32 - 212 °F)
31032/41032	(1031)	Read Only	Proof of Closure	uint16		0 = Disabled
						1 = Enabled
31033/41033	(1032)	Read Only	Remote Start	uint16		0 = Disabled
						1 = Enabled
31034/41034	(1033)	Read Only	Pressure Type	uint16		0 = Disabled
						1 = Digital
						2 = 4-20
31035/41035	(1034)	Read Only	Pressure Span Min	int32	10x	Reading multiplied by 10 in configured Pressure Units
31037/41037	(1036)	Read Only	Pressure Span Max	int32	10x	Reading multiplied by 10 in configured Pressure Units
31039/41039	(1038)	Read Only	Pressure Low Trip	int32	10x	Reading multiplied by 10 in configured Pressure Units
31041/41041	(1040)	Read Only	Pressure High Trip	int32	10x	Reading multiplied by 10 in configured Pressure Units
31043/41043	(1042)	Read Only	Pressure Deadband	uint16	10x	Reading multiplied by 10 in configured Pressure Units
31044/41044	(1043)	Read Only	Low Pressure Delay	uint16		2 - 20 seconds
31045/41045	(1044)	Read Only	Low Pressure Mode	uint16		0 = Alarm
						1 = Wait
						2 = Warning
						3 = Main Permissive
31047/41047	(1046)	Read Only	Pressure High	uint16		0 = Disabled
						1 = Digital
31048/41048	(1047)	Read Only	Level Type	uint16		0 = Disabled
						1 = Digital
						2 = 4-20

31049/41049	(1048)	Read Only	Level Digital Mode	uint16		0 = Alarm
						1 = Wait
31050/41050	(1049)	Read Only	Level Low Trip Mode	uint16		0 = Alarm
						1 = Wait
31051/41051	(1050)	Read Only	Level High Trip Mode	uint16		0 = Alarm
						1 = Wait
31052/41052	(1051)	Read Only	Level Span Min	int32	10x	Reading multiplied by 10 in configured Level Units
31054/41054	(1053)	Read Only	Level Span Max	int32	10x	Reading multiplied by 10 in configured Level Units
31056/41056	(1055)	Read Only	Level Low Trip	int32	10x	Reading multiplied by 10 in configured Level Units
31058/41058	(1057)	Read Only	Level High Trip	int32	10x	Reading multiplied by 10 in configured Level Units
31060/41060	(1059)	Read Only	Level Deadband	uint16	10x	Reading multiplied by 10 in configured Level Units
31061/41061	(1060)	Read Only	Level Delay	uint16		2 - 20 seconds
31094/41094	(1093)	Read Only	Status Contact Mode	uint16		0 = Run Status
						1 = Heating Status
						2 = Low Temp Warning
						3 = Level Control
31101/41101	(1100)	Read Only	Pilot Valve PWM	uint16		10 - 100 %
31102/41102	(1101)	Read Only	SSV PWM	uint16		10 - 100 %
31104/41104	(1103)	Read Only	TCV Min Position	uint16		0 - 70 %
31105/41105	(1104)	Read Only	TCV Purge Position	uint16		0 - 100 %
31106/41106	(1105)	Read Only	TCV Pilot Position	uint16		0 - 100 %
31109/41109	(1108)	R/W	Process Proportional Band	uint16	10x	°C Range: 0 - 10000 (0 - 1000°C)
						°F Range: 320 - 18320 (32 - 1832°F)
31110/41110	(1109)	R/W	Process Integral Time	uint16	10x	0 - 10000 (0 - 1000 min/rep)
31111/41111	(1110)	R/W	Process Derivative Time	uint16	10x	0 - 10000 (0 - 1000 min)
31112/41112	(1111)	R/W	Process Integral Reset Range	uint16	10x	°C Range: 0 - 10000 (0 - 1000°C)
						°F Range: 320 - 18320 (32 - 1832°F)
31117/41117	(1116)	R/W	PID Output Rate Limit	uint16	10x	1 - 0 (0.1 = %/sec)
31118/41118	(1117)	R/W	PID Ramp Time	uint16		0 - 255 seconds
31119/41119	(1118)	Read Only	Process Control Mode	uint16		0 = On/Off Control
						1 = Staged Heating
						2 = Bath PID Control
						3 = Aux PID Control
31120/41120	(1119)	Read Only	Pilot Off Mode	uint16		0 = Disabled
						1 = Off At Pilot Off Setpoint
						2 = Off At Main Off Setpoint
31122/41122	(1121)	Read Only	Relight Attempts	uint16		0 - 3
31124/41124	(1123)	Read Only	Purge Time	uint16		10 - 900 seconds
31125/41125	(1124)	Read Only	Pilot Startup Delay Time	uint16		5 - 600 seconds
31126/41126	(1125)	Read Only	Main Startup Delay Time	uint16		30 - 600 seconds

31127/41127	(1126)	Read Only	Voltage Setting	uint16		0 = 12V 1 = 24V
31128/41128	(1127)	Read Only	Voltage Restart	uint16		0 = Disabled 1 = Enabled
31129/41129	(1128)	Read Only	L1 Password Enable	uint16		0 = Disabled 1 = Enabled
31131/41131	(1130)	Read Only	Server Address	uint16		1 - 247
31132/41132	(1131)	Read Only	Baud Rate	uint16		0 = 9600 1 = 19200
31133/41133	(1132)	Read Only	Stop Bits	uint16		0 = 1 1 = 2
31134/41134	(1133)	Read Only	Parity	uint16		0 = None 1 = Odd 2 = Even
31135/41135	(1134)	Read Only	Modbus Termination	uint16		0 = Disabled 1 = Enabled
31136/41136	(1135)	Read Only	Modbus Enable	uint16		0 = Disabled 1 = Enabled
31137/41137	(1136)	Read Only	Temperature Units	uint16		0 = Celsius 1 = Fahrenheit
31138/41138	(1137)	Read Only	Pressure Units	uint16		0 = kPa 1 = psi 2 = inch wc 3 = oz/in2 4 = kg/cm2 5 = Percent 6 = Milliamps
31139/41139	(1138)	Read Only	Level Units	uint16		0 = Litres 1 = m3 2 = US Gallons 3 = bbl 4 = ft3 5 = Percent 6 = Milliamps
31144/41144	(1143)	Read Only	Level Control Setpoint	int32	10x	Reading multiplied by 10 in configured Level Units

2.2.3 BMS READ ONLY STATUS INFORMATION

ADDRESS (OFFSET)		NAME	TYPE	10X	RANGE	
30001/40001	(0)	Run and Valve Status Bits *Legacy PF2100 Register	Bitset		0b0000 Run	0 = Not Running 1 = Running
					0b0000 Pilot	0 = De-energized 1 = Energized
					0b0000 Low Fire	
					0b0000 High Fire	
30002/40002 30007/40007	(1) (6)	Input Status and Flags (non latching) Input Status and Flags (latching) *Legacy PF2100 Registers	Bitset		0b0000 0000 0000 0000 Level Input	0 = Closed 1 = Open
					0b0000 0000 0000 0000 Main Solenoid Feedback	0 = De-energized 1 = Energized
					0b0000 0000 0000 0000 Pilot Solenoid Feedback	
					0b0000 0000 0000 0000 High Pressure Input	0 = Closed 1 = Open
					0b0000 0000 0000 0000 Proof of Closure	
					0b0000 0000 0000 0000 ESD Input	
					0b0000 0000 0000 0000 Start Input	
					0b0000 0000 0000 0000 Low Pressure	
					0b0000 0000 0000 0000 Flame Detected	0 = No Flame 1 = Flame Detected
					0b0000 0000 0000 0000 Flame Test Fail	0 = Flame Test Passed 1 = Flame Test Failed
					0b0000 0000 0000 0000 Unit Failure	0 = No unit failure 1 = Unit failure
					0b0000 0000 0000 0000 Low or High Voltage	0 = Alarm not set 1 = Alarm set
					0b0000 0000 0000 0000 HiTemp Alarm	
					0b0000 0000 0000 0000 4-20 Card Alarm	
30003/40003	(2)	Bath A Thermocouple Reading *Legacy PF2100 Register	int16		-50°C to 1350°C *Celsius Only	
30004/40004	(3)	Bath B Thermocouple Reading *Legacy PF2100 Register	int16		-50°C to 1350°C *Celsius Only	
30005/40005	(4)	Aux Temp Thermocouple Reading *Legacy PF2100 Register	int16		-50°C to 1350°C *Celsius Only	
30006/40006	(5)	Pilot Flame Quality *Legacy PF2100 Register	uint16		0% = No Flame	
					100% = Good Flame	
30011/40011	(10)	4-20mA Level Reading *Legacy PF2100 Register	uint16		4-20 Level Input reading	
30012/40012	(11)	4-20mA Pressure Reading *Legacy PF2100 Register	uint16	10x	4-20 Pressure Input reading multiplied by 10	
30014/40014	(13)	4-20mA Input Alarm *Legacy PF2100 Register	Bitset		0b0000 0000 Level Low Alarm	0 = Alarm not set 1 = Alarm set
					0b0000 0000 Level High Alarm	
					0b0000 0000 Pressure Low Alarm	
					0b0000 0000 Pressure High Alarm	
					0b0000 0000 Level or Pressure Invalid	
30015/40015	(14)	Modbus Communication Error	uint16		0 = No error, 1 = Communication Error	
30016/40016	(15)	Modbus Comm Error Counter	uint16		0 - 65535	

30018/40018	(17)	Ambient Board Temp *Legacy PF2100 Register	uint16		-100°C to 1350°C *Celsius Only	
30021/40021	(20)	UI Clock Seconds *Legacy PF2100 Register	uint16		0 - 59 Seconds	
30022/40022	(21)	UI Clock Minutes *Legacy PF2100 Register	uint16		0 - 59 Minutes	
30023/40023	(22)	UI Clock Hour *Legacy PF2100 Register	uint16		0 - 23 Hours	
30024/40024	(23)	UI Clock Day *Legacy PF2100 Register	uint16		1 - 31 Days	
30025/40025	(24)	UI Clock Month *Legacy PF2100 Register	uint16		1 - 12 Months	
30026/40026	(25)	UI Clock Year *Legacy PF2100 Register	uint16		2000 - 2099 Years	
30030/40030	(29)	System Bundle Firmware Version *Legacy PF2100 Register	uint16		0x**0A**0B: Major version 0x0A**0B**: Minor version	
30031/40031	(30)	Pilot Flame Quality *Legacy PF2100 Register	uint16		Pilot flame quality in %.	
33001/43001 33002/43002 33003/43003	(3000) (3001) (3002)	Controller State Primary Next Controller State Secondary Next Controller State	int16 int16 int16		-1 = Invalid 0 = Lockout 1 = Alarm 2 = Power On 3 = Ready 4 = Confirm start 5 = Waiting 6 = Pre-ignition 7 = Ignition 8 = Pilot 9 = Main Delay 10 = Main 11 = Stage 1 12 = Stage 2 13 = PID Control	
33004/43004	(3003)	Shutdown Code	uint16		0 - 255	
33005/43005	(3004)	Relights Remaining	uint16		0 - 3	
33006/43006	(3005)	State Timer	uint16		Current state timer in seconds.	
33007/43007	(3006)	Purge Timer	uint16		Purge timer in seconds.	
33008/43008	(3007)	Delta Time	uint16		Processors delta time in milliseconds.	
33111/43111	(3110)	Alarm Bits 80 to 95	Bitset		0b**0**000 0000 0000 0000: AL095 0b0000 0000 0000 000**0**: AL080	0 = Alarm not set 1 = Alarm set
33112/43112	(3111)	Alarm Bits 64 to 79	Bitset		0b**0**000 0000 0000 0000: AL079 0b0000 0000 0000 000**0**: AL064	
33113/43113	(3112)	Alarm Bits 48 to 63	Bitset		0b**0**000 0000 0000 0000: AL063 0b0000 0000 0000 000**0**: AL048	
33114/43114	(3113)	Alarm Bits 32 to 47	Bitset		0b**0**000 0000 0000 0000: AL047 0b0000 0000 0000 000**0**: AL032	
33115/43115	(3114)	Alarm Bits 16 to 31	Bitset		0b**0**000 0000 0000 0000: AL031 0b0000 0000 0000 000**0**: AL016	
33116/43116	(3115)	Alarm Bits 0 to 15	Bitset		0b**0**000 0000 0000 0000: AL015 0b0000 0000 0000 000**0**: AL000	

33204/43204	(3203)	Wait Bits 0 to 15	Bitset		0b**0**000 0000 0000 0000: WT015 0b0000 0000 0000 000**0**: WT000	0 = Wait not set 1 = Wait set
33303/43303	(3302)	Warning Bits 16 to 31	Bitset		0b**0**000 0000 0000 0000: WN031 0b0000 0000 0000 000**0**: WN016	0 = Warning not set 1 = Warning set
33304/43304	(3303)	Warning Bits 0 to 15	Bitset		0b**0**000 0000 0000 0000: WN015 0b0000 0000 0000 000**0**: WN000	
33404/43404	(3403)	Main Permissive Bits 0 to 15	Bitset		0b**0**000 0000 0000 0000: MP015 0b0000 0000 0000 000**0**: MP000	0 = Main Permissive not set 1 = Main Permissive set
33501/43501	(3500)	System Voltage	int16	10x	System Voltage reading multiplied by 10	
33502/43502	(3501)	Authentication Level	uint16		0 = None 1 = Remote 2 = L1 3 = L2 4 = SYS	
33503/43503	(3502)	Is Running	uint16		0 = Not Running 1 = Running	
33504/43504	(3503)	Sync Count	uint32		Processor synchronization count	
33506/43506	(3505)	Transition Status	int16		-1 = Invalid 0 = Lockout 1 = Alarm 2 = Power On 3 = Ready 4 = Confirm start 5 = Waiting 6 = Pre-ignition 7 = Ignition 8 = Pilot 9 = Main Delay 10 = Main 11 = Stage 1 12 = Stage 2 13 = PID Control	
33507/43507	(3506)	Hardware Model Number	uint32		Expected reading: 0x0021 5002	
33509/43509	(3508)	Firmware Product Variant	uint16		0 = Invalid 8 = PF2150-E	
33510/43510	(3509)	Region Code	uint16		0 = Invalid 1 = North America	
33511/43511	(3510)	Bundle Version	uint32		0x**0A**0B0C0D: Product Variant 0x0A**0B**0C0D: Major 0x0A0B**0C**0D: Minor 0x0A0B0C**0D**: Release Number	Example: A read of 0x0801 0300 corresponds to firmware bundle E 1.3.0
33513/43513	(3512)	BMS Firmware Version	uint32		0x**0A**0B0C0D: Major 0x0A**0B**0C0D: Minor 0x0A0B**0C**0D: Release number high byte 0x0A0B0C**0D**: Release number low byte	

33515/43515	(3514)	BMS Bootloader Version	uint32		0x**0A**0B0C0D: Major	
					0x0A**0B**0C0D: Minor	
					0x0A0B**0C**0D: Release number high byte	
					0x0A0B0C**0D**: Release number low byte	
33517/43517	(3516)	BMS BOM Version	uint32		0x**0A**0B0C0D: Major	
					0x0A**0B**0C0D: Minor	
					0x0A0B**0C**0D: Release number high byte	
					0x0A0B0C**0D**: Release number low byte	
33519/43519	(3518)	BMS Serial Number Byte 0 and 1	uint32		e.g., S/N: 0A0B 0C0D **0E0F** Register read: 0x**0F0E** * Note that the byte order is reversed between the serial number and the register read.	
33520/43520	(3519)	BMS Serial Number Byte 2 and 3	Array		e.g., S/N: **0A0B** 0C0D 0E0F Register read: 0x**0D0C** * Note that the byte order is reversed between the serial number and the register read.	
33521/43521	(3520)	BMS Serial Number Byte 4 and 5	Array		e.g., S/N: **0A0B** 0C0D 0E0F Register read: 0x**0B0A** * Note that the byte order is reversed between the serial number and the register read.	
33522/43522	(3521)	Manufacture Date	Array		0x**0A**0B0C0D: N/A	
					0x0A**0B**0C0D: Year - 2000	
					0x0A0B**0C**0D: Month	
					0x0A0B0C**0D**: Day	
33524/43524	(3523)	Manufacture Test Date	uint32		0x**0A**0B0C0D: N/A	
					0x0A**0B**0C0D: Year - 2000	
					0x0A0B**0C**0D: Month	
					0x0A0B0C**0D**: Day	
33526/43526	(3525)	PFN Version	uint32		0x0A0B0C0D: Major	
					0x0A0B0C0D: Minor	
					0x0A0B0C0D: Release number high byte	
					0x0A0B0C0D: Release number low byte	
33605/43605	(3604)	Bath A Temp	int16	10x	°C Range: -1000 - 13500 (-100 - 1350°C)	
					°F Range: -1480 - 24620 (-148 - 2462°F)	
33606/43606	(3605)	Bath B Temp	int16	10x	°C Range: -1000 - 13500 (-100 - 1350°C)	
					°F Range: -1480 - 24620 (-148 - 2462°F)	
33607/43607	(3606)	Aux Temp	int16	10x	°C Range: -1000 - 13500 (-100 - 1350°C)	
					°F Range: -1480 - 24620 (-148 - 2462°F)	
33610/43610	(3609)	Ambient Temp 1	int16	10x	°C Range: -1000 - 13500 (-100 - 1350°C)	
					°F Range: -1480 - 24620 (-148 - 2462°F)	
33611/43611	(3610)	Ambient Temp 2	int16	10x	°C Range: -1000 - 13500 (-100 - 1350°C)	
					°F Range: -1480 - 24620 (-148 - 2462°F)	
33612/43612 33622/43622 33632/43632	(3611) (3621) (3631)	Bath A Faults Bath B Faults Aux Temp Faults	Bitset Bitset Bitset		0b0000 000**0**: TC Open	0 = Alarm not set 1 = Alarm set
					0b0000 00**0**0: Reserved	
					0b0000 0**0**00: Reserved	
					0b0000 **0**000: Out of Range	
					0b000**0** 0000: Stale Data	
33672/43672	(3671)	Pilot Flame Status	uint16		0 = No Flame	
					1 = Flame	

33675/43675	(3674)	Pilot Faults	Bitset		0b0000 0000: Flame Ion+ Wiring Fault 0b0000 0000: Reserved 0b0000 0000: Flame Voltage Fault 0b0000 0000: Reserved 0b0000 0000: Flame DC Input Open Fault 0b0000 0000: Reserved 0b0000 0000: Reserved	0 = Alarm not set 1 = Alarm set
33685/43685	(3684)	Interlock Input Contact Status	Bitset		0b0000 0000 0000 0000: Proof of Closure 0b0000 0000 0000 0000: ESD 0b0000 0000 0000 0000: Start 0b0000 0000 0000 0000: Pressure 0b0000 0000 0000 0000: Reserved 0b0000 0000 0000 0000: Level 0b0000 0000 0000 0000: Reserved 0b0000 0000 0000 0000: Reserved 0b0000 0000 0000 0000: Reserved 0b0000 0000 0000 0000: Reserved 0b0000 0000 0000 0000: Pressure High 0b0000 0000 0000 0000: Reserved	0 = De-energized 1 = Energized
33698/43698	(3697)	ESD Voltage	int16		ESD Input voltage	
33699/43699	(3698)	Start Voltage	int16		Start Input voltage	
33700/43700	(3699)	POC Voltage	int16		POC Input voltage	
33701/43701	(3700)	4-20 Level	int32	10x	4-20 Level Input reading multiplied by 10	
33703/43703	(3702)	4-20 Pressure	int32	10x	4-20 Pressure Input reading multiplied by 10	
33715/43715	(3714)	I2C Bus Faults	Bitset		0b0000: Pressure 0b0000: Reserved 0b0000: Level	0 = Alarm not set 1 = Alarm set
33720/43720	(3719)	ADC Faults	Bitset		0b0000 0000 0000 0000: ADC1 Start 0b0000 0000 0000 0000: ADC1 Read 0b0000 0000 0000 0000: ADC1 Stop 0b0000 0000 0000 0000: ADC2 Start 0b0000 0000 0000 0000: ADC2 Read 0b0000 0000 0000 0000: ADC2 Stop 0b0000 0000 0000 0000: ADC3 Start 0b0000 0000 0000 0000: ADC3 Read 0b0000 0000 0000 0000: ADC3 Stop	0 = Alarm not set 1 = Alarm set
33725/43725	(3724)	Valve Driver Status	Bitset		0b0000 0000: Pilot 0b0000 0000: Reserved 0b0000 0000: SSV 1 0b0000 0000: SSV 2 0b0000 0000: Reserved	0 = De-energized 1 = Energized
33730/43730	(3729)	Status Contact State	uint16		0 = Deenergized 1 = Energized	

33734/43734	(3733)	TCV Wiring Fault Warning	uint16		0 = Warning WN017 not set
					1 = Warning WN017 set
33737/43737	(3736)	TCV Output Percent	uint16		0 - 100%
33738/43738	(3737)	Firing Rate	uint16		0 - 100%
33773/43773	(3772)	Pilot Flame Strength	int16		Pilot Flame Strength in millivolts
33775/43775	(3774)	System Voltage Fault	uint16		0 = Absent
					1 = Present
33780/43780	(3779)	Hardware Product Variant	uint16		0 = Invalid
					8 = PF2150-E

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