BLUESTREAK PMBus SOFTWARE MANUAL

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BLUESTREAK PMBus SOFTWARE MANUAL

1 Purpose of this Document

This document is for customer use, and describes in detail each of the PMBus commands available in the Bluestreak power supply.

2 Operation Notes

The Bluestreak power supply uses PMBus Revision 1.1 and will operate with a clock rate of up to 100kHz.

All Bluestreak PMBus commands allow the use of the PEC (Packet Error Check) mechanism to help insure that the correct data has been transferred.

PMBus faults and warnings are reported to the host using the #SMBALERT signal method.

3 Applicable Documents

The following documents that are available from the pmbus.org website (Specifications section) are required to be used in conjunction with this document;

PMBus Power System Management Protocol Specification Part I

PMBus Power System Management Protocol Specification Part II

4 The Bluestreak PMBus Commands

In the following sections of this document, each of the commands that are used in the Bluestreak power supply are described in detail.

Key to the diagrams and nomenclature used in the following PMBus command descriptions;

Command Code	The hexadecimal PMBus command code value.
Command Name	The PMBus name of the command.
SMBus Transaction Type	The PMBus uses a subset of the various possible SMBus transactions.
Number of Data Bytes	The number of data bytes to be read or written by the command.
Data Format	Identifying how to interpret the data.
Data Value	More detailed breakdown of the data to bit or byte level.
Data Range	Information on the range of values that could be transferred by the command. The value could be clipped by the device if the value is not practical.
Data Resolution	Indication of the resolution that the command can transfer.

Illustration of the Command Data Bits

High Data Byte								Low Data Byte							
MSBit							LSBit	MSBit							LSBit
S	E	E	E	E	S	M	M	M	M	M	M	M	M	M	M

Bit Usage S = Sign Bit
E = Exponent Bit
M = Mantissa Bit

Number Base Identification AAh = hexadecimal value
170d = decimal value

Non Vol Memory Commands Lists the PMBus commands that can be used to store or restore the value.

Default Value The value that is read if the command has not been written to before.

Maximum Error The maximum error of the setting or reading over -20C to 70C ambient temperature range and from zero to full load.

Comments Additional information or conditions that apply to the command.

4.1 01h OPERATION

Command Code 01h

Command Name OPERATION

SMBus Transaction Type R/W BYTE

Number of Data Bytes 1

Data Format See the PMBus Specification.

7	6	5	4	3	2	1	0

Non Vol Memory Commands None

Default Setting 00h

Comments The margin commands with ignore fault have not been implemented and the device will respond with invalid data if bit 2 is set.

All the other OPERATION commands have been implemented.

4.2 02h ON_OFF_CONFIG

Command Code 02h

Command Name ON_OFF_CONFIG

SMBus Transaction Type R/W BYTE

Number of Data Bytes 1

Data Format — See the PMBus specification.

7	6	5	4	3	2	1	0

Non Vol Memory Commands — RESTORE_DEFAULT_ALL, STORE_USER_ALL and RESTORE_USER_ALL.

Default Setting — 1Eh

Comments — See the MISC_CONFIG command for an additional power up configuration bit.

4.3 03h CLEAR_FAULTS

Command Code — 03h

Command Name — CLEAR_FAULTS

SMBus Transaction Type — SEND BYTE

Number of Data Bytes — 0

Non Vol Memory Commands — None

Comments — Any faults or warnings still active will immediately set the status bits again.

4.4 10h WRITE_PROTECT

Command Code — 10h

Command Name — WRITE_PROTECT

SMBus Transaction Type — R/W BYTE

Number of Data Bytes — 1

Data Format — See the PMBus specification.

7	6	5	4	3	2	1	0

Non Vol Memory Commands — RESTORE_DEFAULT_ALL, STORE_USER_ALL and RESTORE_USER_ALL.

Default Setting — 00h

Comments — The WRITE_PROTECT command is available from Software Version 2.08 onwards and has the following allowed values.

80h Writes are allowed to the WRITE_PROTECT command. The STORE_USER_ALL command is also available to allow the new value to be saved. The CLEAR_FAULTS command is also available to allow use of the status commands for monitoring fault and warning conditions.

40h Writes are also allowed to the OPERATION command in addition to the above commands.

20h Writes to the ON_OFF_CONFIG and VOUT_COMMANDs are also available in addition to the above commands.

00h None of the commands are write protected.

Any other value will cause an Invalid Or Unsupported Data Received STATUS_CML error.

Writing to any write protected command will cause an Invalid Or Unsupported Data Received STATUS_CML error.

4.5 12h RESTORE_DEFAULT_ALL

Command Code	12h
Command Name	RESTORE_DEFAULT_ALL
SMBus Transaction Type	SEND BYTE
Number of Data Bytes	0
Comments	The device will operate normally during the EEPROM read so the output does not need to be disabled. Restores the Operating Memory to the factory settings.

4.6 15h STORE_USER_ALL

Command Code	15h
Command Name	STORE_USER_ALL
SMBus Transaction Type	SEND BYTE
Number of Data Bytes	0
Comments	The Operating Memory data is written to the EEPROM after the SMBus stop condition has been received. A delay of 300ms should be allowed while the device is busy before the next command is transmitted to this device. The device will operate normally during the EEPROM write so the output does not need to be disabled.

4.7 16h RESTORE_USER_ALL

Command Code	16h
Command Name	RESTORE_USER_ALL
SMBus Transaction Type	SEND BYTE
Number of Data Bytes	0
Comments	The device will operate normally during the EEPROM read so the output does not need to be disabled. Restores the Operating Memory to the user settings.

4.8 20h VOUT_MODE

Command Code	20h
Command Name	VOUT_MODE
SMBus Transaction Type	READ BYTE
Number of Data Bytes	1
Data Format	See the PMBus Specification.

0	0	0	1	0	1	1	0

Non Vol Memory Commands	None
Default Setting	16h
Comments	This command is read only as the mode is fixed.
	Bits 7 to 5 of this value indicates that the mode is linear and bits 4 to 0 indicate that the VOUT related values have an exponent of -10d.

4.9 21h VOUT_COMMAND

Command Code	21h
Command Name	VOUT_COMMAND
SMBus Transaction Type	R/W WORD
Number of Data Bytes	2
Data Format	Linear
Data Value	16d bit mantissa, (exponent = -10d)
Data Range	0.0V to + 63.999V
Data Resolution	1/1024V

M	M	M	M	M	M	M	M

M	M	M	M	M	M	M	M

Non Vol Memory Commands	RESTORE_DEFAULT_ALL, STORE_USER_ALL and RESTORE_USER_ALL.		
Default Setting	48V Model	Front End 48.0V	Rectifier 54.4V
	24V Model	Front End 24.0V	Rectifier 27.2V
	12V Model	Front End 12.0V	Rectifier 13.6V
Maximum Error in Output	+/- 1.2% of the output voltage setting.		
Comments	48V Model	Output voltage range	30V to 60V
	24V Model	Output voltage range	15V to 30V
	12V Model	Output voltage range	7.5V to 15V
	The output voltage setting is clipped to the output voltage range (or VOUT_MAX) after the effect of VOUT_TRIM, margin and push button adjust have been included.		
	The remote adjust pin overrides the output voltage setting and the clipping limits.		

4.10 22h VOUT_TRIM

Command Code	22h
Command Name	VOUT_TRIM
SMBus Transaction Type	R/W WORD
Number of Data Bytes	2
Data Format	Linear

Data Value	16d bit 2's complement mantissa, (exponent = -10d)
Data Range	-32V to + 31.999V
Data Resolution	1/1024V

S	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M

Non Vol Memory Commands	RESTORE_DEFAULT_ALL, STORE_USER_ALL and RESTORE_USER_ALL.
Default Setting	0.0V
Maximum Error in Output	This setting causes no additional error to the output voltage.
Comments	48V Model Output voltage range 30V to 60V
	24V Model Output voltage range 15V to 30V
	12V Model Output voltage range 7.5V to 15V
	The output voltage setting is clipped to the output voltage range (or VOUT_MAX) after the effect of VOUT_TRIM, margin and push button adjust have been included.
	The remote adjust pin overrides the output voltage setting and the clipping limits.

4.11 24h VOUT_MAX

Command Code	24h
Command Name	VOUT_MAX
SMBus Transaction Type	R/W WORD
Number of Data Bytes	2
Data Format	Linear
Data Value	16d bit mantissa, (exponent = -10d)
Data Range	0.0V to + 63.999V
Data Resolution	1/1024V

M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M

Non Vol Memory Commands	RESTORE_DEFAULT_ALL, STORE_USER_ALL and RESTORE_USER_ALL.
Default Setting	48V Model 60.0V
	24V Model 30.0V
	12V Model 15.0V
Maximum Error in Output	This setting causes no additional error to the output voltage.
Comments	48V Model Output voltage range 30V to 60V
	24V Model Output voltage range 15V to 30V
	12V Model Output voltage range 7.5V to 15V

The output voltage setting is clipped to the output voltage range (or VOUT_MAX) after the effect of VOUT_TRIM, margin and push button adjust have been included.

The remote adjust pin overrides the output voltage setting and the clipping limits.

4.12 25h VOUT_MARGIN_HIGH

Command Code	25h
Command Name	VOUT_MARGIN_HIGH
SMBus Transaction Type	R/W WORD
Number of Data Bytes	2
Data Format	Linear
Data Value	16d bit mantissa, (exponent = -10d)
Data Range	0.0V to + 63.999V
Data Resolution	1/1024V

M	M	M	M	M	M	M	M

M	M	M	M	M	M	M	M

Non Vol Memory Commands	RESTORE_DEFAULT_ALL, STORE_USER_ALL and RESTORE_USER_ALL.		
Default Setting	48V Model	Front End 48.0V	Rectifier 54.4V
	24V Model	Front End 24.0V	Rectifier 27.2V
	12V Model	Front End 12.0V	Rectifier 13.6V

Maximum Error in Output This setting causes no additional error to the output voltage.

Comments	48V Model	Output voltage range	30V to 60V
	24V Model	Output voltage range	15V to 30V
	12V Model	Output voltage range	7.5V to 15V

The output voltage setting is clipped to the output voltage range (or VOUT_MAX) after the effect of VOUT_TRIM, margin and push button adjust have been included.

The remote adjust pin overrides the output voltage setting and the clipping limits.

4.13 26h VOUT_MARGIN_LOW

Command Code	26h
Command Name	VOUT_MARGIN_LOW
SMBus Transaction Type	R/W WORD
Number of Data Bytes	2
Data Format	Linear
Data Value	16d bit mantissa, (exponent = -10d)
Data Range	0.0V to + 63.999V
Data Resolution	1/1024V

M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M

Non Vol Memory Commands	RESTORE_DEFAULT_ALL, STORE_USER_ALL and RESTORE_USER_ALL.	
Default Setting	48V Model	Front End 48.0V Rectifier 54.4V
	24V Model	Front End 24.0V Rectifier 27.2V
	12V Model	Front End 12.0V Rectifier 13.6V

Maximum Error in Output This setting causes no additional error to the output voltage.

Comments	48V Model	Output voltage range 30V to 60V
	24V Model	Output voltage range 15V to 30V
	12V Model	Output voltage range 7.5V to 15V

The output voltage setting is clipped to the output voltage range (or VOUT_MAX) after the effect of VOUT_TRIM, margin and push button adjust have been included.

The remote adjust pin overrides the output voltage setting and the clipping limits.

4.14 27h VOUT_TRANSITION_RATE

Command Code	27h
Command Name	VOUT_TRANSITION_RATE
SMBus Transaction Type	R/W WORD
Number of Data Bytes	2
Data Format	Linear
Data Value	5 bit 2’s compliment exponent + 11d bit 2’s compliment mantissa
Data Range	15mV/s to 1023V/ms
Data Resolution	10d bit mantissa

S	E	E	E	E	S	M	M	M	M	M	M	M	M	M	M

Non Vol Memory Commands	RESTORE_DEFAULT_ALL, STORE_USER_ALL and RESTORE_USER_ALL.	
Default Setting	48V Model	1mV/us, 1V/ms
	24V Model	0.5mV/us, 0.5V/ms
	12V Model	0.25mV/us, 0.25V/ms
Maximum Error in Rate	48V Model	+/-1% of setting when the setting is slower than 2V/ms.
	24V Model	+/-1% of setting when the setting is slower than 1V/ms.
	12V Model	+/-1% of setting when the setting is slower than 0.5V/ms.
Comments	48V Model	Negative transitions rely on the load current to reduce the voltage stored on the output filter capacitors.
	24V Model	Negative transitions are aided by the synchronous rectifiers being able to sink current to reduce the voltage stored on the output filter capacitors.

12V Model Negative transitions are aided by the synchronous rectifiers being able to sink current to reduce the voltage stored on the output filter capacitors.

4.15 42h VOUT_OV_WARN_LIMIT

Command Code	42h
Command Name	VOUT_OV_WARN_LIMIT
SMBus Transaction Type	R/W WORD
Number of Data Bytes	2
Data Format	Linear
Data Value	16d bit mantissa, (exponent = -10d)
Data Range	0.0V to + 63.999V
Data Resolution	1/1024V

M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M

Non Vol Memory Commands	RESTORE_DEFAULT_ALL, STORE_USER_ALL and RESTORE_USER_ALL.		
Default Setting	48V Model	Front End 50.40V	Rectifier 57.12V
	24V Model	Front End 25.20V	Rectifier 28.56V
	12V Model	Front End 12.60V	Rectifier 14.28V

Maximum Error in Setting +/- 1.7% between this setting and the output voltage.

Comments The default setting is the default VOUT_COMMAND setting +5%.

4.16 43h VOUT_UV_WARN_LIMIT

Command Code	43h
Command Name	VOUT_UV_WARN_LIMIT
SMBus Transaction Type	R/W WORD
Number of Data Bytes	2
Data Format	Linear
Data Value	16d bit mantissa, (exponent = -10d)
Data Range	0.0V to + 63.999V
Data Resolution	1/1024V

M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M

Non Vol Memory Commands	RESTORE_DEFAULT_ALL, STORE_USER_ALL and RESTORE_USER_ALL.	
Default Setting	48V Model	45.60V
	24V Model	22.80V
	12V Model	11.40V

Maximum Error in Setting +/- 1.7% between this setting and the output voltage.

Comments For front ends the default setting is the default VOUT_COMMAND setting -5%.

For rectifiers the default setting is the Model voltage -5%.

4.17 44h VOUT_UV_FAULT_LIMIT

Command Code 44h

Command Name VOUT_UV_FAULT_LIMIT

SMBus Transaction Type R/W WORD

Number of Data Bytes 2

Data Format Linear

Data Value 16d bit mantissa, (exponent = -10d)

Data Range 0.0V to + 63.999V

Data Resolution 1/1024V

M	M	M	M	M	M	M	M

M	M	M	M	M	M	M	M

Non Vol Memory Commands RESTORE_DEFAULT_ALL, STORE_USER_ALL and RESTORE_USER_ALL.

Default Setting 48V Model 10.00V

24V Model 6.00V

12V Model 3.00V

Maximum Error in Setting +/- 1.7% between this setting and the output voltage.

Comments This value is used in conjunction with the VOUT_UV_FAULT_RESPONSE setting to provide overload protection for the power supply.

48V Model The value written is clipped to 10.00V minimum.

24V Model The value written is clipped to 6.00V minimum.

12V Model The value written is clipped to 3.00V minimum.

4.18 45h VOUT_UV_FAULT_RESPONSE

Command Code 45h

Command Name VOUT_UV_FAULT_RESPONSE

SMBus Transaction Type R/W BYTE

Number of Data Bytes 1

Data Format See the PMBus specification.

7	6	5	4	3	2	1	0

Non Vol Memory Commands RESTORE_DEFAULT_ALL, STORE_USER_ALL and RESTORE_USER_ALL.

Default Setting BAh Shutdown and retry after a delay of 1s, unlimited retries.

Comments	The supported fault responses are;	
	40h to 47h	Lockout and no retry + delay time units of 50ms.
	B8h to BFh	Shutdown and retry forever + delay time units of 500ms.
	This setting is used in conjunction with the VOUT_UV_FAULT_LIMIT value to provide overload protection for the power supply.	

4.19 46h IOUT_OC_FAULT_LIMIT

Command Code	46h	
Command Name	IOUT_OC_FAULT_LIMIT	
SMBus Transaction Type	R/W WORD	
Number of Data Bytes	2	
Data Format	Linear	
Data Value	5 bit 2's compliment exponent + 11d bit 2's compliment mantissa	
Data Range	48V Model	0.0A to 63.938A
	24V Model	0.0A to 127.88A
	12V Model	0.0A to 127.88A
Data Resolution	48V Model	62.5mA
	24V Model	125mA
	12V Model	125mA

S	E	E	E	E	S	M	M

M	M	M	M	M	M	M	M

Non Vol Memory Commands	RESTORE_DEFAULT_ALL, STORE_USER_ALL and RESTORE_USER_ALL.	
Default Setting	48V Model	44.875A
	24V Model	64.625A
	12V Model	105.25A
Maximum Error in Setting	48V Model	+/-1.5A +/-3.2% of the setting.
	24V Model	+/-3.0A +/-2.7% of the setting.
	12V Model	+/-3.1A +/-2.1% of the setting.
Comments	48V Model	Command read returns with an exponent of -4.
	24V Model	Command read returns with an exponent of -3.
	12V Model	Command read returns with an exponent of -3.
	A command write will accept any exponent.	
	The default setting guarantees that the unit will current limit at no less than the output current rating unless automatic power limiting or temperature de-rating is occurring.	
	48V Model	The output current rating is 42A.
	24V Model	The output current rating is 60A.

12V Model The output current rating is 100A.

The minimum output power limit is 2000W high line and 1500W low line and The output power and current de-rates with temperature from 50C ambient to 50% at 70C ambient.

4.20 47h IOUT_OC_FAULT_RESPONSE

Command Code	47h
Command Name	IOUT_OC_FAULT_RESPONSE
SMBus Transaction Type	R/W BYTE
Number of Data Bytes	1
Data Format	See the PMBus specification.

7	6	5	4	3	2	1	0

Non Vol Memory Commands	None as only one value is supported.
Default Setting	00h Continue operation.
Comments	The supported fault responses are;
	00h Continue operation.

4.21 4Ah IOUT_OC_WARN_LIMIT

Command Code	4Ah
Command Name	IOUT_OC_WARN_LIMIT
SMBus Transaction Type	R/W WORD
Number of Data Bytes	2
Data Format	Linear
Data Value	5 bit 2’s compliment exponent + 11d bit 2’s compliment mantissa
Data Range	48V Model 0.0A to 63.938A
	24V Model 0.0A to 127.88A
	12V Model 0.0A to 127.88A
Data Resolution	48V Model 62.5mA
	24V Model 125mA
	12V Model 125mA

S	E	E	E	E	S	M	M

M	M	M	M	M	M	M	M

Non Vol Memory Commands	RESTORE_DEFAULT_ALL, STORE_USER_ALL and RESTORE_USER_ALL.
Default Setting	48V Model 39.875A
	24V Model 57.000A
	12V Model 95.000A

Maximum Error in Setting	48V Model	+/-1.5A +/-3.2% of the setting.
	24V Model	+/-3.0A +/-2.7% of the setting.
	12V Model	+/-3.1A +/-2.1% of the setting.
Comments	The default setting is at 95% of the output current rating.	
	48V Model	Command read returns with an exponent of -4.
	24V Model	Command read returns with an exponent of -3.
	12V Model	Command read returns with an exponent of -3.
	The command write will accept any exponent.	

4.22 4Fh OT_FAULT_LIMIT

Command Code	4Fh
Command Name	OT_FAULT_LIMIT
SMBus Transaction Type	R/W WORD
Number of Data Bytes	2
Data Format	Linear
Data Value	5 bit 2's compliment exponent + 11d bit 2's compliment mantissa
Data Range	-128C to 127.875C
Data Resolution	0.125C

S	E	E	E	E	S	M	M	M	M	M	M	M	M	M	M	M

Non Vol Memory Commands	RESTORE_DEFAULT_ALL, STORE_USER_ALL and RESTORE_USER_ALL.
Default Setting	120C

Maximum Error in Setting +/- 10.7C, the error in reading the internal temperature.

Comments

The read command exponent is always -3 but the write command will accept any exponent.

This setting is compared to a measurement of the internal temperature of the unit.

The over temperature fault status bit has hysteresis. Once the temperature has reached this setting the over temperature fault bit will be set. If the status bit is cleared the bit will be set again until the measured temperature falls to 10C below this setting.

4.23 50h OT_FAULT_RESPONSE

Command Code	50h
Command Name	OT_FAULT_RESPONSE
SMBus Transaction Type	R/W BYTE
Number of Data Bytes	1
Data Format	See the PMBus specification.

7	6	5	4	3	2	1	0

Non Vol Memory Commands	None as only one value is supported.
Default Setting	C0h Disable the output while fault then resume.
Comments	The supported fault responses are;
	C0h Disable the output while fault then resume.

4.24 51h OT_WARN_LIMIT

Command Code	51h
Command Name	OT_WARN_LIMIT
SMBus Transaction Type	R/W WORD
Number of Data Bytes	2
Data Format	Linear
Data Value	5 bit 2's compliment exponent + 11d bit 2's compliment mantissa
Data Range	-128C to 127.875C
Data Resolution	0.125C

S	E	E	E	E	S	M	M

M	M	M	M	M	M	M	M

Non Vol Memory Commands	RESTORE_DEFAULT_ALL, STORE_USER_ALL and RESTORE_USER_ALL.
Default Setting	95C

Maximum Error in Setting +/- 10.7C, the error in reading the internal temperature.

Comments	The read command exponent is always -3 but the write command will accept any exponent.
	This setting is compared to a measurement of the internal temperature of the unit.
	The over temperature warning status bit has hysteresis. Once the temperature has reached this setting the over temperature warning bit will be set. If the status bit is cleared the bit will be set again until the measured temperature falls to 10C below this setting.

4.25 52h UT_WARN_LIMIT

Command Code	52h
Command Name	UT_WARN_LIMIT
SMBus Transaction Type	R/W WORD
Number of Data Bytes	2
Data Format	Linear
Data Value	5 bit 2's compliment exponent + 11d bit 2's compliment mantissa
Data Range	-128C to 127.875C
Data Resolution	0.125C

S	E	E	E	E	S	M	M	M	M	M	M	M	M	M	M

Non Vol Memory Commands RESTORE_DEFAULT_ALL, STORE_USER_ALL and RESTORE_USER_ALL.

Default Setting -20C

Maximum Error in Setting +/- 10.7C, the error in reading the internal temperature.

Comments The read command exponent is always -3 but the write command will accept any exponent.

This setting is compared to a measurement of the internal temperature of the unit.

The under temperature warning status bit has hysteresis. Once the temperature has reached this setting the under temperature warning bit will be set. If the status bit is cleared the bit will be set again until the measured temperature rises to 5C above this setting.

4.26 53h UT_FAULT_LIMIT

Command Code 53h

Command Name UT_FAULT_LIMIT

SMBus Transaction Type R/W WORD

Number of Data Bytes 2

Data Format Linear

Data Value 5 bit 2's compliment exponent + 11d bit 2's compliment mantissa

Data Range -128C to 127.875C

Data Resolution 0.125C

S	E	E	E	E	S	M	M	M	M	M	M	M	M	M	M

Non Vol Memory Commands RESTORE_DEFAULT_ALL, STORE_USER_ALL and RESTORE_USER_ALL.

Default Setting -30C

Maximum Error in Setting +/- 10.7C, the error in reading the internal temperature.

Comments The read command exponent is always -3 but the write command will accept any exponent.

This setting is compared to a measurement of the internal temperature of the unit.

The under temperature fault status bit has hysteresis. Once the temperature has reached this setting the under temperature fault bit will be set. If the status bit is cleared the bit will be set again until the measured temperature rises to 5C above this setting.

4.27 54h UT_FAULT_RESPONSE

Command Code 54h

Command Name UT_FAULT_RESPONSE

SMBus Transaction Type	R/W BYTE
Number of Data Bytes	1
Data Format	See the PMBus specification.

7	6	5	4	3	2	1	0

Non Vol Memory Commands	None as only one value is supported.
Default Setting	C0h Disable the output while fault then resume.
Comments	The supported fault responses are; C0h Disable the output while fault then resume.

4.28 5Eh POWER_GOOD_ON

Command Code	5Eh
Command Name	POWER_GOOD_ON
SMBus Transaction Type	R/W WORD
Number of Data Bytes	2
Data Format	Linear
Data Value	16d bit mantissa, (exponent = -10d)
Data Range	0.0V to + 63.999V
Data Resolution	1/1024V

M	M	M	M	M	M	M	M

M	M	M	M	M	M	M	M

Non Vol Memory Commands	RESTORE_DEFAULT_ALL, STORE_USER_ALL and RESTORE_USER_ALL.
Default Setting	48V model 45.60V 24V model 22.80V 12V model 11.40V
Maximum Error in Setting	+/- 1.7% between this setting and the output voltage.
Comments	For front ends the default setting is the default VOUT_COMMAND setting -5%. For rectifiers the default setting is the Model voltage -5%. The DCOK signal will become true within 1ms of the output voltage reaching this value.

4.29 5Fh POWER_GOOD_OFF

Command Code	5Fh
Command Name	POWER_GOOD_OFF
SMBus Transaction Type	R/W WORD
Number of Data Bytes	2

Data Format	Linear
Data Value	16d bit mantissa, (exponent = -10d)
Data Range	0.0V to + 63.999V
Data Resolution	1/1024V

M	M	M	M	M	M	M	M		M	M	M	M	M	M	M	M

Non Vol Memory Commands	RESTORE_DEFAULT_ALL, STORE_USER_ALL and RESTORE_USER_ALL.
Default Setting	48V model 39.00V 24V model 21.60V 12V model 10.80V
Maximum Error in Setting	+/- 1.7% between this setting and the output voltage.
Comments	The DCOK signal will be become false within 1ms of the output voltage falling below this value.

4.30 60h TON_DELAY

Command Code	60h
Command Name	TON_DELAY
SMBus Transaction Type	R/W WORD
Number of Data Bytes	2
Data Format	Linear
Data Value	5 bit 2’s compliment exponent + 11d bit 2’s compliment mantissa
Data Range	0ms to 100s
Data Resolution	Depends on the exponent, up to 10d bits.

S	E	E	E	E	S	M	M		M	M	M	M	M	M	M	M

Non Vol Memory Commands	RESTORE_DEFAULT_ALL, STORE_USER_ALL and RESTORE_USER_ALL.
Default Setting	0ms
Maximum Error in Setting	+/-1ms +/-1% of this setting.
Comments	From power on to the time the output starts to rise is determined by the device configuration and three time delays; Power Up Delay, PFC Delay and TON_DELAY. Power Up Delay 130ms to 300ms This is the time from power on to the bias supply being enabled. The PMBus will start running within 10ms of the bias supply being established. PFC Delay 150ms Software version up to 2.05. 500ms Software version 2.06 onwards.

This is a time delay to allow the Power Factor Correction circuit to charge the bulk hold-up capacitors and to complete soft start.

TON_DELAY This setting After this delay the output will rise at the rate determined by the value of TON_RISE.

If the device is configured to wait for the CONTROL signal or the OPERATION command, the instruction should be given after the Power Up Delay and PFC Delay have elapsed to maintain the expected timing.

See the MISC_CONFIG command for information on an additional power up configuration bit.

4.31 61h TON_RISE

Command Code	61h
Command Name	TON_RISE
SMBus Transaction Type	R/W WORD
Number of Data Bytes	2
Data Format	Linear
Data Value	5 bit 2's compliment exponent + 11d bit 2's compliment mantissa
Data Range	0ms to 100s
Data Resolution	Depends on exponent, up to 10d bits.

S	E	E	E	E	S	M	M	M	M	M	M	M	M	M	M	M

Non Vol Memory Commands	RESTORE_DEFAULT_ALL, STORE_USER_ALL and RESTORE_USER_ALL.
Default Setting	50ms
Maximum Error in Rise Time	+/-1ms +/-1% of setting for values of 30ms or greater. The fastest rise time achievable is less than 20ms.
Comments	The PMBus Specification part II calls for the default value to be 0ms but the device is set up with a default value of 50ms.

4.32 64h TOFF_DELAY

Command Code	64h
Command Name	TOFF_DELAY
SMBus Transaction Type	R/W WORD
Number of Data Bytes	2
Data Format	Linear
Data Value	5 bit 2's compliment exponent + 11d bit 2's compliment mantissa
Data Range	0ms to 100s
Data Resolution	Depends on exponent, up to 10d bit.

S	E	E	E	E	S	M	M	M	M	M	M	M	M	M	M

Non Vol Memory Commands	RESTORE_DEFAULT_ALL, STORE_USER_ALL and RESTORE_USER_ALL.
Default Setting	0ms
Maximum Error in Setting	+/-1ms +/-1% of this setting.
Comments	

4.33 78h STATUS_BYTE

Command Code	78h
Command Name	STATUS_BYTE
SMBus Transaction Type	READ BYTE
Number of Data Bytes	1
Data Format	See the PMBus specification.

7	6	5	4	3	2	1	0

Non Vol Memory Commands	None
Comments	The following status bits are implemented;

Bit 7 BUSY

Bit 6 OFF

Bit 4 IOUT_OC

Bit 2 TEMPERATURE

Bit 1 CML

Bit 0 NONE OF THE ABOVE

Status bit 5 VOUT_OV has not been implemented because the programmable OVP (over voltage protection) is implemented in hardware and not in software.

Status bit 3 VIN_UV has not been implemented as an input voltage under voltage fault results in the PFC (power factor corrector) hardware shutting down.

4.34 79h STATUS_WORD

Command Code	79h
Command Name	STATUS_WORD
SMBus Transaction Type	READ WORD
Number of Data Bytes	2
Data Format	See the PMBus specification.

7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

Non Vol Memory Commands	None
Comments	The low byte status bits are the same as in the STATUS_BYTE above.
	The following High Byte status bits are implemented;
	Bit 7 VOUT
	Bit 6 IOUT/POUT
	Bit 5 INPUT
	Bit 3 POWER_GOOD#
	Bit 2 FANS

4.35 7Ah STATUS_VOUT

Command Code	7Ah
Command Name	STATUS_VOUT
SMBus Transaction Type	READ BYTE
Number of Data Bytes	1
Data Format	See the PMBus specification.

7	6	5	4	3	2	1	0

Non Vol Memory Commands	None
Comments	The following status bits are implemented;
	Bit 6 VOUT Overvoltage Warning
	Bit 5 VOUT Undervoltage Warning
	Bit 4 VOUT Undervoltage Fault
	Bit 3 VOUT_MAX_FAULT
	Status bit 7 VOUT Overvoltage Fault has not been implemented because the programmable OVP (over voltage protection) is implemented in hardware and not in software.
	Status bits 2 to 0 have not been implemented.

4.36 7Bh STATUS_IOUT

Command Code	7Bh
Command Name	STATUS_IOUT
SMBus Transaction Type	READ BYTE
Number of Data Bytes	1
Data Format	See the PMBus specification.

7	6	5	4	3	2	1	0

Non Vol Memory Commands	None

Comments

The following status bits are implemented;

Bit 7 IOUT Overcurrent Fault

Bit 5 IOUT Overcurrent Warning

Bit 3 Current Share Fault

Bit 2 Power Limiting

A current share fault is set when this unit is delivering less than the Ishare value by 5% of rating - 10% of Ishare reading.

e.g. 48V Model rated Iout = 42.0A

If Ishare = 40.0A and Iout = 33.8A

If Iout < (Ishare – Ishare * 10% - Irating * 5%) set the share fault bit.

33.8A < 40.0A – 4.0A – 2.1A = 33.9A, the current share fault bit is set.

The power limiting bit is set when the measured output power exceeds the unit power limit which depends on the line voltage and internal temperature measurement.

4.37 7Ch STATUS_INPUT

Command Code	7Ch
Command Name	STATUS_INPUT
SMBus Transaction Type	READ BYTE
Number of Data Bytes	1
Data Format	See the PMBus specification.

7	6	5	4	3	2	1	0

Non Vol Memory Commands None

Comments

The following status bits are implemented;

Bit 6 VIN Overvoltage Warning - Removed Software version 2.09

Bit 5 VIN Undervoltage Warning

Up to Software version 2.08. A warning bit is set if the READ_VIN voltage is outside the range 80V to 270V. The VIN warning bits are not set if the READ_VIN voltage is within the range 83V to 267V.

From Software version 2.09. The VIN undervoltage warning bit is set if the READ_VIN voltage is below 80V. The VIN undervoltage warning bit is cleared if the READ_VIN voltage is above 83V.

4.38 7Dh STATUS_TEMPERATURE

Command Code	7Dh
Command Name	STATUS_TEMPERATURE
SMBus Transaction Type	READ BYTE
Number of Data Bytes	1
Data Format	See the PMBus specification.

7	6	5	4	3	2	1	0

Non Vol Memory Commands None

Comments The following status bits are implemented;

Bit 7 Overtemperature Fault

Bit 6 Overtemperature Warning

Bit 5 Undertemperature Warning

Bit 4 Undertemperature Fault

4.39 7Eh STATUS_CML

Command Code 7Eh

Command Name STATUS_CML

SMBus Transaction Type READ BYTE

Number of Data Bytes 1

Data Format See the PMBus specification.

7	6	5	4	3	2	1	0

Non Vol Memory Commands None

Comments The following status bits are implemented;

Bit 7 Invalid Or Unsupported Command Received

Bit 6 Invalid Or Unsupported Data Received

Bit 5 Packet Error Check Failed

Bit 1 Other Communication Fault

4.40 81h STATUS_FANS_1_2

Command Code 81h

Command Name STATUS_FANS_1_2

SMBus Transaction Type READ BYTE

Number of Data Bytes 1

Data Format See the PMBus specification.

7	6	5	4	3	2	1	0

Non Vol Memory Commands None

Comments The following status bits are implemented;

Bit 7 Fan 1 Fault

Bit 6 Fan 2 Fault

Bit 5 Fan 1 Warning

Bit 4 Fan 2 Warning

A fan warning bit is set if the fan speed is below 80% of the expected speed. A fan fail bit is set if the speed drop is double i.e. to 60% of the expected speed.

Looking at the unit front panel, fan 1 is on the left and fan 2 is on the right.

4.41 88h READ_VIN

Command Code	88h
Command Name	READ_VIN
SMBus Transaction Type	READ WORD
Number of Data Bytes	2
Data Format	Linear
Data Value	5 bit 2's compliment exponent + 11d bit 2's compliment mantissa
Data Range	0.0V to +511.5V
Data Resolution	0.5V

S	E	E	E	E	S	M	M	M	M	M	M	M	M	M	M	M

Non Vol Memory Commands	None
Maximum Error in Reading	+/-10.8% of the reading.
Comments	The read command exponent is always -1.

4.42 8Ah READ_VCAP

Command Code	8Ah
Command Name	READ_VCAP
SMBus Transaction Type	READ WORD
Number of Data Bytes	2
Data Format	Linear
Data Value	5 bit 2's compliment exponent + 11d bit 2's compliment mantissa
Data Range	0.0V to +511.5V
Data Resolution	0.5V

S	E	E	E	E	S	M	M	M	M	M	M	M	M	M	M	M

Non Vol Memory Commands	None
Maximum Error in Reading	+/- 57V
Comments	The read command exponent is -1.

The read value is the instantaneous high voltage power bus voltage which will include 31Vpkpk ripple at full load.

4.43 8Bh READ_VOUT

Command Code	8Bh
Command Name	READ_VOUT
SMBus Transaction Type	READ WORD
Number of Data Bytes	2
Data Format	Linear
Data Value	16d bit mantissa, (exponent = -10d)
Data Range	0.0V to + 63.999V
Data Resolution	1/1024V

M	M	M	M	M	M	M	M		M	M	M	M	M	M	M	M

Non Vol Memory Commands	None
Maximum Error in Reading	+/-1.7% between this reading and the output voltage.
Comments	The measurement resolution is approximately;
	48V Model 80mV
	24V Model 40mV
	12V Model 20mV

4.44 8Ch READ_IOUT

Command Code	8Ch
Command Name	READ_IOUT
SMBus Transaction Type	READ WORD
Number of Data Bytes	2
Data Format	Linear
Data Value	5 bit 2’s compliment exponent + 11d bit 2’s compliment mantissa
Data Range	48V Model 0.0A to + 63.937A
	24V Model 0.0A to + 127.88A
	12V Model 0.0A to + 127.88A
Data Resolution	48V Model 62.5mA
	24V Model 125mA
	12V Model 125mA

S	E	E	E	E	S	M	M		M	M	M	M	M	M	M	M

Non Vol Memory Commands	None

Maximum Error in Reading	48V Model	+/-1.5A +/-3.2% of the reading.
	24V Model	+/-3.0A +/-2.7% of the reading.
	12V Model	+/-3.1A +/-2.1% of the reading.
Comments	48V Model	The read exponent is always -4.
	24V Model	The read exponent is always -3.
	12V Model	The read exponent is always -3.

4.45 8Dh READ_TEMPERATURE_1

Command Code	8Dh
Command Name	READ_TEMPERATURE_1
SMBus Transaction Type	READ WORD
Number of Data Bytes	2
Data Format	Linear
Data Value	5 bit 2's compliment exponent + 11d bit 2's compliment mantissa
Data Range	-128.0C to 127.875C
Data Resolution	0.125C

S	E	E	E	E	S	M	M	M	M	M	M	M	M	M	M	M

Non Vol Memory Commands	None
Maximum Error in Reading	+/-11.7C
Comments	This command returns a measurement of the internal temperature of the unit.

4.46 90h READ_FAN_SPEED_1

Command Code	90h
Command Name	READ_FAN_SPEED_1
SMBus Transaction Type	READ WORD
Number of Data Bytes	2
Data Format	Linear
Data Value	5 bit 2's compliment exponent + 11d bit 2's compliment mantissa
Data Range	0 RPM to 32736 RPM
Data Resolution	32 RPM

S	E	E	E	E	S	M	M	M	M	M	M	M	M	M	M	M

Non Vol Memory Commands	None
Maximum Error in Reading	62 RPM
Comments	The read command exponent is always 5.

This is the speed of the left hand fan when viewed from the front of the unit. The fan speed is automatically controlled from the internal temperature measurement. Above 45C the fans will be running at full speed. Below -10C the fans will be stopped until the temperature rises above -5C.

4.47 91h READ_FAN_SPEED_2

Command Code	91h
Command Name	READ_FAN_SPEED_2
SMBus Transaction Type	READ WORD
Number of Data Bytes	2
Data Format	Linear
Data Value	5 bit 2's compliment exponent + 11d bit 2's compliment mantissa
Data Range	0 RPM to 32736 RPM
Data Resolution	32 RPM

S	E	E	E	E	S	M	M

M	M	M	M	M	M	M	M

Non Vol Memory Commands	None
Maximum Error in Reading	62RPM
Comments	The read command exponent is always 5.

This is the speed of the right hand fan when viewed from the front of the unit. The fan speed is automatically controlled from the internal temperature measurement. Above 45C the fans will be running at full speed. Below -10C the fans will be stopped until the temperature rises above -5C.

4.48 98h PMBUS_REVISION

Command Code	98h
Command Name	PMBUS_REVISION
SMBus Transaction Type	READ BYTE
Number of Data Bytes	1
Data Format	See the PMBus Specification.

7	6	5	4	3	2	1	0

Non Vol Memory Commands	None
Default Setting	011h
Comments	This device uses PMBus Revision 1.1.

4.49 99h MFR_ID

Command Code	99h
Command Name	MFR_ID

SMBus Transaction Type	READ BLOCK
Number of Data Bytes	9
Data Format	Byte count N + Byte 1 + ... + Byte N
Data Values	Length + 8 text characters
Non Vol Memory Commands	None
Default Setting	Length = 8, + ‘Unipower’
Comments	See the PMBus Specification.

4.50 9Ah MFR_MODEL

Command Code	9Ah
Command Name	MFR_MODEL
SMBus Transaction Type	READ BLOCK
Number of Data Bytes	2 to 21d
Data Format	Byte count N + Byte 1 + ... + Byte N
Data Values	Length + 1 to 20d text characters
Non Vol Memory Commands	None
Comments	See the PMBus Specification.

4.51 9Bh MFR_REVISION

Command Code	9Bh
Command Name	MFR_REVISION
SMBus Transaction Type	READ BLOCK
Number of Data Bytes	2 to 7
Data Format	Byte count N + Byte 1 + ... + Byte N
Data Values	Length + 1 to 6 text characters
Non Vol Memory Commands	None
Comments	See the PMBus Specification.

4.52 9Ch MFR_LOCATION

Command Code	9Ch
Command Name	MFR_LOCATION
SMBus Transaction Type	READ BLOCK
Number of Data Bytes	2 to 17d
Data Format	Byte count N + Byte 1 + ... + Byte N
Data Values	length + 1 to 16d characters
Non Vol Memory Commands	None
Comments	See the PMBus Specification.

4.53 9Dh MFR_DATE

Command Code	9Dh
Command Name	MFR_DATE
SMBus Transaction Type	READ BLOCK
Number of Data Bytes	2 to 7
Data Format	Byte count N + Byte 1 + ... + Byte N
Data Values	length + 1 to 6 characters
Non Vol Memory Commands	None
Comments	See the PMBus Specification.

4.54 9Eh MFR_SERIAL

Command Code	9Eh
Command Name	MFR_SERIAL
SMBus Transaction Type	READ BLOCK
Number of Data Bytes	2 to 11d
Data Format	Byte count N + Byte 1 + ... + Byte N
Data Values	length + 1 to 10d characters
Non Vol Memory Commands	None
Comment	See the PMBus Specification.

4.55 D0h OVP_SETTING

Command Code	D0h
Command Name	OVP_SETTING
SMBus Transaction Type	R/W WORD
Number of Data Bytes	2
Data Format	Linear
Data Value	16d bit mantissa, (exponent = -10d)
Data Range	0.0V to + 63.999V
Data Resolution	1/1024V

M	M	M	M	M	M	M	M		M	M	M	M	M	M	M	M

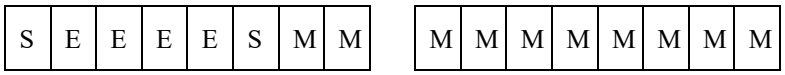
Non Vol Memory Commands	RESTORE_DEFAULT_ALL, STORE_USER_ALL and RESTORE_USER_ALL.		
Default Setting	48V Model	Front End = 52.80V	Rectifier = 59.00V
	24V Model	Front End = 30.00V	Rectifier = 30.00V
	12V Model	Front End = 15.00V	Rectifier = 15.00V

Maximum Error in Setting +/-2.7% between this setting and the output voltage.

Comments	This parameter determines the output voltage which will set the hardware over voltage protection latch which shuts down the output voltage converter. The latch can be reset only by powering the unit off and on.

4.56 D1h READ_ISHARE

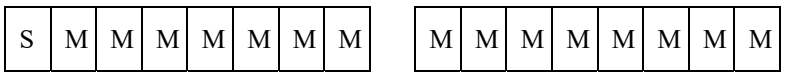
Command Code	D1h	
Command Name	READ_ISHARE	
SMBus Transaction Type	READ WORD	
Number of Data Bytes	2	
Data Format	Linear	
Data Value	5 bit 2's compliment exponent + 11d bit 2's compliment mantissa	
Data Range	48V Model	0.0A to + 63.875A
	24V Model	0.0A to + 127.88A
	12V Model	0.0A to + 127.88A
Data Resolution	48V Model	62.5mA
	24V Model	125mA
	12V Model	125mA



Non Vol Memory Commands	None	
Maximum Error in Reading	48V Model	+/-1.5A +/-3.2%
	24V Model	+/-3.0A +/-2.7%
	12V Model	+/-3.1A +/-2.1%
	of the largest output current of the paralleled units.	
Comments	The READ_ISHARE value indicates the output current of the unit outputting the largest current in a group of paralleled units with a commoned IShare signal.	

4.57 D2h READ_VOUT_BUTTON_ADJUST

Command Code	D2h
Command Name	READ_VOUT_BUTTON_ADJUST
SMBus Transaction Type	READ WORD
Number of Data Bytes	2
Data Format	Linear
Data Value	16d bit 2's compliment mantissa, (exponent = -10d)
Data Range	-32.0V to + 31.999V
Data Resolution	1/1024V



Non Vol Memory Commands	None. See below.
Default Setting	0.0V
Maximum Error in Output	The button adjust value does not add any extra error to the output voltage.
Comments	The purpose of the value is to allow users not using PMBus to be able to adjust the output voltage by using the front panel push buttons. The two push buttons can be used to adjust the output voltage when the output is enabled. The buttons are labelled **V▲** and **V▼**. Short presses for a fraction of a second adjust the output voltage at the output voltage setting resolution. If the button is held down, the rate of change increases to around 1V/s after 10s. If both buttons are pressed together, the button adjust value is cleared to zero. The new value is automatically stored in non volatile memory after a delay of 5s. The output voltage setting is clipped to the output voltage range (or VOUT_MAX) after the effect of VOUT_TRIM, margin and push button adjust have been included. The remote adjust pin overrides the output voltage setting and the clipping limits. See the MISC_CONFIG command to enable/disable the buttons or to clear the READ_VOUT_BUTTON_ADJUST value.

4.58 D3h MINIMUM_FAN_SPEED_RPM

Command Code	D3h
Command Name	MINIMUM_FAN_SPEED_RPM
SMBus Transaction Type	R/W WORD
Number of Data Bytes	2
Data Format	Linear
Data Value	5 bit 2’s compliment exponent + 11d bit 2’s compliment mantissa
Data Range	0 RPM to 32736 RPM
Data Resolution	32 RPM

S	E	E	E	E	S	M	M	M	M	M	M	M	M	M	M	M

Non Vol Memory Commands	RESTORE_DEFAULT_ALL, STORE_USER_ALL and RESTORE_USER_ALL.
Default Setting	8000 RPM
Maximum Error in Setting	62 RPM
Comments	The read exponent is always 5 but the command will accept any write exponent. This value allows the minimum fan speed to be set at a higher value. The higher airflow could be used for cooling other equipment.

Setting this value to a lower value will not slow the fans as a minimum drive level is maintained to keep the fans rotating.

4.59 D4h MISC_CONFIG

Command Code	D4h
Command Name	MISC_CONFIG
SMBus Transaction Type	R/W BYTE
Number of Data Bytes	1
Data Format	See below.

7	6	5	4	3	2	1	0

Non Vol Memory Commands	RESTORE_DEFAULT_ALL, STORE_USER_ALL and RESTORE_USER_ALL.
Default Setting	04h
Comments	Miscellaneous configuration bits.

Bit	Default	Function
Bit 7	0	1 = FANOK signal is high active.
Bit 6	0	1 = TEMPOK signal is high active.
Bit 5	0	1 = DCOK signal is high active.
Bit 4	0	1 = ACOK signal is high active.
Bit 3	0/1	1 = Disable Current Limit causing the Red LED to flash.
Bit 2	1	1 = Power up command on.
Bit 1	0	1 = Clear Vout button adjust value.
Bit 0	0	1 = Disable the push buttons.

Bits 7 to 4 configure the polarity of the output signals. A one bit sets high active and a zero bit sets low active.

Bit 3 Introduced in Software version 2.09. When the unit is used as a Rectifier the bit is set high to disable the warning flashing Red LED when the unit is operating in current limit. When the unit is used as a Front End the bit is set low to allow the warning Red LED to flash when the unit is operating in current limit.

Bit 2 configures the power up behaviour of the unit. A zero bit produces standard PMBus behaviour where if the unit is set to be controlled by the ‘ON’ part of the OPERATION command the unit will not automatically power up and provide output power. The unit will wait for an OPERATION command with the ‘ON’ bit set.

A one bit produces a more useful behaviour for rectifiers where if the unit has been configured to be controlled by the ‘ON’ part of the OPERATION command, the unit will power up and enable the main output automatically.

Bit 1 clears the READ_VOUT_BUTTON_ADJUST value. A one bit clears the value at the time of the command. If the buttons are pressed after the command, the value is changed. A zero bit does nothing. Pressing both buttons together also resets the value to zero.

Bit 0 enables/disables the front panel Vout adjust buttons. A zero bit enables the buttons. A one bit disables the buttons.

4.60 D5h SOFTWARE_VERSION

Command Code	D5h
Command Name	SOFTWARE_VERSION
SMBus Transaction Type	READ BLOCK
Number of Data Bytes	2 to 6
Data Format	Byte count N + Byte 1 + ... + Byte N
Data Values	Length + 1 to 5 text characters
Non Vol Memory Commands	None
Comments	This command always returns 5 characters to describe the software version programmed into the device. The two first characters show the major version, then a full stop (period) and then the last two characters shows the minor version. The first leading zero will be replaced by a space character but trailing zeros are included. e.g. ‘ 2.10’

4.61 D6h MODEL

Command Code	D6h
Command Name	MODEL
SMBus Transaction Type	READ BYTE
Number of Data Bytes	1
Data Format	Linear
Data Value	8 bit mantissa, (exponent = 0)
Data Range	0 to 255d
Data Resolution	1

M	M	M	M	M	M	M	M

Non Vol Memory Commands	None	
Default Value	48V Model	48d
	24V Model	24d
	12V Model	12d
Comments	This value indicates the hardware assemblies the unit is built from.	

4.62 D7h PART_NUMBER

Command Code	D7h
Command Name	PART_NUMBER
SMBus Transaction Type	READ BLOCK
Number of Data Bytes	2 to 17d
Data Format	Byte count N + Byte 1 + ... + Byte N
Data Values	length + 1 to 16d characters
Non Vol Memory Commands	None
Comments	The Unipower part number of the unit.

Appendix 1 - REVISION HISTORY

Rev. #	Description	Checked/ Approved by & Date
9	See PCO 45386.	CJM / 8-8-19

Appendix 2 – PRODUCT SUPPORT

Product support can be obtained using the following addresses and telephone numbers.

Corporate office:
UNIPOWER, LLC
210 N University Dr
Coral Springs, FL 33071
United States

Manufacturing facility:
UNIPOWER, LLC
65 Industrial Park Rd
Dunlap, TN 37327
United States

Manufacturing facility:
UNIPOWER Slovakia SRO
ZLATOVSKA 1279
Business Center 22
91105 Trencin, Slovakia

Phone: +1-954-346-2442
Toll Free: 1-800-440-3504
Web site – www.unipowerco.com

When contacting UNIPOWER, please be prepared to provide:

1. The product model number, spec number, S build number, and serial number - see the equipment nameplate on the front panel
2. Your company's name and address
3. Your name and title
4. The reason for the contact
5. If there is a problem with product operation:
   - Is the problem intermittent or continuous?
   - What revision is the firmware?
   - What actions were being performed prior to the appearance of the problem?
   - What actions have been taken since the problem occurred?