

The application note describes the PMBus™ digital communications protocol features of **D1U54T-M-1500-12-HUxC-xx** and **D1U54T-W-1500-12-HUxTC-xx** series power supplies.

### Standard PMBus™ characteristics

- Complies with PMBus™ Power Systems Management Protocol Part 1 – General Requirements Rev 1.2 including use of PEC (Packet Error Checking).
- Linear data format is used for all supported parameters unless noted.
- A minimum of 300µs delay between transactions (between the STOP of one command and the START of the next command) is required.
- 100KHz I<sup>2</sup>C communications is supported for the PMBus™ interface.

### Internal PSU Device Details

Power Supply Controllers			
Vendor	MFG Part Number	Package	Description
Texas Instruments	UCD3138128PFCR	TQFP80	(Secondary) 32-bit ARM7, 64Kx2 flash, 8K SRAM, -40C to 125C
Texas Instruments	UCD3138064RMH	QFN40	(Primary) 32-bit ARM7, 32Kx2 flash, 4K SRAM, -40C to 125C
Microchip	24AA512	SOIC8	Power Supply External 512kb EEPROM

### Device Addressing:

The following addresses can be assigned to the power module's internal slave devices by placing a pull-down resistor "Rn" from "APS" pin to output return as defined in the following table:

Power Supply Module's Internal Slave Device Serial Addresses		
Slave Device Address Options		Rn (ohm) connected between ASP and output return
Microcontroller	External EEPROM	
0xB0	0xA0	820
0xB2	0xA2	2700
0xB4	0xA4	5600
0xB6	0xA6	8200
0xB8	0xA8	15000
0xBA	0xAA	27000
0xBC	0xAC	56000
0xBE	0xAE	180000

Note: Leaving the APS pin unterminated will result in default address BE/AE being assigned; Resistor tolerance +/-5% or better

PMBus™ Command List: Pg. 0

Command Code	Command Name	Read / Write	# of Bytes	Byte Name	Bit(s) Number	Bit Name	Definition	Supported Y/N
00	PAGE	R/W Byte	1				Command to provide ability to configure, control & monitor multiple outputs Page 0 -> Main output Page 1 -> Standby output	YES
01	OPERATION	R/W Byte	1				Turn the power supply on/off 00h - to turn off 80h - to turn on The default value is 80h	YES
02	ON_OFF_CONFIG	Read Byte	1				Define ON/OFF config. Always read 1Dh	YES
03	CLEAR_FAULTS	Send Byte	0				Write only command clears all faults that have been set in all the STATUS_XXXX	YES
10	WRITE_PROTECT	R/W Byte	1				Data byte value = 1000 0000b => Disable all writes except to the WRITE_PROTECT command Data byte value = 0100 0000b => Disable all writes except to the WRITE_PROTECT, OPERATION, PAGE command Data byte value = 0000 0000b => Enable writes to all commands Default value: 00000000b	YES
19	CAPABILITY	Read Byte	1				This command provides a way for a host system to determine some key capabilities of a PMBus device. Always read B0h PEC supported, 400kHz bus speed, SMBALERT supported	YES
1B	SMBALERT_MASK	Write Word/Block Write - Read Process Call	2 / Variable				Used to prevent a warning or fault condition from asserting the SMB_ALERT signal. Support the following Status_x command code: 7A, 7B, 7C, 7D, 7E, 81	YES
20	VOUT_MODE	Read Byte	1				Single data byte sets the READ_VOUT sensor to linear mode data format and supplies N exponent; refer to <a href="#">linear mode details</a> for output voltage reading real world value determinations	NO
3A	FAN_CONFIG_1_2	Read Byte	1				Show the config of fan. Always read D0h Fan installed in position 1. Fan 1 commanded in RPM. 2 Tachometer pulses per revolution. No fan installed in position 2.	YES
3B	FAN_COMMAND_1	R/W Word	2				Manual fan override command fan speed value in RPM Command speed formatted in Linear	YES
40	VOUT_OV_FAULT_LIMIT	Read Byte	2				Output overvoltage fault threshold (13.9V)	NO
42	VOUT_OV_WARN_LIMIT	Read Byte	2				Output overvoltage warning threshold (13.1/12.6V)	NO
43	VOUT_UV_WARN_LIMIT	Read Byte	2				Output undervoltage warning threshold (11.4/11.7V)	NO
44	VSTBY_UV_FAULT_LIMIT	Read Byte	2				Output undervoltage fault threshold (10.5V)	NO
4F	OT_FAULT_LIMIT	Read Byte	2				Overtemperature fault threshold (65/58 degC)	NO
46	IOUT_OC_FAULT_LIMIT	R/W Word	2				Sets the value of the output current, in amperes, that causes the overcurrent detector to indicate an overcurrent fault condition (Main output latch off and IOUT_OC_F bit of STATUS_IOUT register is set). Default setting is 150A for high range input, 83.4A for low range input. Allowable limit range is 1A to 150A for high range input, 1A to 83.4A for low range input.	YES
4A	IOUT_OC_WARN_LIMIT	R/W Word	2				Sets the value of the output current, in amperes, that causes the overcurrent detector to indicate an overcurrent warning (Output keeps operating and IOUT_OC_W bit of STATUS_IOUT register is set). Warning status will be cleared when output current drops to 2A below the warning set threshold. Default setting is 137.5A for high range input, 76.5A for low range input. Allowable limit range is 1A to 137.5A for high range input, 1A to 76.5A for low range input.	YES
51	OT_WARN_LIMIT (Hot Spot)	R/W Word	2				Set the temperature, in degrees Celsius, of the unit at which it should indicate an Overtemperature Warning alarm. (Output keeps operating and TEMPERATURE_OT_W bit of STATUS_TEMPERATURE register is set). Warning status will be cleared when temperature drops to 10degC below the warning set threshold. Default setting is 98degC. Allowable limit range is 0 to 98degC.	YES
55	VIN_OV_FAULT_LIMIT	Read Byte	2				Input overvoltage fault threshold (323/322Vac for AC input, 405/401V for DC input)	NO

Command Code	Command Name	Read / Write	# of Bytes	Byte Name	Bit(s) Number	Bit Name	Definition	Supported Y/N
57	VIN_OV_WARN_LIMIT	Read Byte	2				: Input overvoltage warning threshold (305/302Vac for AC input , 400/397V for DC input)	NO
58	VIN_UV_WARN_LIMIT	Read Byte	2				Input undervoltage fault threshold (83/87Vac for low range AC input, 165/174Vac for high range AC input, 180/186V for DC input)	NO
59	VIN_UV_FAULT_LIMIT	Read Byte	2				Input undervoltage warning threshold (80/86Vac for AC input, 160/170V for DC input)	NO
5D	IIN_OC_WARN_LIMIT	R/W Word	2				Sets the value of the input current, in amperes, that causes a warning that the input current is high (Output keeps operating and IIN_OC_W bit of STATUS_INPUT register is set). Warning status will be cleared when input current drops to 1A below the warning set threshold. Default setting is 17.5A. Allowable limit range is 0 to 17.5A.	YES
6A	POUT_OP_WARN_LIMIT	R/W Word	2				Sets the value of the output power, in watts, that causes a warning that the output power is high (Output keeps operating and POUT_OP_W bit of STATUS_IOUT register is set). Warning status will be cleared when output power drops to 50W below the warning set threshold. Default setting is 1600W for high range input, 892W for low range input. Allowable limit range is 0W to 1600W for high range input, 0W to 892W for low range input.	YES
6B	PIN_OP_WARN_LIMIT	R/W Word	2				Sets the value of the input power, in watts, that causes a warning that the input power is high (Output keeps operating and PIN_OP_W bit of STATUS_INPUT register is set). Warning status will be cleared when input power drops to 50W below the warning set threshold. Default setting is 1850W for high range input, 1030W for low range input. Allowable limit range is 0W to 1850W for high range input, 0W to 1030W for low range input.	YES
78	STATUS_BYTE	Read Byte	1	STATUS_BYTE (Lower byte of STATUS_WORD)	7	BUSY_F	Asserted when device busy and unable to respond fault	NO
					6	UNIT_OFF	Asserted when unit not providing power to the output	YES
					5	OUTPUT_OV_F	Asserted when an output overvoltage fault has occurred	YES
					4	OUTPUT_OC_F	Asserted when an output overcurrent fault has occurred	YES
					3	INPUT_UV_F	Asserted when an input undervoltage fault has occurred	YES
					2	TEMPERATURE_F_W	Asserted when an overtemperature fault or warning has occurred	YES
					1	CML_F	Asserted when a communications, memory, or logic fault has occurred	YES
					0	NONE_F_W	Asserted when a fault not listed in [7:1] occurred	YES
79	STATUS_WORD	Read Word	2	STATUS_BYTE (Lower byte of STATUS_WORD)	7	BUSY_F	Asserted when device busy and unable to respond fault	NO
					6	UNIT_OFF	Asserted when unit not providing power to the output	YES
					5	OUTPUT_OV_F	Asserted when an output overvoltage fault has occurred	YES
					4	OUTPUT_OC_F	Asserted when an output overcurrent fault has occurred	YES
					3	INPUT_UV_F	Asserted when an input undervoltage fault has occurred	YES
					2	TEMPERATURE_F_W	Asserted when an overtemperature fault or warning has occurred	YES
					1	CML_F	Asserted when a communications, memory, or logic fault has occurred	YES
					0	NONE_F_W	Asserted when a fault not listed in [7:1] occurred	YES
				STATUS_WORD (Upper byte of STATUS_WORD)	7	VOUT_F_W	Asserted when an output voltage fault or warning has occurred	YES
					6	IOUT_POUT_F_W	Asserted when an output current / output power fault or warning has occurred	YES
					5	INPUT_F_W	Asserted when an Input voltage/current/power fault or warning has occurred	YES
					4	MFG_SPECIFIC_F_W	Manufacturer specific fault or warning has occurred	NO
					3	POWER_GOOD_L	Asserted when the POWER_GOOD signal is negated	YES
					2	FANS_F_W	Asserted when a fan fault or warning has occurred	YES
					1	STATUS_OTHER_F_W	Asserted when a bit in command STATUS_OTHER set	NO
0	UNKNOWN_F_W	Asserted when a fault not listed in [15:1] has occurred	Yes					

Command Code	Command Name	Read / Write	# of Bytes	Byte Name	Bit(s) Number	Bit Name	Definition	Supported Y/N
7A	STATUS_VOUT	R/W Byte	1		7	VOUT_OV_F	Asserted when an output overvoltage fault has occurred	YES
					6	VOUT_OV_W	Asserted when an output overvoltage warning has occurred	YES
					5	VOUT_UV_W	Asserted when an output undervoltage warning has occurred	YES
					4	VOUT_UV_F	Asserted when an output undervoltage fault has occurred	YES
					3	VOUT_MAX_F	Asserted when the output is set higher than the commanded VOUT_MAX limit	NO
					2	TON_MAX_F	Asserted when the output turn-on timing has exceeded the TON_MAX fault timing	NO
					1	TON_MAX_W	Asserted when the output turn-on timing has exceeded the TON_MAX warning timing	NO
					0	VOUT_TRACKING_E	Asserted when an error in the output voltage during power-up/down has occurred	NO
7B	STATUS_IOUT	R/W Byte	1		7	IOUT_OC_F	Asserted when an output overcurrent fault has occurred	YES
					6	IOUT_OC_SHUTDOWN	Asserted when an output overcurrent and low voltage shutdown fault has occurred	NO
					5	IOUT_OC_W	Asserted when an output overcurrent warning has occurred	YES
					4	IOUT_UC_W	Asserted when an output undercurrent warning has occurred	NO
					3	CURRENT_SHARE_F	Asserted when an output current share fault has occurred	NO
					2	POWER_LIMIT_MODE	Asserted when the unit has entered output power limiting mode	NO
					1	POUT_OP_F	Asserted when an output overpower fault has occurred	YES
					0	POUT_OP_W	Asserted when an output overpower warning has occurred	YES
7C	STATUS_INPUT	R/W Byte	1		7	VIN_OV_F	Asserted when an input overvoltage fault has occurred (For D1U54T-M-1500-12-HUxC, Vin > 323Vac/405Vdc. For D1U54T-W-1500-12-HUxTC, Vin > 300Vac/310Vdc)	YES
					6	VIN_OV_W	Asserted when an input overvoltage warning has occurred	YES
					5	VIN_UV_W	Asserted when an input undervoltage warning has occurred	YES
					4	VIN_UV_F	Asserted when an input undervoltage fault has occurred	YES
					3	VIN_UV_OFF	Asserted when the Unit is OFF for insufficient input voltage	YES
					2	IIN_OC_F	Asserted when an input overcurrent fault has occurred	NO
					1	IIN_OC_W	Asserted when an input overcurrent warning has occurred	YES
					0	PIN_OP_W	Asserted when an input overpower warning has occurred	YES
7D	STATUS_TEMPERATURE	R/W Byte	1		7	TEMPERATURE_OT_F	Asserted when an overtemperature fault has occurred	YES
					6	TEMPERATURE_OT_W	Asserted when an overtemperature warning has occurred	YES
					5	TEMPERATURE_UT_W	Asserted when an undertemperature warning has occurred	NO
					4	TEMPERATURE_UT_F	Asserted when an undertemperature fault has occurred	NO
					3	RESERVED	Reserved	NO
					2	RESERVED	Reserved	NO
					1	RESERVED	Reserved	NO
					0	RESERVED	Reserved	NO
7E	STATUS_CML	R/W Byte	1		7	CML_COMMAND_E	Asserted when an invalid or unsupported command is received	YES
					6	CML_DATA_E	Asserted when invalid or unsupported data is received	YES
					5	CML_PEC_E	Asserted when a packet error checking (PEC) failed has occurred	YES
					4	CML_MEMORY_F	Asserted when a memory fault is detected (example: Checksum errors during bootloader)	NO
					3	CML_PROCESSOR_F	Asserted when a processor fault is detected	NO
					2	RESERVED	Reserved	NO
					1	COMMS_F	Asserted when an internal communication fault has occurred	YES
					0	CML_OTHER_F	Asserted when another memory or logic fault has occurred (example: UART error)	NO
81	STATUS_FANS_1_2	R/W Byte	1		7	FAN_1_F	Fan 1 fault	YES
					6	FAN_2_F	Fan 2 fault	NO
					5	FAN_1_W	Fan 1 warning	YES
					4	FAN_2_W	Fan 2 warning	NO
					3	FAN_1_OVERRIDE	Fan 1 speed overridden	YES
					2	FAN_2_OVERRIDE	Fan 2 speed overridden	NO
					1	FAN_AIRFLOW_F	Airflow fault	NO
					0	FAN_AIRFLOW_W	Airflow warning	NO
88	READ_VIN	Read Word	2				Input Voltage Sensor Reading in Vdc PMBus Data Format : Linear PMBus Resolution: 0.25Vdc Full-scale : 511Vdc Accuracy: +/-2%	YES

Command Code	Command Name	Read / Write	# of Bytes	Byte Name	Bit(s) Number	Bit Name	Definition	Supported Y/N
89	READ_IIN	Read Word	2				Input Current Sensor Reading in Arms PMBus Data Format : Linear PMBus Resolution: 1mA Full-scale : 28.2A Accuracy: +/-5% @>20% load	YES
8A	READ_VCAP	Read Word	2				Bulk Capacitor Voltage Sensor Reading in Vdc PMBus Data Format : Linear PMBus Resolution: 0.1Vdc Full-scale : 511 Vdc Accuracy: +/-2%	YES
8B	READ_VOUT	Read Word	2				Output Voltage Sensor Reading in Vdc PMBus Data Format : Linear PMBus Resolution: 0.00195Vdc Full-scale : 16 Vdc Accuracy: +/-2%	YES
8C	READ_IOUT	Read Word	2				Output Current Sensor Reading in Adc PMBus Data Format : Linear PMBus Resolution: 0.0625A Full-scale : 226A Accuracy: +/-5% @>20% load	YES
8D	READ_TEMPERATURE_1	Read Word	2				Temperature Sensor reading in °C PMBus Data Format : Linear (N = -3) PMBus Resolution: 0.125 °C Range : -128°C to 128°C Accuracy: +/-3°C	YES
8E	READ_TEMPERATURE_2	Read Word	2				Temperature Sensor reading in °C PMBus Data Format : Linear (N = -3) PMBus Resolution: 0.125 °C Range : -128°C to 128°C Accuracy: +/-3°C	YES
8F	READ_TEMPERATURE_3	Read Word	2				Temperature Sensor reading in °C PMBus Data Format : Linear (N = -3) PMBus Resolution: 0.125 °C Range : -128°C to 128°C Accuracy: +/-3°C	YES
90	READ_FAN_SPEED_1	Read Word	2				Fan Speed Sensor reading in RPM PMBus Sensor Data Format : Linear (N = 5 RPM_MAX <= 32736) PMBus Sensor Resolution: 32 RPM (N=5) Full-scale : 32736 RPM Accuracy: +/-500RPM of full-speed	YES
96	READ_POUT	Read Word	2				Output Power Sensor reading in watts PMBus Data Format : Linear PMBus Resolution: 0.25 Watts Full-scale : 4092W Accuracy: +/-5% @>20% load	YES
97	READ_PIN	Read Word	2				Input Power Sensor reading in watts PMBus Data Format : Linear PMBus Resolution: 0.25 Watts Full-scale : 4092W Accuracy: +/-5% @>20% load	YES
98	PMBUS_REVISION	Read Byte	1				Reading of the PMBus revision to which the power supply is compliant Always read 22h	YES
99	MFR_ID	Block Read	1+9				Manufacturer's ID (ASCII code): Murata-PS	YES
9A	MFR_MODEL		1+22				Manufacturer's Model Number (ASCII code) : D1U54T-M-1500-12-HU4C (M5803) or D1U54T-M-1500-12-HU3C (M5804) or D1U54T-W-1500-12-HU4TC (M5808) or D1U54T-W-1500-12-HU3TC (M5809)	YES
9B	MFR_REVISION		1+14				Manufacturer's model revision (ASCII code). XXXX-YYYY-0000 XXXX - Primary FW version/revision, YYYY- Secondary FW version/revision	YES
9C	MFR_LOCATION		1+5				Identify the facility that manufactured the unit (ASCII code) : China	YES
9D	MFR_DATE		1+4				Identify the unit's date of manufacture (ASCII code: YYWW, e.g. 1935, 19-> year, 35 -> week)	YES

Command Code	Command Name	Read / Write	# of Bytes	Byte Name	Bit(s) Number	Bit Name	Definition	Supported Y/N
9E	MFR_SERIAL	Block Read	1+12				Serial Number : S5YYWRR**** MPS 12-digit serial number	YES
A0	MFR_VIN_MIN	Read Word	2				Minimum rated value of the input voltage = 90Vrms. Always read F8B4h	YES
A1	MFR_VIN_MAX	Read Word	2				For D1U54T-M-1500-12-HUxC, Maximum rated value of the input voltage = 305Vrms Always read FA62h. For D1U54T-W-1500-12-HUxTC, Maximum rated value of the input voltage = 264Vrms Always read FA10h.	YES
A2	MFR_IIN_MAX	Read Word	2				Maximum rated value of the input current = 10 Amps (High line AC or DC input) / 11Amps (Low line AC input). Always read D280h (High line AC or DC input) / D2C0h (Low line AC input).	YES
A3	MFR_PIN_MAX	Read Word	2				Maximum rated value of the input power = 1700 W (High line AC or DC input) / 1000 W (Low line AC input). Always read 0B52h (High line AC or DC input) / 03E8h (Low line AC input).	YES
A4	MFR_VOUT_MIN	Read Word	2				Minimum rated value of the output voltage = 11.64V. Always read D2E9h.	YES
A5	MFR_VOUT_MAX	Read Word	2				Maximum rated value of the output voltage = 12.36V. Always read D317h.	YES
A6	MFR_IOUT_MAX	Read Word	2				Maximum rated value of the output current = 125A (High line AC or DC input) / 69.5A (Low line AC input). Always read EBE8h (High line AC or DC input) / EA2Ch (Low line AC input).	YES
A7	MFR_POUT_MAX	Read Word	2				Maximum rated value of the output power = 1500W (High line AC or DC input) / 836W (Low line AC input). Always read 0AEEh (High line AC or DC input) / 0344h (Low line AC input).	YES
A8	MFR_TAMBIENT_MAX	Read Word	2				Maximum ambient temperature 45degC. Always read E2D0h	YES
A9	MFR_TAMBIENT_MIN	Read Word	2				Minimum ambient temperature: -5degC. Always read CD80h	YES
AA	MFR_EFFICIENCY_LL	Block Read	1+14				Retrieves information about the efficiency of the device while operating at a low line condition. Vin =115V, LP = 167W, Leff = 92%, MP = 418W, Meff = 94%, HP = 836W, Heff = 90%. Always read 0x98, 0xEB, 0x4E, 0xF9, 0xE0, 0xEA, 0xA2, 0x01, 0xF0, 0xEA, 0xA2, 0x09, 0xD0, 0xEA	YES
AB	MFR_EFFICIENCY_HL	Block Read	1+14				Retrieves information about the efficiency of the device while operating at a high line condition. Vin =230V, LP = 300W, Leff = 94%, MP = 750W, Meff = 96%, HP = 1500W, Heff = 91%. Always read 0x98, 0xF3, 0x58, 0xFA, 0xF0, 0xEA, 0xEE, 0x02, 0x00, 0xEB, 0xEE, 0x0A, 0xD8, 0xEA	YES
D0	READ_VOUT2	Read Word	2				Standby Output Voltage Sensor Reading in Vdc PMBus Data Format : Linear (N=-6) PMBus Resolution: 0.01563Vdc Full-scale : 16 Vdc Accuracy: +/-2%	YES
D1	READ_IOUT2	Read Word	2				Standby Output Current Sensor Reading in Adc PMBus Data Format : Linear (N=-7) PMBus Resolution: 0.00781A Full-scale : 8A Accuracy: +/-5% @>20% load	YES
D2	READ_POUT2	Read Word	2				Standby Output Power Sensor reading in watts PMBus Data Format : Linear (N=-5) PMBus Resolution: 0.03125W Full-scale : 32W Accuracy: +/-5% @>20% load	YES

Command Code	Command Name	Read / Write	# of Bytes	Byte Name	Bit(s) Number	Bit Name	Definition	Supported Y/N
D3	VSB_STATUS_WORD	Read Word	2	STATUS_BYTE (Lower byte of STATUS_WORD)	7	BUSY_F	Asserted when device busy and unable to respond fault	NO
					6	UNIT_OFF	Asserted when unit not providing power to the output	YES
					5	VSB_VOUT_OV_F	Asserted when an output overvoltage fault has occurred	YES
					4	VSB_IOUT_OC_F	Asserted when an output overcurrent fault has occurred	YES
					3	INPUT_UV_F	Asserted when an input undervoltage fault has occurred	YES
					2	TEMPERATURE_F_W	Asserted when an overtemperature fault or warning has occurred	YES
					1	CML_F	Asserted when a communications, memory, or logic fault has occurred	YES
				0	NONE_F_W	Asserted when a fault not listed in [7:1] occurred	YES	
				STATUS_WORD (Upper byte of STATUS_WORD)	7	VSB_VOUT_F_W	Asserted when an output voltage fault or warning has occurred	YES
					6	VSB_IOUT_POUT_F_W	Asserted when an output current / output power fault or warning has occurred	YES
					5	INPUT_F_W	Asserted when an Input voltage/current/power fault or warning has occurred	YES
					4	MFG_SPECIFIC_F_W	Manufacturer specific fault or warning has occurred	NO
					3	POWER_GOOD_L	Asserted when the POWER_GOOD signal is negated	YES
					2	FANS_F_W	Asserted when a fan fault or warning has occurred	YES
					1	STATUS_OTHER_F_W	Asserted when a bit in command STATUS_OTHER set	NO
0	UNKNOWN_F_W	Asserted when a fault not listed in [15:1] has occurred	Yes					
D4	VSB_STATUS_VOUT	R/W Byte	1		7	VSB_VOUT_OV_F	Asserted when an output overvoltage fault has occurred	YES
					6			NO
					5			NO
					4	VSB_VOUT_UV_F	Asserted when an output undervoltage fault has occurred	YES
					3			NO
					2			NO
					1			NO
					0			NO
D5	VSB_STATUS_IOUT	R/W Byte	1		7	VSB_IOUT_OC_F	Asserted when an output overcurrent fault has occurred	YES
					6			NO
					5	VSB_IOUT_OC_W	Asserted when an output overcurrent warning has occurred	YES
					4			NO
					3			NO
					2			NO
					1			NO
0			NO					
D6	SEC_BL_FW_REVISION	Read Word	2				SEC Bootloader FW Revision = MM.mm Bit 0~7: Major Revision (MM); Bit8~15: Minor Revision (mm)	YES
D7	SEC_APP_FW_REVISION	Read Word	2				SEC Application FW Revision = MM.mm Bit 0~7: Major Revision (MM); Bit8~15: Minor Revision (mm)	YES
D8	Optn_Time_Total	Block Read	1+4				This is a read of the Total Power ON Seconds (POS) the PSU has been powered on and delivering energy to the main output since it was manufactured. The register must increment in seconds while the main output is delivering energy. When the main output is not delivering energy the PSU must hold the current value. Time accuracy must be within +-5%. For example the returned value of 70 73 00 00 represents 29552s.	YES
D9	Optn_Time_Present	Block Read	1+4				This is a read of Total Power ON Seconds (POS) since the PSU has been powered on and delivering energy to the main output since it was last started. This value must be reset to Zero when the main output of the PSU is started. The register must increment in seconds while the main outputs is delivering energy. When the main output is not delivering energy the PSU must hold the current value. Time Accuracy must be within +-5%.	YES
DA	READ_IOUT1_ISHARE	Read Word	2				Main Output Current Share voltage PMBus Data Format : Linear (N=-6) PMBus Resolution: 0.01563Vdc Full-scale : 16 Vdc Accuracy: +/-5% @>20% load	YES
DC	PRI_BL_FW_REVISION	Read Word	2				PRI Bootloader FW Revision = MM.mm Bit 0~7: Major Revision (MM); Bit8~15: Minor Revision (mm)	YES
DD	PRI_APP_FW_REVISION	Read Word	2				PRI Application FW Revision = MM.mm Bit 0~7: Major Revision (MM); Bit8~15: Minor Revision (mm)	YES
DE	HOT_STANDBY	R/W Word	2		15~3	RESERVED	Reserved	NO
					2	HS Status	0 = Not Activated; 1 = Activated	YES

				1	HS Enable Line	0 = Low; 1 = High	YES
				0	HS Select	0 = Disable (Default); 1 = Enable	YES

Command Code	Command Name	Read / Write	# of Bytes	Byte Name	Bit(s) Number	Bit Name	Definition	Supported Y/N
DF	POWER_SUPPLY_CONTROL	R/W Word	2		15~3	RESERVED	Reserved	NO
					2	EEPROM write protect control	0 = Enable write protect (Default); 1 = Disable write protect	YES
					1	SMBAlert control	0 = Disable SMB_ALERT_L (Default) ; 1 = Enable SMB_ALERT_L	YES
					0	Disable Fan	0 = Don't disable fan (Default); 1 = Disable fan	YES
E0	MFR_VOUT2_MIN	Read Word	2				Minimum rated value of the output voltage = 3.135V. Always read C323h.	YES
E1	MFR_VOUT2_MAX	Read Word	2				Maximum rated value of the output voltage = 3.465V. Always read C377h.	YES
E2	MFR_IOUT2_MAX	Read Word	2				Maximum rated value of the output current = 5A. Always read CA80h.	YES
E3	MFR_POOUT2_MAX	Read Word	2				Maximum rated value of the output power = 16.5W. Always read DA10h.	YES
E4 - FA	Reserve for manufacturer use							
FB	MFR_BLACK_BOX	Write Word	2				<p>Data is saved to the Black Box for the following fault events:</p> <ul style="list-style-type: none"> <li>·General fault</li> <li>·Over voltage on output</li> <li>·Over current on output</li> <li>·Loss of AC input</li> <li>·Input voltage fault</li> <li>· Over temperature</li> </ul> <p>It should be organized as a 5 pages shift register. Page 0 record the latest failure. The history can be read via PMBus command (FBh)</p> <p>Write a key (55AAh) in FBh register to clear history log.</p> <p>Write format: AddrW FBh AAh 55h PEC</p>	YES
FB	MFR_BLACK_BOX	Block write block read process call	1+41				<p>Read format: AddrW FBh ByteCnt(1) FailurePage(0-4) AddrR ByteCnt(41) Data0 Data1 .....Data40 PEC</p> <p>Data0: FailurePage Data1:2 STATUS_WORD(79h) Data3 V1_Status_Vout(7Ah) Data4 V1_Status_Iout(7Bh) Data5:6 Vsb_Status_Word(D3h) Data7 Vsb_Status_Vout(D4h) Data8 Vsb_Status_Iout(D5h) Data9 Status_Input(7Ch) Data10 Status_Temp(7Dh) Data11 Status_CML(7Eh) Data12 Status_Fans_12(81h) Data13:14 Read_Vin(88h) Data15:16 Read_Iin(89h) Data17:18 Read_Vout(8Bh) Data19:20 Read_Iout(8Ch) Data21:22 Read_Temp1(8Dh) Data23:24 Read_Temp2(8Eh) Data25:26 Read_Temp3(8Fh) Data27:28 Read_FanSpeed1(90h) Data29:30 Pri_Code_Version(DDh) Data31:32 Sec_Code_Version(D7h) Data33:36 Optn_Time_Total(D8h) Data37:40 Optn_Time_Present(D9h)</p>	YES



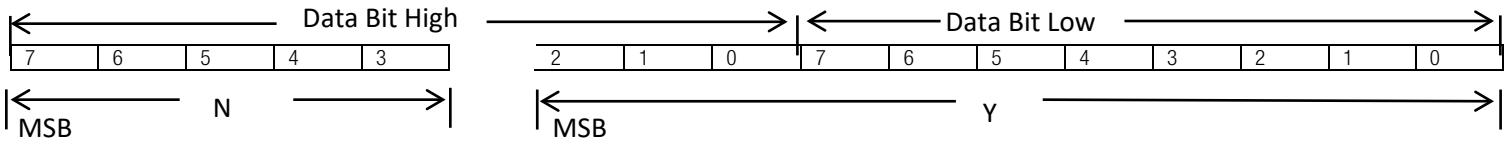
PMBus™ Command List: Pg. 1

Command Code	Command Name	Read / Write	# of Bytes	Byte Name	Bit(s) Number	Bit Name	Definition	Supported Y/N
00-3B	Same as page 0							
46	IOUT_OC_FAULT_LIMIT	R/W Word	2				Sets the value of the output current, in amperes, that causes the overcurrent detector to indicate an overcurrent fault condition. (Standby output latch off and VSB_IOUT_OC_F bit of VSB_STATUS_IOUT register is set). Default setting is 3A. Allowable limit range is 0.1A to 3A.	YES
4A	IOUT_OC_WARN_LIMIT	R/W Word	2				Sets the value of the output current, in amperes, that causes the overcurrent detector to indicate an overcurrent warning. (Output keeps operating and VSB_IOUT_OC_W bit of VSB_STATUS_IOUT register is set). Warning status will be cleared when output current drops to 0.1A below the warning set threshold. Default setting is 2.2A. Allowable limit range is 0.1A to 2.2A.	YES
51	Same as page 0							
5D	Same as page 0							
6A-6B	Same as page 0							
78	STATUS_BYTE	Read Byte	1	STATUS_BYTE (Lower byte of STATUS_WORD)	7	BUSY_F	Asserted when device busy and unable to respond fault	NO
					6	UNIT_OFF	Asserted when unit not providing power to the output	YES
					5	VSB_VOUT_OV_F	Asserted when an output overvoltage fault has occurred	YES
					4	VSB_IOUT_OC_F	Asserted when an output overcurrent fault has occurred	YES
					3	INPUT_UV_F	Asserted when an input undervoltage fault has occurred	YES
					2	TEMPERATURE_F_W	Asserted when an overtemperature fault or warning has occurred	YES
					1	CML_F	Asserted when a communications, memory, or logic fault has occurred	YES
79	STATUS_WORD	Read Word	2	STATUS_BYTE (Lower byte of STATUS_WORD)	0	NONE_F_W	Asserted when a fault not listed in [7:1] occurred	YES
					7	BUSY_F	Asserted when device busy and unable to respond fault	NO
					6	UNIT_OFF	Asserted when unit not providing power to the output	YES
					5	VSB_VOUT_OV_F	Asserted when an output overvoltage fault has occurred	YES
					4	VSB_IOUT_OC_F	Asserted when an output overcurrent fault has occurred	YES
					3	INPUT_UV_F	Asserted when an input undervoltage fault has occurred	YES
					2	TEMPERATURE_F_W	Asserted when an overtemperature fault or warning has occurred	YES
				1	CML_F	Asserted when a communications, memory, or logic fault has occurred	YES	
				0	NONE_F_W	Asserted when a fault not listed in [7:1] occurred	YES	
				STATUS_WORD (Upper byte of STATUS_WORD)	7	VSB_VOUT_F_W	Asserted when an output voltage fault or warning has occurred	YES
					6	VSB_IOUT_POUT_F_W	Asserted when an output current / output power fault or warning has occurred	YES
					5	INPUT_F_W	Asserted when an Input voltage/current/power fault or warning has occurred	YES
					4	MFG_SPECIFIC_F_W	Manufacturer specific fault or warning has occurred	NO
					3	POWER_GOOD_L	Asserted when the POWER_GOOD signal is negated	YES
2	FANS_F_W	Asserted when a fan fault or warning has occurred	YES					
1	STATUS_OTHER_F_W	Asserted when a bit in command STATUS_OTHER set	NO					
7A	VSB_STATUS_VOUT	R/W Byte	1		0	UNKNOWN_F_W	Asserted when a fault not listed in [15:1] has occurred	NO
					7	VSB_VOUT_OV_F	Asserted when an output overvoltage fault has occurred	YES
					6			NO
					5			NO
					4	VSB_VOUT_UV_F	Asserted when an output undervoltage fault has occurred	YES
					3			NO
					2			NO
					1			NO
7B	VSB_STATUS_IOUT	R/W Byte	1		0			NO
					7	VSB_IOUT_OC_F	Asserted when an output overcurrent fault has occurred	YES
					6			NO
					5	VSB_IOUT_OC_W	Asserted when an output overcurrent warning has occurred	YES
					4			NO
					3			NO
					2			NO
					1			NO
7C-89	Same as page 0							

Command Code	Command Name	Read / Write	# of Bytes	Byte Name	Bit(s) Number	Bit Name	Definition	Supported Y/N
8B	READ_VOUT2	Read Word	2				Standby Output Voltage Sensor Reading in Vdc PMBus Data Format : Linear (N=-6) PMBus Resolution: 0.01563Vdc Full-scale : 16 Vdc Accuracy: +/-2%	YES
8C	READ_IOUT2	Read Word	2				Standby Output Current Sensor Reading in Adc PMBus Data Format : Linear (N=-7) PMBus Resolution: 0.00781A Full-scale : 8A Accuracy: +/-5% @>20% load	YES
8D-90	Same as page 0							
96	READ_POUT2	Read Word	2				Standby Output Power Sensor reading in watts PMBus Data Format : Linear (N=-5) PMBus Resolution: 0.03125W Full-scale : 32W Accuracy: +/-5% @>20% load	YES
97-A3	Same as page 0							
A4	MFR_VOUT2_MIN	Read Word	2				Minimum rated value of the output voltage = 3.135V. Always read C323h.	YES
A5	MFR_VOUT2_MAX	Read Word	2				Maximum rated value of the output voltage = 3.465V. Always read C377h.	YES
A6	MFR_IOUT2_MAX	Read Word	2				Maximum rated value of the output current = 5A. Always read CA80h.	YES
A7	MFR_POUT2_MAX	Read Word	2				Maximum rated value of the output power = 16.5W. Always read DA10h.	YES
A7 - FF	Same as page 0							

### Linear Data Format

Telemetry sensor and output voltage readings follow linear format as defined by PMBus Power System Mgt Protocol Specification – Part II – Revision 1.2 (summarized below)



The Relationship between Y, N and the “real world” value is:

$$X = Y \cdot 2^N$$

Where, as described above:

- X is the “real world” value;
- Y is an 11 bit, two’s compliment integer; and
- N is a 5 bit, two’s compliment integer.

Link back to [VOUT MODE](#) command list

