

# PEC2000-54-074NA

## AC-DC CRPS Front-End Power Supply

PEC2000-54-074NA is a 2000 Watt, CRPS AC to DC switching power supply module with a +54.5 V single DC output. The power supply operates as a single supply, or N+1 parallel configuration. PEC2000-54-074NA utilizes full digital control architecture for greater efficiency, control and functionality.

This power supply meets international safety standards and displays the CE-Mark for the European Low Voltage Directive (LVD).



### Key Features & Benefits

- Input Voltage Range 90 – 136 / 180 – 264 VAC; 180 – 310 VDC
- Single Output Voltage +54.5 VDC
- Output Power up to 2000 W
- Intel Standard CRPS Form Factor
- Dimensions: 185 x 73.5 x 40 mm (7.28 x 2.89 x 1.57 in)
- High Power Density
- UL/CSA 62368-1, EN/IEC 62368-1 Certified
- Supports N+1 Redundancy, Internal ORing
- Clockwise and Counter-Clockwise Fan Rotation
- Supports Power Management Bus Communication Protocol

### Applications

- Networking Switches
- Servers & Routers
- Telecommunications



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Please read our datasheet & drawing disclaimer [here](#).

## 1 ORDERING INFORMATION

| PEC            | 2000        | -    | 54        | -    | 074     | N         | A     |
|----------------|-------------|------|-----------|------|---------|-----------|-------|
| Product Family | Power Level | Dash | V1 Output | Dash | Width   | Airflow   | Input |
| PEC Front-Ends | 2000 W      |      | 54.5 V    |      | 73.5 mm | N: Normal | A: AC |

## 2 INPUT

| PARAMETER              | DESCRIPTION / CONDITION                                      | MIN  | NOM     | MAX | UNIT             |
|------------------------|--------------------------------------------------------------|------|---------|-----|------------------|
| Input Voltage Ranges   | Low Line Voltage AC Range (1000 W)                           | 90   | 100-127 | 136 | V <sub>RMS</sub> |
|                        | Start-up (V <sub>BROWN_IN</sub> )                            | 85   |         | 90  | VAC              |
|                        | Power Off (V <sub>BROWN_OUT</sub> )                          | 75   |         | 85  | VAC              |
|                        | High Line Voltage AC Range (2000 W)                          | 180  | 200-240 | 264 | V <sub>RMS</sub> |
|                        | HVDC (2000 W)                                                | 180  | 240     | 310 | VDC              |
|                        | Start-up (V <sub>BROWN_IN</sub> )                            | 170  |         | 180 | VDC              |
|                        | Power Off (V <sub>BROWN_OUT</sub> )                          | 160  |         | 170 | VDC              |
| Input Current          | AC Low Line                                                  |      |         | 13  |                  |
|                        | AC High Line                                                 |      |         | 10  | A <sub>RMS</sub> |
|                        | HVDC                                                         |      | 10      |     |                  |
| AC Line Inrush Current | for up to 1/4 of the AC cycle                                |      |         | 55  | A <sub>pk</sub>  |
| Input Frequency        |                                                              | 47   | 50/60   | 63  | Hz               |
| Power Factor           | 230 VAC and 115 VAC / 50/60 Hz, 20% load                     | 0.75 |         |     |                  |
|                        | 230 VAC and 115 VAC / 50/60 Hz, 50% load                     | 0.90 |         |     |                  |
|                        | 230 VAC and 115 VAC / 50/60 Hz, 100% load                    | 0.97 |         |     |                  |
| Efficiency             | 230 VAC / 50 Hz, 20% load                                    | 90   |         |     | %                |
|                        | 230 VAC / 50 Hz, 50% load                                    | 94   |         |     | %                |
|                        | 230 VAC / 50 Hz, 100% load                                   | 91   |         |     | %                |
| Hold-up Time           | 80% of rated load                                            | 12   |         |     | ms               |
| AC Line Sag            | 0 to 1/2 AC cycle (nom AC voltage ranges, 50/60 Hz)          |      |         | 95  | %                |
|                        | No loss of function or performance.                          |      |         |     |                  |
|                        | > 1 AC cycle (nom AC voltage ranges, 50/60 Hz)               | 30   |         |     | %                |
| AC Line Surge          | Loss of function acceptable, self-recoverable (0 ~ 50% load) |      |         |     |                  |
|                        | Continuous (nom AC voltage ranges, 50/60 Hz)                 |      |         | 10  | %                |
|                        | No loss of function or performance                           |      |         |     |                  |
| AC Line Isolation      | 0 to 1/2 AC cycle (mid-point of nom VAC ranges, 50/60 Hz)    |      |         | 30  | %                |
|                        | No loss of function or performance                           |      |         |     |                  |
| AC Line Isolation      | Primary to secondary; reinforced insulation per IEC 62368-1  | 3000 |         |     | VAC              |
|                        |                                                              | 4242 |         |     | VDC              |

Notes: The Brown IN/OUT Hysteresis min is 3 VAC.

1. Maximum input current at low input voltage range shall be measured at 90 VAC, at max load.

2. Maximum input current at high input voltage range shall be measured at 180 VAC, at max load.

3. This requirement is not to be used for determining agency input current markings.



### 3 OUTPUT

| PARAMETER                   | DESCRIPTION / CONDITION                                                              | MIN     | NOM   | MAX     | UNIT             |
|-----------------------------|--------------------------------------------------------------------------------------|---------|-------|---------|------------------|
| Output Voltage <sup>1</sup> |                                                                                      |         | 54.5  |         | VDC              |
| Voltage Regulation Limits   | ± 3 % tolerance                                                                      | +52.865 | +54.5 | +56.135 | V <sub>RMS</sub> |
| Max Continuous Output Power | Low line: 1000 W                                                                     |         |       | 2000    | W                |
| Output Current              | @ 90 – 136 VAC                                                                       | 0       |       | 18.35   | A                |
|                             | @ 180 – 220 VAC / 180 – 220 VDC                                                      | 0       |       | 29.36   |                  |
|                             | (see power derating curve 1)                                                         |         |       |         |                  |
|                             | @ 220 – 264 VAC / 220 – 310 VDC                                                      | 0       |       | 36.70   |                  |
| Transient Load              | Δ Step Load Size, 60% of max. load, 1000 μF                                          |         |       | 0.5     | A/μs             |
| Dynamic Load                | @ +54.5 V min loading is 10% of max load<br>Voltage regulation limit tolerance ± 5 % | +51.775 | +54.5 | +57.225 | V <sub>RMS</sub> |
| Capacitive Loading          | @ +54.5 V                                                                            | 100     |       | 3000    | μF               |
| Ripple & Noise              | 10 Hz to 20 MHz BW @ +54.5 V                                                         |         |       | 540     | mVpp             |
| Line Regulation             | @ +54.5 V                                                                            |         | ±1    |         | %                |
| Load Regulation             | @ +54.5 V                                                                            |         | ± 3   |         | %                |
| Hot-swap                    | Available                                                                            |         |       |         |                  |

<sup>1</sup> +54.5 V main output voltage should be adjusted to 54.5 ± 0.3 V at 18.35 A load

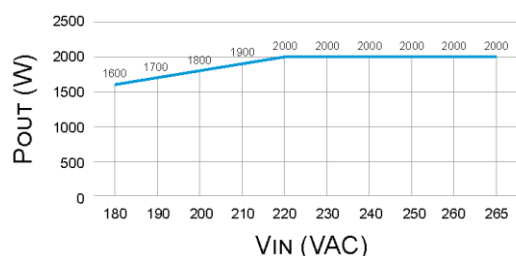


Figure 1. Power Derating Curve 1

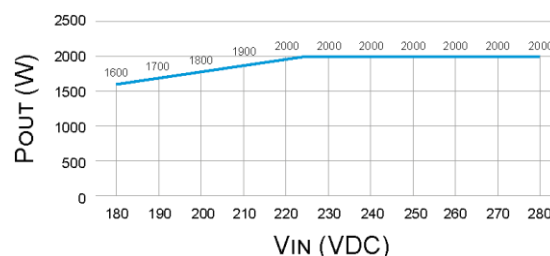


Figure 2. Power Derating Curve 2

#### 3.1 FORCED LOAD SHARING

The +54.5 V output has active load sharing. The output will share within 5% at full load. The failure of a power supply should not affect the load sharing or output voltages of the other supplies still operating. The supplies must be able to load share in parallel and operate in a hot-swap / redundant 1+1 configurations.

The VLS pins are connected together at user system board for load sharing function of two or more units.

The Ishare voltage (+54.5V VIBUS) corresponding to 100% load is 8 V.

10% - 24% of Rated load of single power supply, current sharing accuracy has to be ± 15%

25% - 50% of Rated load of single power supply, current sharing accuracy has to be ± 10%

51% - 100% of Rated load of single power supply, current sharing accuracy has to be ± 5%

**NOTE:** Current sharing has to meet following accuracy at different load range running in 1+1 configuration.

In N+1 configuration total load current should be multiplication N times total rated output current of single supply.



Asia-Pacific  
+86 755 298 85888

Europe, Middle East  
+353 61 498 955

North America  
+1 866 513 2839

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### 3.2 TIMING

These are the timing requirements for the power supply operation. The output voltages must rise from 10% to within regulation limits ( $T_{vout\_rise}$ ) within 2 to 70 ms. All outputs must rise monotonically. The table below shows the timing requirements for the power supply being turned on and off via the AC input, with PS\_ON held low and the PS\_ON signal, with the AC input applied.

| ITEM               | DESCRIPTION                                                                                            | MIN | MAX  |
|--------------------|--------------------------------------------------------------------------------------------------------|-----|------|
| $T_{vout\_rise}$   | Output voltage rise time                                                                               | 2.0 | 70   |
| TAC_ON Delay       | Delay from AC being applied to all output voltages being within regulation.<br>( $V_{in}$ :100~240Vac) | -   | 3000 |
| $T_{Vout\_Holdup}$ | Time +54.5V output voltage stays within regulation after loss of AC at 80% load.<br>(fall to 46Vdc)    | 13  | -    |
| TPW_OK Holdup      | Delay from loss of AC to de-assertion of PW_OK                                                         | 12  | -    |
| TPS_ON# delay      | Delay from PS_ON# active to output voltages within regulation limits.                                  | 5   | 400  |
| TPS_ON#_PW_OK      | Delay from PS_ON# deactivate to PW_OK being de-asserted.                                               | -   | 5    |
| TPW_OK On          | Delay from output voltages within regulation limits to PW_OK asserted at turn on.                      | 100 | 500  |
| TPW_OK Off         | Delay from PW_OK de-asserted to output voltages dropping out of regulation limits.                     | 1   | -    |
| TPW_OK Low         | Duration of PW_OK being in the de-asserted state during an off/on cycle using AC or the PS_ON signal.  | 100 | -    |
| TAC_OK On          | Delay from AC input on to ACOK signal goes high                                                        | 1   | -    |
| TAC_OK Off         | Delay from AC input off to ACOK signal goes low, psu with at least 20% load                            | -   | 10   |

Units in ms.

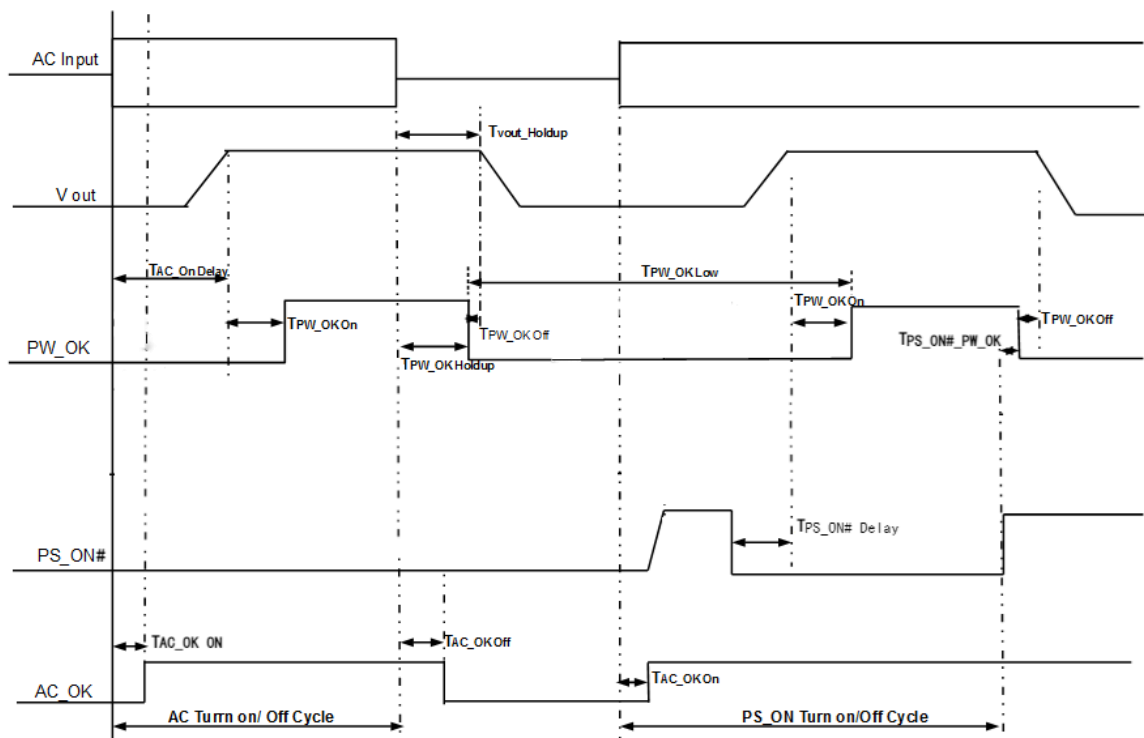


Figure 3. Turn On/Off Timing (Power Supply Signals)



## 4 PROTECTIONS

### 4.1 CURRENT LIMIT (OCP)

The power supply has a current limit to prevent the outputs from exceeding the values shown in the table below. If the current limits are exceeded the power supply shuts down, the power supply will not be damaged from repeated power cycling in this condition.

| OUTPUT  | INPUT VOLTAGE RANGE | OVER CURRENT LIMITS |
|---------|---------------------|---------------------|
| +54.5 V | 90 – 136 VAC        | 20.2 - 27.5 A       |
| +54.5 V | 180 – 264 VAC       | 40.3 – 55.0 A       |

### 4.2 OVER VOLTAGE PROTECTION (OVP)

The power supply will shut down and latch off after an over voltage condition occurs. This latch will be cleared by toggling the PS\_ON# signal or by an AC power interruption. The values are measured at the output of the power supply's connectors. The voltage shall never trip any lower than the minimum levels when measured at the power connector.

| OUTPUT  | MIN    | MAX  |
|---------|--------|------|
| +54.5 V | 57.3 V | 60 V |

### 4.3 OVER TEMPERATURE PROTECTION (OTP)

The power supply is protected against over temperature conditions caused by loss of fan cooling or excessive ambient temperature. In an OTP condition the PSU will shut down. When the power supply temperature drops to within specified limits, the power supply will restore power automatically, while the VSSO remains always on. The OTP circuit must have built in margin such that the power supply will not oscillate on and off due to temperature recovering condition. The OTP trip level has a minimum of 4 °C of ambient temperature margin.

### 4.4 SHORT CIRCUIT PROTECTION (SCP)

Short circuit of the power supply output will not result in fire hazard, shock hazard, or damage to the power supply. The power supply will shut down after an over current condition occurs. After PSU shut down the main output will auto recover.



## 5 CONTROL AND INDICATOR FUNCTIONS

The following sections define the input and output signals from the power supply. Signals that can be defined as low true use the following convention: Signal# = low true

Periodic and Random Deviation ripple / noise must be less than 260 mV in Output Signal, "PW\_OK", "AC\_OK" and "PS-ALERT" at all specified input voltage condition, all specified output loading and any operating environmental requirements.

### 5.1 AC\_OK (S2)

Each module has two LED status indicators on the front panel. The AC at 90 VAC – 264 VAC, AC\_OK (S2) is high. So, when the AC is below 90 VAC AC\_OK (S2) is low.

The AC\_OK has not done (shutdown or abnormal power down) can notify the system early.

| SIGNAL TYPE              | PARAMETER         |
|--------------------------|-------------------|
| Logic level low voltage  | 0 V ~ 0.4 V       |
| Logic level high voltage | 2.1 V ~ 3.46 V    |
| Sink current             | 400 $\mu$ A (Max) |
| Source current           | 4 mA (Max)        |

Table 1. AC\_OK Signal Characteristics

### 5.2 PS\_ALERT SIGNAL (S4)

This signal indicates that the power supply is experiencing a problem that the user should investigate. This needs to be asserted due to Critical events or Warning events. The signal is activated if critical component temperature reached a warning threshold, general failure, over-current, over-voltage, failed fan. This signal may also indicate the power supply is reaching its end of life or is operating in an environment exceeding the specified limits. This signal is to be asserted in parallel with LED turning solid Amber or blink Amber.

| SIGNAL TYPE (ACTIVE HIGH) | PULL-UP TO 3.3 VSB LOCATED IN PSU |             |
|---------------------------|-----------------------------------|-------------|
| PS_ALERT = High           | OK                                |             |
| PS_ALERT = Low            | Power Alert to system             |             |
|                           | MIN                               | MAX         |
| Logic level low voltage   | 0 V                               | 0.4 V       |
| Logic level high voltage  | 2.1 V                             | 3.46 V      |
| Source current            | -                                 | 4 mA        |
| Sink current              | -                                 | 400 $\mu$ A |

Table 2. PS\_ALERT Signal Characteristics

### 5.3 SDA & SCL SIGNAL (S5 / S6)

SDA and SCL signals are used for communication with user system. The Power Management Bus operation frequency is 100 kHz.

Inner parameters:

1. Inner Pulled up Resistor to internal 3.3 V = 10 kohm / 0603.
2. Inner Filter capacitor = 100 pF
3. Inner serial Resistor (Rs) = 100 ohm / 0603.

Note: The manufacturer reserves the right to change inner parameters for matching user system.

| SIGNAL TYPE               | I2C CONFIGURATION                    |
|---------------------------|--------------------------------------|
| Logic level low voltage   | 0 V ~ 0.4 V                          |
| Logic level high voltage  | 2.0 V ~ 3.46 V                       |
| Sink current              | 1 mA                                 |
| Source current            | 0.5 mA                               |
| Signal rise and fall time | Risetime: 1000 ns, Fall time: 300 ns |

Table 3. SDA / SCL Signal Characteristics



## 5.4 PS\_KILL# INPUT SIGNAL (S7)

PS\_KILL# signal is required to remotely turn on/off the power supply unit.

If PS\_KILL# signal is LOW, it means that +54.5 V is turned on.

If PS\_KILL# signal is pulled HIGH, it means that +54.5 V is turned off.

| Signal Type                         | Accepts an open collector/drain input from the system. Pull-up to 3.3VSB located in power supply. |        |
|-------------------------------------|---------------------------------------------------------------------------------------------------|--------|
| PS_KILL# = Low                      | ON                                                                                                |        |
| PS_KILL# = High or Open             | OFF                                                                                               |        |
|                                     | MIN                                                                                               | MAX    |
| Logic level low (power supply ON)   | 0 V                                                                                               | 0.4 V  |
| Logic level high (power supply OFF) | 2.1 V                                                                                             | 3.46 V |
| Source current, VPS_KILL# = high    | -                                                                                                 | 0.5 mA |

Table 4. PS\_KILL# Signal Characteristics

## 5.5 PS\_ON# INPUT SIGNAL (S8)

The PS\_ON# signal is required to remotely turn on/off the power supply. PS\_ON# is an active low signal that turns on the +54.5 V power rail. When this signal is not pulled low by the system, or left open, the outputs (except the VSSO) turn off.

This signal is pulled to a Standby voltage by a pull-up resistor internal to the power supply.

| Signal Type                         | Accepts an open collector/drain input from the system. Pull-up to 3.3VSB located in power supply. |        |
|-------------------------------------|---------------------------------------------------------------------------------------------------|--------|
| PS_ON# = Low                        | ON                                                                                                |        |
| PS_ON# = High or Open               | OFF                                                                                               |        |
|                                     | MIN                                                                                               | MAX    |
| Logic level low (power supply ON)   | 0 V                                                                                               | 0.4 V  |
| Logic level high (power supply OFF) | 2.1 V                                                                                             | 3.46 V |
| Source current, VPS_ON# = high      | -                                                                                                 | 0.5 mA |

Table 5. PS\_ON# Signal Characteristics

## 5.6 PW\_OK (POWER OK) OUTPUT SIGNAL (S9)

PW\_OK is a power OK signal and will be pulled high by the power supply to indicate that all the outputs are within the regulation limits of the power supply. When any output voltage falls below regulation limits or when AC power has been removed for a time sufficiently long so that power supply operation is no longer guaranteed, PW\_OK will be de-asserted to a LOW state.

See table for a representation of the timing characteristics of PW\_OK.

The start of the PW\_OK delay time is inhibited as long as any power supply output is in current limit.

| Signal Type              | Open collector/drain output from power supply. |             |
|--------------------------|------------------------------------------------|-------------|
| PW_OK = High             | Power OK                                       |             |
| PW_OK = Low              | Power Not OK                                   |             |
|                          | MIN                                            | MAX         |
| Logic level low voltage  | 0 V                                            | 0.4 V       |
| Logic level high voltage | 2.1 V                                          | 3.46 V      |
| Sink current             | -                                              | 400 $\mu$ A |
| Source current           | -                                              | 4 mA        |

Table 6. PW\_OK Signal Characteristics



## 5.7 POWER MANAGEMENT BUS ADDRESS SIGNALS (S10 / S15)

User system use "PS\_A0 (S15) / PS\_A1 (S10)" to allocate address of power supply unit in particular slot location for Power Management Bus communication.

Note: This signal has internal pull high resistor to inner 3.3 V. The address of power supply unit must be set by user system for Power Management Bus communication reliability.

| Signal Type              | Input pin, No inner pull-high / Low Resistor |        |
|--------------------------|----------------------------------------------|--------|
| PS_A0 / PS_A1 = High     | Address 1                                    |        |
| PS_A0 / PS_A1 = Low      | Address 0                                    |        |
|                          | MIN                                          | MAX    |
| Logic level low voltage  | 0 V                                          | 0.4 V  |
| Logic level high voltage | 2.1 V                                        | 3.46 V |
| Source current           | -                                            | 0.5 mA |

Table 7. PS\_A0/PS\_A1 Signal Characteristics

## 5.8 PS\_PRESENT# SIGNAL (S14)

PS\_PRESENT# signal is used to indicate that the power supply unit presence in user system.

When power supply unit is present in card-edge receptacle, the PS\_PRESENT# signal is in LOW level. (This signal is connected to inner RTN by an internal 100 ohm / 0805 resistor. In user system, this signal must be pulled up to outside 3.3 V an external 4.7 kohm pull-up resistor.)

| Signal Type        | Input pin, No inner pull-high / Low Resistor |
|--------------------|----------------------------------------------|
| PS_PRESENT# = Low  | PSU is Present                               |
| PS_PRESENT# = High | PSU is not Present                           |

Table 8. PS\_Present# Signal Characteristics

## 5.9 VSSO SIGNAL (S17)

Each module provides +12 V auxiliary power for micro controller Vdd device of redundant power supply. VSSO pins should be linked together and closer.

| Signal Type                | Power            |
|----------------------------|------------------|
| System minimum requirement | 12 V / 1 A (max) |

Table 9. VSSO Signal Characteristics

## 5.10 EEPROM-WP SIGNAL (S18)

PSU write the EEPROM data only using, pull down this pin at PDB.





## 6 ELECTROMAGNETIC COMPATIBILITY

### 6.1 IMMUNITY

The power supply complies with the limits defined in EN 55024.

| PARAMETER                         | DESCRIPTION / CONDITION | CRITERION |
|-----------------------------------|-------------------------|-----------|
| Electrostatic Discharge           | IEC / EN 61000-4-2      |           |
| Radiated Immunity                 | IEC / EN 61000-4-3      |           |
| Fast Transient / Burst            | IEC / EN 61000-4-4      |           |
| Surge Immunity                    | IEC / EN 61000-4-5      |           |
| Conducted Susceptibility          | IEC / EN 61000-4-6      |           |
| Power Frequency Magnetic Immunity | IEC / EN 61000-4-8      |           |
| Voltage Dips and Interruptions    | IEC / EN 61000-4-11     |           |

### 6.2 EMISSION

| PARAMETER                       | DESCRIPTION / CONDITION | CRITERION              |
|---------------------------------|-------------------------|------------------------|
| Conducted & Radiated Emissions  | EN 55032 / CISPR32      | Class A<br>6 dB margin |
| Power Harmonics                 | EN 61000-3-2            | Class A                |
| Voltage Fluctuation and Flicker | EN 61000-3-3            | Class A                |

## 7 ENVIRONMENTAL

| PARAMETER                        | DESCRIPTION / CONDITION                                                                                                                                                                                                                      | MIN | NOM | MAX     | UNIT |
|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|---------|------|
| Ambient Temperature              | Operating                                                                                                                                                                                                                                    | -5  |     | +50     | °C   |
|                                  | Non-Operating (max. rate of change of 20°C/h)                                                                                                                                                                                                | -40 |     | +70     |      |
| Humidity                         | Operating, relative (non-condensing)                                                                                                                                                                                                         | 5   |     | 90      | %    |
|                                  | Non-Operating, relative (non-condensing)                                                                                                                                                                                                     | 5   |     | 95      |      |
| Altitude                         | Operating                                                                                                                                                                                                                                    |     |     | 5 000   | m    |
|                                  | Non-Operating                                                                                                                                                                                                                                |     |     | 15 200  |      |
| Mechanical Shock (non-operating) | 50 G Trapezoidal Wave,<br>Velocity change = 170 in. / sec                                                                                                                                                                                    |     |     |         |      |
| Vibration (non-operating)        | <b>Sine sweep:</b><br>5 Hz to 200 Hz @ 1 g <sub>RMS</sub> at 1 octave/min; dwell 15 min at each of 3 resonant points                                                                                                                         |     |     |         |      |
|                                  | <b>Random:</b><br>5 Hz @ 0.0 1g <sup>2</sup> /Hz to 20 Hz @ 0.02 g <sup>2</sup> /Hz (slope up); 20 Hz to 500 Hz @ 0.02 g <sup>2</sup> /Hz (flat);<br>Input acceleration = 3.13 g <sub>RMS</sub> ; 10 min. per axis for 3 axis on all samples |     |     |         |      |
| Thermal Shock (non-operating)    | 50 cycles, 30°C/min ≥ transition time ≤ 15°C/min,<br>Duration of exposure to temperature extremes for each 1/2 cycle = 30 min                                                                                                                | -40 |     | +70     | °C   |
| Audible Noise                    | @ T <sub>A</sub> = 25°C / @ T <sub>A</sub> = 50°C                                                                                                                                                                                            |     |     | 60 / 70 | dB   |

## 8 SAFETY / APPROVALS

| PARAMETER        | DESCRIPTION / CONDITION                                                                                                                                                                                                                                                                                                                                                                     | STATUS |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Agency Approvals | <ul style="list-style-type: none"> <li>UL / CSA 62368-1 (USA / Canada)</li> <li>EN / IEC 62368-1 (Europe / International)</li> <li>CB Certificate &amp; Report, IEC 62368-1 (Report includes all country national deviations)</li> <li>CE – Low Voltage Directive 2006/95/EC (Europe)</li> <li>Nordics – EMKO-TSE (74-SEC) 207/94</li> <li>GB4943.1 – CNCA Certification (China)</li> </ul> |        |
| Leakage Current  | < 1.6 mA @ 1+1 redundant, 250 VAC, 60 Hz                                                                                                                                                                                                                                                                                                                                                    |        |



Asia-Pacific  
+86 755 298 85888

Europe, Middle East  
+353 61 498 955

North America  
+1 866 513 2839

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9 RELIABILITY

| PARAMETER | DESCRIPTION / CONDITION            | MIN | NOM | MAX | UNIT |
|-----------|------------------------------------|-----|-----|-----|------|
| MTBF      | @ T <sub>A</sub> = 25°C, 100% load | 200 |     |     | kh   |

10 MECHANICAL

| PARAMETER              | DESCRIPTION / CONDITION | MIN | NOM             | MAX | UNIT |
|------------------------|-------------------------|-----|-----------------|-----|------|
| Dimensions (W x H x L) |                         |     | 39.8 x 73 x 185 |     | mm   |
|                        |                         |     |                 |     | in   |
| Weight                 |                         |     | TBD             |     | g    |

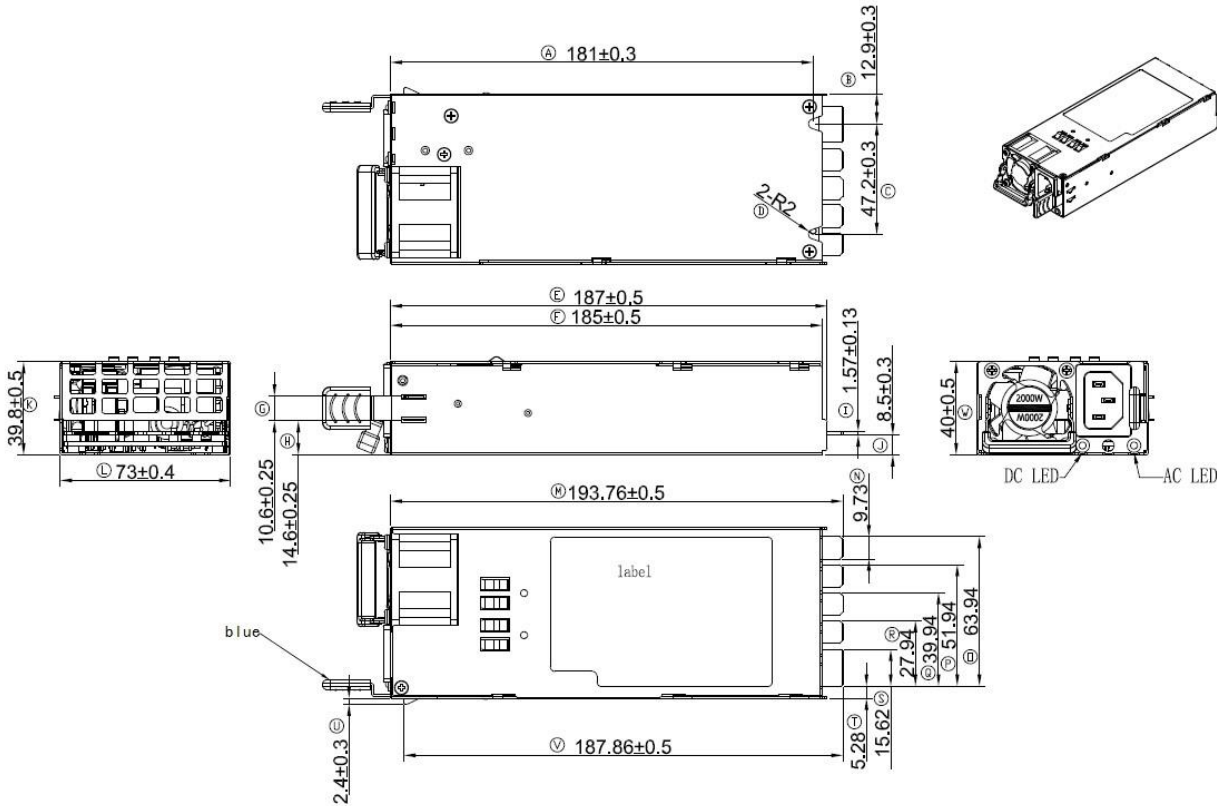


Figure 4. Mechanical Drawing

10.1 HANDLE RETENTION

The power supply has a handle to assist extraction. The module can be inserted and extracted without the assistance of tools. The power supply has a latch which retains the power supply into the system and prevents the power supply from being inserted or extracted from the system when the AC power cord is pulled into the power supply. The handle protects the operator from any burn hazard through the use of the Customer Corporation Industrial designed plastic handle.



## 10.2 LED MARKING AND IDENTIFICATION

The power supply has two bi-colored LEDs for indication of the power supply status.  
The LED is driven by an internal circuitry and should even illuminate in an 1+1 configuration even without AC power.

| POWER SUPPLY CONDITION                           | LED STATUS              |                       |
|--------------------------------------------------|-------------------------|-----------------------|
| PSU STATUS                                       | DC OK (left side)       | AC OK (right side)    |
| AC present /Only VSSO on                         | Green / 0.5 Hz flashing | Green                 |
| Power supply DC outputs on and OK                | Green                   | Green                 |
| Power supply failure, PSU shut down <sup>1</sup> | Red                     | Green                 |
| AC no present                                    | Green                   | Red / 0.5 Hz flashing |
| AC loss                                          | Green                   | Red / 0.5 Hz flashing |

<sup>1</sup> Power supply DC fail : OCP, OVP, OTP, FAN

## 11 CONNECTORS

### 11.1 AC INPUT CONNECTOR

The AC input connector shall be an IEC 320 C-14/C-16 power inlet.

### 11.2 DC OUTPUT CONNECTOR PIN LOCATIONS

The power supply uses a card edge output connection for power and signal that is compatible with a 12x2 + 4x2 Power Card Edge connector (equivalent to 12 x 2 + 4 x 2 pin configuration of the OUPIN PN 9392-4SP08S24N12CB30DT-U545 (24 signal)).

| BACK SIDE |             |                                    |          | TOP SIDE |              |                                              |          |
|-----------|-------------|------------------------------------|----------|----------|--------------|----------------------------------------------|----------|
| PIN       | SIGNAL NAME | FUNCTION                           | H/L SIDE | PIN      | SIGNAL NAME  | FUNCTION                                     | H/L SIDE |
| P1        | SGND        | Ground for signal using only       | L        | P5       | SGND         | Ground for signal using only                 | L        |
| P2        | NC          | NC without gold finger             | -        | P6       | NC           | NC without gold finger                       | -        |
| P3        | +54.5V_VRTN | +54.5V return                      | H        | P7       | +54.5V_VRTN  | +54.5V return                                | H        |
| P4        | +54.5V      | +54.5V main output                 | H        | P8       | +54.5V       | +54.5V main output                           | H        |
| S1        | NC          | NC without gold finger             | -        | S13      | NC           | NC without gold finger                       | -        |
| S2        | AC_OK       | AC good signal output              | L        | S14      | PS_PRESENT#  | Power supply present                         | L        |
| S3        | NC          | NC without gold finger             | -        | S15      | PS_A0        | 2C address bit 0                             | L        |
| S4        | PS_ALERT    | Power supply Alert to system       | L        | S16      | NC           | NC without gold finger                       | -        |
| S5        | SDA         | I2C serial data                    | L        | S17      | VSSO         | +12V auxiliary power output with ORing-diode | L        |
| S6        | SCL         | I2C serial clock                   | L        | S18      | EEPROM-WP    | PSU write the EEPROM data only using         | L        |
| S7        | PS_KILL#    | For PSU hot swap signal            | L        | S19      | NC           | NC without gold finger                       | -        |
| S8        | PS_ON#      | Power enable input signal          | L        | S20      | NC           | NC with gold finger                          | L        |
| S9        | PW_OK       | Power good signal output           | L        | S21      | NC           | Isolation pin, without gold finger           | -        |
| S10       | PS_A1       | I2C address bit 1                  | L        | S22      | NC           | Isolation pin, without gold finger           | -        |
| S11       | NC          | Isolation pin, without gold finger | -        | S23      | NC           | Isolation pin, without gold finger           | -        |
| S12       | NC          | Isolation pin, without gold finger | -        | S24      | +54.5V VIBUS | +54.5V main output current share bus         | H        |

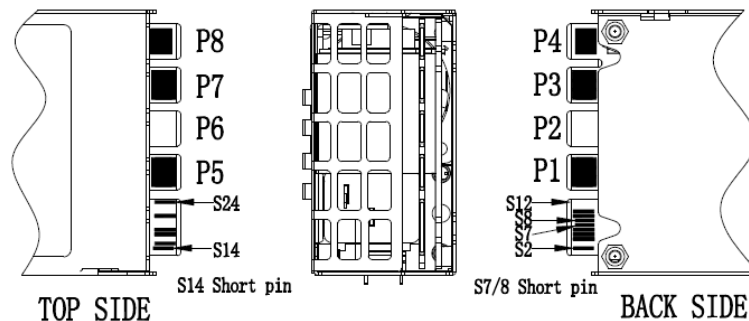


Figure 5. DC Output Connector



Asia-Pacific  
+86 755 298 85888

Europe, Middle East  
+353 61 498 955

North America  
+1 866 513 2839

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BCD.20250\_A

## 12 POWER MANAGEMENT BUS

### 12.1 OVERVIEW

The Power Management Bus features included in this specification are requirements for ac/dc golden box power supply for use in server systems. This specification is based on the Power Management Bus™ specifications parts I and II, revision 1.2.

### 12.2 RELATED DOCUMENTS

Power Management Bus Power System Management Protocol Specification Part I – General Requirements, Transport and Electrical Interface; Revision 1.2. Power Management Bus Power System Management Protocol Specification Part II – Command Language; Revision 1.2. SMBus 2.0.

### 12.3 HARDWARE

#### 12.3.1 OVERVIEW

The device in the power supply shall be compatible with both SMBus 2.0 ‘high power’ specification for I2C Vdd based power and drive (for Vdd = 3.3V). This bus shall operate at 3.3V.

#### 12.3.2 POWER MANAGEMENT BUS POWER SOURCING

The circuits inside the power supply shall derive their power from the standby output. For redundant power supplies the device(s) shall be powered from the system side of the or’ing device. The Power Management Bus device shall be on whenever AC power is applied to the power supply or a parallel redundant power supply in the system.

#### 12.3.3 PULL UPS

Only weak pull-up resistors shall be on SCL or SDA inside the power supply. The main pull-up resistors are provided by the system and may be connected to 3.3Vsb. For the system design, the main pull-ups shall be located external to the power supply and derive their power from the standby rail.

#### 12.3.4 DATA SPEED

The POWER MANAGEMENT BUS device in the power supply shall operate at the full 100 kbps SMBus speed and avoid using clock stretching that can slow down the bus. For example, the power supply can clock stretch while parsing a command or a power supply servicing multiple internal interrupts or NACK may require some use of clock stretching.

The Power Management Bus device shall support SMBus cumulative clock low extend time (Tlow:sext) if < 25msec. This requires the device to extend the clock time no more than 25msec between START and STOP for any given message.

### 12.4 ACCURACY

The sensor commands shall meet the following accuracy requirements.

The accuracies shall be met over the specified ambient temperature and the full range of rated input voltage.

| Output Loading   | 10% - 20% | > 20% - 50% | > 50% -100% |
|------------------|-----------|-------------|-------------|
| READ_VIN         |           |             | +/-5%       |
| READ_PIN         | +/-10%    | +/-8%       | +/-5%       |
| READ_VOUT        |           |             | +/- 5%      |
| READ_IOUT        | +/-10%    | +/-5%       | +/-5%       |
| READ_TEMPERATURE |           |             | +/- 5°C     |

Table 10. Required Accuracy



## 12.5 POWER MANAGEMENT BUS COMMAND SET

Via the Power Management Bus the computer system can communicate with the power supply to access currents, voltages, fan control and speed and temperatures. As soon as AC Power is connected to the PSU the Power Management Bus functionality must be available.

Following Table shows mandatory Power Management Bus commands to be supported by the PSU

| Command Code | Command Name       | SMBus Transaction Type: |                             | Number Of Data Bytes | Comment                               |
|--------------|--------------------|-------------------------|-----------------------------|----------------------|---------------------------------------|
|              |                    | Writing Data            | Reading Data                |                      |                                       |
| 00h          | PAGE               | Write Byte              | Read Byte                   | 1                    |                                       |
| 01h          | OPERATION          | Write Byte              | Read Byte                   | 1                    | 0x80 ON;<br>0x00 OFF<br>Default: 0x80 |
| 02h          | ON_OFF_CONFIG      | Write Byte              | Read Byte                   | 1                    | 0x1D                                  |
| 03h          | CLEAR_FAULTS       | Send Byte               | N/A                         | 0                    |                                       |
| 05h          | PAGE_PLUS_WRITE    | Block Write             | N/A                         | Variable             |                                       |
| 06h          | PAGE_PLUS_READ     | N/A                     | Block Write –<br>Block Read | Variable             |                                       |
| 19h          | CAPABILITY         | N/A                     | Read Byte                   | 1                    | 0xB0                                  |
| 1Ah          | QUERY              | N/A                     | Block Write –<br>Block Read | 1                    |                                       |
| 1Bh          | PS_ALERT_MASK      | Write Word              | Block Write –<br>Block Read | 2                    |                                       |
| 20h          | VOUT_MODE          |                         | Read Byte                   | 1                    | 0x17 (n=-9)                           |
| 21h          | VOUT_COMMAND       | Write Word              | Read Word                   | 2                    |                                       |
| 30h          | COEFFICIENTS       | N/A                     | Block Write –<br>Block Read | 5                    | Use for Ein/Eout                      |
| 31h          | POUT_MAX           | N/A                     | Read Word                   | 2                    |                                       |
| 3Ah          | FAN_CONFIG_1_2     | Write Byte              | Read Byte                   | 1                    | Default is Duty                       |
| 3Bh          | FAN_COMMAND_1      | Write Word              | Read Word                   | 2                    |                                       |
| 4Ah          | IOUT_OC_WARN_LIMIT |                         | Read Word                   | 2                    |                                       |
| 51h          | OT_WARN_LIMIT      |                         | Read Word                   | 2                    |                                       |
| 5Dh          | IIN_OC_WARN_LIMIT  |                         | Read Word                   | 2                    |                                       |
| 6Ah          | POUT_OP_WARN_LIMIT |                         | Read Word                   | 2                    |                                       |
| 6Bh          | PIN_OP_WARN_LIMIT  |                         | Read Word                   | 2                    |                                       |
| 78h          | STATUS_BYTE        | Write Byte              | Read Byte                   | 1                    |                                       |
| Bit 6        | OFF                |                         |                             |                      |                                       |
| Bit 5        | VOUT_OV_FAULT      |                         |                             |                      |                                       |
| Bit 4        | IOUT_OC            |                         |                             |                      |                                       |
| Bit 3        | VIN_UV             |                         |                             |                      |                                       |
| Bit 2        | TEMPERATURE        |                         |                             |                      |                                       |
| Bit 1        | CML                |                         |                             |                      |                                       |
| Bit 0        | NON OF THE ABOVE   |                         |                             |                      |                                       |
| 79h          | STATUS_WORD        | Write Word              | Read Word                   | 2                    |                                       |
| Bit 7(H)     | VOUT               |                         |                             |                      |                                       |
| Bit 6        | IOUT/POUT          |                         |                             |                      |                                       |
| Bit 5        | INPUT              |                         |                             |                      |                                       |
| Bit 3        | POWER_GOOD#        |                         |                             |                      |                                       |
| Bit 2        | FANS               |                         |                             |                      |                                       |
| Bit 6(L)     | OFF                |                         |                             |                      |                                       |
| Bit 5        | VOUT_OV_FAULT      |                         |                             |                      |                                       |
| Bit 4        | IOUT_OC_FAULT      |                         |                             |                      |                                       |
| Bit 3        | VIN_UV_FAULT       |                         |                             |                      |                                       |
| Bit 2        | TEMPERATURE        |                         |                             |                      |                                       |
| Bit 1        | CML                |                         |                             |                      |                                       |
| Bit 0        | NON OF THE ABOVE   |                         |                             |                      |                                       |
| 7Ah          | STATUS_VOUT        | Write Byte              | Read Byte                   | 1                    |                                       |
| Bit 7        | VOUT_OV_FAULT      |                         |                             |                      |                                       |



|       |                                 |             |            |               |                          |
|-------|---------------------------------|-------------|------------|---------------|--------------------------|
| Bit 4 | VOUT_UV_FAULT                   |             |            |               |                          |
| 7Bh   | STATUS_IOUT                     | Write Byte  | Read Byte  | 1             |                          |
| Bit 7 | Iout OC fault                   |             |            |               |                          |
| Bit 5 | Iout OC warning                 |             |            |               |                          |
| Bit 1 | Pout OP fault                   |             |            |               |                          |
| Bit 0 | Pout OP warning                 |             |            |               |                          |
| 7Ch   | STATUS_INPUT                    | Write Byte  | Read Byte  | 1             |                          |
| Bit 5 | Vin UV warning                  |             |            |               |                          |
| Bit 4 | Vin UV fault                    |             |            |               |                          |
| Bit 3 | Unit off for insufficient input |             |            |               |                          |
| Bit 1 | Iin over current warning        |             |            |               |                          |
| Bit 0 | Pin over power warning          |             |            |               |                          |
| 7Dh   | STATUS_TEMPERATURE              | Write Byte  | Read Byte  | 1             |                          |
| Bit 7 | OT fault                        |             |            |               |                          |
| Bit 6 | OT warning                      |             |            |               |                          |
| 7Eh   | STATUS_CML                      | Write Byte  | Read Byte  | 1             |                          |
| Bit 7 | Invalid COMMAND                 |             |            |               |                          |
| Bit 6 | Invalid DATA                    |             |            |               |                          |
| Bit 5 | PEC Failed                      |             |            |               |                          |
| 81h   | STATUS_FANS_1_2                 | Write Byte  | Read Byte  | 1             |                          |
| Bit 7 | Fan 1 fault                     |             |            |               |                          |
| Bit 5 | Fan 1 warning                   |             |            |               |                          |
| Bit 3 | Fan1 speed overridden           |             |            |               |                          |
| 86h   | READ_EIN                        | N/A         | Block Read | 6             | DIRECT Data Format       |
| 87h   | READ_EOUT                       | N/A         | Block Read | 6             | DIRECT Data Format       |
| 88h   | READ_VIN                        | N/A         | Read Word  | 2             | Linear                   |
| 89h   | READ_IIN                        | N/A         | Read Word  | 2             | Linear                   |
| 8Bh   | READ_VOUT                       | N/A         | Read Word  | 2             | Linear16                 |
| 8Ch   | READ_IOUT                       | N/A         | Read Word  | 2             | Linear                   |
| 8Dh   | READ_TEMPERATURE_1              | N/A         | Read Word  | 2             | Ambient                  |
| 8Eh   | READ_TEMPERATURE_2              | N/A         | Read Word  | 2             | SR Hotspot               |
| 8Fh   | READ_TEMPERATURE_3              | N/A         | Read Word  | 2             | PFC Hotspot              |
| 90h   | READ_FAN_SPEED_1                | N/A         | Read Word  | 2             | In RPM                   |
| 96h   | READ_POUT                       | N/A         | Read Word  | 2             | Linear                   |
| 97h   | READ_PIN                        | N/A         | Read Word  | 2             | Linear                   |
| 98h   | POWER MANAGEMENT BUS_REVISION   | N/A         | Read Byte  | 1             | 1.2                      |
| 99h   | MFR_ID                          | Block Write | Block Read | Variable (3)  | "bel"                    |
| 9Ah   | MFR_MODEL                       | Block Write | Block Read | Variable (16) | "PEC2000-54-074NA"       |
| 9Bh   | MFR_REVISION                    | Block Write | Block Read | Variable (3)  | "VXX"                    |
| 9Ch   | MFR_LOCATION                    | Block Write | Block Read | Variable (8)  | "DONGGUAN"               |
| 9Dh   | MFR_DATE                        | Block Write | Block Read | Variable (8)  | "YYYYMMDD"               |
| 9Eh   | MFR_SERIAL                      | Block Write | Block Read | Variable (19) | Serial Number            |
| 9Fh   | APP_PROFILE_SUPPORT             | N/A         | Block Read | Variable (2)  | Power Management Bus 1.2 |
| A0h   | MFR_VIN_MIN                     | N/A         | Read Word  | 2             | 90V                      |
| A1h   | MFR_VIN_MAX                     | N/A         | Read Word  | 2             | 264V                     |
| A2h   | MFR_IIN_MAX                     | N/A         | Read Word  | 2             | 13.0A                    |
| A3h   | MFR_PIN_MAX                     | N/A         | Read Word  | 2             | 2500W                    |
| A4h   | MFR_VOUT_MIN                    | N/A         | Read Word  | 2             | 51.77V                   |
| A5h   | MFR_VOUT_MAX                    | N/A         | Read Word  | 2             | 57.22V                   |
| A6h   | MFR_IOUT_MAX                    | N/A         | Read Word  | 2             | 36.7A                    |
| A7h   | MFR_POUT_MAX                    | N/A         | Read Word  | 2             | 2000W                    |
| A8h   | MFR_TAMBIENT_MAX                | N/A         | Read Word  | 2             | 50°C                     |
| A9h   | MFR_TAMBIENT_MIN                | N/A         | Read Word  | 2             | -5°C                     |



|     |                         |             |            |    |                 |
|-----|-------------------------|-------------|------------|----|-----------------|
| AAh | MFR_EFFICIENCY_LL       | N/A         | Block Read | 14 | At 20%/50%/100% |
| ABh | MFR_EFFICIENCY_HL       | N/A         | Block Read | 14 | At 20%/50%/100% |
| C0h | MFR_MAX_TEMP_1          | N/A         | Read Word  | 2  |                 |
| C1h | MFR_MAX_TEMP_2          | N/A         | Read Word  | 2  |                 |
| C2h | MFR_MAX_TEMP_3          | N/A         | Read Word  | 2  |                 |
| D4h | MFR_HW_COMPATIBILITY    | N/A         | Read Word  | 2  |                 |
| D5h | MFR_FWUPLOAD_CAPABILITY | N/A         | Read Byte  | 1  |                 |
| D6h | MFR_FWUPLOAD_MODE       | Write Byte  | Read Byte  | 1  |                 |
| D7h | MFR_FWUPLOAD            | Block Write | N/A        |    |                 |
| D8h | MFR_FWUPLOAD_STATUS     | N/A         | Read Word  | 21 |                 |
| D9h | MFR_FW_REVISION         | N/A         | Block Read | 3  |                 |

**Note:**  
Write

protocol must include PEC (Packet Error Checking).

Table 11. Supported Power Management Bus Command Set

## 12.6 STATUS COMMANDS

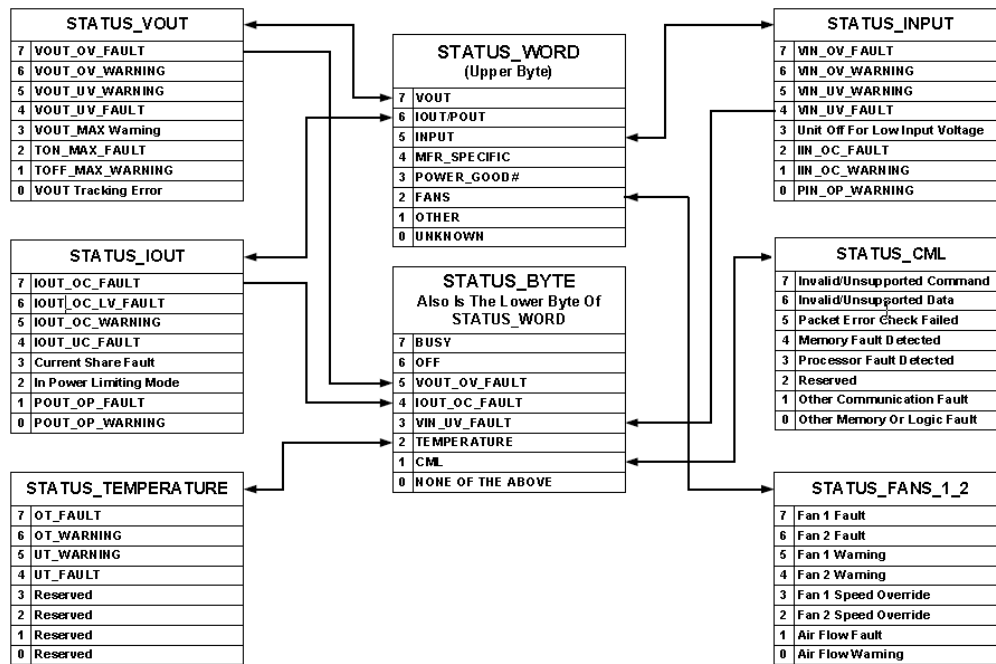


Figure 6. Summary Of The Status Registers

The following Power Management Bus STATUS commands shall be supported. All STATUS commands stated in Table Supporting PAGE instances shall support the PAGE\_PLUS\_WRITE and PAGE\_PLUS\_READ commands since they are used by both the BMC and ME. The BMC and ME refer to the two instances of the commands accessed via the PAGE\_PLUS\_WRITE and PAGE\_PLUS\_READ commands. The status bits shall assert whenever the event driving the status bit is present. Once a bit is asserted it shall stay asserted until cleared

The STATUS commands that are supported with the PAGE\_PLUS\_READ and PAGE\_PLUS\_WRITE commands shall still support direct access of the base STATUS\_XXX commands using the read word, write word, read byte, and write byte protocols.

STATUS\_FAN\_1\_2 command is only accessed by the system BMC. It uses the standard read byte protocol to read status and write byte protocol to clear bits.

The STATUS events are also used to control the PS\_ALERT signal. The new PS\_ALERT\_MASK command is used to define which status event control the PS\_ALERT signal. Default values for these mask bits are shown in the table below.

| Power Management Bus | Bit location | PSU state when bit | Instances | PS_ALERT_MASK defaults for each of the |
|----------------------|--------------|--------------------|-----------|----------------------------------------|
|----------------------|--------------|--------------------|-----------|----------------------------------------|



| command                        |           | is asserted ('1')           | No PAGE'ing <sup>2</sup><br>PAGE 00h = BMC<br>PAGE 01h = ME | three instances (No PAGE, PAGE 00h,<br>PAGE 01h)<br>0 = causes assertion of PS_ALERT<br>1 = does not cause assertion of PS_ALERT |
|--------------------------------|-----------|-----------------------------|-------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| STATUS_WORD                    |           |                             | No PAGE'ing, 00h, 01h                                       |                                                                                                                                  |
| OFF                            | 6 (lower) | OFF                         |                                                             | NA                                                                                                                               |
| IOUT_OC_FAULT                  | 4 (lower) | Refer to STATUS_IOUT        |                                                             | NA                                                                                                                               |
| VIN_UV_FAULT                   | 3 (lower) | Refer to STATUS_INPUT       |                                                             | NA                                                                                                                               |
| TEMPERATURE                    | 2 (lower) | Refer to STATUS_TEMPERATURE |                                                             | NA                                                                                                                               |
| CML                            | 1 (lower) | ON                          |                                                             | NA                                                                                                                               |
| VOUT                           | 7 (upper) | Refer to STATUS_VOUT        |                                                             | NA                                                                                                                               |
| IOUT/POUT                      | 6 (upper) | Refer to STATUS_IOUT        |                                                             | NA                                                                                                                               |
| INPUT                          | 5 (upper) | Refer to STATUS_INPUT       |                                                             | NA                                                                                                                               |
| FANS                           | 2 (upper) | Refer to STATUS_FANS        |                                                             | NA                                                                                                                               |
| STATUS_VOUT                    |           |                             | No PAGE'ing                                                 |                                                                                                                                  |
| VOUT_OV_FAULT                  | 7         | OFF                         |                                                             | 1, 1, 1                                                                                                                          |
| VOUT_UV_FAULT                  | 4         | OFF                         |                                                             | 1, 1, 1                                                                                                                          |
| STATUS_IOUT                    |           |                             | No PAGE'ing, 00h,01h                                        |                                                                                                                                  |
| IOUT_OC_FAULT                  | 7         | OFF                         |                                                             | 1, 1, 1                                                                                                                          |
| IOUT_OC_WARNING                | 5         | ON                          |                                                             | 1, 1, 0                                                                                                                          |
| POUT_OP_FAULT                  | 1         | OFF                         |                                                             | 1, 1, 1                                                                                                                          |
| POUT_OP_WARNING                | 0         | ON                          |                                                             | 1, 1, 1                                                                                                                          |
| STATUS_INPUT                   |           |                             | No PAGE'ing, 00h,01h                                        |                                                                                                                                  |
| VIN_UV_WARNING                 | 5         | ON                          |                                                             | 1, 1, 1                                                                                                                          |
| VIN_UV_FAULT 1                 | 4         | OFF                         |                                                             | 1, 1, 0                                                                                                                          |
| Unit off for low input voltage | 3         | OFF                         |                                                             | 1, 1, 1                                                                                                                          |
| IIN_OC_WARNING                 | 1         | ON                          |                                                             | 1, 1, 1                                                                                                                          |
| PIN_OP_WARNING                 | 0         | ON                          |                                                             | 1, 1, 1                                                                                                                          |
| STATUS_TEMPERATURE             |           |                             | No PAGE'ing, 00h,01h                                        |                                                                                                                                  |
| OT_FAULT                       | 7         | OFF                         |                                                             | 1, 1, 1                                                                                                                          |
| OT_WARNING                     | 6         | ON                          |                                                             | 1, 1, 0                                                                                                                          |
| STATUS_FANS_1_2                |           |                             | No PAGE'ing                                                 |                                                                                                                                  |
| Fan 1 fault 3                  | 7         | OFF                         |                                                             | 1, 1, 1                                                                                                                          |
| Fan 1 warning 3                | 5         | ON                          |                                                             | 1, 1, 1                                                                                                                          |

Table 12. Power Management Bus Status Commands Summary

- <sup>1</sup> The Vin Fault bit in STATUS\_INPUT shall get asserted if the input power has dropped below the PSU's operating range for any duration of time; even if the PSU continues to operate normally through a momentary input dropout event.
- <sup>2</sup> 'No PAGE' is the standard STATUS\_ commands accessed directly without using the PAGE\_PLUS commands.
- <sup>3</sup> All fans in the PSU shall be OR'ed into a single fan status bit for fault and warning conditions.

## 12.7 POWER MANAGEMENT BUS TEMPERATURE READ COMMANDS

The following temperature read commands as documented by the Power Management Bus specification Part II version 1.2 should be supported.

READ\_TEMPERATURE\_1(8Dh), should provide the PSU inlet temperature. READ\_TEMPERATURE\_2(8Eh), should provide the temperature of the SR heat sink in the PSU. READ\_TEMPERATURE\_3(8Fh), should provide the temperature of the PFC heat sink in the PSU.

## 12.8 PAGE (00h)

Setting a PAGE value of FFh is used to clear all status bits in all PAGES with the CLEAR\_FAULT command.





## 12.9 OPERATION (01h)

The OPERATION command is used to configure the operational state of the converter, in conjunction with input from the CONTROL pin. The OPERATION command is used to Turn the Power Management Bus device output on and off.

Bit [7] controls whether the Power Management Bus device output is on or off.

If Bit [7] is cleared (equals 0) then the output is off. If Bit [7] is set (equals 1), then the output is on.

## 12.10 ON\_OFF\_CONFIG (02h)

The ON\_OFF\_CONFIG command configures the combination of CONTROL pin input and serial bus commands needed to turn the unit on and off. This includes how the unit responds when power is applied. The default response for any Power Management Bus device is specified by the device manufacturer. The details of the ON\_OFF\_CONFIG data byte are shown in Table ON\_OFF\_CONFIG Data Byte.

Example conditions:

- If bit [4] is cleared, then the unit powers up and operates any time bias power is available regardless of the setting of bits [3:0].
- If bit [4] is set, bit [3] is set, and bit [2] is cleared, then the unit is turned on and off only by commands received over the serial bus.
- If bit [4] is set, bit [3] is cleared, and bit [2] is set, then the unit is turned on and off only by the CONTROL pin.

If bit [4] is set, bit [3] is set, and bit [2] is set, then the unit is turned on and off only when both the commands received over the serial bus AND the CONTROL pin are commanding the device to be on. If either a command from the serial bus OR the CONTROL pin commands the unit to be off, the unit turns off.

| BIT NUMBER | PURPOSE                                                                                                                                | BIT VALUE | MEANING                                                                                                                                                                                                                                         |
|------------|----------------------------------------------------------------------------------------------------------------------------------------|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [7:5]      |                                                                                                                                        | 000       | Reserved For Future Use                                                                                                                                                                                                                         |
| 4          | Sets the default to either operate any time power is present or for the on/off to be controlled by CONTROL pin and serial bus commands | 0         | Unit powers up any time power is present regardless of state of the CONTROL pin                                                                                                                                                                 |
|            |                                                                                                                                        | 1         | Unit does not power up until commanded by the CONTROL pin and OPERATION command (as programmed in bits [3:0]).                                                                                                                                  |
| 3          | Controls how the unit responds to commands received via the serial bus                                                                 | 0         | Unit ignores the on/off portion of the OPERATION command from serial bus                                                                                                                                                                        |
|            |                                                                                                                                        | 1         | To start, the unit requires that that the on/off portion of the OPERATION command is instructing the unit to run. Depending on bit [2], the unit may also require the CONTROL pin to be asserted for the unit to start and energize the output. |
| 2          | Controls how the unit responds to the CONTROL pin                                                                                      | 0         | Unit ignores the CONTROL pin (on/off controlled only the OPERATION command)                                                                                                                                                                     |
|            |                                                                                                                                        | 1         | Unit requires the CONTROL pin to be asserted to start the unit. Depending on bit [3], the OPERATION command may also be required to instruct the device to start before the output is energized.                                                |
| 1          | The CONTROL pin                                                                                                                        | 0         | Active low (Pull pin low to start the unit)                                                                                                                                                                                                     |
|            |                                                                                                                                        | 1         | Active high (Pull high to start the unit)                                                                                                                                                                                                       |
| 0          | CONTROL pin action when commanding the unit to turn off                                                                                | 0         | Use the programmed turn off delay and fall time                                                                                                                                                                                                 |
|            |                                                                                                                                        | 1         | Turn off the output and stop transferring energy to the output as fast as possible. The device's product literature shall specify whether or not the device sinks current to decrease the output voltage fall time.                             |

Table 13: ON\_OFF\_CONFIG Data Byte



### 12.11 CLEAR\_FAULTS COMMAND (03H)

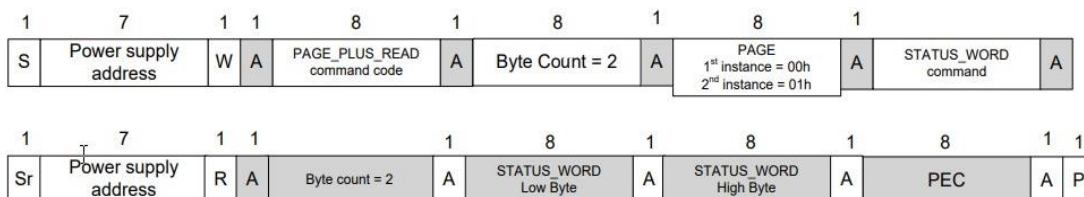
The CLEAR\_FAULTS command is used to clear any fault bits that have been set. This command clears all bits in all status registers simultaneously. At the same time, the device negates (clears, releases) its PS\_ALERT signal output if the device is asserting the PS\_ALERT signal.

### 12.12 NEW PAGE\_PLUS\_WRITE / PAGE\_PLUS\_READ COMMANDS (05H/06H)

The new PAGE\_PLUS\_WRITE and PAGE\_PLUS\_READ commands are used with the STATUS\_WORD, STATUS\_INPUT, STATUS\_TEMPERATURE, STATUS\_IOUT, and STATUS\_CML to create two instances of the same command. Each instance is set by the same events but cleared by their own master in the system. The instances at PAGE 00h are controlled by the system BMC and the instances at PAGE 01h are controlled by the system ME. Below are the protocols used to read and clear the STATUS\_ commands using the PAGE\_PLUS\_WRITE and PAGE\_PLUS\_READ commands.

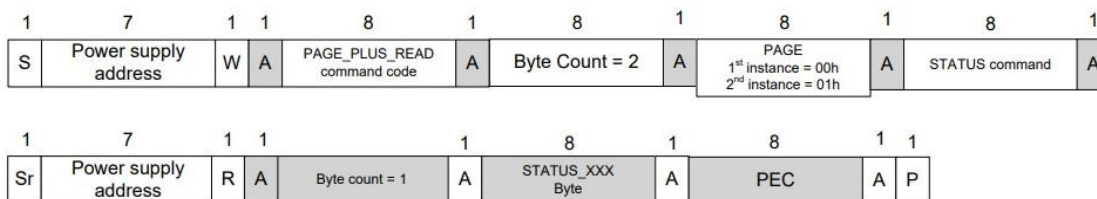
Reading STATUS\_WORD

Block Write – Block Read Process Call with PEC



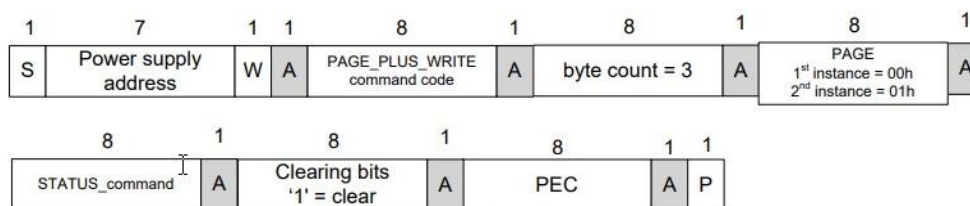
Reading STATUS\_TEMPERATURE, STATUS\_IOUT, STATUS\_INPUT, STATUS\_CML

Block Write – Block Read Process Call with PEC



Clearing STATUS commands (write '1' to clear a bit) STATUS\_TEMPERATURE, STATUS\_IOUT, STATUS\_INPUT, STATUS\_CML

Block Write with PEC



STATUS\_WORD cannot be cleared directly It is cleared based on lower level status commands

### 12.13 CAPABILITY (19h)

This command provides a way for a host system to determine some key capabilities of a Power Management Bus device. There is one data byte formatted as shown in Table 12.2. This command is read only.

| BITS | DESCRIPTION           | VALUE | MEANING                                                                                     |
|------|-----------------------|-------|---------------------------------------------------------------------------------------------|
| 7    | Packet Error Checking | 0     | Packet Error Checking not supported                                                         |
|      |                       | 1     | Packet Error Checking is supported                                                          |
| 6:5  | Maximum Bus Speed     | 00    | Maximum supported bus speed is 100 kHz                                                      |
|      |                       | 01    | Maximum supported bus speed is 400 kHz                                                      |
|      |                       | 10    | Reserved                                                                                    |
|      |                       | 11    | Reserved                                                                                    |
| 4    | PS_ALERT              | 0     | The device does not have a PS_ALERT pin and does not support the PS_ALERT Response protocol |
|      |                       | 1     | The device does have a PS_ALERT pin and does support the PS_ALERT Response protocol         |
| 3:0  | Reserved              | X     | Reserved                                                                                    |

Table 14: CAPABILITY COMMAND Data Byte Format

### 12.14 QUERY (1Ah)

The QUERY command is used to ask a Power Management Bus device if it supports a given command, and if so, what data formats it supports for that command. This command uses the Block Write-Block Read Process Call described in the SMBus specification

| BITS | VALUE | MEANING                                                                                          |
|------|-------|--------------------------------------------------------------------------------------------------|
| 7    | 1     | Command is supported                                                                             |
|      | 0     | Command is not supported                                                                         |
| 6    | 1     | Command is supported for write                                                                   |
|      | 0     | Command is not supported for write                                                               |
| 5    | 1     | Command is supported for read                                                                    |
|      | 0     | Command is not supported for read                                                                |
| 4:2  | 000   | Linear Data Format used                                                                          |
|      | 001   | 16 bit signed number                                                                             |
|      | 010   | Reserved                                                                                         |
|      | 011   | Direct Mode Format used                                                                          |
|      | 100   | 8 bit unsigned number                                                                            |
|      | 101   | VID Mode Format used                                                                             |
|      | 110   | Manufacturer specific format used                                                                |
|      | 111   | Command does not return numeric data. This is also used for commands that return blocks of data. |
| 1:0  | XX    | Reserved for future use                                                                          |

If bit [7] is zero, then the rest of the bits are “don’t care”.

Table 15: QUERY Command Returned Data Byte Format

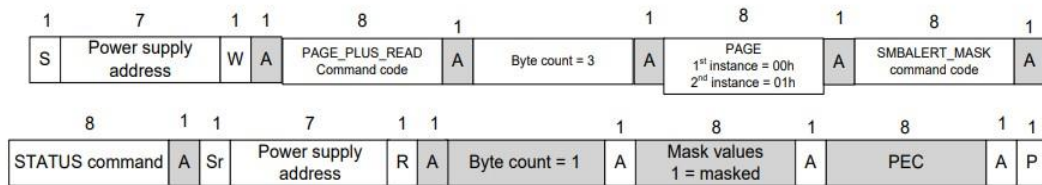
### 12.15 PS\_ALERT\_MASK (1Bh)

This allows the system to mask events from asserting the PS\_ALERT signal and to read back this information from the PSU. PS\_ALERT\_MASK command can be used with any of the supported STATUS events. The events are masked from asserting PS\_ALERT by writing a ‘1’ to the associated STATUS bits. The PS\_ALERT\_MASK command is used in conjunction with the PAGE\_PLUS command and STATUS\_ commands. It is not supported for masking the Non-PAGE'd STATUS\_ commands. Below are the protocols.



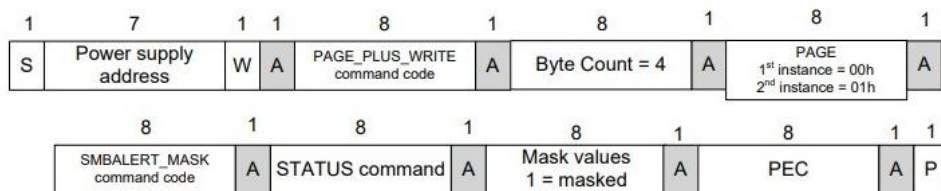
## Reading mask values using PAGE\_PLUS

## Block Write – Block Read Process Call with PEC



## Writing mask values using PAGE\_PLUS

## Block Write with PEC

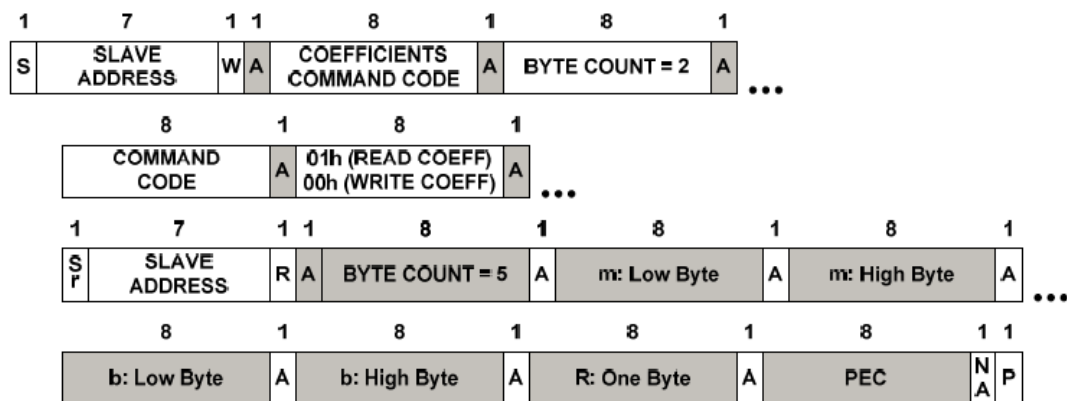


STATUS\_WORD is not used with SMBALERT\_MASK. Only the 'root' event bits are used to control the SMBAlert signal

## 12.16 COEFFICIENT (30h)

The power supply shall support the Power Management Bus COEFFICIENT command. The system shall use this to read the values of m, b, and R used to determine READ\_EIN and READ\_EOUT accumulated power values.

| COMMAND   | COEFFICIENTS SUPPORT | m   | B   | R   |
|-----------|----------------------|-----|-----|-----|
| READ_EIN  | Yes                  | 01h | 00h | 00h |
| READ_EOUT | Yes                  | 01h | 00h | 00h |



### 12.17 FAN\_CONFIG\_1\_2 (3Ah)

The FAN\_CONFIG\_1\_2 command is used to define the presence of a fan and the method it is controlled (by duty cycle or RPM).

The first of the configuration tells the Power Management Bus device whether or not a fan associated with position 1 (or 2) is installed. Any combination of fan installation is permitted.

The second part of the configuration tells the device whether the fan speed commands are in RPM or PWM duty cycle (in percent). These settings do not have to be the same for Fan 1 and Fan 2.

The third part of the configuration data tells the Power Management Bus device the number of tachometer pulses per revolution each fan provides. This information is needed to be commanding and reporting fan speed in RPM. Two bits are provided for each fan. These settings do not have to be the same for Fan 1 and Fan 2. The binary values of these bits map to pulses per revolution as follows:

- 00b = 1 pulse per revolution,
- 01b = 2 pulses per revolution,
- 10b = 3 pulses per revolution,
- 11b = 4 pulses per revolution.

This command has one data byte formatted as follows:

| BITS | VALUE    | MEANING                                |
|------|----------|----------------------------------------|
| 7    | 1        | Fan in position 1                      |
| 6    | 0        | Fan 1 commanded in Duty Cycle          |
|      | 1        | Fan 1 commanded in RPM                 |
| 5:4  | 00b-11b  | Fan 1 Tachometer Pulses Per Revolution |
| 3    | 0        | No fan in position 2                   |
| 2    | Not used |                                        |
| 1:0  | Not used |                                        |

Table 16. FAN\_CONFIG\_1\_2 Command

### 12.18 FAN\_COMMAND\_1 (3Bh)

The system may increase the power supplies fan speed through using the FAN\_COMMAND\_1 command. This command can only increase the power supplies fan speed; it cannot decrease the PSU fan speed below what the PSU minimum speed of the thermal requirement.

The default control mode of fan is duty (0-100).

### 12.19 READ\_FAN\_SPEED\_1 (90h)

The system will read the fan speed by using the READ\_FAN\_SPEED\_1 command. This data shall return the fan speed in the Power Management Bus linear format.

### 12.20 POWER MANAGEMENT BUS\_REVISION (98h)

This is a correction to the table in the Power Management Bus part II specification regarding the POWER MANAGEMENT BUS\_REVISION command.

| Bits [7:4] | Part I revision | Bits [3:0] | Part II Revision |
|------------|-----------------|------------|------------------|
| 0000       | 1.0             | 0000       | 1.0              |
| 0001       | 1.1             | 0001       | 1.1              |
| 0010       | 1.2             | 0010       | 1.2              |
| 0011       | 1.3             | 0011       | 1.3              |

Table 17. POWER MANAGEMENT BUS\_REVISION Command



### 12.21 MFR\_EFFICIENCY\_LL (AAh)

The MFR\_EFFICIENCY\_LL command sets or retrieves information about the efficiency of the device while operating at a low line condition. Not including the PEC byte, if used, and the byte count byte, there are fourteen data bytes as described below. The efficiency is specified at one input voltage and three data points consisting of output power and the efficiency at that output power. The three power ratings are typically referred as low, medium and high output power and are transmitted in that order. For example, the low, medium and high output power might correspond to 20%, 50% and 100% of the rated output power. The exact values of the output power is specified is left to the Power Management Bus device manufacturer. Each value (voltage, power or efficiency) is transmitted as two bytes in linear format.

| BYTE NUMBER | BYTE ORDER | DESCRIPTION                                                                                                                                                          |
|-------------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0           | Low Byte   | The input voltage, in volts, at which the low line efficiency data is applicable. Note that byte 0 is the first data byte transmitted as part of the block transfer. |
| 1           | High Byte  |                                                                                                                                                                      |
| 2           | Low Byte   | Power, in watts, at which the low power efficiency is specified                                                                                                      |
| 3           | High Byte  |                                                                                                                                                                      |
| 4           | Low Byte   | The efficiency, in percent, at the specified low power.                                                                                                              |
| 5           | High Byte  |                                                                                                                                                                      |
| 6           | Low Byte   | Power, in watts, at which the medium power efficiency is specified                                                                                                   |
| 7           | High Byte  |                                                                                                                                                                      |
| 8           | Low Byte   | The efficiency, in percent, at the specified medium power.                                                                                                           |
| 9           | High Byte  |                                                                                                                                                                      |
| 10          | Low Byte   | Power, in watts, at which the high power efficiency is specified                                                                                                     |
| 11          | High Byte  |                                                                                                                                                                      |
| 12          | Low Byte   | The efficiency, in percent, at the specified high power. Note that byte 13 is the last data byte transmitted as part of the block transfer.                          |
| 13          | High Byte  |                                                                                                                                                                      |

Table 18. MFR\_EFFICIENCY\_LL

### 12.22 MFR\_EFFICIENCY\_HL (ABh)

The MFR\_EFFICIENCY\_HL command sets or retrieves information about the efficiency of the device while operating at a high line condition. Not including the PEC byte, if used, and the byte count byte, there are fourteen data bytes as described below. The efficiency is specified at one input voltage and three data points consisting of output power and the efficiency at that output power. The three power ratings are typically referred as low, medium and high output power and are transmitted in that order. For example, the low, medium and high output power might correspond to 20%, 50% and 100% of the rated output power. The exact values of the output power is specified is left to the Power Management Bus device manufacturer. Each value (voltage, power or efficiency) is transmitted as two bytes in linear format.

| BYTE NUMBER | BYTE ORDER | DESCRIPTION                                                                                                                                                           |
|-------------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0           | Low Byte   | The input voltage, in volts, at which the high line efficiency data is applicable. Note that byte 0 is the first data byte transmitted as part of the block transfer. |
| 1           | High Byte  |                                                                                                                                                                       |
| 2           | Low Byte   | Power, in watts, at which the low power efficiency is specified                                                                                                       |
| 3           | High Byte  |                                                                                                                                                                       |
| 4           | Low Byte   | The efficiency, in percent, at the specified low power.                                                                                                               |
| 5           | High Byte  |                                                                                                                                                                       |
| 6           | Low Byte   | Power in watts, at which the medium power efficiency is specified                                                                                                     |
| 7           | High Byte  |                                                                                                                                                                       |
| 8           | Low Byte   | The efficiency, in percent, at the specified medium power.                                                                                                            |
| 9           | High Byte  |                                                                                                                                                                       |
| 10          | Low Byte   | Power, in watts, at which the high power efficiency is specified                                                                                                      |
| 11          | High Byte  |                                                                                                                                                                       |
| 12          | Low Byte   | The efficiency, in percent, at the specified high power. Note that byte 13 is the last data byte transmitted as part of the block transfer.                           |
| 13          | High Byte  |                                                                                                                                                                       |

Table 19. MFR\_EFFICIENCY\_HL



### 12.23 READ\_EIN (86h)

The new READ\_EIN command is used to allow the system to apply its own input power filtering. This will allow the system to get faster input power data while preventing aliasing. The command returns an accumulated power value and an associated sample count of number of accumulated power values. This allows the system to calculate its own average power value each time the system polls the PSU.

|                                | MIN                                                             | MAX    | DESCRIPTION                                                                                                                           |
|--------------------------------|-----------------------------------------------------------------|--------|---------------------------------------------------------------------------------------------------------------------------------------|
| Format                         | Power Management Bus Direct format<br>m = 01h, R = 00h, b = 00h |        | Power Management Bus data format; refer to Power Management Bus specification for details.                                            |
| Psample averaging period       | 4 AC cycles                                                     |        | Period instantaneous input power is averaged over to calculate Psample.                                                               |
| READ_EIN update period         | 80 / 66.7 ms (50/60 Hz)                                         |        | Period at which the power accumulator and sample counter are updated                                                                  |
| Accuracy (Pin>1000W Load)      | +/-5%                                                           |        | The input power data shall meet these accuracy requirements over 100-127 VAC / 200-240 VAC and under the defined system polling rate. |
| Accuracy (Pin<1000 W Load)     | +/-10 W                                                         |        |                                                                                                                                       |
| Range of System polling period | 1 sec                                                           | 100 ms | The PSU shall be polled over this range of rates while testing accuracy.                                                              |

**IMPORTANT:**

The PSU READ\_EIN update period MUST always be less than the system polling period. To make sure the PSU is compatible with all possible system polling periods; the PSU must update the READ\_EIN power accumulator and sample counter at a period less than 100msec (required period is 4 AC cycles 80/67msec).

Table 20. READ\_EIN REQUIREMENTS SUMMARY

### 12.24 READ\_EOUT (87h)

The new READ\_EOUT command is used to allow the system to apply its own output power filtering. This will allow the system to get faster output power data while preventing aliasing. The command returns an accumulated power value and an associated sample count of number of accumulated power values. This allows the system to calculate its own average power value each time the system polls the PSU.

|                                          | MIN                                                             | MAX           | DESCRIPTION                                                                                                                        |
|------------------------------------------|-----------------------------------------------------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------|
| Format                                   | Power Management Bus Direct format<br>m = 01h, R = 00h, b = 00h |               | Power Management Bus data format; refer to Power Management Bus specification for details.                                         |
| Psample averaging period                 | Nominal 50 msec                                                 |               | Period instantaneous input power is averaged over to calculate Psample.                                                            |
| Sampling period                          | Nominal 50 msec                                                 |               | Period at which the power accumulator and sample counter are updated                                                               |
| [Paccum / N] Accuracy (50% to 100% load) | ±5%                                                             |               | The calculated output power data shall meet these accuracy requirements over 100-240VAC and under the defined system polling rate. |
| [Paccum / N] Accuracy (20% to 50% load)  | ±5%                                                             |               |                                                                                                                                    |
| System polling rate                      | 1 sample/s                                                      | 10 samples /s | The PSU shall be polled over this range of rates while testing accuracy.                                                           |

Table 21. READ\_EOUT REQUIREMENTS SUMMARY

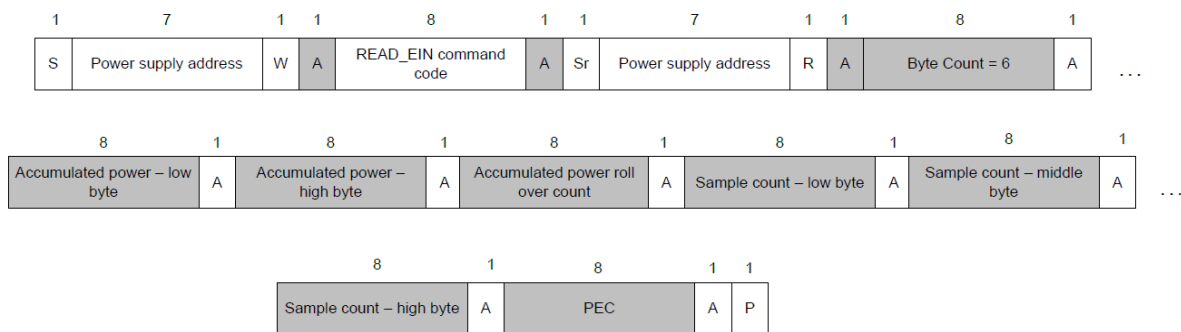
### 12.25 READ\_EIN & READ\_EOUT FORMATS

The READ\_EIN and READ\_EOUT commands shall use the Power Management Bus direct format to report an accumulated power value and the sample count. The Power Management Bus coefficients m, R, and b shall be fixed values and the PSU shall report these values using the Power Management Bus COEFFICIENT command. The coefficient m shall be set to 01h, coefficient R shall be set to 00h, and coefficient b shall be set to 00h.

READ\_EIN and READ\_EOUT shall use the SMBus Block Read with PEC protocol in the below format.







## 12.26 READ\_EIN AND READ\_EOUT ACCUMULATORS

The accumulated power data shall be the sum of input power values averaged over 4 AC cycles (or over 50ms for READ\_EOUT). The value shall automatically roll-over when the 15 bit maximum value is reached ( $> 7FFFh$ ). The sample count should increment 1 for each accumulated power value. The system shall calculate average power by dividing the accumulated power value by the sample count. The system must sample READ\_EIN and READ\_EOUT faster than the roll-over period to get an accurate power calculation. Below is a block diagram depicting the accumulator function in the PSU.

Important note: When the PSU responds to the system requesting READ\_EIN or READ\_EOUT data; the data in the sample count must always alignment with the number of samples accumulated in the power accumulator. To achieve this power accumulator, power rollover counter, and sample counter shall be loaded into a READ\_EIN and READ\_EOUT register at the same time.

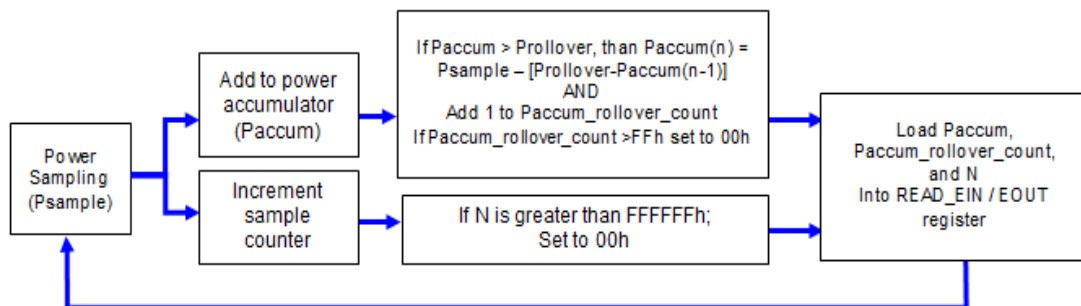


Figure 7. READ\_EIN PSU Functional Diagram

| VALUE                  | DESCRIPTION                                                                                                                                     |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| Psample:               | The sampled power value in linear or direct format                                                                                              |
| Paccum:                | 2 bytes in Power Management Bus linear or direct format. The accumulated power values made up of $Psample(0) + Psample(1) + \dots + Psample(n)$ |
| N:                     | 3 byte unsigned integer value. The number of accumulated power values summed in Paccum                                                          |
| Prollover:             | The max value of Paccum before a rollover will occur                                                                                            |
| Paccum_rollover_count: | 1 byte unsigned integer counting the number of times Paccum rolls over. Once this reaches FFh; it will automatically get reset to 00h           |

## 12.27 LINEAR DATA FORMAT

The Linear Data Format is typically used for commanding and reporting the parameters such as (but not only) the following:

- Output Current,
- Input Voltage,
- Input Current,
- Operating Temperatures,
- Time (durations), and Energy Storage capacitor Voltage.





The Linear Data Format is a two byte value with:

- An 11 bit, two's complement mantissa and,
- A 5 bit, two's complement exponent (scaling factor),
- The format of the two data bytes is illustrated in Figure 5.1 as show below.

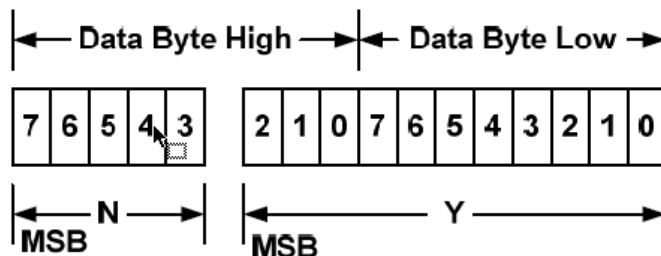


Figure 8. Linear Data Format Data Bytes

The relation 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 complement integer; and

$N$  is a 5 bit, two's complement integer.

Devices that use the linear format must accept and be able to process any value of  $N$ .

## 12.28 VOUT\_MODE (20h)

The data byte for the VOUT\_MODE command is one byte that consists of a three bit Mode and a five bit exponent. The three bit Mode shall be set to indicate the LINEAR mode for output voltage related commands. The five bit Exponent shall be set to indicate the value of the five bit two's complement exponent for the mantissa delivered as the data bytes for an output voltage related command.

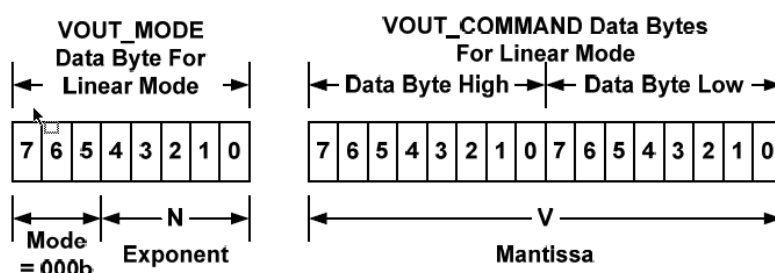


Figure 9. Linear Format Data Bytes

The voltage, in volts, is calculated from the equation Voltage =  $V \cdot 2^N$ , where:

- $V$  is a 16 bit unsigned binary integer
- $N$  is a 5 bit two's complement binary integer

Sending the VOUT\_MODE command with the address set for writing is not supported. If the system sends a VOUT\_MODE command for a write, the power supply shall reject the command, and set the Invalid/Unsupported Data bit in the STATUS\_CML register.



## 13 FRU SPECIFICATION

### 13.1 FRU DATA

The FRU data format is compliant with the IPMI ver.1.0 (per rev.1.1 from Sept.25, 1999) specification. The following is the exact listing of the EEPROM content. During testing this listing shall be followed and verified.

### 13.2 FRU DEVICE PROTOCOL

The FRU device will implement the same protocols, including the Byte Read, Sequential Read, Byte Write, and Page Read protocols.

Four pins will be allocated for the FRU information on the Power Supply connector. One pin is the serial clock (SCL). The second pin is used for serial data (SDA). Two pins are for address lines to indicate to the power supply's EEPROM which position the power supply is located in the system. The SCL and SDA signals are pulled up by system, the address lines are also pulled up by system.

| A1 LOGICAL VOLTAGE | A0 LOGICAL VOLTAGE | PSU ADDRESS | FRU ADDRESS |
|--------------------|--------------------|-------------|-------------|
| 0                  | 0                  | 0xB0        | 0xA0        |
| 0                  | 1                  | 0xB2        | 0xA2        |
| 1                  | 0                  | 0xB4        | 0xA4        |
| 1                  | 1                  | 0xB6        | 0xA6        |

### 13.3 PEC2000-54-074NA FRU DATA

| ITEM | 01    | BYTE VALUE |     | DESCRIPTION                                                                                                  | BLOCK TITLE                 |
|------|-------|------------|-----|--------------------------------------------------------------------------------------------------------------|-----------------------------|
|      |       | DEC        | HEX |                                                                                                              |                             |
| 1    | 0000H | 1          | 01  | COMMON HEADER FORMAT VERSION                                                                                 | COMMON HEADER               |
| 2    | 0001H | 0          | 00  | INTERNAL USE AREA STARTING OFFSET (In Multiples Of 8 Bytes).<br>00H Indicates That This Area Is Not Present  |                             |
| 3    | 0002H | 0          | 00  | CHASSIS INFO AREA STARTING OFFSET (In Multiples Of 8 Bytes).<br>00H Indicates That This Area Is Not Present. |                             |
| 4    | 0003H | 0          | 00  | BOARD AREA STARTING OFFSET (In Multiples Of 8 Bytes).<br>00H Indicates That This Area Is Not Present.        |                             |
| 5    | 0004H | 1          | 01  | PRODUCT INFO AREA STARTING OFFSET (In Multiples Of 8 Bytes).                                                 |                             |
| 6    | 0005H | 11         | 0B  | MULTIRECORD AREA STARTING OFFSET (In Multiples Of 8 Bytes).                                                  |                             |
| 7    | 0006H | 0          | 00  | PAD, Write As 00H                                                                                            |                             |
| 8    | 0007H | 243        | F3  | COMMON HEADER CHECKSUM (ZERO CHECKSUM)                                                                       |                             |
| 1    | 0008H | 1          | 01  | PRODUCT AREA FORMAT VERSION<br>7:4 - Reserved, Write As 0000B<br>3:0 - Format Version Number = 1H            | PRODUCT INFORMATION AREA    |
| 2    | 0009H | 10         | 0A  | PRODUCT AREA LENGTH (In multiples of 8 bytes)                                                                |                             |
| 3    | 000AH | 25         | 19  | LANGUAGE CODE (ENGLISH)Z                                                                                     |                             |
| 4    | 000BH | 200        | C8  | MANUFACTURER NAME TYPE / LENGTH (C8H)<br>7:6 - Type Code<br>5:0 - Number Of Data Bytes.                      |                             |
| 5    | 000CH | 98         | 62  | b                                                                                                            |                             |
| 6    | 000DH | 101        | 65  | e                                                                                                            |                             |
| 7    | 000EH | 108        | 6C  | l                                                                                                            |                             |
| 8    | 000FH | 32         | 20  |                                                                                                              |                             |
| 9    | 0010H | 32         | 20  |                                                                                                              |                             |
| 10   | 0011H | 32         | 20  |                                                                                                              |                             |
| 11   | 0012H | 32         | 20  |                                                                                                              |                             |
| 12   | 0013H | 32         | 20  |                                                                                                              |                             |
| 13   | 0014H | 208        | D0  | PRODUCT NAME Type/Length (CEh)<br>7:6 - Type Code<br>5:0 - Number Of Data Bytes.                             | MANUFACTURER'S MODEL NUMBER |
| 14   | 0015H | 80         | 50  | P                                                                                                            |                             |



|    |       |     |    |                                             |                           |
|----|-------|-----|----|---------------------------------------------|---------------------------|
| 15 | 0016H | 69  | 45 | E                                           |                           |
| 16 | 0017H | 67  | 43 | C                                           |                           |
| 17 | 0018H | 50  | 32 | 2                                           |                           |
| 18 | 0019H | 48  | 30 | 0                                           |                           |
| 19 | 001AH | 48  | 30 | 0                                           |                           |
| 20 | 001BH | 48  | 30 | 0                                           |                           |
| 21 | 001CH | 45  | 2D | -                                           |                           |
| 22 | 001DH | 53  | 35 | 5                                           |                           |
| 23 | 001EH | 52  | 34 | 4                                           |                           |
| 24 | 001FH | 45  | 2D | -                                           |                           |
| 25 | 0020H | 48  | 30 | 0                                           |                           |
| 26 | 0021H | 55  | 37 | 7                                           |                           |
| 27 | 0022H | 52  | 34 | 4                                           |                           |
| 28 | 0023H | 78  | 4E | N                                           |                           |
| 29 | 0024H | 65  | 41 | A                                           |                           |
| 30 | 0025H | 212 | D4 | PRODUCT PART/MODEL NUMBER Type/Length (D4h) | CUSTOMER PART NUMBER      |
| 31 | 0026H | 71  | 47 | G                                           |                           |
| 32 | 0027H | 78  | 4E | N                                           |                           |
| 33 | 0028H | 48  | 30 | 0                                           |                           |
| 34 | 0029H | 65  | 41 | A                                           |                           |
| 35 | 002AH | 32  | 20 |                                             |                           |
| 36 | 002BH | 32  | 20 |                                             |                           |
| 37 | 002CH | 32  | 20 |                                             |                           |
| 38 | 002DH | 32  | 20 |                                             |                           |
| 39 | 002EH | 32  | 20 |                                             |                           |
| 40 | 002FH | 32  | 20 |                                             |                           |
| 41 | 0030H | 32  | 20 |                                             |                           |
| 42 | 0031H | 32  | 20 |                                             |                           |
| 43 | 0032H | 32  | 20 |                                             |                           |
| 44 | 0033H | 32  | 20 |                                             |                           |
| 45 | 0034H | 32  | 20 |                                             |                           |
| 46 | 0035H | 32  | 20 |                                             |                           |
| 47 | 0036H | 32  | 20 |                                             |                           |
| 48 | 0037H | 32  | 20 |                                             |                           |
| 49 | 0038H | 32  | 20 |                                             |                           |
| 50 | 0039H | 32  | 20 |                                             |                           |
| 51 | 003AH | 195 | C3 | PRODUCT VERSION NUMBER Type/Length (C3h)    | CUSTOMER CURRENT REVISION |
| 52 | 003BH | 86  | 56 | V                                           | To be updated             |
| 53 | 003CH | 48  | 30 | 0                                           | To be updated             |
| 54 | 003DH | 48  | 30 | 0                                           | To be updated             |
| 55 | 003EH | 211 | D3 | PRODUCT SERIAL NUMBER type/length byte (D3) |                           |
| 56 | 003FH | 80  | 50 | P                                           | To be updated             |
| 57 | 0040H | 69  | 45 | E                                           | To be updated             |
| 58 | 0041H | 67  | 43 | C                                           | To be updated             |
| 59 | 0042H | 50  | 32 | 2                                           | To be updated             |
| 60 | 0043H | 48  | 30 | 0                                           | To be updated             |
| 61 | 0044H | 48  | 30 | 0                                           | To be updated             |
| 62 | 0045H | 48  | 30 | 0                                           | To be updated             |
| 63 | 0046H | 78  | 4E | N                                           | To be updated             |
| 64 | 0047H | 65  | 41 | A                                           | To be updated             |
| 65 | 0048H | 89  | 59 | Y                                           | To be updated             |
| 66 | 0049H | 89  | 59 | Y                                           | To be updated             |



Asia-Pacific  
+86 755 298 85888

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|    |       |     |    |                                                                                                                                                                                                                                                   |                                    |
|----|-------|-----|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| 67 | 004AH | 77  | 4D | M                                                                                                                                                                                                                                                 | To be updated                      |
| 68 | 004BH | 77  | 4D | M                                                                                                                                                                                                                                                 | To be updated                      |
| 69 | 004CH | 88  | 58 | X                                                                                                                                                                                                                                                 | To be updated                      |
| 70 | 004DH | 88  | 58 | X                                                                                                                                                                                                                                                 | To be updated                      |
| 71 | 004EH | 88  | 58 | X                                                                                                                                                                                                                                                 | To be updated                      |
| 72 | 004FH | 88  | 58 | X                                                                                                                                                                                                                                                 | To be updated                      |
| 73 | 0050H | 88  | 58 | X                                                                                                                                                                                                                                                 | To be updated                      |
| 74 | 0051H | 0   | 00 |                                                                                                                                                                                                                                                   | To be updated                      |
| 75 | 0052H | 192 | C0 | FRU FILE ID Type/Length Byte                                                                                                                                                                                                                      | Not used, code is zero length byte |
| 76 | 0053H | 192 | C0 | FRU FILE ID Type/Length Byte                                                                                                                                                                                                                      | Not required                       |
| 77 | 0054H | 193 | C1 | ENCODED TO INDICATE NO MORE INFO FIELDS                                                                                                                                                                                                           |                                    |
| 78 | 0055H | 0   | 00 | PAD ( Always Zero )                                                                                                                                                                                                                               |                                    |
| 79 | 0056H | 0   | 00 | PAD ( Always Zero )                                                                                                                                                                                                                               |                                    |
| 80 | 0057H | 78  | 56 | CHECKSUM(100H-LOWER BYTE(SUM OF BYTES))                                                                                                                                                                                                           | To be updated                      |
| 1  | 0058H | 0   | 00 | RECORD TYPE ID 0x00 = POWER SUPPLY INFORMATION                                                                                                                                                                                                    | MULTI RECORD AREA                  |
| 2  | 0059H | 2   | 02 | 7:7 END OF LIST, 6:4 = 000B, 3:0 RECORD<br>FORMAT VERSION = 2                                                                                                                                                                                     |                                    |
| 3  | 005AH | 24  | 18 | RECORD LENGTH OF MULTIRECORD                                                                                                                                                                                                                      |                                    |
| 4  | 005BH | 134 | 86 | RECORD CHECKSUM (ZERO CHECKSUM)                                                                                                                                                                                                                   |                                    |
| 5  | 005CH | 96  | 60 | HEADER CHECKSUM (ZERO CHECKSUM)                                                                                                                                                                                                                   |                                    |
| 1  | 005DH | 208 | D0 | 15-12:RESERVED,WRITE AS 0000B                                                                                                                                                                                                                     | 2000W                              |
| 2  | 005EH | 7   | 07 | 11-0:OVERALL CAPACITY(WATTS)                                                                                                                                                                                                                      |                                    |
| 3  | 005FH | 196 | C4 | PEAK VALUE                                                                                                                                                                                                                                        | 2500W                              |
| 4  | 0060H | 9   | 09 | LSB FIRST                                                                                                                                                                                                                                         |                                    |
| 5  | 0061H | 55  | 37 | INRUSH CURRENT ,FFH IF NOT SPECIFIED                                                                                                                                                                                                              | 55A                                |
| 6  | 0062H | 5   | 05 | INRUSH INTERVAL IN MS.                                                                                                                                                                                                                            | 5mS                                |
| 7  | 0063H | 16  | 10 | LOW END INPUT VOLTAGE RANGE 1<br>100V = 2710H                                                                                                                                                                                                     | 100V                               |
| 8  | 0064H | 39  | 27 |                                                                                                                                                                                                                                                   |                                    |
| 9  | 0065H | 156 | 9C | HIGH END INPUT VOLTAGE RANGE 1<br>127V=319CH                                                                                                                                                                                                      | 127V                               |
| 10 | 0066H | 49  | 31 |                                                                                                                                                                                                                                                   |                                    |
| 11 | 0067H | 32  | 20 | LOW END INPUT VOLTAGE RANGE 2<br>200V = 4E20H                                                                                                                                                                                                     | 200V                               |
| 12 | 0068H | 78  | 4E |                                                                                                                                                                                                                                                   |                                    |
| 13 | 0069H | 192 | C0 | HIGH END INPUT VOLTAGE RANGE 2<br>240V = 5DC0H                                                                                                                                                                                                    | 240V                               |
| 14 | 006AH | 93  | 5D |                                                                                                                                                                                                                                                   |                                    |
| 15 | 006BH | 50  | 32 | LOW END INPUT FREQUENCY RANGE 50HZ=32H                                                                                                                                                                                                            | 50Hz                               |
| 16 | 006CH | 60  | 3C | HIGH END INPUT FREQUENCY RANGE<br>60HZ = 3CH                                                                                                                                                                                                      | 60Hz                               |
| 17 | 006DH | 12  | 0C | A/C DROPOUT TOLERANCE IN mS 10mS=0CH                                                                                                                                                                                                              | 12mS                               |
| 18 | 006EH | 30  | 1E | 7-5:RESERVED,WRITE AS 000B<br>4:TACHOMETER PULSES PER POTATION/PREDICTIVE FALL POLARITY<br>YES=1(FAIL=1,PASS=0)<br>3:HOT SWAP/REDUNDANCY SUPPORT YES=1<br>2:AUTOSWITCH YES=1<br>1:POWER FACTOR CORRECTION YES=1<br>0:PREDICTIVE FALL SUPPLY YES=1 |                                    |
| 19 | 006FH | 108 | 6C | PEAK WATTAGE 15-12:HOLD UP TIME IN SECONDS 1S=1H                                                                                                                                                                                                  |                                    |
| 20 | 0070H | 247 | F7 | 11-0 PEAK CAPACITY (WATTS)(LSB FIRST)<br>2100W=0834H                                                                                                                                                                                              | 15S                                |
| 21 | 0071H | 0   | 00 | COMMBINED WATTAGE<br>7-4:Voltage 1<br>3-0:Voltage 2=00H                                                                                                                                                                                           |                                    |
| 22 | 0072H | 0   | 00 | BYTE 2:3 TOTAL COMBINED WATTAGE (LSB FIRST) W=0000H                                                                                                                                                                                               | 0                                  |
| 23 | 0073H | 0   | 00 | BYTE 2:3 TOTAL COMBINED WATTAGE (LSB FIRST) W=0000H                                                                                                                                                                                               |                                    |
| 24 | 0074H | 16  | 10 | PREDICTIVE FAIL TACHOMETER LOWER THRESHOLD (PRM/60)1000/60=16                                                                                                                                                                                     |                                    |
| 1  | 0075H | 10  | 0A | RECORD TYPE ID 0X01 =DC OUTPUT Record                                                                                                                                                                                                             | MULTIRECORD                        |



|    |       |     |    |                                                                       |        |
|----|-------|-----|----|-----------------------------------------------------------------------|--------|
| 2  | 0076H | 130 | 82 | 7:7 END OF LIST<br>6:4=000 3:0 RECORD<br>FORMAT VERSION=2             | HEADER |
| 3  | 0077H | 13  | 0D | RECORD LENGTH OF MULTIRECORD                                          |        |
| 4  | 0078H | 97  | 61 | RECORD CHECKSUM                                                       |        |
| 5  | 0079H | 6   | 06 | HEADER CHECKSUM                                                       |        |
| 1  | 007AH | 1   | 01 | +54.5V 7:STANDBY =0,<br>6-4:RESERVED 000B,<br>3-0:OUTPUT NUMBER=0001B | +54.5V |
| 2  | 007BH | 74  | 4A | NOMINAL VOLTAGE (10mV)1220=04C4H                                      | 54.5V  |
| 3  | 007CH | 21  | 15 |                                                                       |        |
| 4  | 007DH | 57  | 39 | MAXIMUM NEGATIVE VOLTAGE DEVIATION (10mV) 1159=0487H                  | 51.77V |
| 5  | 007EH | 20  | 14 |                                                                       |        |
| 6  | 007FH | 90  | 5A | MAXIMUM POSITIVE VOLTAGE DEVIATION (10mV) 1281=0501H                  | 57.22V |
| 7  | 0080H | 22  | 16 |                                                                       |        |
| 8  | 0081H | 28  | 1C | RIPPLE AND NOISE PK-PK 10Hz TO 20MHz(mV)<br>120mV=0078H               | 540mV  |
| 9  | 0082H | 2   | 02 |                                                                       |        |
| 10 | 0083H | 0   | 00 | MINIMUM CURRENT DRAW(10mA)                                            | 0A     |
| 11 | 0084H | 0   | 00 |                                                                       |        |
| 12 | 0085H | 86  | 56 | MAXIMUM CURRENT DRAW(10mA)                                            | 36.7A  |
| 13 | 0086H | 14  | 0E |                                                                       |        |
| 1  | 0087H | 0   | 00 | Unused Area                                                           |        |
| 2  | 0088H | 0   | 00 | Unused Area                                                           |        |
| 3  | 0089H | 0   | 00 | Unused Area                                                           |        |
| 4  | 008AH | 0   | 00 | Unused Area                                                           |        |
| 5  | 008BH | 0   | 00 | Unused Area                                                           |        |
| 1  | 008CH | 0   | 00 | Unused Area                                                           |        |
| 2  | 008DH | 0   | 00 | Unused Area                                                           |        |
| 3  | 008EH | 0   | 00 | Unused Area                                                           |        |
| 4  | 008FH | 0   | 00 | Unused Area                                                           |        |
| 5  | 0090H | 0   | 00 | Unused Area                                                           |        |
| 6  | 0091H | 0   | 00 | Unused Area                                                           |        |
| 7  | 0092H | 0   | 00 | Unused Area                                                           |        |
| 8  | 0093H | 0   | 00 | Unused Area                                                           |        |
| 9  | 0094H | 0   | 00 | Unused Area                                                           |        |
| 10 | 0095H | 0   | 00 | Unused Area                                                           |        |
| 11 | 0096H | 0   | 00 | Unused Area                                                           |        |
| 12 | 0097H | 0   | 00 | Unused Area                                                           |        |
| 13 | 0098H | 0   | 00 | Unused Area                                                           |        |
| 1  | 0099H | 0   | 00 | Unused Area                                                           |        |
| 2  | 009AH | 0   | 00 | Unused Area                                                           |        |
| 3  | 009BH | 0   | 00 | Unused Area                                                           |        |
| 4  | 009CH | 0   | 00 | Unused Area                                                           |        |
| 5  | 009DH | 0   | 00 | Unused Area                                                           |        |
| 6  | 009EH | 0   | 00 | Unused Area                                                           |        |
| 7  | 009FH | 0   | 00 | Unused Area                                                           |        |
| 8  | 00A0H | 0   | 00 | Unused Area                                                           |        |
| 9  | 00A1H | 0   | 00 | Unused Area                                                           |        |
| 10 | 00A2H | 0   | 00 | Unused Area                                                           |        |
| 11 | 00A3H | 0   | 00 | Unused Area                                                           |        |
| 12 | 00A4H | 0   | 00 | Unused Area                                                           |        |
| 13 | 00A5H | 0   | 00 | Unused Area                                                           |        |
| 14 | 00A6H | 0   | 00 | Unused Area                                                           |        |
| 15 | 00A7H | 0   | 00 | Unused Area                                                           |        |



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|----|-------|---|----|-------------|--|
| 16 | 00A8H | 0 | 00 | Unused Area |  |
| 17 | 00A9H | 0 | 00 | Unused Area |  |
| 18 | 00AAH | 0 | 00 | Unused Area |  |
| 19 | 00ABH | 0 | 00 | Unused Area |  |
| 20 | 00ACH | 0 | 00 | Unused Area |  |
| 21 | 00ADH | 0 | 00 | Unused Area |  |
| 22 | 00AEH | 0 | 00 | Unused Area |  |
| 23 | 00AFH | 0 | 00 | Unused Area |  |
| 24 | 00B0H | 0 | 00 | Unused Area |  |
| 25 | 00B1H | 0 | 00 | Unused Area |  |
| 26 | 00B2H | 0 | 00 | Unused Area |  |
| 27 | 00B3H | 0 | 00 | Unused Area |  |
| 28 | 00B4H | 0 | 00 | Unused Area |  |
| 29 | 00B5H | 0 | 00 | Unused Area |  |
| 30 | 00B6H | 0 | 00 | Unused Area |  |
| 31 | 00B7H | 0 | 00 | Unused Area |  |
| 32 | 00B8H | 0 | 00 | Unused Area |  |
| 33 | 00B9H | 0 | 00 | Unused Area |  |
| 34 | 00BAH | 0 | 00 | Unused Area |  |
| 35 | 00BBH | 0 | 00 | Unused Area |  |
| 36 | 00BCH | 0 | 00 | Unused Area |  |
| 37 | 00BDH | 0 | 00 | Unused Area |  |
| 38 | 00BEH | 0 | 00 | Unused Area |  |
| 39 | 00BFH | 0 | 00 | Unused Area |  |
| 40 | 00C0H | 0 | 00 | Unused Area |  |
| 41 | 00C1H | 0 | 00 | Unused Area |  |
| 42 | 00C2H | 0 | 00 | Unused Area |  |
| 43 | 00C3H | 0 | 00 | Unused Area |  |
| 44 | 00C4H | 0 | 00 | Unused Area |  |
| 45 | 00C5H | 0 | 00 | Unused Area |  |
| 46 | 00C6H | 0 | 00 | Unused Area |  |
| 47 | 00C7H | 0 | 00 | Unused Area |  |
| 48 | 00C8H | 0 | 00 | Unused Area |  |
| 49 | 00C9H | 0 | 00 | Unused Area |  |
| 50 | 00CAH | 0 | 00 | Unused Area |  |
| 51 | 00CBH | 0 | 00 | Unused Area |  |
| 52 | 00CCH | 0 | 00 | Unused Area |  |
| 53 | 00CDH | 0 | 00 | Unused Area |  |
| 54 | 00CEH | 0 | 00 | Unused Area |  |
| 55 | 00CFH | 0 | 00 | Unused Area |  |
| 56 | 00D0H | 0 | 00 | Unused Area |  |
| 57 | 00D1H | 0 | 00 | Unused Area |  |
| 58 | 00D2H | 0 | 00 | Unused Area |  |
| 59 | 00D3H | 0 | 00 | Unused Area |  |
| 60 | 00D4H | 0 | 00 | Unused Area |  |
| 61 | 00D5H | 0 | 00 | Unused Area |  |
| 62 | 00D6H | 0 | 00 | Unused Area |  |
| 63 | 00D7H | 0 | 00 | Unused Area |  |
| 64 | 00D8H | 0 | 00 | Unused Area |  |
| 65 | 00D9H | 0 | 00 | Unused Area |  |
| 66 | 00DAH | 0 | 00 | Unused Area |  |
| 67 | 00DBH | 0 | 00 | Unused Area |  |



|     |       |   |    |             |  |
|-----|-------|---|----|-------------|--|
| 68  | 00DCH | 0 | 00 | Unused Area |  |
| 69  | 00DDH | 0 | 00 | Unused Area |  |
| 70  | 00DEH | 0 | 00 | Unused Area |  |
| 71  | 00DFH | 0 | 00 | Unused Area |  |
| 72  | 00E0H | 0 | 00 | Unused Area |  |
| 73  | 00E1H | 0 | 00 | Unused Area |  |
| 74  | 00E2H | 0 | 00 | Unused Area |  |
| 75  | 00E3H | 0 | 00 | Unused Area |  |
| 76  | 00E4H | 0 | 00 | Unused Area |  |
| 77  | 00E5H | 0 | 00 | Unused Area |  |
| 78  | 00E6H | 0 | 00 | Unused Area |  |
| 79  | 00E7H | 0 | 00 | Unused Area |  |
| 80  | 00E8H | 0 | 00 | Unused Area |  |
| 81  | 00E9H | 0 | 00 | Unused Area |  |
| 82  | 00EAH | 0 | 00 | Unused Area |  |
| 83  | 00EBH | 0 | 00 | Unused Area |  |
| 84  | 00ECH | 0 | 00 | Unused Area |  |
| 85  | 00EDH | 0 | 00 | Unused Area |  |
| 86  | 00EEH | 0 | 00 | Unused Area |  |
| 87  | 00EFH | 0 | 00 | Unused Area |  |
| 88  | 00F0H | 0 | 00 | Unused Area |  |
| 89  | 00F1H | 0 | 00 | Unused Area |  |
| 90  | 00F2H | 0 | 00 | Unused Area |  |
| 91  | 00F3H | 0 | 00 | Unused Area |  |
| 92  | 00F4H | 0 | 00 | Unused Area |  |
| 93  | 00F5H | 0 | 00 | Unused Area |  |
| 94  | 00F6H | 0 | 00 | Unused Area |  |
| 95  | 00F7H | 0 | 00 | Unused Area |  |
| 96  | 00F8H | 0 | 00 | Unused Area |  |
| 97  | 00F9H | 0 | 00 | Unused Area |  |
| 98  | 00FAH | 0 | 00 | Unused Area |  |
| 99  | 00FBH | 0 | 00 | Unused Area |  |
| 100 | 00FCH | 0 | 00 | Unused Area |  |
| 101 | 00FDH | 0 | 00 | Unused Area |  |
| 102 | 00FEH | 0 | 00 | Unused Area |  |
| 103 | 00FFH | 0 | 00 | Unused Area |  |



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Table showing PEC2000-54-074NA HEX Information

| Addr | 0  | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | A  | B  | C  | D  | E  | F  |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 00   | 01 | 00 | 00 | 00 | 01 | 0B | 00 | F3 | 01 | 0A | 19 | C8 | 62 | 65 | 6C | 20 |
| 10   | 20 | 20 | 20 | 20 | D0 | 50 | 45 | 43 | 32 | 30 | 30 | 30 | 2D | 35 | 34 | 2D |
| 20   | 30 | 37 | 34 | 4E | 41 | D4 | 47 | 4E | 30 | 41 | 20 | 20 | 20 | 20 | 20 | 20 |
| 30   | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | C3 | 56 | 30 | 30 | D3 | 50 |
| 40   | 45 | 43 | 32 | 30 | 30 | 30 | 4E | 41 | 59 | 59 | 4D | 4D | 58 | 58 | 58 | 58 |
| 50   | 58 | 00 | C0 | C0 | C1 | 00 | 00 | 56 | 00 | 02 | 18 | 80 | 60 | D0 | 07 | C4 |
| 60   | 09 | 37 | 05 | 10 | 27 | 9C | 31 | 20 | 4E | C0 | 5D | 32 | 3C | 0C | 1E | 6C |
| 70   | F7 | 00 | 00 | 00 | 10 | 0A | 82 | 0D | 01 | 06 | 01 | 4A | 15 | 39 | 14 | 5A |
| 80   | 16 | 1C | 02 | 00 | 00 | 56 | 0E | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| 90   | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| A0   | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| B0   | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| C0   | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| D0   | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| E0   | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| F0   | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |

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