EPS Power Supply
A Server System Infrastructure (SSI) Specification for Entry Chassis Power Supplies

Revision 1.0

Disclaimer:

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1.0 Purpose

The 'Entry-Level Power Supply Specification' defines a common power supply used in entry-level servers. This supply may range typically from 300 to 400 watts and is used in a single configuration. The scope of this document defines the volume and connector of the supply, without defining the exact wattage capacity. This allows vendors the flexibility to produce supplies with different feature sets that have potential applications for a wide range of system vendor platforms. Because of its connector leads, the entry-level power supply is not intended to be a hot swap type of power supply.

2.0 Conceptual Overview

In the Entry-Level server market, the bulk power system sources power on several output rails. These typically are:

- + 3.3 V
- + 5 V
- + 12 V
- – 12 V

Local DC-DC converters are utilized for processor power, and converts the power from either a +5 V or +12 V source, but most commonly from a +12 V converter.

The form factor is PS/2, with connector/cable assemblies required for the motherboard power, remote sensing and control functions, and peripheral power. To reduce cost, certain features found in higher performance systems are not provided, such as redundancy and hot swapping. The cooling fan must meet the acoustical requirements for the system, while providing system cooling.

To ensure power supply compatibility with any intended system design, the fan performance must be specified using P/Q (Pressure / Airflow Quantity) curves. Two- (2) fan speeds are required; a full speed operation and a lower speed for reduced acoustical noise for operation at typical ambient and operating conditions. Utilizing two- (2) P/Q curves (that also define the power supply airflow performance), specifies these fan speeds. In addition, the maximum, system airflow impedance curve is also defined in terms of pressure and airflow. Fan speed control is provided through an ATX compatible pin, FAN C, with the P13 connector size set at ten pins, and the first six pins assigned ATX compatibility. While the PFC is preferred, this specification can also apply to a non-PFC power supply that meets all of these requirements.

3.0 Background

This specification is intended for entry-level servers that require a single power supply. Its' design leverage comes from the ATX style power supply, which defines a connector allowing the wattage range to be extended from 300 to 400 watts.

4.0 Definitions / Terms / Acronyms

Table 4-1: Definitions/Terms/Acronyms

Autoranging	A power supply that automatically senses and adjusts itself to the proper input voltage range (110 VAC or 220 VAC). No manual switches or manual adjustments are required.
CFM	Cubic Feet per Minute (airflow).
Dropout	A condition that allows the line voltage input to the power supply to drop below the minimum operating voltage, which includes 0 V.
FRU	Field Replaceable Unit.
IA	Intel architecture.
I2C	Inter-Integrated Circuit. Two- (2) wire communications bus. One wire is 'clock ' the other wire is 'data.'
Latch Off	The shut-off of a power supply after detection of a fault. Even if the fault condition disappears the supply does not restart unless manual or electronic intervention occurs. Manual intervention commonly includes briefly removing and then reconnecting the AC power input, or it can be done through a switch. Electronic intervention can be accomplished by electronic signals in the Server System.
LFM	Linear Feet per Minute (airflow).
Monotonically	A waveform changes from one level to another in a steady fashion, without intermediate retracement or oscillation.
MTBF	Mean Time Between Failures.
Noise	The periodic or random signals over frequency band of 10 Hz to 30 MHz.
Overcurrent	A condition in which a supply attempts to provide more output current than the amount for which it is rated. This commonly occurs if there is a 'short circuit' condition in the load attached to the supply.
PARD	Periodic And Random Deviations.
P/Q Curve	Pressure Vs Airflow Quantity that is used to specify airflow performance, or to specify system airflow impedance. Pressure is in units of inches of water and Airflow is in units of CFM.
PFC	Power Factor Correction.
Power Good Signal	A typical logic level output signal (provided by the supply). This output signal tells the Server System that all DC output voltages are within their specified range.
PS or P/S	Power Supply.
Ripple	The periodic or random signals sent over frequency bands of 10 Hz to 30 MHz.
Regulation Bandwidth	Rise time is defined as the time it takes any output voltage to rise from 10% to 90% of regulation limit.
Sag	The condition where the AC lines' voltage drops below the nominal voltage conditions.
STP	Standard Temperature and Pressure.
Surge	The condition where the AC lines' voltage rises above nominal voltage.
VSB	Standby voltage or output voltages that are present when the power supply is turned off via the PS-ON signal.

5.0 General

5.1 Mechanical Overview

The physical size of a standard power supply enclosure is intended to accommodate power ranges from 300 to 400 watts. The chassis for the entry-level power supply is designed using the PS/2 type form factor, which is identical to the ATX revision 2.01 specified power supply form factor. Refer to Figure 5-1 that follows.

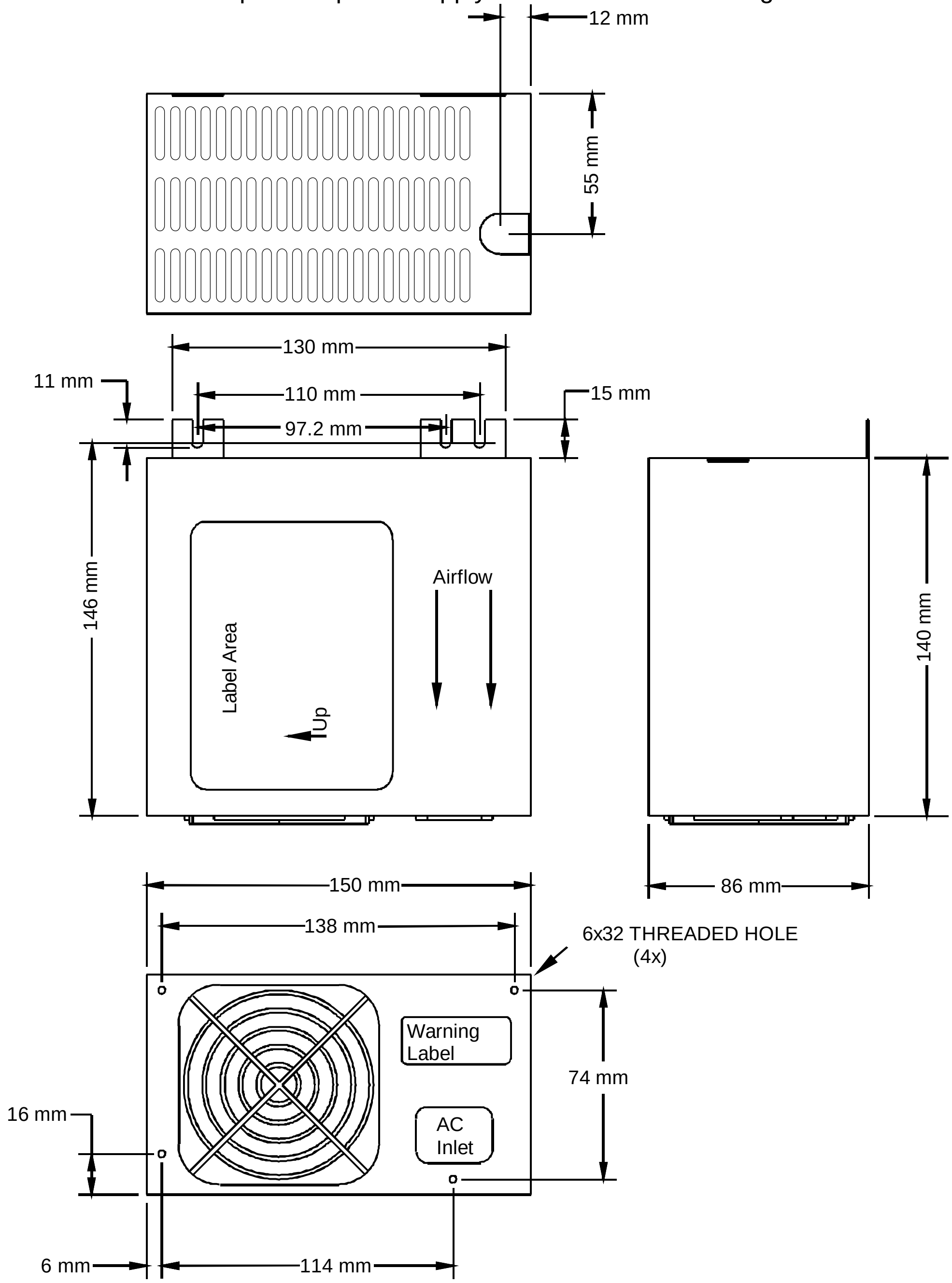

Figure 5-1: Power Supply Enclosure

5.1.1 Fan Requirements

The power supply must provide cooling to both the supply and the system. To meet minimum system requirements the power supply must reach a noise level of 38 dBa measured at one meter on all faces, for low speed fan operation. (Refer to the power supply's airflow chart shown in Figure 5-2.) A two-speed fan is a requirement for this specification. There are two- (2) fan performance P-Q curves shown, low speed and high speed, which may be selected by the system (FANC) to provide the required airflow over the system temperature requirements. . Refer to Section 6.5 for details of FanC operation. Also shown is a curve for the maximum system air resistance that will allow cooling of the power supply. The minimum airflow required is 9.6CFM, which is marked with a vertical line at the intersection of the lower P-Q curve and the system resistance. This maximum system resistance is also shown separately in Figure 5.3. The minimum airflow requirement of 9.6CFM is marked with a vertical line.

The noise level of 38 dBa, is the maximum level set for low fan speed operations. The performance characteristics for low fan speed are specified in the lower P-Q (pressure vs. airflow) curve, and defined in Figure 5-2 as well. This curve is configured for the power-supply (not the fan), with the power supply having the ability to override the FANC operation when it senses over temperature conditions.

The higher performance fan curve reflects higher fan speed operations and may be set by the FANC signal on pin 2 of connector P13. The system can adjust to this higher fan speed at elevated temperature environments. When the system is not controlling the fan speed through the FANC signal pin, the power supply fan defaults to high speed.

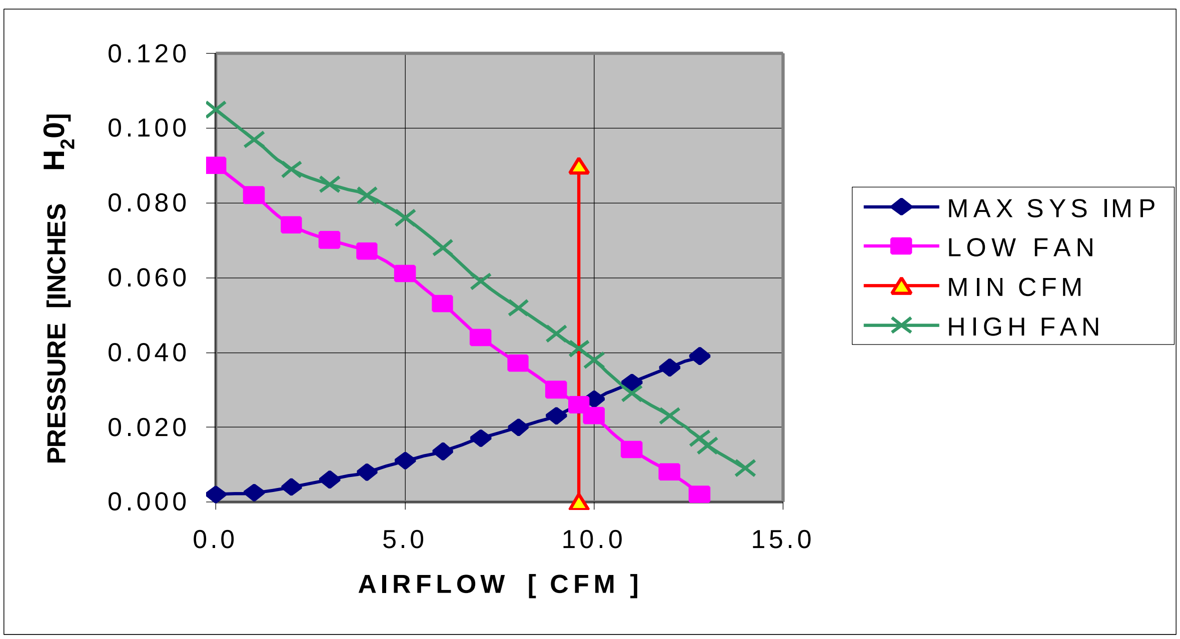

Figure 5-2: The Power Supply Airflow P-Q Curve

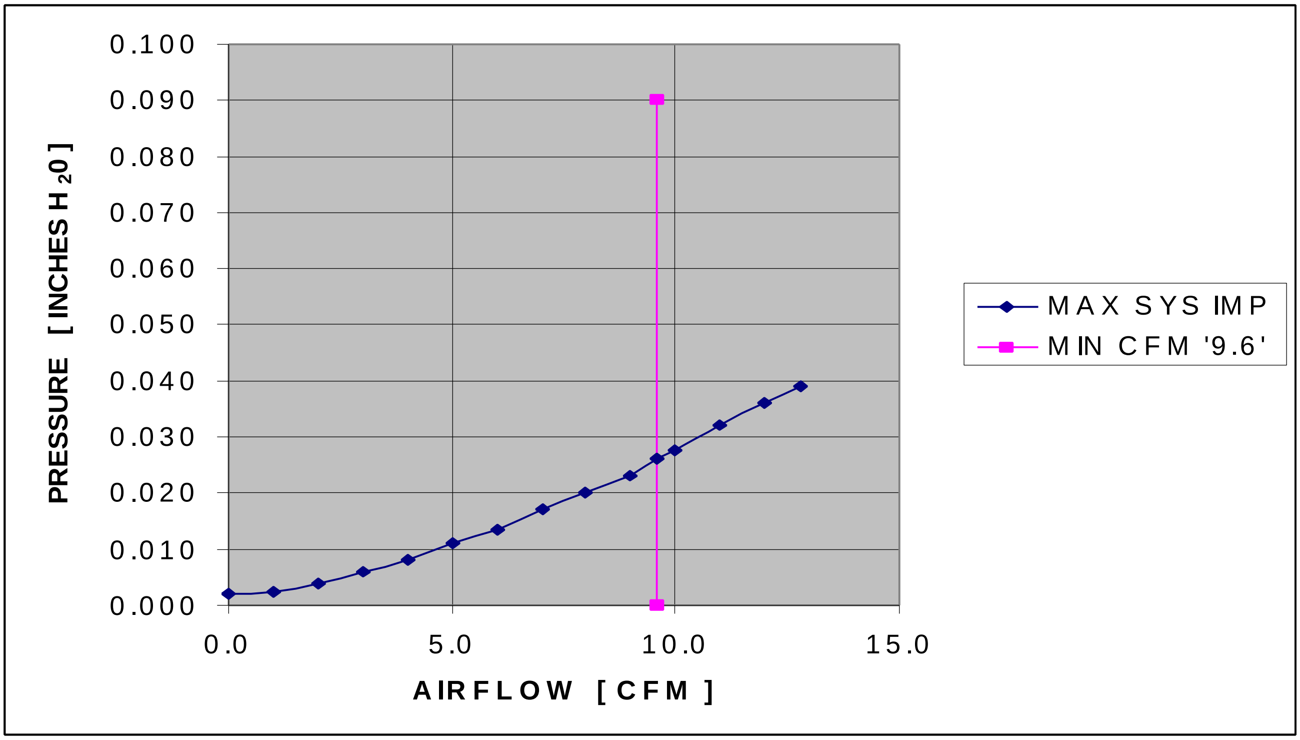

Figure 5-3: Maximum System Airflow Impedance P-Q Curve

5.1.2 Air Temperature Rise

At the high fan speed settings, the temperature rising through the power supply is less than 15° C.

5.1.3 Operating Environment

The operating ambient (inlet air) temperature range for the power supply is 0°C to 50°C.

5.2 Electrical Interface

5.2.1 AC Inlet

The AC input connector is an *IEC 320 C-14* power inlet. This inlet is rated for 15A / 250VAC.

Note: The connector location is shown in Figure 5-1 in the Mechanical Overview, Section 5.1.

Table 5-1 that follows shows input voltage and frequency ranges.

Table 5-1: Input Voltage and Frequency Ranges

Parameter	Min	Nom	Max	Units
Voltage	90	100-120	132	V_{rms}
Voltage	180	200-240	264	V_{rms}
Frequency	47		63	Hz

5.2.2 Power Factor Correction

If the power supply is PFC certified, it meets the requirements of document *EN61000-3-2: Electromagnetic Compatibility* (*EMC)* Part 3: Limits-Section 2: Limits for harmonic current emissions, and also meets the harmonic current emission limits specified for ITE equipment. It also is tested per the process described in *JEIDA MIT: I Guideline for Suppression of High Harmonics in Appliances and General-Use Equipment*, and is in compliance with this document for ITE equipment.

5.2.3 Hold-Up Time

The power supply shall sustain no loss of performance during a minimum of a one-cycle dropout (20 ms) of the AC input voltage, and the PW-OK (as discussed in Section 6.3) shall remain valid during the Hold-Up Time. This means the output voltages must stay within regulation limits for a minimum of 21ms and the PW-OK signal must stay high for a minimum of 20ms after loss of the AC input voltage.

5.2.4 AC Inrush

AC line inrush current shall not exceed 65A peak at turn on under any output loading condition when tested with worst case for the rated line input voltage range.

5.2.5 AC Line Fuse

The AC line fuse must be acceptable for all safety agency requirements. AC inrush current shall not cause the fuse to blow under any conditions. No power supply operating condition shall cause the fuse to blow unless a component in the power supply has failed. This includes DC output load short conditions.

5.2.6 AC Auxiliary Outlet

The power supply shall not contain an AC convenience output or AC auxiliary outlet.

5.3 Output Connectors

5.3.1 Main Power Connector

The following is the main power connector's component data. Refer to Table 5-2, which follows for the connector color codes and pin-out configurations.

P1 Connector housing: 24- Pin Molex 39-01-2240 or equivalent
Contact: Molex 39-00-0038 or equivalent

Table 5-2: Main Output Power Connector Color Codes and Pin-Out

PIN	SIGNAL	18 AWG COLOR	PIN	SIGNAL	18 AWG COLOR
1	+3.3 VDC	Orange	13	+3.3 VDC	Orange
2	+3.3 VDC	Orange	14	-12 VDC	Blue
3	COM	Black	15	COM	Black
4	+5 VDC	Red	16	PS_ON	Green
5	COM	Black	17	COM	Black
6	+5 VDC	Red	18	COM	Black
7	COM	Black	19	COM	Black
8	PWR OK	Gray	20	Reserved (-5V in ATX)	N.C.
9	5VSB	Purple	21	+5 VDC	Red
10	+12 VDC	Yellow	22	+5 VDC	Red
11	+12 VDC	Yellow	23	+5 VDC	Red
12	+3.3 VDC	Orange	24	COM	Black

a) P2-P8, P11, P12 Peripheral Power Connectors

The following section provides the component data for the peripheral power connectors. Refer to Table 5-3 for the connector pin-out configurations.

Peripheral Power Connector housing: Amp 1-480424-0 or equivalent
Contact: Amp 61314-1 contact or equivalent

Table 5-3: Peripheral Power Connector Pin-Out

Pin	Signal	18 AWG Color
1	+12 VDC	Yellow
2	COM	Black
3	COM	Black
4	+5 VDC	Red

b) P9 Floppy Power Connector

The following section provides the component data for the P9 Floppy power connectors. Refer to Table 5-4 for the connector pin-out configurations.

Floppy Power Connector housing: Amp 171822-4 or equivalent

Table 5-4: Floppy Power Connector Pin-Out

Pin	Signal	22 AWG Color
1	+5 VDC	Red
2	COM	Black
3	COM	Black
4	+12 VDC	Yellow

c) P13 Auxiliary Signal Connector

The following section provides the component data for the P13 auxiliary signal power connectors. Refer to Table 5-5 for the auxiliary signal connector pin-out configurations.

Auxiliary Signal Connector housing: 10- pin Molex 39-01-2100 or equivalent
Contacts: Molex 39-00-0038 or equivalent

Table 5-5: Auxiliary Signal Connector Pin-Out

Pin	Signal	24 AWG Color	Pin	Signal	24 AWG Color
1	Fan M	White	6	1394 Gnd	N.C.
2	Fan C	Blue	7	1394 (26V)	N.C.
3	3.3 V Remote Sense	Orange	8	+3.3 V Standby	N.C.
4	Resv (mem V on)	N.C.	9	I2C Data	N.C.
5	3.3 V Remote Sense Return	N.C.	10	I2C Clock	N.C.

d) P10 ATX Auxiliary Power Connector

The following section provides the component data for the P10 ATX auxiliary power connectors. Refer to Table 5-6 for the connector pin-out configurations.

Power Supply Connector housing: 6- Pin Molex 90331-0010 or equivalent
Power Supply Connector Contacts: Molex 08-50-0277 or equivalent
Wire size: 18 AWG

Table 5-6: ATX Auxiliary Power Connector Pin-Out

Pin	Signal	Color
1	COM	Black
2	COM	Black
3	COM	Black
4	+3.3 Vdc	Orange
5	+3.3 Vdc	Orange
6	+5 Vdc	Red

5.3.2 Output Harness Detail

The DC output harness connectors and lengths are shown in Figure 5-4.

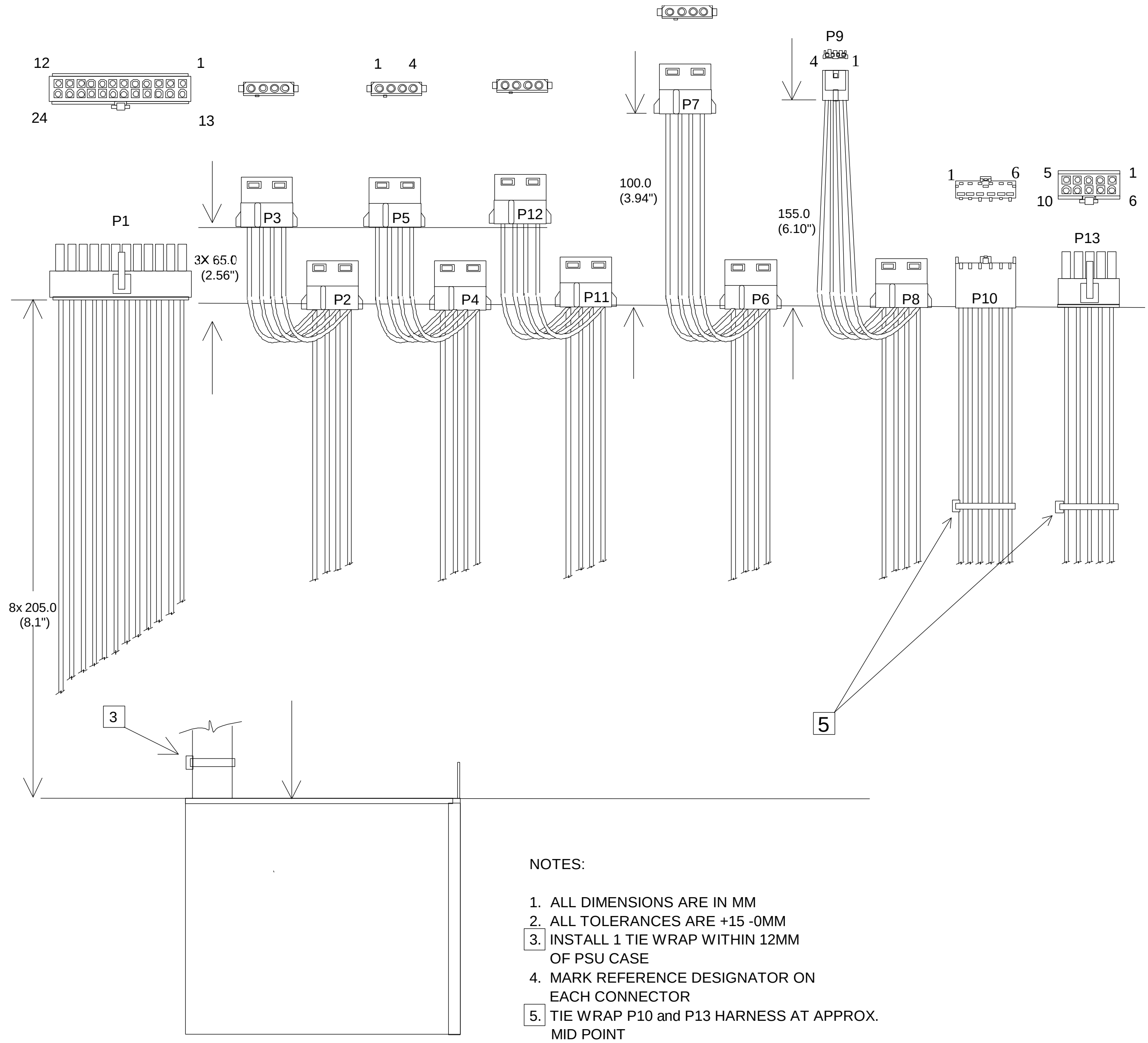

Figure 5-4: Output Harness Detail

5.3.3 Power Recovery

The power supply must be able to recover automatically after an AC power failure. Power recovery means that as soon as AC power is applied, the power supply turns ON, assuming the PS-ON signal is true.

5.3.4 Remote Sense

For the +5 V and +12 V, the power supply shall use remote sensing wires to achieve regulation at the P1 output connector. These wires are to be crimped into P1 at the output connector. The remote sense pins for the +3.3 V are located in the P13 connector as defined back in Table 5-2. If the remote connection is lost to any of these outputs, then internal resistive feedback causes the power supply to regulate and prevent OVP.

5.3.5 Maximum Current on P1

The output connector P1 (and the number of pins assigned to each output voltage) limits the maximum amount of output current. The current rating for each pin is 6A.

5.3.6 Current Rating

At a minimum, the power supply must regulate properly over the following load ranges.

Minimum Loading

	Load Range 1	
Voltage	Minimum Continuous	Maximum Continuous
+3.3V	0.5 A	3 A
+5V	3 A	12 A
+12V	0.75 A	5 A
-12V	0 A	0.5 A
+5VSB	0 A	0.8A

Maximum +3.3V Loading

	Load Range 2	
Voltage	Minimum Continuous	Maximum Continuous
+3.3V	0.5 A	16 A
+5V	8 A	22 A
+12V	3 A	10 A
-12V	0 A	0.5 A
+5VSB	0 A	0.8A

Maximum +5V Loading

	Load Range 3	
Voltage	Minimum Continuous	Maximum Continuous
+3.3V	0.5 A	11 A
+5V	8 A	26 A
+12V	4 A	10 A
-12V	0 A	0.5 A
+5VSB	0 A	0.8A

5.3.7 Power Timing

Output voltages must reach their nominal settings within 1.5 seconds after power on. The output voltage then must rise from 10%, to within regulation limits in a minimum of 5 ms (or a maximum of 70 ms) as measured at full load on each output. See Figure 5-5, T2, for the accepted output rise time.

The +3.3 V, +5 V and +12 V output voltages should start to rise approximately at the same time. The rise time of the +3.3 V and the +5.0 V outputs must track in such way, that the difference does not exceed 2.25 V at any time during turn-on. Each output voltage shall reach regulation within 100 ms of each other. Refer to Figure 5-5.

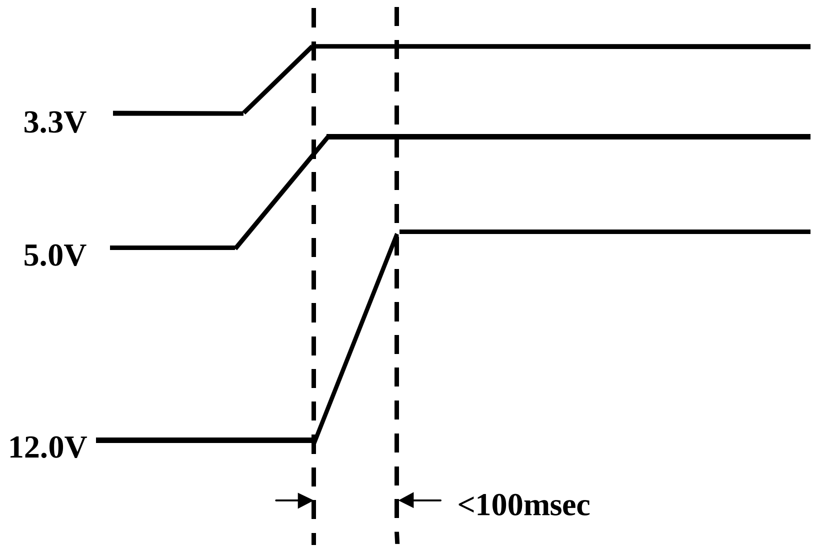

Figure 5-5: Power Timing

5.3.8 Ripple / Noise

The maximum ripple/noise output allowed from the power supply is defined in Table 5-7. This is over a bandwidth of 0 Hz to 20 MHz, with one- (1)10µF electrolytic, and one- (1) 0.1µF ceramic capacitor, each being connected to the output connectors.

Table 5-7: Maximum Output Ripple and Noise

Voltage	Noise 10 Hz to 30 MHz (PARD)	Ripple pk-pk
+ 3.3 V	50 mVp-p	1.5%
+ 5 V	50 mVp-p	1 %
+12 V	120 mVp-p	1 %
- 12 V	120 mVp-p	4 %
+ 5 V standby	50 mVp-p	1 %

5.3.9 Current Limit

The power supply is designed to shutdown in a latch off mode after a current overload. The latch is then cleared by toggling the PS_ON signal, or by a powering cycle of >5 seconds duration which resets the latch in the OFF condition. The power supply must adhere to the 240 VA limits as defined in the regulatory document, *CSA C22.2 No.234, Level 3*.

5.3.10 Voltage Regulation

All the power supply output voltages must stay within the following voltage limits over all conditions of the power supply operation. This voltage output is then measured at the point of load (or at the remote sense points, if available.)

Table 5-8: Voltage Regulation

Parameter	O/P	Min	Nom	Max	Units	Tolerance
+ 3.3 V	V1	+ 3.17	+ 3.30	+ 3.43	V	± 4%
+ 5 V	V2	+ 4.80	+ 5.00	+ 5.20	V	± 4 %
+ 12 V	V3	+11.52	+12.00	+ 12.48	V	± 4%
- 12 V	V4	- 10.80	- 12.00	- 13.2	V	± 10%
+ 5 V standby	V7	+ 4.75	+ 5.00	+ 5.25	V	± 5%

5.3.11 Load Transients

For the power supply to maintain the system voltage regulation limits, it must be able to provide the following load transient rates and still stay within regulation limits.

Table 5-9: Load Transients

O/P	Step Load Size	Slew Rate
+3.3 V	8 A	0.2 A/µs
+5 V	8 A	0.2 A/µs
+12 V	8 A	0.2 A/µs

5.3.12 Capacitance Loads

Table 5-10 contains the maximum capacitive loading on the voltage outputs.

Table 5-10: Maximum Capacitive Loading

Voltage	Capacitance
+ 3.3 V	10,000 µF
+ 5.0 V	29,000 µF
+ 12 V	5,000 µF
- 12 V	350 µF

5.3.13 Overvoltage Protection (OVP)

The power supply shall shutdown in a latch OFF mode after an over voltage condition occurs. The latch is cleared by toggling the PS_ON signal, (or running a power cycle of >5 seconds duration) to reset from the latch OFF condition. This limit applies to the over all specified conditions. The inputs for the OVP circuit shall be the remote sense connections. Table 5-11 contains the overvoltage limits.

Table 5-11: Overvoltage Limits

Voltage Source	Protection Point
3.3 V	3.8 - 4.5 V
5 V	5.6 - 6.5 V
12 V	13 - 14.5 V

6.0 Power Control Signals

6.1 PS-ON

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 +3.3 V, 5 V, 12 V, and –12 V power rails. When this signal is held high by the PC board, or left open circuited, outputs of the power rails should be OFF. The power supply then provides potential at the +3.3 V, 5 V, 12 V, and -12V power rails only when this signal is held at ground potential. This signal should be held at +5 VDC by a 1K pull-up resistor internal to the power supply's +5 VSB.

Table 6-1: PS-ON Signal Characteristics

PS-ON	Min	Max
Vil, Input Low Voltage		0.8 V
Iil, Input Low Current, Vin = 0.4 V		-1.6 mA
Vih, Input High Voltage, Iin = -200uA	2.0 V	
Vih open circuit, Iin = 0		5.25 V

6.2 5 VSB

5 VSB refers to a standby voltage that is used to run circuits requiring power during the powered-down state of all power rails. The 5 VSB pin delivers 5 V at a minimum of 0.8 A. 5 VSB is also required for the implementation of PS-ON and other system circuits that must stay powered when the system is turned OFF.

6.3 PW-OK

PW-OK is a power good signal and is asserted high by the power supply to indicate that all the outputs are above the regulation limits of the power supply. When this signal is asserted high, the power supply operates within the specification limits. Before any output voltage falls below its regulation limit, (or when AC power has been removed for a time greater than 20 ms) as discussed in the *Hold-Up Time,* Section 5.2.3 so that the power supply operation is no longer guaranteed, PW-OK is then de-asserted to a low state. See Figure 6-2 for a review of the timing characteristics of the PW-OK, PS-ON, and outputs. The start of the PW-OK delay time is inhibited as long as any power supply output is in current limit. Note that the PW-OK signal provides a minimum of 1 ms warning before any output voltage drops out of specified limits.

Table 6-2: PW-OK Signal Characteristics

Signal Type:	Open collector/drain +5 VDC, TTL compatible
Logic level low:	< 0.4V while sinking 4 mA
Logic level high:	3.5 VDC minimum output while sourcing 200 uA
High state output impedance:	1KΩ from output to common
PW-OK delay:	100 ms < T_3 < 1500 ms
PW-OK rise time:	$T_1 \leq$ 300 usec
PW-OK fall time:	$T_5 \leq$ 300 usec
Power down warning:	T_4 > 1 ms, Over load range and AC input voltage
Output Ramp rate:	5 ms < T_2 < 70 ms
Delay from AC loss to PW-OK low:	≥20 ms
Delay from AC loss to outputs out of regulation:	≥21 ms
PW-OK pull-up resistor:	1KΩ from +5 VDC to PW-OK inside power supply

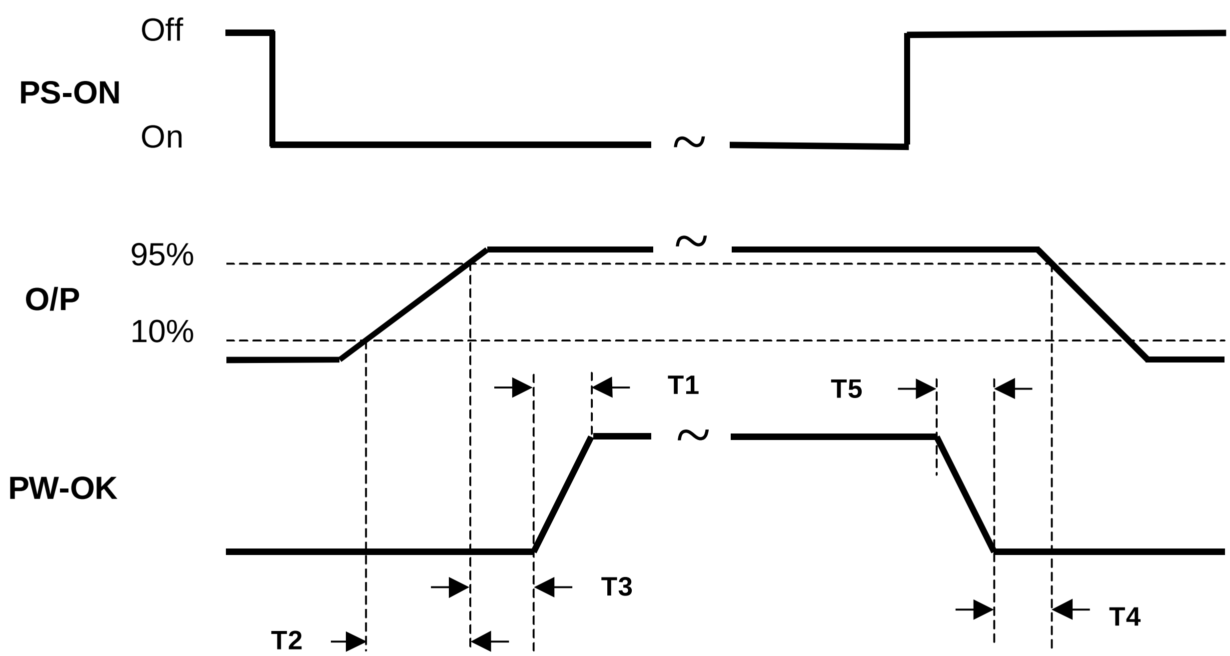

Figure 6-1: Power On/Off Characteristics

6.4 Fan Monitor (FanM) Signal

FanM signal requirements are identical to those specified in Section 4.3.1 of the ATX specification, Rev. 2.01.

The FanM signal is an open collector, two- (2) pulse per revolution tachometer signal from the power supply fan. The signal stops cycling during a lock rotor state; the level is either high or low. This signal allows the system to monitor the power supply for fan speed or failures. Implementation of this signal would allow a system designer to gracefully power down the system in case of a critical fan failure. The monitoring circuit on the motherboard uses a 1K Ohm to 10K Ohm pull-up resistor for this signal. The FanM signal must be able to sink a minimum of 6mA. The output is fed into a high impedance gate for the motherboard implementation. If this signal is not implemented on the motherboard, it does not impact the power supply function.

6.5 Fan Control (FanC) Signal

FanC signal requirements are identical to those specified in Section 4.3.2 of the ATX specification, Rev. 2.01.

The FanC signal is an optional fan speed and shutdown control signal. The fan speed and shutdown are controlled by a variable voltage on this pin. This signal allows the system to request control of the power supply fan from full speed to OFF. Implementation of this signal would allow a system designer to implement a request-fan-speed control or shut-down during low power states, such as sleep or suspend. The control circuit on the motherboard supplies voltage to this pin from +12 VDC to 0 VDC for the fan control request.

- If a voltage level of +1 volts or less is sensed by the power supply at pin 2 of the optional connector, the fan is requested by the motherboard to shut down.
- If a voltage level of +10.5 volts or higher is being supplied to pin 2, the fan in the power supply is requested to operate at high speed.
- If a voltage level of between +2 volts and +3 volts (+2 volts < FanC < +3 volts then) is being supplied to pin 2, the fan in the power supply is requested to operate at low speed.

The fan control in the power supply may be implemented so that it allows variable speed operation of the fan, depending on the voltage level supplied. If, for example, a +6 volt signal is sensed at pin 2, the power supply would operate the fan at a medium speed. If this signal is used for on/off control of the power supply fan, and speed control is not implemented in the fan control circuit of the power supply, the power supply fan would operate at full speed for any voltage level over +1 VDC. The power supply would draw no more than 20 mA from pin 2 of the optional power supply connector. A pull-up must be used internal to the power supply for this signal so that if the connector is left open, the fan is requested to operate at full speed.

6.6 Power Supply Field Replacement Unit (FRU) signals

The FRUs are optional at this time, but have a high probability of being required in a future revision of this specification. Two- (2) pins have been reserved on connector P13 to provide FRU information for the power supply. One pin is the Serial Clock (I²C Clock). The second pin is used for Serial Data (I²C Data). Both pins are bi-directional and are used to form a serial bus. Since only one power supply is required in a system, the device in the power supply is address at **0x50**.

Refer to the Intelligent Management Platform Interface specifications for component definition. The current versions of these specifications are available at http://developer.intel.com/design/servers/ipmi/spec.htm.

6.7 FRU Data Format

If FRU signals are utilized, it is required that the FRU data format be compliant with the Intelligent Platform Management Interface (IPMI) specifications as they are released and revised. It is very likely that future revisions of this specification will require IPMI compliance.

Refer to the Intelligent Management Platform Interface specifications for component definition. The current versions of these specifications are available at http://developer.intel.com/design/servers/ipmi/spec.htm.

7.0 MTBF

The power supply shall have a minimum MTBF of continuous operation of: 1) 50,000 hours at 100% loading and 50° C, as calculated by Bellcore RPP, or 2) 100,000 hours demonstrated at 100% load and 50° C.

8.0 Regulatory Compliance

This Entry-Level power supply must comply with all regulatory requirements for its' intended geographical market. Depending on the chosen market, regulatory requirements may vary. Although a power supply can be designed for worldwide compliance, there may be cost factors that drive different versions of supplies for different geographically targeted markets.

This specification requires that the power supply meet all regulatory requirements for the intended market at the time of manufacturing. Typically this includes:

- UL
- CSA
- A Nordic CENELEC
- TUV
- VDE
- CISPR Class B
- FCC Class B

The power supply, when installed in the system, shall meet immunity requirements specified in *EN50082-1*. Specific tests are to be *IEC 801-2, IEC 801-3, IEC 801-4*, and *IEC801-5*, each at level 3. The power supply must maintain normal performance within specified limits. This testing must be completed by the system EMI engineer. Conformance must be designated with the European Union CE Marking.

9.0 Appendix A: Reference Documents

Table 9-1: Reference Documents

Document Title	Comments
ANSI C63.4-1992:	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low Voltage Electronic Equipment in the Range of 9 kHz to 40 GHz for EMI Testing.
ANSI C62.41:	(SWC) Tests for Category A and B.
Bellcore TR-NWT-000332 Issue 4	Reliability Prediction Procedure for Electronic Equipment, Bell Communications Research, Technical Reference, TR-NWT-000332, Issue 4, September 1992 Revision.
CFR 47 Part 15, Subpart B:	Code of Federal Regulations, Regulations for Class B Computing Devices.
CISPR 22 and EN55022:	Limits and Methods of Measurements of Radio Interference Characteristics of Information Technology Equipment, Class B.
CSA C22.2 No.950:	Safety of Information Technology Equipment including Business Equipment.
CSA C22.2 No.234, Level 3:	Safety of Component Power Supplies. Intended for use with Electronic Data Processing Equipment and Office Machines.
EN50082-1:	CENELEC Generic Immunity Standard.
IEC801-/IEC1000-4	Immunity Requirements for Information Technology Equipment. 2: ESD Requirements. 3: Immunity to Radio Frequencies. 4: Conducted Immunity.
IEC801-5/IEC1000-4-5	Surge Immunity Test.
IEC 950, plus A1, A2 and A3	Safety of Information Technology Equipment, Including electrical business equipment (2nd Ed. 1991 & Amendments).
IEC Publication 417	International Graphic Symbol Standard.
IEEE Std. 587-1980 or IEEE:	IEEE Guide for Surge Withstand Capability.
ISO Standard 7000	Graphic symbols for Use on Equipment.
MIL-STD-105K:	Quality Control.
MIL-STD-217F:	Reliability Predictions for Electronic Equipment.
UL 1950 without D3 Deviations:	Standard for Safety, Information Technology And Vfg 243/1991 Regulations for the Radio Frequency Interference Suppression of High Frequency Apparatus and Installations. Equipment including Electrical Business Equipment.
EN60950 plus A1 and A2:	Safety of Information Technology Equipment, Including electrical business equipment.
EN 61000-3-2:	Electromagnetic Compatibility (EMC) Limits for harmonic current emissions.
JEIDA MITI	Guideline for Suppression of High Harmonics in Appliances and General-Use Equipment.
ATX 2.01	ATX board specification.