420-watt ATX with
Active PFC 90-260 VAC

CONTENTS

1. GENERAL

This specification describes the performance characteristic of a 420W ATX power supply module with +3.3V, +5V, +12V, -5V, 12V main DC outputs, and 5V standby outputs.

2. ELECTRICAL PERFORMANCE

2.1. AC INPUT

2.1.1. INPUT VOLTAGE AND FREQUENCY

	Minimum	Nominal	Maximum	Units
Range 1	90	120	132	Vrms
Range 2	180	230	264	Vrms

Table 1 – Input voltage range

	Minimum	Nominal	Maximum	Units
Range 1	47	60	63	Hz
Range 2	47	50	53	Hz

Table 2 – Input frequency range

2.1.2. INPUT CURRENT AND INRUSH CURRENT

Input current shall meet the limits shown in table 3.

Input voltage	Maximum input current	Maximum inrush current
Range 1	10 A	50 A_{peak}
Range 2	5 A	100 A_{peak}

Table 3 – Input current

Inrush current shall be measured after the power supply has been sitting for a minimum of ten minutes with the input voltage removed at an ambient temperature of 25° C.

2.1.3. INPUT CURRENT HARMONICS

The input current drawn on the power line shall not exceed the limits set by IEC-1000-3-2 when unit is operated at RANGE 1 and 2 described in section 2.1.1.

2.1.4. INPUT POWER FACTOR CORRECTION

Power factor shall be better than 0.95 output full load.

2.1.5. BROWNOUT

The power supply shall not be damaged when AC input voltage is dropped below the minimum specified AC input voltage. Furthermore, when AC input voltage returns to normal, the power supply shall return to normal operation.

2.2. SIGNAL INPUT

The power supply shall have one TTL compatible signal inputs, *PSON.

2.2.1. OUTPUT ON/OFF CONTROL

The power supply shall have a TTL compatible input for on/off control of the output voltages. This input shall be driven by an external signal, *PSON, referenced to the output voltage common. The external circuitry providing *PSON shall be capable of sinking 1.6 mA.

The output voltages shall turn on when *PSON is low (≤ 0.8 V). They shall turn off when *PSON is high (open). *PSON shall have no control over the auxiliary voltages.

2.3. DC OUTPUT VOLTAGES

The power supply shall provide a total of six DC output voltages. Five of these voltages shall be controlled by the state of *PSON defined in section 2.2.1. The remaining one is an auxiliary voltage. It is energized whenever AC input within the range specified above is applied. The state of *PSON shall have no effect on this output.

2.3.1. OUTPUT CURRENT CAPACITY

The voltage outputs shall be capable of supplying the output current shown in table 4 subject to: Total output power for 3.3 V and 5 V combined should be ≤ 220 W

Output	Nominal output (V_{dc})	Minimum	Maximum	Units	Conditions
1	3.3 V	0.5	30 [a]	A	a: Combined power ≤ 220 W
2	5 V	3	40 [a]	A	
3	12 V	0.0	15	A	
4	-5 V	0	0.5	A	
5	-12 V	0	1	A	
6*	+5 V_{sb}	0	2	A	

Table 4 – Output current capacity

* Output 6 is auxiliary outputs.

2.3.2. STAND-BY POWER

The unit shall provide a standby output of 5V +/- 5% with current sourcing capability of 2.0A. The ripple and noise of this output shall be less than 50mVp-p. This output shall be active whenever AC power is available to the unit. *PSON shall have no effect on this output.

2.3.3. REGULATION, RIPPLE AND NOISE

The power supply shall meet the regulation, ripple and noise parameters shown in table 5, subject to the cross loading conditions in section 2.3.2.

	Output voltage limits (V_{dc})			Ripple/noise
Output	Minimum	Nominal	Maximum	Maximum
1	3.17 V	3.30 V	3.46 V	50 mV_{p-p}
2	4.80 V	5.00 V	5.25 V	50 mV_{p-p}
3	11.40 V	12.00 V	12.60 V	120 mV_{p-p}
4	-4.75 V	-5.00 V	-5.25 V	120 mV_{p-p}
5	-11.40 V	-12.00 V	-12.60 V	120 mV_{p-p}
6	4.75 V	5.00 V	5.25 V	50 mV_{p-p}

Table 5 – Output voltage regulation

Output ripple and noise measurement shall be made using the following methods:

a) Measurements made differentially (common mode noise subtracted from the measured voltage).
b) Ground lead of oscilloscope probe ≤ 0.25 inch.
c) Measurements made where the cable connectors attach to the load.
d) Outputs bypassed at the point of measurement with the following:
    - o 3.3 V use 220uF electrolytic and 0.1 uF ceramic capacitors
    - o 5 V use 47 uF electrolytic and 0.1 uF ceramic capacitors
    - o 12 V, -5 V, and -12 V use 10 uF electrolytic and 0.1 uF ceramic capacitors
e) Oscilloscope bandwidth limited to 20 MHz.

2.3.4. OUTPUT VOLTAGE RISE TIME

The rise time of all output voltages shall be between 0.1mS to 1sec, measured from 10 % to 90 % on the leading edge of the voltage waveform.

2.3.5. OUTPUT VOLTAGE HOLD-UP TIME

Upon loss of input voltage (at nominal), the output voltages shall remain in regulation for at least 20 msec.

2.3.6. OVERSHOOT

Any output overshoot at turn on shall be less than 10% of the nominal output value. Any overshoot shall recover to within regulation in less than 50mS.

2.3.7. TRANSIENT RESPONSE

The following shall apply to the 3.3 V, 5 V, and 12 V outputs: Output voltage shall recover to within 1 % of its static operating level ≤ 1 mS under the following conditions:

1. Load step from 75 % to 100 % to 75 % maximum load
2. Repetition rate of 10 mS with 50 % duty cycle
3. Current slew rate ≤1A/μS.

2.3.8. CAPACITIVE LOADS

The power supply should be able to power up and operate normally with the following capacitances simultaneously present on the DC outputs.

Output	+12VDC	+5VDC	+3.3VDC	-5VDC	-12VDC	$+5V_{sb}$
Capacitive load (μF)	1,000	10,000	6,000	350	350	350

Table 6 – Output capacitive loads

2.3.9. MAXIMUM LOAD CHANGE

The power supply shall continue to operate normally when there is a step change ≤ 1 A / μS from minimum load to maximum load or maximum load to minimum load

2.3.10. TEMPERATURE COEFFICIENT

After operating for 30 minutes or longer at 25° C ambient, the output voltages shall change no more than ± 0.05 % per degree C.

2.3.11. EFFICIENCY

The power supply efficiency measured at nominal input voltage (115 V or 230 V) and maximum load shall be ≥ 68 %.

2.3.12. OUTPUT PROTECTION

2.3.12.1. Short circuit protection

A short circuit on any output shall cause no damage to the power supply. A short circuit shall be defined as a resistance ≤ 0.01 Ω.

2.3.12.2. Over voltage protection

If the output exceeds the over voltage limits shown in table 7, the power supply shall turn off and remain off until the input voltage is disconnected and then reconnected.

Output	Nominal Voltage	Over voltage Limit
1	3.3 V	4.0 V +/- 10 %
2	5 V	6.2 V +/- 10 %
3	12 V	14.6 V +/- 10 %

Table 7 – Over voltage limits

2.3.12.3. Over current protection

+3.3V, +5V and +12V output shall be equipped with over current protection. Their set point shall be between 110% and 150%.

2.3.12.4. Recovering from fault

The latch off state shall be cleared after the fault is removed and switching *PSON to high for ≥ one second. It shall also be cleared after the fault is removed and removing AC power for ≥ 10 seconds.

2.3.12.5. Remote sensing

The power supply +3.3V, +5V and +12V output must be able to correct for a voltage drop on connector, cable and PCB trace of 100mV minimum.

2.4. SIGNAL OUTPUT

2.4.1. POWER GOOD

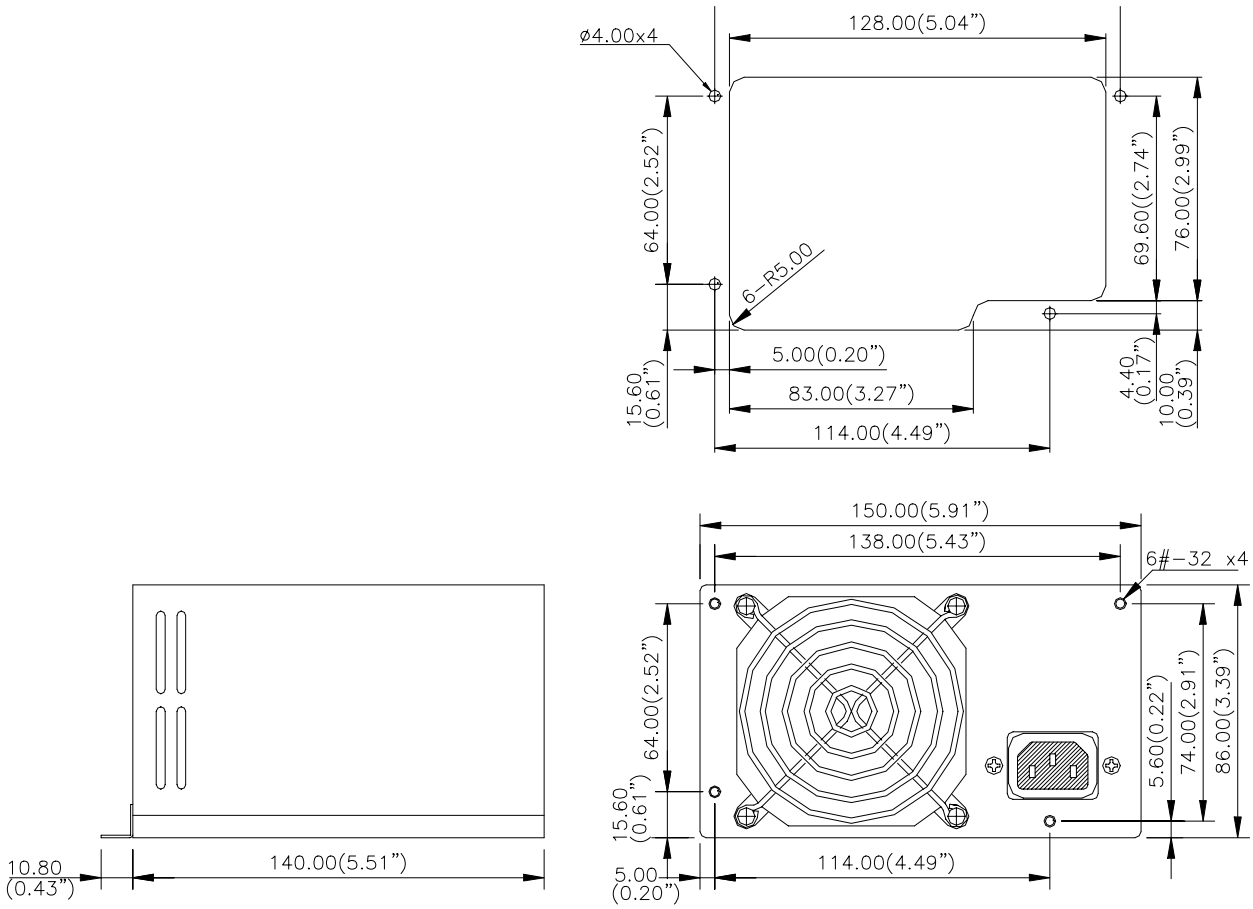
Power good shall be a TTL compatible signal capable of sinking 5 mA and sourcing 100 μA. Power good low shall be ≤ 0.4 V, and high shall be ≥ 3.0 V. Power good shall change from low to high between 100 and 500mS after the 5 V and 3.3 V outputs attain a static operating level within their specified regulation parameters. Power good shall change from high to low 1 msec before 5 V or 3.3 V output falls below its specified regulation parameter. Power good rise time shall be less than 10μS with capacitive load ≤ 47 pF.

3. MECHANICAL

3.1. DIMENSION

The outside dimension, not including handle and output connector, shall be W150mm x H86mm x D140mm.

Click here for larger (printer friendly) view of mechanical drawing



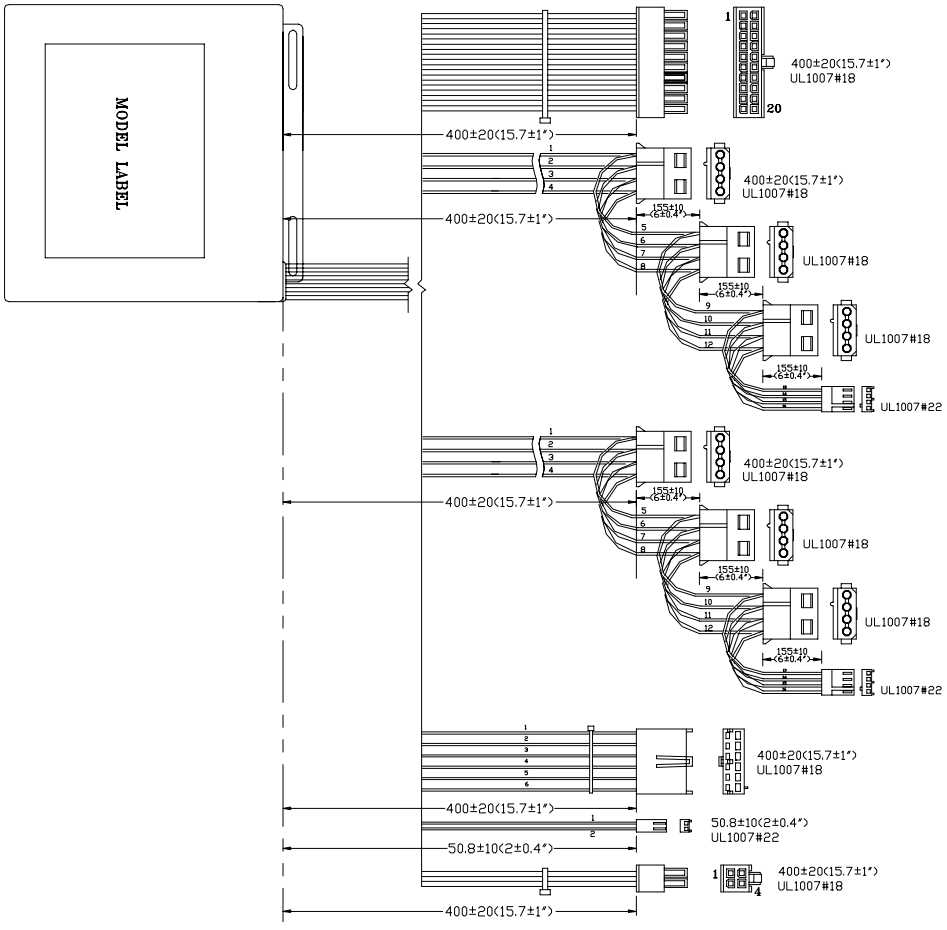
3.2. AC INPUT CONNECTOR

The power supply shall have an internal IEC320 AC inlet.

3.3. OUTPUT AND SIGNALS CONNECTORS

There are 6 sets of output cable, 20-pin for motherboard, a 6-pin for motherboard and one 4-pin 12V cable. Two drive cables for three HDD and one FDD. There is also 2-pin connector for disabling the fan control circuit.

Click here for larger (printer friendly) view of cable drawing



MOLEX 8981-4P (PZA) AWG18 UL1007 style wires followed by MOLEX 8981-4P (PZB) AWG 18 UL 1007 style wires to 171822-4 S4P (PZC) or equiv AWG22 UL 1007 style wires.			
Pin	Output	Color	Comments
PZA-1	+12V	YELLOW	
PZA-2	COM	BLACK	
PZA-3	COM	BLACK	
PZA-4	+5V	RED	
PZB-1	+12V	YELLOW	
PZB-2	COM	BLACK	
PZB-3	COM	BLACK	
PZB-4	+5V	RED	
PZC-1	+12V	YELLOW	
PZC-2	COM	BLACK	
PZC-3	COM	BLACK	
PZC-4	+5V	RED	

Table 8 – Drive cables connector Pin out

20P:MOLEX 20pin receptacle, PN 39-01-2200,MOLEX female terminals PN 39-00-0039.			
Pin	Output	Pin	Output
1	+3.3V	11	+3.3V +3.3VS(22#)
2	+3.3V	12	-12V
3	COM	13	COM
4	+5V +5VS(22#)	14	ON/OFF
5	COM COM (22#)	15	COM
6	+5V	16	COM
7	COM	17	COM
8	PG	18	-5V
9	$+5V_{sb}$	19	+5V
10	+12V +12VS(22#)	20	+5V

Table 9 - 20P Connector Pin out

Connector: MOLEX 90331-0010 (keyed pin 6) or equivalent		
Pin	Signal	18 AWG Wire
1	COM	Black
2	COM	Black
3	COM	Black
4	+3.3VDC	Gray
5	+3.3VDC	Gray
6	+5VDC	Red

Table 10 - 6P Connector Pin out

Connector: MOLEX 39-01-2040 or equivalent (Mating motherboard connector is Molex 39-29-9042 or equivalent)		
Pin	Signal	20AWG Wire
1	COM	Black
2	COM	Black
3	+12VDC	Yellow
4	+12VDC	Yellow

Table 11 - +12V Power Connector Pin out

Connector: MOLEX 22-01-3027 or equivalent (Mating motherboard connector is Molex 08-70-0056 or equivalent)		
Pin	Signal	20AWG Wire
1	Fan Control on/off	Red
2	Jumper = fan control off.	Red

Table 12 - +12V Power Connector Pin out

3.4. COOLING

The power supply shall be equipped with an internal 80 mm, ball bearing fan. The fan shall have zero pressure airflow of at least 44 CFM. The fan has an internal fan speed control circuit to keep the unit quiet when cooling is not required.

4. ENVIRONMENTAL

The power supply shall operate normally, show no degradation of performance, and sustain no damage as a result of the environmental conditions listed in paragraphs 4.1 through 4.5.

4.1. TEMPERATURE

Operating:	0 to 50° C
Non-operating:	-40 to 70° C

4.2. HUMIDITY

Operating:	5 % to 90 % non-condensing
Non-operating:	5 % to 90 % non-condensing

4.3. ALTITUDE

Operating:	Sea level to 7,000 feet
Non-operating:	Sea level to 40,000 feet

4.4. SHOCK

Operating:	5 g for 11 ms with a ½ sine wave for each of the perpendicular axes X, Y, and Z.
Non-operating:	30 g for 11 ms with a ½ sine wave for each of the perpendicular axes X, Y, and Z.

4.5. VIBRATION

Operating:	10 Hz to 500 Hz sweep at 0.5 g constant acceleration for one hour on each of the perpendicular axes X, Y, and Z.
Non-operating:	10 Hz to 300 Hz sweep at 2 g constant acceleration for one hour on each of the perpendicular axes X, Y, and Z.

4.6. POWER LINE DISTURBANCE

4.6.1. OVER VOLTAGE

The power supply shall function with no interruption when line input is surged 15 % above nominal for one second. The verification of this shall be done 10 times with a 10 % duty cycle.

4.6.2. UNDER VOLTAGE

The power supply shall function with no interruption when line input is sagged 20 % below nominal for one second. The verification of this shall be done 10 times with a 10 % duty cycle.

4.6.3. SURVIVING SURGE AND SAG

Power supply shall survive a surge voltage to 147 VAC for 0.5 second and sag to 80 VAC for 0.5 second without damage.

5. REGULATORY

5.1. SAFETY CERTIFICATION

The power supply is UL, C-UL, CE and TUV approved and safety logos appear on power supply model label. A CB report is also available.

5.1.1. LEAKAGE CURRENT

Leakage current from power supply AC input to safety ground shall not exceed 1.25 mA at 240VAC/50Hz.

5.2. ELECTROMAGNETIC COMPATIBILITY

5.2.1. EMI

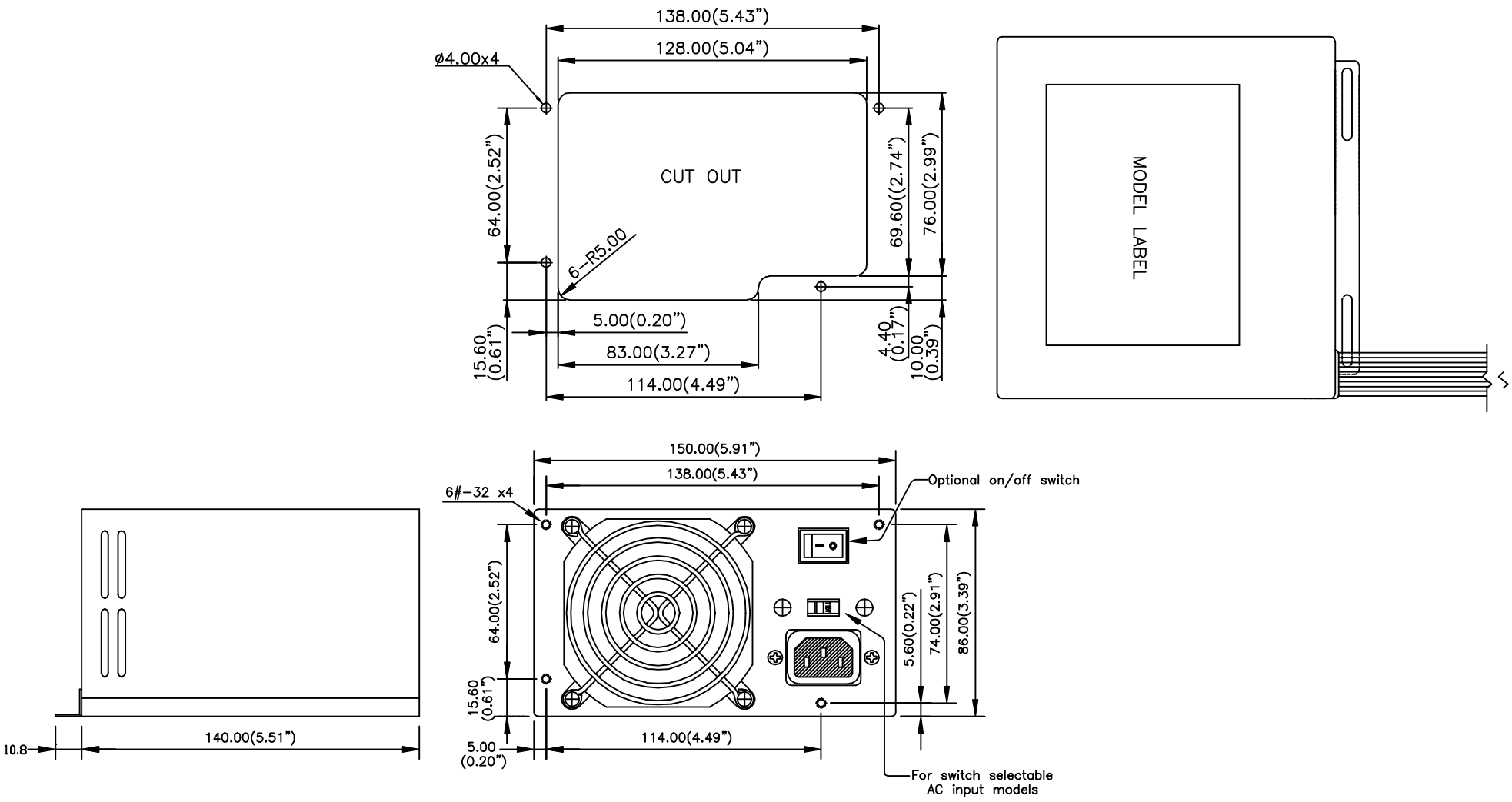
The power supply, operating with resistive load, shall meet FCC Part 15, class B and EN55022 class B conducted limit.

5.2.2. AC LINE TRANSIENTS

The power supply shall comply with the surge voltage requirements of EN61000-4-5 level 3 (2 kV peak open circuit voltage from line/neutral to GND, and 1 kV from line to neutral).

5.2.3. LINE NOISE DISTURBANCE

The power supply shall operate normally when installed in a computer system and subjected to power line noise described in EN61000-4-4, level 3 (2 kV open circuit voltage). The power supply shall not cause any failure in the host computer system during line noise testing.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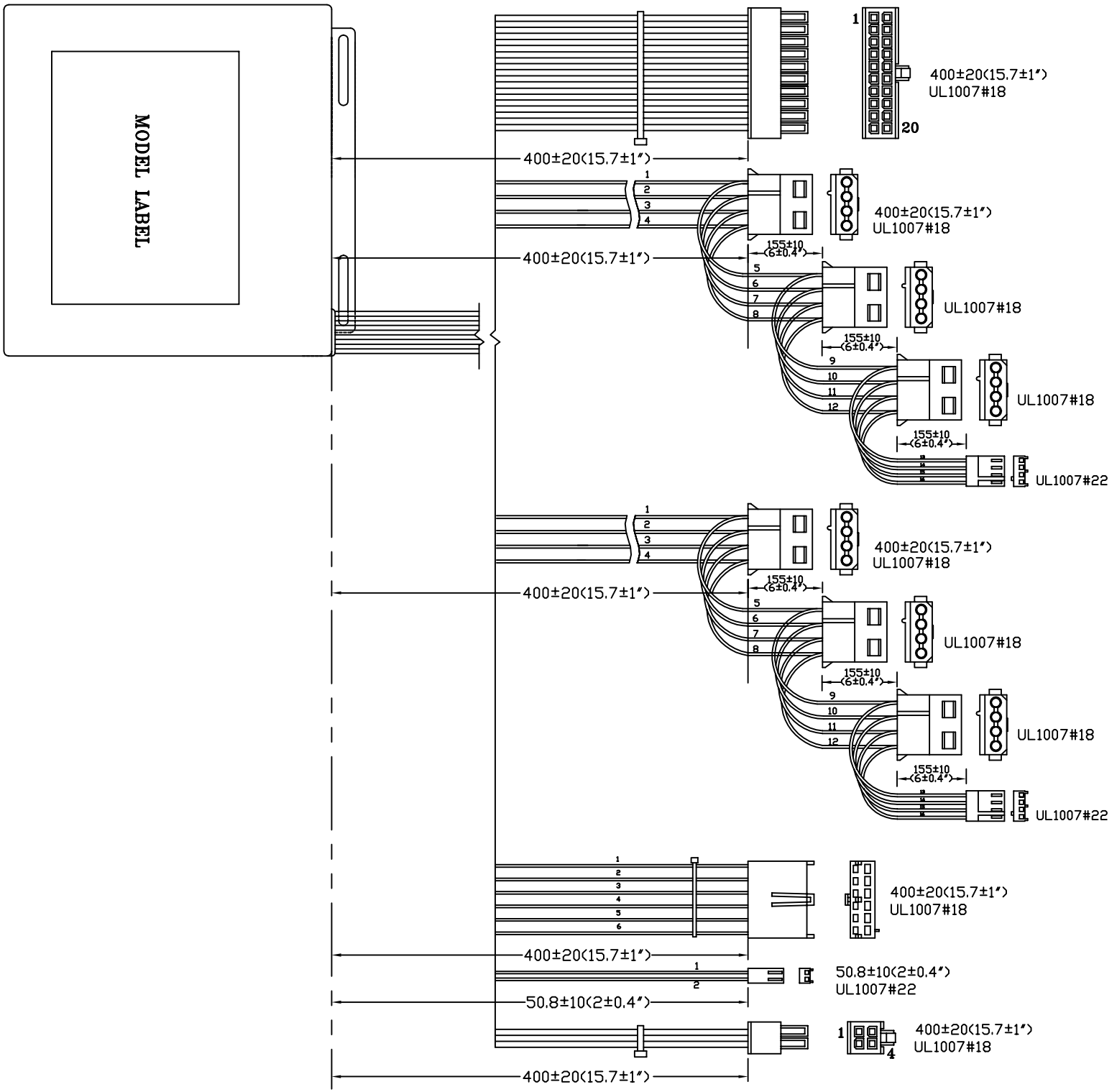
For switch selectable
AC input models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