400-watt ATX with
Autoranging AC input

CONTENTS

1. GENERAL

This specification describes the performance characteristic of a 400-watt ATX power supply module with +3.3V, +5V, +12V, -5V, -12V main DC outputs, and 5V standby outputs and auto-ranging input. This power supply is compliant with ATX 2.03 versions 0.9, 1.0 and 12V.

2. ELECTRICAL PERFORMANCE

2.1. AC power Input

2.1.1. INPUT VOLTAGE AND FREQUENCY

The power supply shall be capable of operating over the voltage ranges shown in table 1 with a frequency range of 47 to 63Hz. The basic model will have a select switch for the two ranges. However, this switch can be eliminated as an option. See section below.

Table 1- Input Voltage Range

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

Table 2 - AC Input Frequency Range

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

2.1.2. INPUT CURRENT

Input current shall meet the limits shown in table 3.

Table 3 - Input Steady State and Inrush Current

Input Voltage	Maximum Input current	Maximum Inrush current
Range 1	10A	$50A_{p-p}$
Range 2	5A	$100A_{p-p}$

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. 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 1.6mA.

The output voltages shall turn on when *PSON is low (≤ 0.8V). 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:

a. TOTAL output power for 3.3V and 5V combined shall be ≤ 220W.
b. TOTAL output power should be no more than 400-watts.

Table 4 - Output Current Capacity

Output	Nominal output (V_{dc})	Minimum	Maximum	Units	Conditions
1	3.3V	0.5	30	A	a. Combined power ≤ 220W
2	5V	3.5	40	A	
3	12V	0.5	12	A	
4	-5V	0	0.5	A	
5	-12V	0	0.5	A	
6*	$+5V_{SB}$	0	2	A	

* Output 6 is the auxiliary output.

2.3.2. 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 2.3.3.

Table 5 - Output Voltage Regulation and Ripple

	Output voltage limits(V_{dc})			Ripple/noise
Output	Minimum	Nominal	Maximum	Maximum
1	3.17V	3.30V	3.46V	50mV_{p-p}
2	4.80V	5.00V	5.25V	50mV_{p-p}
3	11.40V	12.00V	12.60V	120mV_{p-p}
4	-4.50V	-5.00V	-5.50V	120mV_{p-p}
5	-11.40V	-12.00V	-12.60V	120mV_{p-p}
6	4.75V	5.00V	5.25V	50mV_{p-p}

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 ≤ 0.25inch.

c) Measurements made where the cable connectors attach to the load.

d) Outputs bypassed at the point of measurement with the following:

3.3V and 5V use 47uF electrolytic and 0.1uF ceramic capacitors
12V, -5V, and -12V use 10uF electrolytic and 0.1uF ceramic capacitors

e) Oscilloscope bandwidth limited to 20MHz.

2.3.3. OUTPUT VOLTAGE RISE TIME

The rise time of all output voltages shall be between 0.1ms to 1.0sec, measured from 10% to 90% on the leading edge of the voltage waveform.

2.3.4. POWER GOOD HOLD-UP TIME

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

2.3.5. 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.

2.3.6. TRANSIENT RESPONSE

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

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

2.3.7. CAPACTIVE LOADING

The power supply must be stable and meet all requirements, except transient loading, with the following capacitive loading conditions.

Table 6 - Capacitive Loads

OUTPUT	Capacitive load	UNITS
+5V	10,000	μF
+12V	1,000	μF
+3.3V	6,000	μF
-5V	350	μF
-12V	350	μF
$+5V_{sb}$	350	μF

2.3.8. MAXIMUM LOAD CHANGE

The power supply shall continue to operate normally when there is a step change ≤ 2A/us from minimum load to maximum load or maximum load to minimum load

2.3.9. 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.

2.3.10. EFFICIENCY

The power supply efficiency measured at nominal input voltage (115V or 230V) and maximum load shall be ≥ 65%.

2.3.11. OUTPUT PROTECTION

2.3.11.1. 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 ≤ 0.01Ω.

2.3.11.2. 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.

Table 7 - Over Voltage Protection Limits

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 %

2.3.11.3. 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%.

2.3.11.4. 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 ≥ 7 seconds.

2.4. Signal output

2.4.1. POWER GOOD

Power good shall be a TTL compatible signal capable of sinking 5mA and sourcing 100uA. Power good low shall be ≤ 0.4V, and high shall be ≥ 3.0V.

Power good shall change from low to high between 100 and 500ms after the 5V and 3.3V outputs attain a static operating level within their specified regulation parameters.

Power good shall change from high to low 1msec before 5V or 3.3V output falls below its specified regulation parameter.

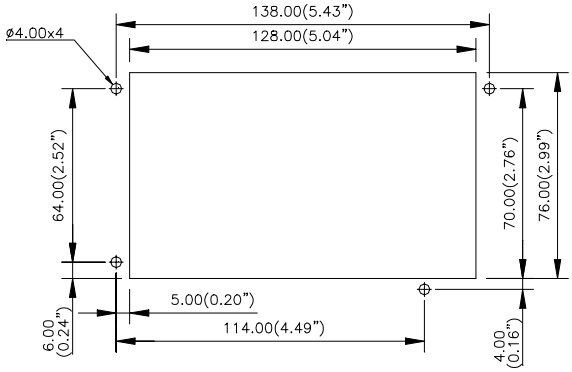
Power good rise time shall be less than 10us with capacitive load ≤ 47pF.

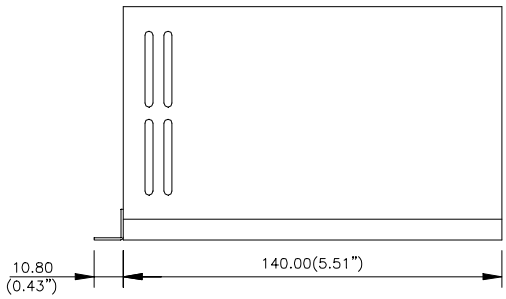
3. MECHANICAL

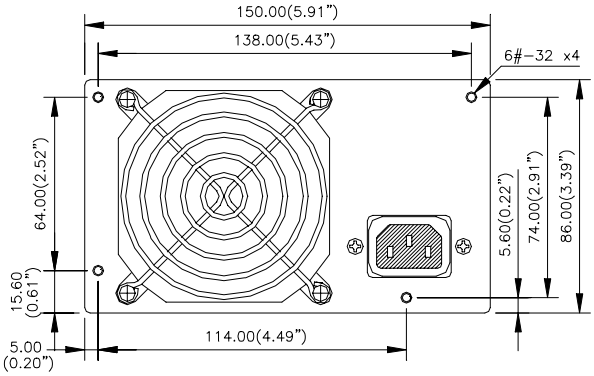
3.1. Dimensions

The casing dimensions are: W150mm x H86mm x D141mm.

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 3 sets of output cable, 20P and 6P for motherboard. One PY for HDD. One PZ for two HDD and one FDD.

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

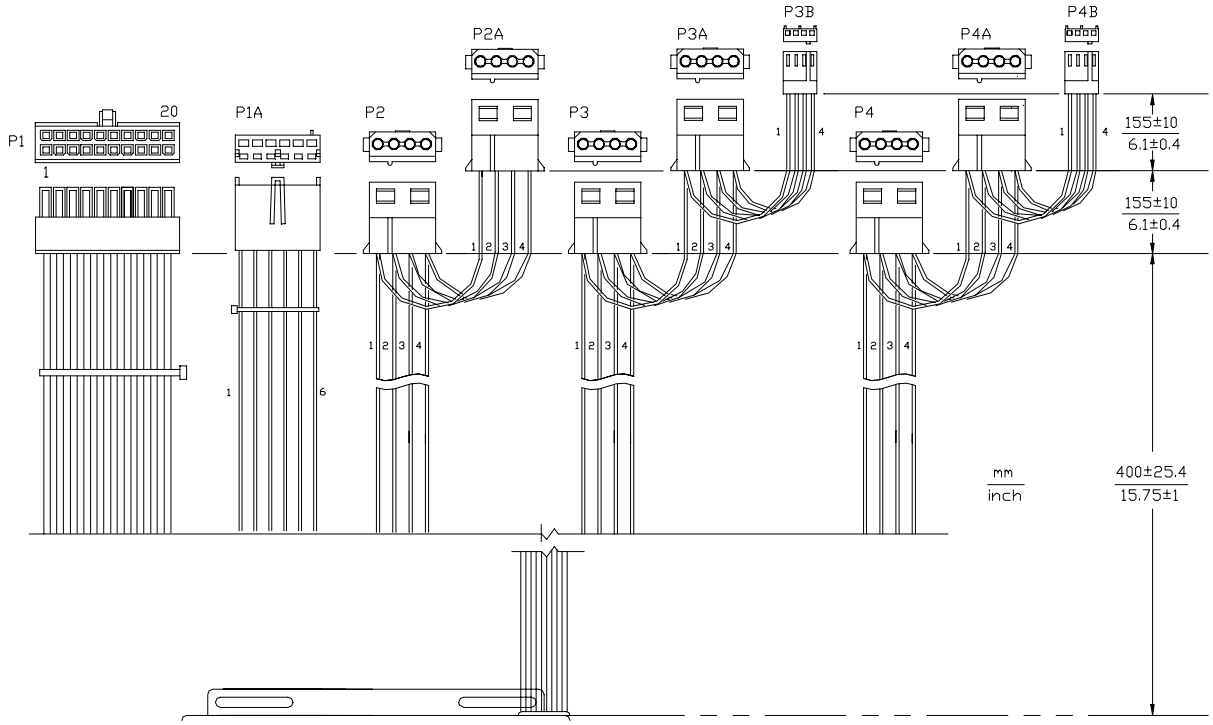


Table 8 - PY Connector Pin Out

PY: MOLEX 8981-4P(PYA) followed by MOLEX 8981-4P(PYB). AWG 18 UL 1007 style wires.			
Pin	Output	Color	Comments
PYA-1	+12V	YELLOW	
PYA-2	COM	BLACK	
PYA-3	COM	BLACK	
PYA-4	+5V	RED	
PYB-1	+12V	YELLOW	
PYB-2	COM	BLACK	
PYB-3	COM	BLACK	
PYB-4	+5V	RED	

Table 9 - PZ Connector Pin Out

PZ: 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 10 - 20 Pin ATX 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 +3.3VS(22#)	11	+3.3V
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	+5VSB	19	+5V
10	+12V +12VS(22#)	20	+5V

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.

3.5. Power on indicator

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℃, derating linearly to 50% at 70℃
Non-operating: -40 to 70℃

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

4.5. Vibration

Operating: 10Hz to 500Hz sweep at 0.5g constant acceleration for one hour on each of the perpendicular axes X, Y, and Z.
Non-operating: 10Hz to 300Hz sweep at 2g 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 147VAC for 0.5 second and a sag to 80VAC for 0.5 second without damage.

5. REGULATORY

5.1. Safety certification

The power supply is approved to UL, C-UL, and TUV. Safety logos are shown on the power supply model label.

5.1.1. LEAKAGE CURRENT

Leakage current from power supply AC input to safety ground shall not exceed 0.75mA at 240VAC/50Hz.

5.2. Electromagnetic compatibility

5.2.1. EMI

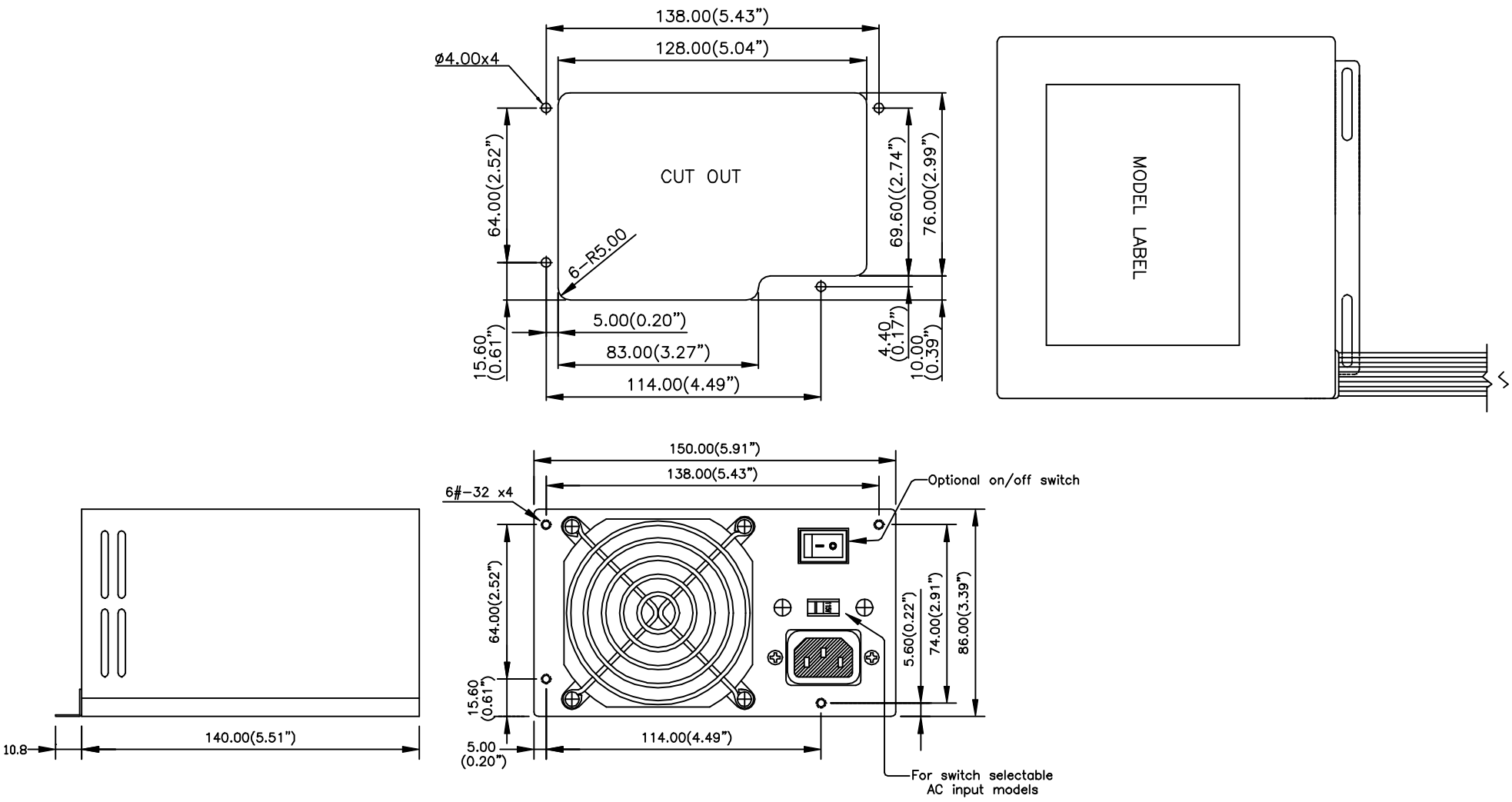
The power supply, operating with resistive load, shall meet FCC Part 15, class B and EN55022 class B conducted limit.

5.2.2. AC LINE TRANSIENTS

The power supply shall comply with the surge voltage requirements of EN61000-4-5 level 3 (2kV peak open circuit voltage from line/neutral to GND, and 1kV 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 (2kV open circuit voltage). The power supply shall not cause any failure in the host computer system during line noise testing.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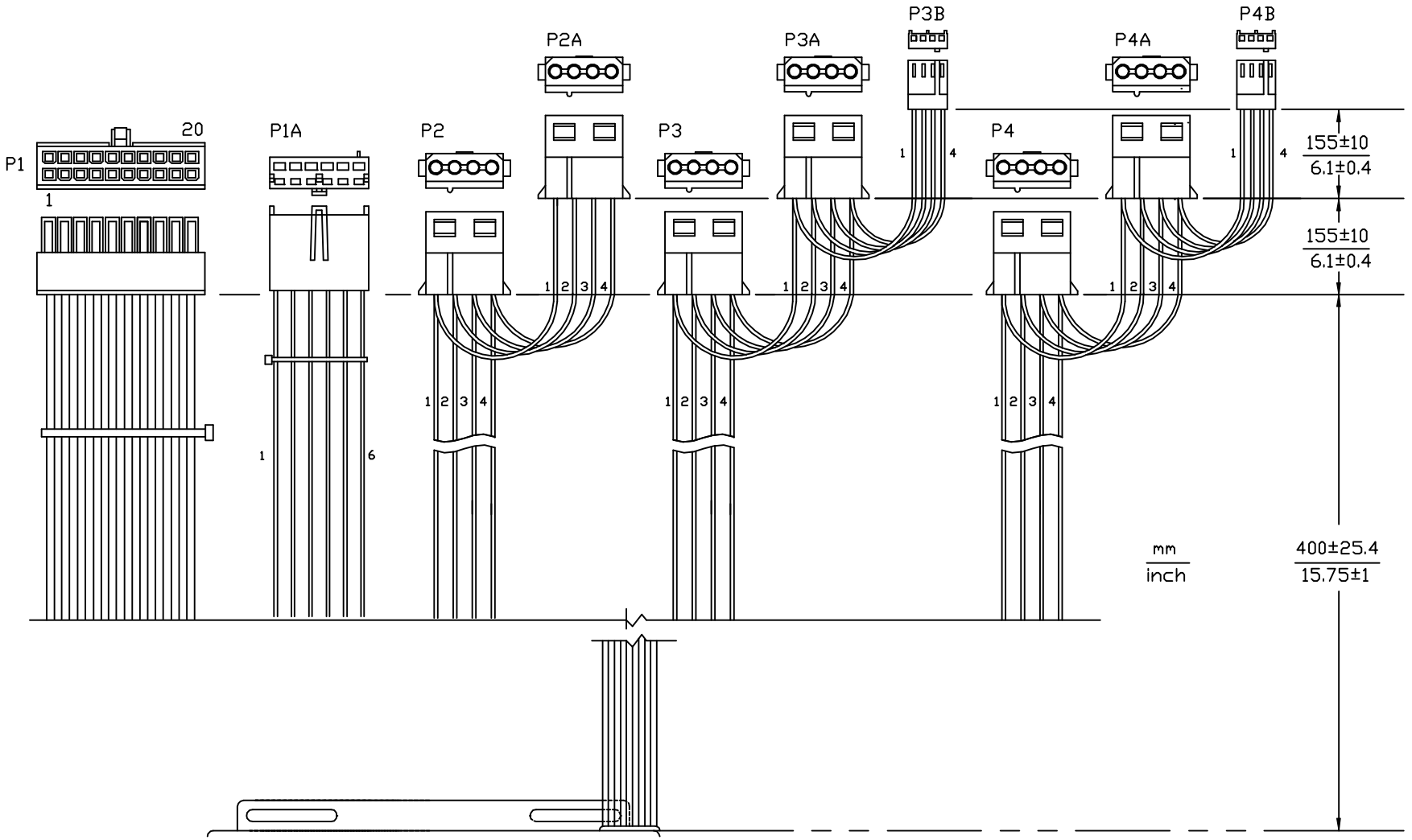
AC input models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