SPECIFICATION

400W ATX 2U

Hot Swappable

Redundant Power System

Industrial Grade Power Supply

With Active PFC

Model: R6403E 2FRV

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1.0 General

This specification describes the physical, functional and electrical characteristics of a 400+400 watts redundant power supply with power factor correction and hot-swappable capabilities.

1.1 Parameter Specifications

Unless specified otherwise, all parameters must be met over the limits of Temperature, load and input voltage.

2.0 Input Characteristics

2.1 Input Voltage

100 to 240 VAC, ±10%

2.2 Input Waveform

The unit is capable of operating with a 10% distorted sine wave input as measured by a distortion analyzer. Its flattopping clipped 10% from the peak value of standard sine wave.

2.3 Input Frequency

47 Hz to 63 Hz

2.4 Input Current

6A max. @ 90VAC input

2.5 Power Factor Correction

The Power Supply shall incorporate universal power input with active power factor correction, which shall reduce line harmonic current in accordance with the EN61000-3-2 and JETI MITI standards.

2.5.1 Power Factor

PF ≥ 0.95 at 50% of rated load and nominal input voltage

2.5.2 Harmonic Distortion

Meet the EN61000-3-2 class "B" standards

2.5 In-Rush Current

CONDITION	LIMITS
132/264 VAC, Full load.	35A Max. at 115VAC,
Turn off 1 sec; turn on at	60A Max. at 230VAC
peak of input voltage cycle.	No damage shall occur or over stressed
25℃ Air Ambient cold star	input fuse shall not blow

2.6 Line Regulation

CONDITIONS	LIMITS
Full load, 90 to 264 VAC	±1%

2.7 Input Leakage Current

Input leakage current from line to ground will be less than 3.5 mA rms. Measurement will be made at 240 VAC and 60Hz.

2.8 Isolation (Hi-pot)

1500Vrms, 50Hz, for one (1) minute between each input AC line and the grounding conductor.

3000Vrms, 50Hz, for one (1) Minute between the input AC lines and secondary low voltage outputs and shields.

All isolation transformers will have been tested prior to assembly into a power supply unit. Any such transformers without a grounded shield will be tested to 3750 Vrms.

3.0 Output Characteristics

3.1 DC Output Characteristics, 400W Max. Total

There are two choices as below, to be met under all combinations of loading.

Output # Voltage	V1 +5V	V2 +3.3V	V3 +12V	V5 -5V	V6 -12V	V7 5VSB
Max. Load	30A	28A	25A	0.3A	0.8A	2A
Min. Load	2A	0A	0.5A	0A	0A	0A
Load Reg.	±5 %	+/-3 %	±5 %	±10 %	±5 %	±5%
Cross Reg.	±5 %	+/-3 %	±5 %	±10%	±5 %	±5%
Line Reg.	±1%	±1%	±1%	±1 %	±1 %	±1%
Ripple & Noise	50mV	50mV	120mV	100mV	120mV	60mV

Note 1: The +5 & +3.3 Volt total output shall not exceed 250 Watts.

Note 2: The +5, +3.3 & +12Volt total output shall not exceed 330 Watts.

Note 3: The +12V outputs of the power supply must be capable of 32 Amps peak for 10 seconds. A +/-10% tolerance is permissible. Output voltage is measured at the load and of the output cable.

Note 4: Noise bandwidth is from DC to 20 MHz.

Note 5: Regulation tolerance shall include temperature change, warm up drift and dynamic load.

3.2 Remote Sensing

The +3.3V, +5V, +12V outputs should have provision for remote sensing to compensate for 200mV of cable, connector, and PCB trace drops.

3.4 Overshoot

Any output overshoot at TURN-ON shall not exceed 5% of nominal voltage value.

3.5 Efficiency

65% minimum at full load and nominal AC input.

4.0 Time Sequence

4.1 Hold-Up Time

Unit shall continue to supply regulated DC outputs and power good signal for at least 20 milliseconds at 115/230 VAC full load after a loss of AC input voltage, which shall be represented by a short circuit at the AC input. See Figure 2.

4.2 Power Good Signal

When the power supply is turned off for a minimum of 1.0 second and turned on, the power-good signal as described below will be generated.
The power supply shall provide a power-good signal to indicate proper operation of the power supply. This signal shall be a TTL compatible high level for normal operation; low level for fault conditions.
Power-good shall go to a low level at least 1 ms before the +5V output voltage falls below the regulation limits described in 3.1 DC output Characteristics. The operation point used as a reference for measuring the 1ms shall be minimum line voltage and maximum load.
All waveform transitions shall be smooth and monotony, i.e. no oscillations.
The power-good signal shall stay low (during POWER-ON) until all output voltages are stable within regulation limits. The power-good signal shall have a TURN-ON delay greater than 100 ms but less than 500 ms.

4.2.1 Fanout

Power Good output circuit shall consist of an active pull down component and a passive pull up resistor.
Power Good output voltage to be met under recommended loading conditions.

CONDITIONS	LIMITS
I_{OH}= -200uA Min.	V_{OH}= 2.7V Min.
I_{OL}= 4mA Min.	V_{OL}= 0.4V Max.

4.3 Output Rise Time

The +5 Volt and +3.3 Volt output shall have a turn-on rise time of less than 100 ms under all load conditions. Rise time is measured between 0.0 and 2.48/4.75 volts.
The +5 V and +3.3V output shall not vary from a smooth curve by more than 0.5 VP-P during turn-on and turn-off.

4.4 Start-up timing

All outputs shall be stable and in regulation in less then 2.0 second under all load and line conditions. Start-up time is measured between the AC turn-on and 4.75 volts on +5V output. See Figure 1.

4.5 Dynamic Load Response Time

Transient response is measured by switching the output load from 70 to 100 to 70 percent of its full value at a frequency of 100 Hz and 50% duty cycle, step load change is 0.5A/us,

The magnitude Vr is less than +/- 5% of +5V, +3.3V and +12V outputs, the recovery time Tr is less than 1ms.

5.0 Protection

5.1 Over Current Protection

This power supply shut down all DC outputs when the outputs are overloaded to the limit. The power supply shall into the off state and recovery by toggling the PSON signal or by an AC power interruption.
The +5VSB outputs will be internally current limited.

Voltage	Minimum	Maximum	Shutdown Mode
+3.3V	34A	38A	Latch Off
+5V	36A	40A	Latch Off
+12V	32A	34A	Latch Off
-12V	1.5A	2.0A	Latch Off
5VSB	2.5A	3.5A	Auto Recovery

5.2 Over Voltage Protection

The power supply shall shutdown and latch off after an over voltage condition occurs. This latch shall be cleared by toggling the PSON signal or by an AC power interruption.

Over Voltage Limits:

Voltage	Minimum	Maximum	Shutdown Mode
+3.3V	3.9V	4.5V	Latch Off
+5V	5.7V	6.5V	Latch Off
+12V	13.3V	14.5V	Latch Off
+5VSB	5.7V	6.5V	Latch Off

5.3 Short Circuit Protection

A short circuit placed on any output shall cause no damage to this unit. The power supply shall shutdown and latch off if the short circuit shown. This latch shall be cleared by toggling the PSON signal or by an AC power interruption.

5.4 No Load Operation

When the primary power is applied, with no load on any output voltage, no damage or hazardous conditions shall occur. In such a case, the power supply shall power up and stabilize.

5.5 +5VSB (Standby)

The +5VSB output is always on (+5V Standby) when AC power is applied and power switch is turned on. The +5VSB line is capable of delivering at a maximum of 2.0A for PC board circuit to operate.

5.6 PS-ON (Remote ON/OFF)

PS-ON is an active low signal that turns on all of the main power rails including +3.3V, +5V, +12V & -12V power rails. When this signal is held by the PC board or left open circuited, outputs of the power rails should not deliver current and should be held at a zero potential with respect to ground. Power should only be delivered to the rails if PS-ON signal is held at ground potential. This signal should be held at +5VDC by a pull-up resistor internal to the power supply.

Power On	PS-ON	Power Switch	PS-ON Connector
ON	L	ON	IN
OFF	H	ON	IN
OFF	X	ON	OUT
OFF	X	OFF	X

6.0 Indicator Function

6.1 Power Fault Signal

The Hot-Swap Redundant Power Supply shall give fault signal (TTL compatible signal) that will indicate the status of the power supply operation.

This signal detects the following conditions:

All output voltages V1 to V5 are within regulation.
Fan is operating normally
Power supply internal temperature is normal

This line has an internal 1KΩ pull up resistor to +5V, and is capable of sinking 20mA, and has a breakdown of 20V.

nGood Low Power Supply Fault	Vol ≤ 0.4V (a) Iol ≤ 20mA
nGood High Power Supply Normal	Voh ≥ 3.5V (a) Ioh ≤ 250uA

6.2 LED Indicator

There will be a bi-color LED to indicate power supply status. When AC is applied to the supply and standby voltages are available the LED shall turn on AMBER. The LED shall turn on GREEN to indicate that all outputs are available. The LED shall turn on AMBER to indicate that the power Supply has failed.

7.0 Physical Characteristics

7.1 Size

W x H x D: 84.7 x 109.7 x 326.3 mm

7.2 Mounting Requirements

See attachment

7.3 Weight

2.5 Kg

7.4 Cooling

Fans: NMB (3110KL-04W-B59) equivalent or better. Air flow from the power supply should be in exhaust direction and shall be rated at 10 cfm minimum.

8.0 Connections

8.1 AC Input Connector

IEC 320 AC Inlet with EMI Filter, 6A/250V

8.2 DC Output Wire Harness List

20 PIN (For ATX motherboard.)

Connector: Molex 39-01-2200 (Mating connector is Molex 39-29-9202).

18AWG Wire	Signal	Pin	Pin	Signal	18AWG Wire
Orange	+3.3VDC	11	1	+3.3VDC	Orange

Brn.	+3.3V default sense	11			
Blue	-12VDC	12	2	+3.3VDC	Orange
Black	COM	13	3	COM	Black
Green	PS-ON	14	4	+5VDC	Red
Black	COM	15	5	COM	Black
Black	COM	16	6	+5VDC	Red
Black	COM	17	7	COM	Black
White	-5VDC	18	8	PG	Gray
Red	+5VDC	19	9	+5VSB	Purple
Red	+5VDC	20	10	+12VDC	Yellow

Auxiliary Power Connector

Connector: Molex 90331-0010 or equivalent

P2 (FOR motherboard)

Pin	Signal	18AWG Wire
1	COM	Black
2	COM	Black
3	COM	Black
4	+3.3VDC	Orange
5	+3.3VDC	Orange
6	+5VDC	Red

+12V Power Connector

Connector: Molex 39-01-2040 or equivalent

P4 (for ATX12V Configurations Only)

Pin	Signal	20AWG Wire
1	COM	Black
2	COM	Black
3	+12V	Yellow
4	+12V	Yellow

9.0 Environmental

9.1 Temperature

9.1.1 Operating

50 to 122 °F (0 to 50 °C). Derate Linearly to 50% at 70 °C

9.1.2 Non-Operating

-4.0 to 140 °F (-20 to 60°C)

9.2 Relative Humidity

9.2.1 Operating

20 to 90 % non-condensing at 104°F (40 °C).

9.2.2 Non-Operating

5 to 95 % non-condensing at 122°F (50°C).

9.3 Altitude

9.3.1 Operating

Sea level to 10,000 feet.

9.3.2 Non-Operating

Sea level to 40,000 feet.

9.4 Shock

9.4.1 Operating

The power supply shall exhibit no sings of damage or degradation of performance when subjected to a shock of 5g`s for 11 ms, with a 1/2 sine wave for each of the perpendicular axes X, Y and Z.

9.4.2 Non-Operating

The power supply shall exhibit no sings of damage or degradation of performance when subjected to a shock of 30g's for 11 ms, with a 1/2 sine wave for each of the perpendicular axes X, Y and Z.

9.5 Vibration

9.5.1 Operating

The power supply shall be subjected to a vibration test consisting of a 10 to 500 Hz sweep at a constant acceleration of 0.5g for a duration of one (1) hour for each of the perpendicular axes X, Y and Z. The output voltages shall remain within specification.

9.5.2 Non-Operating

The power supply shall be subjected to a vibration test consisting of a 10 to 300 Hz sweep at a constant acceleration of 2.0g for a duration of one (1) hour for each of the perpendicular axes X, Y and Z.

The power supply shall not incur physical damage or degradation of any characteristics below the performance specifications.

9.6 Power Line Transient

9.6.1 Drop Out

With a full cycle input voltage drop-out at 50Hz, the unit shall operating within the prescribed voltages with a drop-out cycle repetition rate of 500ms.

CONDITIONS	LIMITS
Full load, Nom. Input AC Voltage	Meet all requirements

9.6.2 Transient Voltage Spikes

The unit shall meet the following standards, The IEEE Standard 587-1980 for surge withstand capability under categories A and B. The crest value of the first half peak of the injected Ringwave (0.5/10us) and Biwave (1.2/50us) will be 3K volts open circuit and 3KA (8us×20us) short circuit.

IEC 801-2 (ESD) to a level of 8KV contact, and 15K air discharge without causing the device(s) to fail the test.

IEC 801-4 (EFT) on the power lines and all I/O cables to a level of 2.5KV without causing the Device(s) to fail the test.

IEC 801-5 Surge immunity measurement on the input power source of 2.5KV.

All output shall be stable and in regulation.

9.7 Acoustic Noise

The power supply shall be tested in accordance with the ANSIS12.10-1985 standard specifications. The "A" weighted overall sound pressure level as well as individual octave band levels from 63 Hz to 16,000 Hz is measured with the noise meter placed 1 meter from the nearest vertical surface of center of fan installed in power supply.

CONDITIONS	LIMITS
115 VAC Input, full load of +5V 0.5A of +12V.	Acoustic noise is 40 db maximum

Octave Band Center Frequency (Hz)								A-Weighted
125	250	500	1k	2k	4k	8k	16k	Max. Sum
20	36	42	42	42	36	30	20	40dBA

10.0 Regulatory Agency Certification

10.1 RFI/EMI Standards

The power supply, when installed in system, shall comply with the following radiated and conducted emissions standards:

a) Meet FCC part 15, Subpart B, Class B computing devices.(Pending)

b) CISPR22 (EN55022) Class B.(Pending)

c) VCCI Class 2.(Pending)

These limits shall be met with a margin of at less 6dB at all applicable frequencies. The unit shall comply with the above limits when tested under all normal working conditions and with all interface cables connected.

10.2 Safety Standards

The power supply shall be certified with the following safety standards,

a) UL 1950 (Information Processing/Business equipment).(Pending)
b) CSA C22.2, NO. 234-M90 level 6 (Safety of component, power supplies) or CSA C22.2, NO. 950-M89. (Pending)
c) TUV Certification to IEC 950 lst edition with Amendment #1, #2, and EN60950(Pending)
d) CE Certificate & Test report. (Pending)

11.0 Reliability

11.1 Mean Time Between failures (MTBF)

Using MIL217E the calculated MTBF = 100,000 hours at 25°C

11.2 Miscellaneous

Date code indicating week and year of manufacture.

Technical information in this specification is subject to change without notice.

The revision of specification will be marked on the cover.