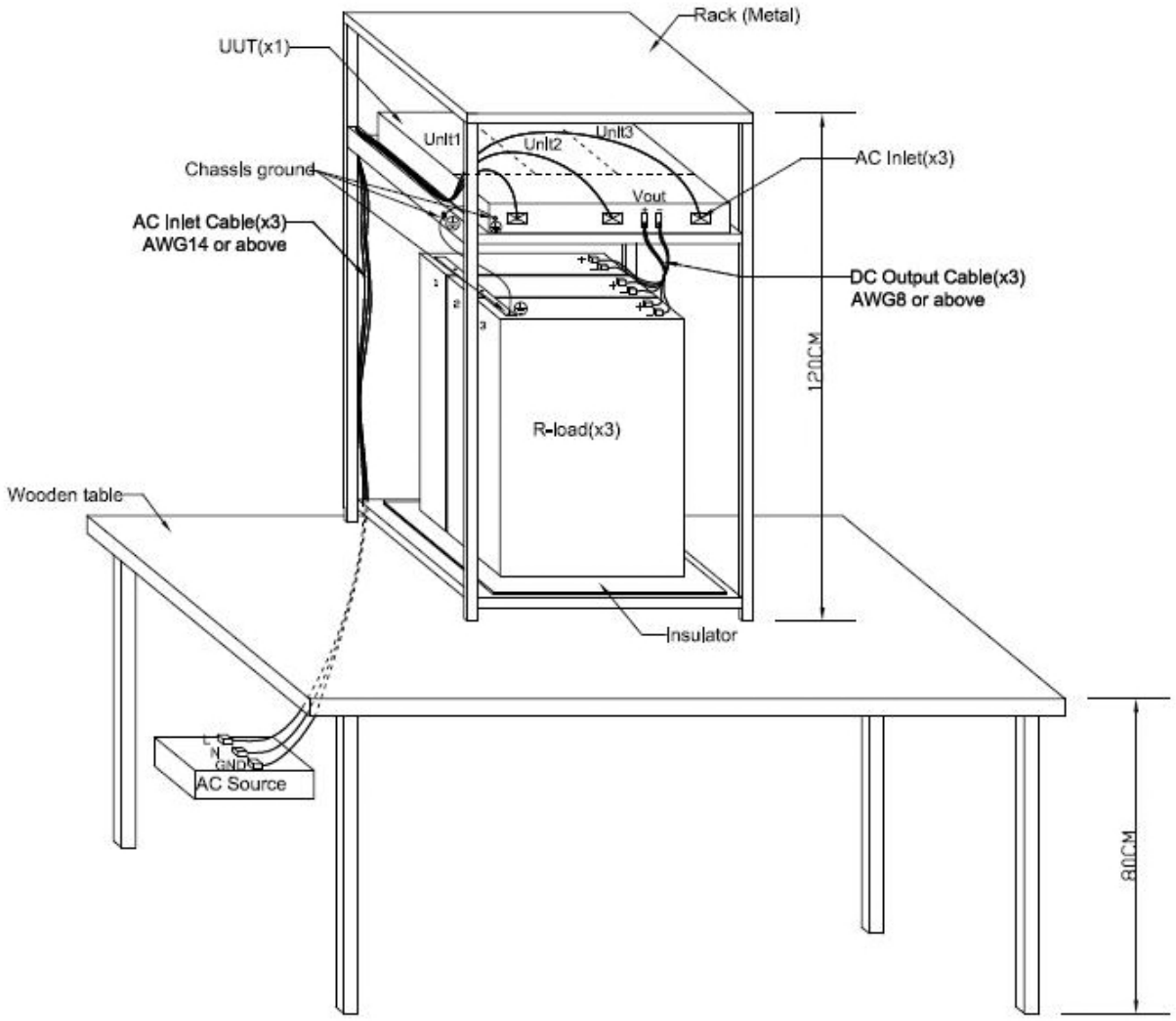
APPENDIX A: Radiated EMI Test Setup



UFR6000-00J Radiated EMI test set-up

8.0 Documentation

8.1 Documentation

The power supply Design Team shall provide Emerson Marketing with the following documentation:

1. Provide Marketing with Schematics, and Assembly Drawings
2. IPS
3. MTBF calculation (Telcordia) – Not Applicable – No Active Components or Electrolytic Capacitors
4. PWB layout with component references
5. DVT reports
6. CB test report CB certificate
7. Mechanical Outline Drawing, with output connector pin function detail
8. Mechanical Outline Drawing Show all dimensions in Inches and Millimeters.
9. Key Component Thermal measurements.

9.0 RoHS Compliant, Lead-Free Requirements

General

The UFR6000 shall meet the generally accepted RoHS specification. Compliance with this specification shall include all of the components, parts, assemblies and packaging of this product. Restricted Materials cannot be contained in the product or used in the manufacturing of this product or its components above the designated thresholds.

EU RoHS Directive

The UFR6000 must be in compliance of the EU RoHS 6/6 Directive.

The rack with power supplies installed shall meet the requirements in Emerson QP4205. All components within the rack and power supplies shall be appropriately secured to prevent failure resulting from this test. At the conclusion of tests, the rack with power supplies shall be powered up under maximum rated load and shall perform within specification.

Vibration	Operating Non-operating	1.0 G peak 1.5 G peak
Shock	Operating Non-operating	10 G peak/11 ms 40 G peak/11 ms

6.8 Weight

The rack without power supplies shall weigh less than or equal to 11 lbs.

7.0 Miscellaneous Requirements

7.1 Burn-In

No burn-in is required, assuming that no active components are used. If active components are proposed for use in the design, engineering should notify marketing for further review.

7.2 MTBF

Not-Applicable – No Active Components or Electrolytic Capacitors

7.3 Quality Assurance

Full QAV testing shall be conducted in accordance with Emerson standards.

7.5 Failure Analysis

N/A

7.6 Warranty

The manufacturer shall warrant the power supply to be free of defects in materials and workmanship for a minimum period of **two years** from the date of shipment, when operated within specifications. The warranty shall be fully transferable to the end owner of the equipment powered by the supply.

7.7 Special Japanese Requirements that MUST be adhered to;

7.7.1 No water based Electrolyte E-Caps allowed in the design

7.7.2 No Tantalum caps are allowed in the design

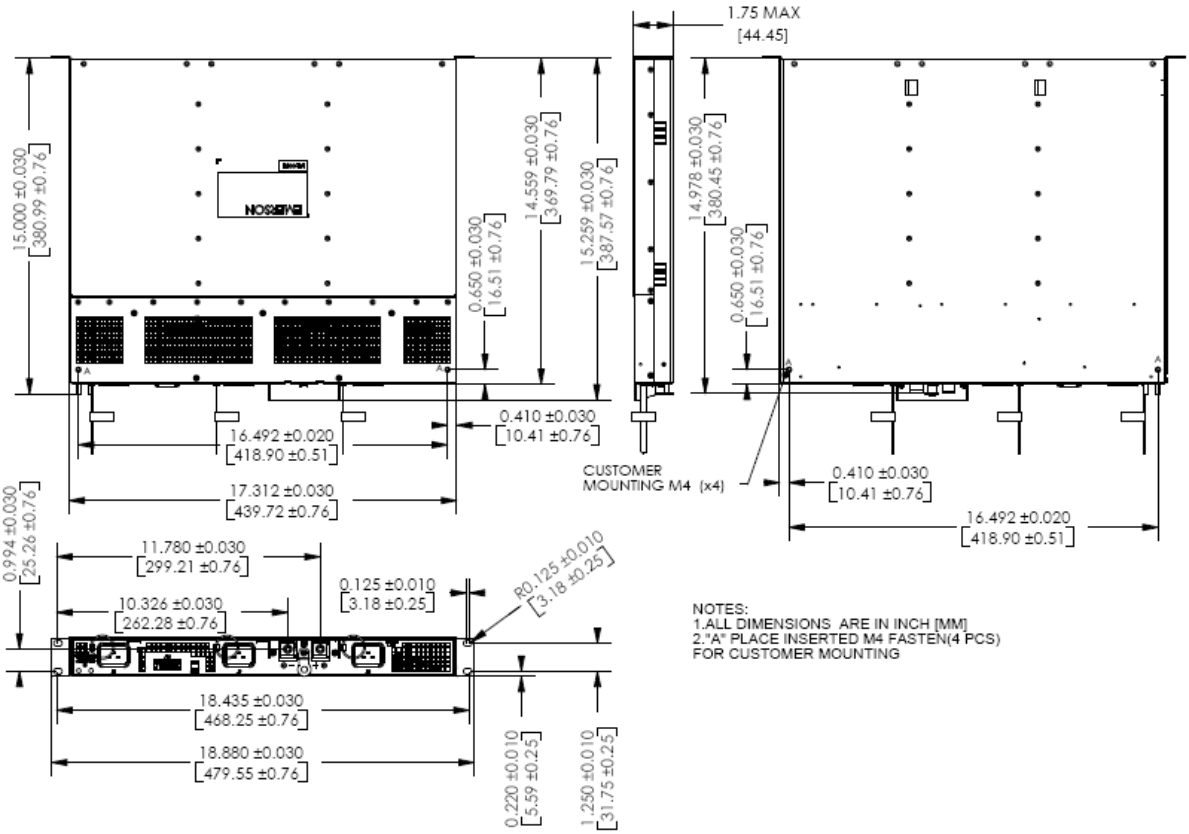
7.7.3 1500VAC Hipot test – 2121Vdc test may be substituted.

7.7.4 Smokeless Design – Not-Applicable – No Active Components or Electrolytic Capacitors

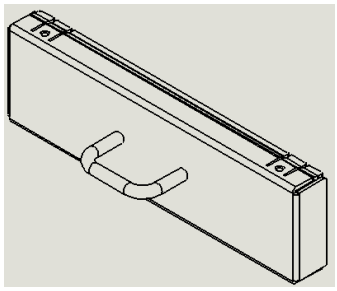
7.7.5 Full RoHS Design, complying to the EU RoHS directive, for 6/6 compliance.

7.7.6 Japanese Sources for Fans – Not-Applicable – No Active Components or Electrolytic Capacitors

6.5 Mechanical Drawing



The filler-panel drawing is shown below.

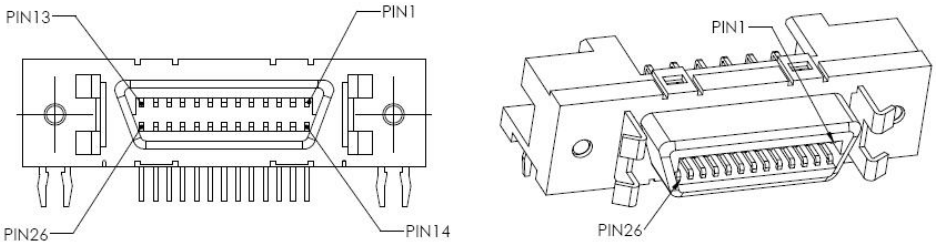


6.6 Marking/Labels

The rack must also be indelibly marked with the connection identifications, the manufacturers name, model number, serial number, input and output voltages, input and output currents and agency logos. The supply must also have a bar code label conforming to Emerson Standard Specification for Bar Code Labeling.

6.7 Shock/Vibration

6.3 Signal Connector (J16)



Shelf Connector	Mating Connector
Molex: 52986-2679	Molex: 52316-2619
Tyco: 2-5178238-4	Tyco: 2-5175677-4

Signal Connector (1 per shelf)

Rack Connector Pin Out			
Pin No.	Function	Pin No.	Function
1	Sense+	14	Ishare
2	Ground	15	Unit 1 Present
3	Sense-	16	Ground
4	Ground	17	Unit 2 Present
5	PS-EN (Control) (8)	18	Ground
6	DC1-OK-L	19	Unit 3 Present
7	DC2-OK-L	20	Ground
8	DC3-OK-L	21	SCL
9	I^2C-En-H-1 (Comm-En-H) (8)	22	Ground
10	I^2C-En-H-2 (Comm-En-H) (8)	23	SDA
11	I^2C-En-H-3 (Comm-En-H) (8)	24	Ground
12	Ground	25	SMBALERT#
13	12V-Aux	26	N/C

NOTE: The Ground in the connector pinout above (Pins 2, 4, 12, 16, 18, 22 and 24) represent signal ground and is distinct from Main Output Return.

6.4 Power Supply Connector

Mating connector shall be compatible with the output connector of the UFE2000 power supplies.

6.1 AC Input Connectors (J1, J2, J3)

6.1.1 The rack shall provide a dedicated IEC-320 style connector for each power supply.

6.1.2 For each connector, IEC-320 style AC input connectors rated appropriately for safety agency requirements shall be used.

6.1.3 An input power cord retainer clip, or alternate mechanism approved by marketing, shall be provided to prevent accidental disconnect of AC power cords.

6.2 DC Output Connector

6.2.1 The DC output connector shall mimic the design currently implemented on 7001009-xxxx or an alternative may be proposed and agreed to by marketing.

6.2.2 The DC output represents an energy hazard and a cover and connection mechanism shall be defined by the engineering team and agreed to by marketing.

The Auxiliary Output provides N+1 redundant power of 2.8W maximum.

5.13 Protection Circuits

The rack design shall not compromise the integrity of any power supply protection features.

Additional protection may be required for safety reasons.

5.14 Rack Addressing (SW1)

The rack shall provide the lowest 2 significant bits to the power supply address lines (corresponding to PS-ID0 & PS-ID1). Each power supply shall receive distinct bit combinations (00, 01, 10). Bit combination 11 shall not be used.

The rack shall provide a 2-position DIP switch (SW1) for setting the next two significant bits of ALL power supplies in the rack (corresponding to PS-ID2 & PS-ID3).

UFR6000 RACK NUMBER	RACK_ID0 (PS-ID2)	RACK_ID1 (PS-ID3)	DIP SWITCH SETTING (SW1)	UFE I²C/SMBus Address		
				LEFT*	CENTER*	RIGHT*
1	1	1	 (Factory Default)	F8	FA	FC
2	1	0		E8	EA	EC
3	0	1		F0	F2	F4
4	0	0		E0	E2	E4

* Left, Center and Right refer to power supply position within rack when viewed from the front.

5.15 Digital Signal Integrity

I2C capacitive loading requirements shall dictate how many racks and/or power supplies can share a communications bus without the need for external buffering.

Notes:

1. Engineering to advise Marketing, so that this can be noted in datasheet and/or application notes.
2. The I^2C must disconnect and go to a High Impedance State when the supply is dead. Verify that this is true at the power supply level and not compromised by the rack design.
3. The current share circuitry is analog and not subject to the same constraints.

6.0 Mechanical and Connectorization

5.3.4 A method shall be provided in the rack for tieing the Return of the Auxiliary Output to either +ve or –ve side of main output. This connection should be user-accessible. Engineering to make proposal to Marketing for approval.

5.3.5 A method shall be provided in the rack for tieing either the +ve or –ve side of the main output to chassis ground point. This shall be user-accessible. Engineering to make proposal to Marketing for approval along with assessment of safety requirements for size and/or labeling of these connections.

5.8 Remote Sense:

Remote sense connections of UFE2000 power supplies shall be incorporated into rack design.

5.9 Redundant Operation

The rack design shall support N+1 redundant operation of populated power supplies, N less than or equal to 11. This configuration would be implemented with 4 racks stacked on top of each other.

5.10.1 Hot Swap Requirement

Hot swapping a power supply is the process of inserting and extracting a power supply from an operating power system. During this process the output voltage shall remain within the specified limits when tested with an external capacitive load between 0 and 40,000uF. The hot swap test shall be conducted when the system is operating under both static and dynamic conditions.

The rack shall support hot insertion of power supplies by the following methods:

1. Power supply inserted without AC applies to rear of rack.
2. Power supply inserted with AC applied to rear of rack and PS_EN set to prevent turn-on of power supply.
3. Power supply inserted with AC applied to rear of rack and PS_EN set to allow turn-on of power supply

The rack shall support hot extraction of power supplies by the following methods:

1. Power supply extracted without AC applied to rear of rack
2. Power supply extracted with AC applied to rear of rack and PS_EN set to prevent turn-on of power supply.
3. Power supply extracted with AC applied to rear of rack and PS_EN set to allow turn-on of power supply

Many variations of the above are possible. The rack and power supplies need to be compatible with these different variations. In general, a failed (off by internal latch or external control) supply may be removed, then replaced with a good power supply, however, hot swap needs to work with operational as well as failed power supplies. The newly inserted power supply may get turned on by insertion or by system management recognizing an inserted supply and explicitly turning it on.

5.11 Forced Load Sharing – Main Output

The rack design shall support load-sharing of the main output on up to 12 UFE2000 power supplies. This configuration would be implemented with up to 4 racks stacked on top of each other.

5.12 Load sharing – Auxiliary Output

No forced load sharing is supported. Passive load sharing is desirable aided by resistance in the rack design.

4.6 Leakage Current

At each input connector, 5.4mA maximum at 240vac input voltage 60hz, at each input. Safety labeling shall be applied as appropriate.

4.7 ON/OFF Power Switch

Not Applicable

4.8 Input Fusing

Not-Applicable. Refer to appropriate UFE2000 power supply specifications.

4.9 Efficiency

Not-Applicable. Refer to appropriate UFE2000 power supply specifications.

4.10 Power Line Transient Protection

Not-Applicable. Refer to appropriate UFE2000 power supply specifications.

4.11 Holdover Storage

Not-Applicable. Refer to appropriate UFE2000 power supply specifications.

4.12 AC Under Voltage Tolerance

The rack and/or power supplies shall not be damaged and shall either operate properly or shut down (latching or non-latching: output load dependent) when the input voltage is less than the minimum operating voltage

5.0 Electrical Output Requirements

5.1 Output Voltage and Current

The rack shall support the maximum rated output voltage and current levels when populated with up to 3 (three) UFE2000 power supplies.

The tolerance of the current share circuits shall be considered during the design.

All main outputs shall be tied together on the backplane to create a single main output bus.

All auxiliary outputs shall be tied together on the backplane to create a single auxiliary output bus.

5.2 No Load Operation

The rack design shall not negatively affect the ability of the power supplies to operate at no-load.

5.3 Grounding

5.3.1 Combined (after ORing) main output shall float relative to chassis and signal ground. Appropriate EMI filter caps may be used.

5.3.2 Combined (after ORing) auxiliary output shall float relative to chassis. Appropriate EMI filter caps may be used.

5.3.3 All signals are referenced to 12V_Auxiliary Ground/Return.

EN55024:1998 – Information Technology Equipment – Immunity Characteristics, Limits and Method of Measurement.

3.0 Environmental Requirements

3.1 Operating Temperature:	-33 to +70 degrees C
3.2 Storage Temperature:	-40 to +100 degrees C
3.3 Operating Relative Humidity:	5 to 80% non-condensing
3.4 Storage Relative Humidity:	5 to 95% non-condensing
3.5 Operating Altitude:	Up to 10,000 feet above sea level.
3.6 Storage Altitude:	Up to 35,000 feet above sea level
3.7 Cooling:	Provided by UFE2000 power supplies
3.8 RoHS Compliant	See Section 9.0
3.9 Acoustic Requirements	The overall A-weighted sound pressure level measured at 1 meter from the rack shall not exceed 58dB, at Min Load, 25C ambient, 1 power supply populated. The overall A-weighted sound pressure level measured at 1 meter from the rack shall not exceed 76dB, at full Load, 55C ambient, 3 power supplies populated.

4.0 Electrical Input Requirements

4.1 AC Input

Each input to the rack, when populated with the UFE2000 power supplies, shall reduce line harmonics at each input in accordance with the *EN61000-3-2* and *JEIDA MITI* standards. The input power factor at each input shall be greater than 0.98 over all specified input voltages, at loads greater than 50% of the power supply's maximum output rating.

4.2 Input Frequency Range

47 to 63 Hz, single phase

4.3 Power Factor Correction:

Not-Applicable. Refer to appropriate UFE2000 power supply specifications.

4.4 Input Current

At each input connector, 18 Amps max input current at 100vac and 16A at 200vac.

4.5 Inrush Current

Not-Applicable. Refer to appropriate UFE2000 power supply specifications.

2.0 Safety and Compliance Requirements (Designed to meet the following)

2.1 UL 60950

The rack must be recognized to UL60950 and so labeled. The recognition shall be without D3 deviations and shall include stalled fan tests. Deliver UL Conditions of Acceptability as early in as possible. Apply for cUL to cover the CSA requirement.

2.2 CSA 22.2 No. 60950

The rack must be certified to CSA 22.2 No. 60950 Level 5 and so labeled. **See UL**.

2.3 EN60950 CB Report

The rack must be certified and licensed to EN60950, Class 1, SELV, and so labeled. This certification must be done by an international safety approvals granting organization such as TUV.

2.4 EN60950 Deviations CB Report

The rack shall be designed to meet all EN60950 Nordic Deviations. CB Report required which includes all deviations.

2.5 CHINA CCC APPROVAL: TBD (Administrative and performance requirements for the CQC China "Related Regulations of Detailed Rules and Procedures for Implementing the Safety License System of Import Commodities" in accordance with Standard GB9254)

2.6 Conducted EMI

The rack, when populated with one (1), two (2) or three (3) power supplies shall meet the conducted EMI limits specified in FCC Docket No. 20780 Part 15 Subpart J Class B and the limits specified in EN55022, Level "B".

2.7 Radiated EMI

The rack, when populated with one (1), two (2) or three (3) power supplies, shall meet the compliance to the radiated EMI limits specified in FCC Docket No. 20780 Part 15 Subpart J Class A and the limits specified in EN55022, Level "A" with a minimum of 6dB margin under the limits. Blank filler panels shall be populated in unused slots.

Test setup is included in Appendix A below.

2.8 Electromagnetic Compatibility/Input Transients

The rack, when populated with the UFE2000 power supplies, shall meet the following specs.

EN61000-3-2 Harmonics

EN61000-3-3 Voltage fluctuations

EN61000-4-2 ESD Air/Contact, Level 3, performance Criteria TBD

EN61000-4-3 Radiated Susceptibility, Level 3, Criteria TBD

EN61000-4-4 Fast Transient, Level 3, Criteria TBD.

EN61000-4-5 Surges, Level 3, Criteria TBD.

EN61000-4-6 Conducted Susceptibility, Level 3, Criteria TBD

1.0 Document Overview

1.1 Scope

This document defines the mechanical and electrical requirements for a 1U rack that holds up to three (3) UFE2000 switching power supplies.

When populated with three (3) UFE2000 power supplies, the rack provides a 48Vdc bus with up to 6000W of non-redundant power or 4000W of N+1 redundant power.

1.2 Model Numbers

Model Number	Description	Notes
UFR6000-00J	1U Rack, accepts up to 3 UFE2000 Power Supplies	
UFR6000PJ	Blank Filler Panel	

10	• 5.14 - Add the Rack address table for rack ID location • 6.3 - Revise the part number of the signal connector (J16) and mating connector. • 6.5 - Update the mechanical drawing with adding 4 screw mounting holes.	Kings Yu	2/24/2009		
11	• Updated Photo	Conor Quinn	3/13/2009		
12	• 5.14 – Add power supply addresses to rack ID location table	Conor Quinn	3/17/2009		

06	• 2.5 – CCC Approvals, changed to TBD – willl be added at later date • 2.7 – Clarify use of filler panels and test setup • 2.8 – Update EMC requirements • 2.8 – Remove reference to EN61000-4-11 • 3.3 – Humidity range to match UFE2000 • 3.9 – Update acoustic requirements • 4.3 – Remove reference to PFC • 4.4 – Change input current rating • 4.5 – Remove reference to Inrush current • 4.6 – Leakage current levels tbd • 4.8 – Fusing not applicable to rack • 4.10 – Transient Protection not applicable to rack • 4.11 – Holdover Storage –not applicable to rack • 5.3 – Floating Output, remove “signal ground” reference • 5.9 – Remove reference to N+N rack redundancy • 5.10.1 – Add external capacitance specification • 6.5 – Add drawing of Filler Panel • 6.6 – Replace Astec with Emerson • 6.8 – Add weight spec and correct typo • 7.7 – Revise Hipot, Smokeless and Fan-source statements • 8.1 – MTBF no applicable;Eliminate “in both directions” from thermal section • 9 – Correct UFR typo, Remove reference to China RoHS	Conor Quinn	8-Oct-08		
07	• 1.1 & 1.2 – Remove reference to UFE1300 • 2.7 – Radiated to Level A • 2.8 – Remove reference to UFE1300 • 3.7 – Remove reference to UFE1300 • 4.1, 4.3 – Remove reference to UFE1300 • 4.3 – Remove reference to UFE1300 • 4.4 – Change input current levels consistent with safety file • 4.5, 4.8, 4.9, 4.10, 4.11 – Remove reference to UFE1300 • 5.1, 5.8, 5.11 – Remove reference to UFE1300 • 6.4 – Remove reference to UFE1300	Conor Quinn			
08	• 2.7 & Appendix A – Add EMI Radiated Test Setup • 4.6 – Modify leakage current requirement • 6.3 – Add drawing of Signal Connectors showing Pin Locations • 6.5 – Update Mechanical Drawing	Conor Qui nn			
09	• 5.15.3 – Remove # of racks that was inconsistent with 5.9 & 5.11	Conor Quinn			

Revision History:

Revision	Change Description	Marketing			
		Approved by	Date		
01	• Initial Draft	Conor Quinn	20-Sept-07		
02a	• Change name to UFR6000 • 1.5 – Model number table • 3.10 – Add cleanroom requirements • 5.3.4 – option for tieing ground of aux output to main output • 5.3.5 – option for strapping main output to chassis ground • 5.12 – Clarify passive load sharing on Auxiliary Output • 6.1.3 – Input power cord retainer clip requirement • 6.5 – Length change to 15" from mounting ears to rear, including input and output connectors • 7.1 – Clarify burn-in requirements based on passive-only design • 7.2 – Clarify MTBF expectations based on passive-only design	Conor Quinn	27-Nov-07		
03a	• Cover – New 3D Drawings • 5.12 – Add maximum auxiliary output power in redundant configuration • 6.5 – Updating dimensions per YH Chung 1/23/08 • 7.2 – Remove requirement for DMTBF	Conor Quinn	24-Mar-08		
03b	• Remove non-spec related marketing and schedule notes	Conor Quinn	30-Apr-08		
04	• 1.2 – change part number for blank panel • 1.4 – remove schedule requirements from spec • 2.3 & 2.4 – remove reference to Nemko • 3.10 – remove reference to Class 10000 clean room • 5.4, 5.5, 5.6 & 5.7 – remove unquantifiable/untestable items • 6.7 – Reference QP4205 for Shock and Vibration testing	Conor Quinn	30-Jul-08		

PRODUCT MARKETING

DRAFT SPECIFICATION

UFR6000
AC/DC Power Supply Rack
Platform

Mar 17, 2009 Rev 12

Conor Quinn
KA&D Marketing

First Drafted September 20, 2007