



APPLICATION FOR PREAPPROVAL SPECIAL SEISMIC CERTIFICATION OF EQUIPMENT AND COMPONENTS

For Office Use Only

APPLICATION NO.

OSP – 0275-10

Check whether application is: NEW RENEWAL

1.0 Emerson Network Power Joshua Beale
Manufacturer Manufacturer's Technical Representative
 975 Pittsburgh Drive, Delaware, OH 43015
Mailing Address

(740) 833-8583

Telephone

Joshua.Beale@emerson.com

E-mail Address

2.0 Liebert APM 208V Uninterruptable Power Supply;
 Bypass Distribution Cabinet;
Product Name Product Type
 NR Series UPS Cabinets; NRMB Series Bypass Distribution Cabinets (See product matrix nomenclature for all model number permutations)
 Product model No (List all unique product identification numbers and/or serial numbers)

General Description: Rigid Base Mounted product line includes uninterruptable power supplies (UPS) and associated bypass distribution cabinets. All units include side panels.

3.0 Emerson Network Power Joshua Beale
Applicant Company Name Contact Person
 975 Pittsburg Drive, Delaware, OH 43015
Mailing Address

(740) 833-8583

Telephone

Joshua.Beale@emerson.com

E-mail Address

I hereby agree to reimburse the Office of Statewide Health Planning and Development for the actual costs incurred by the department for review.

Signature of Applicant

4/26/12

Date

Product Engineer

Title

Emerson Network Power

Company Name



Registered Design Professional Preparing the Report

4.0 Buehler & Buehler Structural Engineers, Inc.
Company Name

Ryan Miller, P.E., S.E. C70940; S5556
Contact Name *California License Number*

600 Q Street, Suite 200, Sacramento, CA 95811
Mailing Address

(916) 443-0303 rmiller@bbse.com
Telephone *E-mail Address*

California Licensed Structural Engineer Review and Acceptance of the Report

5.0 Buehler & Buehler Structural Engineers, Inc.
Company Name

Scott Hooker, S.E. S3937
Contact Name *California License Number*

600 Q Street, Suite 200, Sacramento, CA 95811
Mailing Address

(916) 443-0303 shooker@bbse.com
Telephone *E-mail Address*

Anchorage Pre-Approval

6.0 Anchorage is pre-approved under OPA-
 (Separate application for anchorage pre-approval is required)

Anchorage is not Pre-approved

Certification Method

70. Testing in accordance with: ICC-ES AC-156 Other (Please Specify):

Analysis

Experience data

Combination of Testing, Analysis, and/or Experience Data (Please Specify):

Testing Laboratory (if applicable)

8.0 Qualtech NP Marie Nemier
Company Name *Contact Name*

4600 East tech Drive, Cincinnati, OH 45245
Mailing Address

(513) 528-7900 mnemier@curtisswright.com
Telephone *E-mail:*



Approval Parameters

9.0

Design in accordance with ASCE 7-05 Chapter 13: Yes No

Design Basis of Equipment or Components (F_p/W_p) = 0.45 for UPS cabinets, 1.73 for Bypass Cabinets

S_{DS} (Spectral response acceleration at short period) = 0.63g for UPS cabinets, 2.40g for Bypass Cabinets

a_p (In-structure equipment or component amplification factor) = 1.0

R_p (Equipment or component response modification factor) = 2.5

I_p (Importance factor) = 1.5

z/h (Height factor ratio) = 1.0

Equipment or Component fundamental period(s) = See Table 3

Building period limits (if any) = N/A

Overall dimensions and weight (or range thereof) = See Table 1A and 1B

Equipment or Components @ grade designed in accordance with ASCE 7-05 Chapter 15: Yes No

Design Basis of Equipment or Components (V/W) =

S_{DS} (Spectral response acceleration at short period) =

S_1 (Spectral response acceleration at 1 second period) =

R (Response modification coefficient) = 1.0

Ω_0 (System overstrength factor) = 1.0

C_d (Deflection amplification factor) = 1.0

I_p (Importance factor) = 1.5

Height to Center of Gravity above base =

Equipment or Component fundamental period(s) = Sec

Overall dimensions and weight (or range thereof) =

Tank(s) designed in accordance with ASME BPVC, 2007: Yes No

10.0 List of attachments supporting the special seismic certification of equipment or components:

- Test Report Drawings Manufacturer's Catalog
- Calculations Others (Please Specify): Operability Test Witness Letters

11.0 OSHPD Approval (For Office Use Only)

8/6/2012

December 31, 2016

Signature & Date

Approval Expiration Date

M. R. Karim, SHFR

S_{DS} (g) = **See Section 9.0** z/h = **1.0**

Name & Title

Special Seismic Certification Valid Up to

Condition of Approval (if any):



Special Seismic Certification
OSHPD Preapproval
Liebert APM UPS Systems



Table 1A. Certified Models and Configurations - UPS

Liebert APM

| Model Number | Description | Type | Input Voltage ¹ | Tested/ Interpolated | Width (in) | Depth (in) | Height (in) | Operating Weight (lbs) | Sds | z/h |
|------------------------|------------------|------------|----------------------------|-------------------------|-------------|-------------|-------------|---------------------------|-------------|-------------|
| NRA40CCSCFA3SFA | 15kVA UPS | 4,6 | 208V | UUT-7 | 31.5 | 39.4 | 86.4 | 2,433 | 0.63 | 1.00 |
| | 15kVA UPS | 1 | 208V | Interpolated | 31.5 | 39.4 | 78.7 | 1,874 | 0.63 | 1.00 |
| | 15kVA UPS | 2 | 208V | Interpolated | 31.5 | 39.4 | 78.7 | 1,922 | 0.63 | 1.00 |
| | 15kVA UPS | 3 | 208V | Interpolated | 31.5 | 39.4 | 78.7 | 2,186 | 0.63 | 1.00 |
| | 15kVA UPS | 4 | 208V | Interpolated | 31.5 | 39.4 | 78.7 | 2,402 | 0.63 | 1.00 |
| | 15kVA UPS | 5 | 208V | Interpolated | 31.5 | 39.4 | 78.7 | 796 | 0.63 | 1.00 |
| | 15kVA UPS | 7 | 208V | Interpolated | 31.5 | 39.4 | 78.7 | 909 | 0.63 | 1.00 |
| | 15kVA UPS | 8 | 480V | Interpolated | 31.5 | 39.4 | 78.7 | 1,450 | 0.63 | 1.00 |
| | 15kVA UPS | 9 | 600V | Interpolated | 31.5 | 39.4 | 78.7 | 1,450 | 0.63 | 1.00 |
| | 15kVA UPS | 1,6 | 208V | Interpolated | 31.5 | 39.4 | 86.4 | 1,905 | 0.63 | 1.00 |
| | 15kVA UPS | 2,6 | 208V | Interpolated | 31.5 | 39.4 | 86.4 | 1,953 | 0.63 | 1.00 |
| | 15kVA UPS | 3,6 | 208V | Interpolated | 31.5 | 39.4 | 86.4 | 2,217 | 0.63 | 1.00 |
| | 15kVA UPS | 5,6 | 208V | Interpolated | 31.5 | 39.4 | 86.4 | 827 | 0.63 | 1.00 |
| | 15kVA UPS | 7,6 | 208V | Interpolated | 31.5 | 39.4 | 86.4 | 940 | 0.63 | 1.00 |
| | 15kVA UPS | 8,6 | 480V | Interpolated | 31.5 | 39.4 | 86.4 | 1,481 | 0.63 | 1.00 |
| | 15kVA UPS | 9,6 | 600V | Interpolated | 31.5 | 39.4 | 86.4 | 1,481 | 0.63 | 1.00 |
| | 30kVA UPS | 1 | 208V | Interpolated | 31.5 | 39.4 | 78.7 | 1,950 | 0.63 | 1.00 |
| | 30kVA UPS | 2 | 208V | Interpolated | 31.5 | 39.4 | 78.7 | 1,998 | 0.63 | 1.00 |
| | 30kVA UPS | 3 | 208V | Interpolated | 31.5 | 39.4 | 78.7 | 2,262 | 0.63 | 1.00 |
| | 30kVA UPS | 4 | 208V | Interpolated | 31.5 | 39.4 | 78.7 | 2,478 | 0.63 | 1.00 |
| | 30kVA UPS | 5 | 208V | Interpolated | 31.5 | 39.4 | 78.7 | 872 | 0.63 | 1.00 |
| | 30kVA UPS | 7 | 208V | Interpolated | 31.5 | 39.4 | 78.7 | 1,061 | 0.63 | 1.00 |
| | 30kVA UPS | 8 | 480V | Interpolated | 31.5 | 39.4 | 78.7 | 1,526 | 0.63 | 1.00 |
| | 30kVA UPS | 9 | 600V | Interpolated | 31.5 | 39.4 | 78.7 | 1,526 | 0.63 | 1.00 |
| | 30kVA UPS | 1,6 | 208V | Interpolated | 31.5 | 39.4 | 86.4 | 1,981 | 0.63 | 1.00 |
| | 30kVA UPS | 2,6 | 208V | Interpolated | 31.5 | 39.4 | 86.4 | 2,029 | 0.63 | 1.00 |



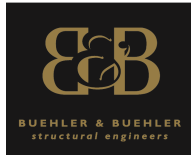
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Liebert APM UPS Systems



Table 1A. Certified Models and Configurations - UPS ~ cont'd

Liebert APM

| | | | | | | | | | | |
|------------------------|------------------|------------|-------------|--------------|-------------|-------------|-------------|--------------|-------------|-------------|
| | 30kVA UPS | 3,6 | 208V | Interpolated | 31.5 | 39.4 | 86.4 | 2,293 | 0.63 | 1.00 |
| | 30kVA UPS | 4,6 | 208V | Interpolated | 31.5 | 39.4 | 86.4 | 2,509 | 0.63 | 1.00 |
| | 30kVA UPS | 5,6 | 208V | Interpolated | 31.5 | 39.4 | 86.4 | 903 | 0.63 | 1.00 |
| | 30kVA UPS | 7,6 | 208V | Interpolated | 31.5 | 39.4 | 86.4 | 1,092 | 0.63 | 1.00 |
| | 30kVA UPS | 8,6 | 480V | Interpolated | 31.5 | 39.4 | 86.4 | 1,557 | 0.63 | 1.00 |
| | 30kVA UPS | 9,6 | 600V | Interpolated | 31.5 | 39.4 | 86.4 | 1,557 | 0.63 | 1.00 |
| | 45kVA UPS | 1 | 208V | Interpolated | 31.5 | 39.4 | 78.7 | 2,026 | 0.63 | 1.00 |
| | 45kVA UPS | 2 | 208V | Interpolated | 31.5 | 39.4 | 78.7 | 2,074 | 0.63 | 1.00 |
| | 45kVA UPS | 3 | 208V | Interpolated | 31.5 | 39.4 | 78.7 | 2,338 | 0.63 | 1.00 |
| | 45kVA UPS | 4 | 208V | Interpolated | 31.5 | 39.4 | 78.7 | 2,554 | 0.63 | 1.00 |
| | 45kVA UPS | 5 | 208V | Interpolated | 31.5 | 39.4 | 78.7 | 948 | 0.63 | 1.00 |
| | 45kVA UPS | 7 | 208V | Interpolated | 31.5 | 39.4 | 78.7 | 1,137 | 0.63 | 1.00 |
| | 45kVA UPS | 8 | 480V | Interpolated | 31.5 | 39.4 | 78.7 | 1,602 | 0.63 | 1.00 |
| | 45kVA UPS | 9 | 600V | Interpolated | 31.5 | 39.4 | 78.7 | 1,602 | 0.63 | 1.00 |
| | 45kVA UPS | 1,6 | 208V | Interpolated | 31.5 | 39.4 | 86.4 | 2,057 | 0.63 | 1.00 |
| | 45kVA UPS | 2,6 | 208V | Interpolated | 31.5 | 39.4 | 86.4 | 2,105 | 0.63 | 1.00 |
| | 45kVA UPS | 3,6 | 208V | Interpolated | 31.5 | 39.4 | 86.4 | 2,369 | 0.63 | 1.00 |
| NRC40CCSCHA3SFA | 45kVA UPS | 4,6 | 208V | UUT-8 | 31.5 | 39.4 | 86.4 | 2,585 | 0.63 | 1.00 |
| | 45kVA UPS | 5,6 | 208V | Interpolated | 31.5 | 39.4 | 86.4 | 979 | 0.63 | 1.00 |
| | 45kVA UPS | 7,6 | 208V | Interpolated | 31.5 | 39.4 | 86.4 | 1,168 | 0.63 | 1.00 |
| | 45kVA UPS | 8,6 | 480V | Interpolated | 31.5 | 39.4 | 86.4 | 1,633 | 0.63 | 1.00 |
| | 45kVA UPS | 9,6 | 600V | Interpolated | 31.5 | 39.4 | 86.4 | 1,633 | 0.63 | 1.00 |
| | 60kVA UPS | 5 | 208V | Interpolated | 31.5 | 39.4 | 78.7 | 1,024 | 0.63 | 1.00 |
| | 60kVA UPS | 7 | 208V | Interpolated | 31.5 | 39.4 | 78.7 | 1,213 | 0.63 | 1.00 |
| | 60kVA UPS | 8 | 480V | Interpolated | 31.5 | 39.4 | 78.7 | 1,678 | 0.63 | 1.00 |
| | 60kVA UPS | 9 | 600V | Interpolated | 31.5 | 39.4 | 78.7 | 1,678 | 0.63 | 1.00 |
| | 60kVA UPS | 5,6 | 208V | Interpolated | 31.5 | 39.4 | 86.4 | 1,055 | 0.63 | 1.00 |
| | 60kVA UPS | 7,6 | 208V | Interpolated | 31.5 | 39.4 | 86.4 | 1,244 | 0.63 | 1.00 |
| | 60kVA UPS | 8,6 | 480V | Interpolated | 31.5 | 39.4 | 86.4 | 1,709 | 0.63 | 1.00 |
| | 60kVA UPS | 9,6 | 600V | Interpolated | 31.5 | 39.4 | 86.4 | 1,709 | 0.63 | 1.00 |



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Table 1A. Certified Models and Configurations - UPS ~ cont'd

Liebert APM

| | | | | | | | | | | |
|------------------------|------------------|------------|-------------|--------------|-------------|-------------|-------------|--------------|-------------|-------------|
| | 75kVA UPS | 5 | 208V | Interpolated | 31.5 | 39.4 | 78.7 | 1,100 | 0.63 | 1.00 |
| | 75kVA UPS | 7 | 208V | Interpolated | 31.5 | 39.4 | 78.7 | 1,289 | 0.63 | 1.00 |
| | 75kVA UPS | 8 | 480V | Interpolated | 31.5 | 39.4 | 78.7 | 1,754 | 0.63 | 1.00 |
| | 75kVA UPS | 9 | 600V | Interpolated | 31.5 | 39.4 | 78.7 | 1,754 | 0.63 | 1.00 |
| | 75kVA UPS | 5,6 | 208V | Interpolated | 31.5 | 39.4 | 86.4 | 1,131 | 0.63 | 1.00 |
| | 75kVA UPS | 7,6 | 208V | Interpolated | 31.5 | 39.4 | 86.4 | 1,320 | 0.63 | 1.00 |
| | 75kVA UPS | 8,6 | 480V | Interpolated | 31.5 | 39.4 | 86.4 | 1,785 | 0.63 | 1.00 |
| | 75kVA UPS | 9,6 | 600V | Interpolated | 31.5 | 39.4 | 86.4 | 1,785 | 0.63 | 1.00 |
| | 90kVA UPS | 5 | 208V | Interpolated | 31.5 | 39.4 | 78.7 | 1,176 | 0.63 | 1.00 |
| | 90kVA UPS | 7 | 208V | Interpolated | 31.5 | 39.4 | 78.7 | 1,365 | 0.63 | 1.00 |
| | 90kVA UPS | 8 | 480V | Interpolated | 31.5 | 39.4 | 78.7 | 1,830 | 0.63 | 1.00 |
| | 90kVA UPS | 9 | 600V | Interpolated | 31.5 | 39.4 | 78.7 | 1,830 | 0.63 | 1.00 |
| | 90kVA UPS | 5,6 | 208V | Interpolated | 31.5 | 39.4 | 86.4 | 1,207 | 0.63 | 1.00 |
| | 90kVA UPS | 7,6 | 208V | Interpolated | 31.5 | 39.4 | 86.4 | 1,396 | 0.63 | 1.00 |
| | 90kVA UPS | 8,6 | 480V | Interpolated | 31.5 | 39.4 | 86.4 | 1,861 | 0.63 | 1.00 |
| NRF90BCSC0A3XXX | 90kVA UPS | 9,6 | 600V | UUT-9 | 31.5 | 39.4 | 86.4 | 1,861 | 0.63 | 1.00 |

Types:

1. With internal batteries (45kVA Frame C&D 100Ah batteries)
2. With internal batteries (45kVA Frame Enersys 100Ah batteries)
3. With internal batteries (45kVA Frame C&D 150Ah batteries)
4. With internal batteries (45kVA Frame Enersys 150Ah batteries)
5. No internal batteries (90kVA Frame)
6. Top Fan Kit - 31 pounds
7. Internal Maintenance Bypass - 189 pounds
8. Internal Transformer 480V - 654 pounds
9. Internal Transformer 600V - 654 pounds

Notes:

1. Output voltage is 208V, typical



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Table 1B. Certified Models and Configurations - Bypass Distribution Cabinet

Liebert APM

| Model Number | Description | Type | Tested/ Interpolated | Special Configuration | Width (in) | Depth (in) | Height (in) | Operating Weight (lbs) | Sds | z/h |
|------------------------|--|------------|-------------------------|--------------------------|-------------|-------------|-------------|---------------------------|-------------|-------------|
| NRMB1B4C2SA0XXX | 45kVA Bypass Distribution Cabinet | 7,3 | UUT-10 | (2) 225A breakers | 23.6 | 39.4 | 78.7 | 1,225 | 2.40 | 1.00 |
| | 45kVA Bypass Distribution Cabinet | 1 | Interpolated | | 23.6 | 39.4 | 78.7 | 525 | 2.40 | 1.00 |
| | 45kVA Bypass Distribution Cabinet | 7 | Interpolated | | 23.6 | 39.4 | 78.7 | 625 | 2.40 | 1.00 |
| | 45kVA Bypass Distribution Cabinet | 1,2 | Interpolated | | 23.6 | 39.4 | 78.7 | 1,110 | 2.40 | 1.00 |
| | 45kVA Bypass Distribution Cabinet | 1,3 | Interpolated | | 23.6 | 39.4 | 78.7 | 1,125 | 2.40 | 1.00 |
| | 45kVA Bypass Distribution Cabinet | 7,2 | Interpolated | | 23.6 | 39.4 | 78.7 | 1,210 | 2.40 | 1.00 |
| | 90kVA Bypass Distribution Cabinet | 1 | Interpolated | | 23.6 | 39.4 | 78.7 | 550 | 2.40 | 1.00 |
| | 90kVA Bypass Distribution Cabinet | 6 | Interpolated | | 23.6 | 39.4 | 78.7 | 660 | 2.40 | 1.00 |
| | 90kVA Bypass Distribution Cabinet | 8 | Interpolated | | 23.6 | 39.4 | 78.7 | 660 | 2.40 | 1.00 |
| | 90kVA Bypass Distribution Cabinet | 1,4 | Interpolated | | 23.6 | 39.4 | 78.7 | 1,522 | 2.40 | 1.00 |
| | 90kVA Bypass Distribution Cabinet | 1,5 | Interpolated | | 23.6 | 39.4 | 78.7 | 1,507 | 2.40 | 1.00 |
| | 90kVA Bypass Distribution Cabinet | 6,4 | Interpolated | | 23.6 | 39.4 | 78.7 | 1,632 | 2.40 | 1.00 |
| | 90kVA Bypass Distribution Cabinet | 6,5 | Interpolated | | 23.6 | 39.4 | 78.7 | 1,617 | 2.40 | 1.00 |
| | 90kVA Bypass Distribution Cabinet | 8,5 | Interpolated | | 23.6 | 39.4 | 78.7 | 1,617 | 2.40 | 1.00 |
| NRMB1A9C4SA0XXX | 90kVA Bypass Distribution Cabinet | 8,4 | UUT-11 | NONE | 23.6 | 39.4 | 78.7 | 1,632 | 2.40 | 1.00 |

Types

1. No Distribution
2. 45k 480V Transformer
3. 45k 600V Transformer
4. 90k 480V Transformer
5. 90k 600V Transformer
6. 2-225A Subfeed Breakers
7. 225A Panelboard
8. 400A Panelboard



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Table 2. Certified Subcomponents

Liebert APM

| Fan & Motor Assembly | | | | |
|---|---------------------------------|---------------------|-----------------|-------------------------|
| Material | Description | Manufacturer | Part No. | Included in Test |
| Plastic: Frame + Impeller; Ball Bearing | Fan, 24V, 152CFM, 18 Watts | Delta | AFB1224SHE-6S50 | UUT-7, 8, 9 |
| Plastic: Frame + Impeller; Ball Bearing | Fan, 24V, 84.1CFM, 9.6 Watts | Delta | FFB0824EHE-R00 | UUT-7, 8, 9 |
| Plastic: Frame + Impeller; Ball Bearing | Fan, 230V, 1340 m3/h, 200 Watts | EBM-Papst Inc | R2E225-BD92-62 | UUT-7, 8, 9 |

| Power Module | | | | |
|--|-----------------------------------|-----------------------|-----------------|-------------------------|
| NOTE: Power Module includes both Rectifier and Inverter | | | | |
| Material | Description | Manufacturer | Part No. | Included in Test |
| Carbon Steel/ Laminate PWB/ Assy. | 208V/ 400V 15/ 30kVA Power Module | Emerson Network Power | 02351752 | UUT-7, 8, 9 |

| Bypass Module | | | | |
|-----------------------------------|--------------------------|-----------------------|-----------------|-------------------------|
| Material | Description | Manufacturer | Part No. | Included in Test |
| Carbon Steel/ Laminate PWB/ Assy. | 208V/ 400V Bypass Module | Emerson Network Power | 02351377 | UUT-7, 8, 9 |

| Sharing Inductor | | | | |
|-------------------------|----------------------|-----------------------|-----------------|-------------------------|
| Material | Description | Manufacturer | Part No. | Included in Test |
| Carbon Steel/Copper | Inductor, 25uH, 350A | Emerson Network Power | 02-817979-00 | UUT-7, 8, 9 |



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Table 2. Certified Subcomponents ~ cont'd

Liebert APM

| Transformer | | | | |
|---------------------|---------------------------|-----------------------|-----------------|-------------------------|
| Material | Description | Manufacturer | Part No. | Included in Test |
| Carbon Steel/Copper | XFMR 50 KVA 480/220-208V | Emerson Network Power | 02-818035-20 | Extrapolated |
| Carbon Steel/Copper | XFMR 50 KVA 600/220-208V | Emerson Network Power | 02-818036-20 | UUT-10 |
| Carbon Steel/Copper | XFMR 100 KVA 480/220-208V | Emerson Network Power | 02-818034-20 | UUT-11 |
| Carbon Steel/Copper | XFMR 100 KVA 600/220-208V | Emerson Network Power | 02-818033-20 | UUT-9 |

| Circuit Breaker | | | | |
|------------------------|-------------------------|---------------------|-----------------|-------------------------|
| Material | Description | Manufacturer | Part No. | Included in Test |
| Molded Plastic | CB, 250A, 65KA, 220V ST | ABB | TS3N225TW | Extrapolated |
| Molded Plastic | CB, 400A, 65KA, 120V ST | ABB | T5N400TW | UUT-11 |
| Molded Plastic | CB, 225A, 25KA | Square-D | QDF32225TS | UUT-10 |
| Molded Plastic | CB, 250A, 65KA, 220V ST | Siemens | HFX3B225MA2REX6 | UUT-7, 8, 9 |
| Molded Plastic | CB, 200A, 65KA, 120V ST | ABB | T3S200TW | UUT-10 |
| Molded Plastic | CB, 175A, 65KA, 120V ST | ABB | T3S175TW | UUT-10 |



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Table 2. Certified Subcomponents ~ cont'd

Liebert APM

| Battery | | | | |
|-----------------|--------------------------------|---------------------|-----------------|-------------------------|
| Material | Description | Manufacturer | Part No. | Included in Test |
| Lead-Acid | Battery, 12V HX100 FR, VRLA | Enersys Inc | 12HX100-BFR | UUT-7 |
| Lead-Acid | Battery, 12V HX150 FR, VRLA | Enersys Inc | 12HX150E-FR | UUT-8 |
| Lead-Acid | Battery, 12V UPS12-100MR, VRLA | C&D Technologies | UPS12-100MR | UUT-7 |
| Lead-Acid | Battery, 12V UPS12-150MR, VRLA | C&D Technologies | UPS12-150MR | UUT-8 |

| Panelboard | | | | |
|-------------------|-------------------------|---------------------|-----------------|-------------------------|
| Material | Description | Manufacturer | Part No. | Included in Test |
| Molded Plastic | Panelboard 225A 54 pole | Square-D | NQM354L2CS | Extrapolated |
| Molded Plastic | Panelboard 400A 54 pole | Square-D | NQM354L4CS | UUT-11 |

| Miscellaneous | | | | | |
|-----------------------|----------------------------|----------------------------------|-----------------------|-----------------|-------------------------|
| Sub-component | Material | Description | Manufacturer | Part No. | Included in Test |
| Fuse | Not specified | Fuse, 550A, 700V | Cooper Bussman | 545230P1 | UUT-7, 8, 9 |
| Relay Card | Laminate PWB + Metal Plate | Relay Communication Card | Benchmark Electronics | IS-RELAY | UUT-7, 8, 9 |
| 485/ModBus Card | Laminate PWB + Metal Plate | OpenComms 485 Communication Card | Benchmark Electronics | IS-485L | UUT-7, 8, 9 |
| Web Card | Laminate PWB + Metal Plate | Web Communication Card | Benchmark Electronics | IS-WEBL | UUT-7, 8, 9 |
| Solenoid Key Release | Copper/Carbon Steel | Solenoid Key Rel w/2 1-in lkg | Kirk Key Interlock | 531347P1 | UUT-10, 11 |
| HMI Control Board | Laminate PWB + Metal Plate | HMI Control Board | Benchmark Electronics | 03034764 | UUT-7, 8, 9 |
| Housing / Side Panels | Steel Cold Rolled 20ga | Panel, Side, Painted 7021 | Emerson Network Power | 603663P1 | All |



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Table 3. Summary of Tested Units ^{1,3,4}

Liebert APM

| Model Number | Function/Size | UUT Mark | Excitation Direction ² | Frequency (Hz) | Width (in) | Depth (in) | Height (in) | Operating Weight (lbs) | A _{FLX-H} | A _{RIG-H} | A _{FLEX-V} | A _{RIG-V} | S _{ds} | z/h |
|-----------------|-----------------------------------|----------|-----------------------------------|----------------|------------|------------|-------------|------------------------|--------------------|--------------------|---------------------|--------------------|-----------------|------|
| NRA40CCSCFA3SFA | 15kVA UPS | UUT-7 | X | 5.0 | 31.5 | 39.4 | 86.4 | 2,433 | 1.01 | 0.76 | 0.42 | 0.17 | 0.63 | 1.00 |
| | | | Y | 3.8 | | | | | | | | | | |
| | | | Z | 15.0 | | | | | | | | | | |
| NRC40CCSCHA3SFA | 45kVA UPS | UUT-8 | X | 5.6 | 31.5 | 39.4 | 86.4 | 2,585 | 1.01 | 0.76 | 0.42 | 0.17 | 0.63 | 1.00 |
| | | | Y | 3.1 | | | | | | | | | | |
| | | | Z | 13.3 | | | | | | | | | | |
| NRF90BCSC0A3XXX | 90kVA UPS | UUT-9 | X | 8.1 | 31.5 | 39.4 | 86.4 | 1,861 | 1.01 | 0.76 | 0.42 | 0.17 | 0.63 | 1.00 |
| | | | Y | 4.8 | | | | | | | | | | |
| | | | Z | 18.6 | | | | | | | | | | |
| NRMB1B4C2SA0XXX | 45kVA Bypass Distribution Cabinet | UUT-10 | X | 6.6 | 23.6 | 39.4 | 78.7 | 1,225 | 3.84 | 2.88 | 1.60 | 0.64 | 2.40 | 1.00 |
| | | | Y | 4.4 | | | | | | | | | | |
| | | | Z | 18.7 | | | | | | | | | | |
| NRMB1A9C4SA0XXX | 90kVA Bypass Distribution Cabinet | UUT-11 | X | 6.4 | 23.6 | 39.4 | 78.7 | 1,632 | 3.84 | 2.88 | 1.60 | 0.64 | 2.40 | 1.00 |
| | | | Y | 3.1 | | | | | | | | | | |
| | | | Z | 16.0 | | | | | | | | | | |

Notes

1. Test performed 2/29/2012 through 3/2/2012 at QualTech Laboratory in Cincinnati, OH (Report #Q1205.1 Rev 2)
2. Excitation Direction: X = front-back; Y = side-side; Z = vertical
3. All units tested with included side panels
4. All units are hard-mounted at the base.



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Table 4. Summary of Tested Unit Subcomponents

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| | Sub-Component | Material | Description | Manufacturer | Part No. |
|-----------------------|-------------------------------|---|-----------------------------------|-----------------------|-----------------|
| UUT-7 15kVA UPS | Top Fan Kit | Plastic: Frame + Impeller; Ball Bearing | Fan, 230V, 1340 m3/h, 200 Watts | EBM-Papst Inc | R2E225-BD92-62 |
| | Bypass Fans | Plastic: Frame + Impeller; Ball Bearing | Fan, 24V, 152CFM, 18 Watts | Delta | AFB1224SHE-6S50 |
| | Power Module Fans | Plastic: Frame + Impeller; Ball Bearing | Fan, 24V, 84.1CFM, 9.6 Watts | Delta | FFB0824EHE-R00 |
| | Circuit Breaker | Molded Plastic | CB, 250A, 65KA, 220V ST | Siemens | HFX3B225MA2REX6 |
| | Sharing Inductor | Steel/Copper | Inductor, 25uH, 350A | Emerson Network Power | 02-817979-00 |
| | Battery C&D 100 Ah | Lead-Acid | Battery, 12V UPS12-100MR, VRLA | C&D Technologies | UPS12-100MR |
| | Battery EnerSys 100 Ah | Lead-Acid | Battery, 12V HX100 FR, VRLA | EnerSys Inc | 12HX100-BFR |
| | Fuse | Not specified | Fuse, 550A, 700V | Cooper Bussman | 545230P1 |
| | Power Module | Carbon Steel/ Laminate PWB/ Assembly | 208V/ 400V 15/ 30kVA Power Module | Emerson Network Power | 02351752 |
| | Bypass Module | Carbon Steel/ Laminate PWB/ Assembly | 208V/ 400V Bypass Module | Emerson Network Power | 02351377 |
| | Air Filter | Aluminum/ Polypropolene | High flow Air filter | Emerson Network Power | N/A |
| | HMI Control Board | Laminate PWB + Metal Plate | HMI Control Board | Benchmark Electronics | 03034764 |
| | (Option) Relay Card | Laminate PWB + Metal Plate | Relay Communication Card | Benchmark Electronics | IS-RELAY |
| | (Option) 485/ModBus Card | Laminate PWB + Metal Plate | OpenComms 485 Communication Card | Benchmark Electronics | IS-485L |
| | (Option) Web Card | Laminate PWB + Metal Plate | Web Communication Card | Benchmark Electronics | IS-WEBL |
| Housing / Side Panels | Carbon Steel Cold Rolled 20ga | Panel, Side, Painted 7021 | Emerson Network Power | 603663P1 | |



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Table 4. Summary of Tested Unit Subcomponents ~ cont'd

Liebert APM

| | Sub-Component | Material | Description | Manufacturer | Part No. |
|-----------------------|-------------------------------|---|-----------------------------------|-----------------------|-----------------|
| UUT-8 45kVA UPS | Top Fan Kit | Plastic: Frame + Impeller; Ball Bearing | Fan, 230V, 1340 m3/h, 200 Watts | EBM-Papst Inc | R2E225-BD92-62 |
| | Bypass Fans | Plastic: Frame + Impeller; Ball Bearing | Fan, 24V, 152CFM, 18 Watts | Delta | AFB1224SHE-6S50 |
| | Power Module Fans | Plastic: Frame + Impeller; Ball Bearing | Fan, 24V, 84.1CFM, 9.6 Watts | Delta | FFB0824EHE-R00 |
| | Circuit Breaker | Molded Plastic | CB, 250A, 65KA, 220V ST | Siemens | HFX3B225MA2REX6 |
| | Sharing Inductor | Carbon Steel/Copper | Inductor, 25uH, 350A | Emerson Network Power | 02-817979-00 |
| | Battery C&D 150 Ah | Lead-Acid | Battery, 12V UPS12-150MR, VRLA | C&D Technologies | UPS12-150MR |
| | Battery EnerSys 150 Ah | Lead-Acid | Battery, 12V HX150 FR, VRLA | EnerSys Inc | 12HX150E-FR |
| | Fuse | Not specified | Fuse, 550A, 700V | Cooper Bussman | 545230P1 |
| | Power Module | Carbon Steel/ Laminate PWB/ Assembly | 208V/ 400V 15/ 30kVA Power Module | Emerson Network Power | 02351752 |
| | Bypass Module | Carbon Steel/ Laminate PWB/ Assembly | 208V/ 400V Bypass Module | Emerson Network Power | 02351377 |
| | Air Filter | Aluminum/ Polypropolene | High flow Air filter | Emerson Network Power | N/A |
| | HMI Control Board | Laminate PWB + Metal Plate | HMI Control Board | Benchmark Electronics | 03034764 |
| | (Option) Relay Card | Laminate PWB + Metal Plate | Relay Communication Card | Benchmark Electronics | IS-RELAY |
| | (Option) 485/ModBus Card | Laminate PWB + Metal Plate | OpenComms 485 Communication Card | Benchmark Electronics | IS-485L |
| (Option) Web Card | Laminate PWB + Metal Plate | Web Communication Card | Benchmark Electronics | IS-WEBL | |
| Housing / Side Panels | Carbon Steel Cold Rolled 20ga | Panel, Side, Painted 7021 | Emerson Network Power | 603663P1 | |



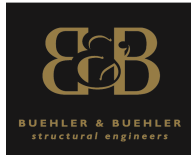
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Table 4. Summary of Tested Unit Subcomponents ~ cont'd

Liebert APM

| | Sub-Component | Material | Description | Manufacturer | Part No. |
|-----------------------|-------------------------------|---|-----------------------------------|-----------------------|-----------------|
| UUT-9 90kVA UPS | Top Fan Kit | Plastic: Frame + Impeller; Ball Bearing | Fan, 230V, 1340 m3/h, 200 Watts | EBM-Papst Inc | R2E225-BD92-62 |
| | Bypass Fans | Plastic: Frame + Impeller; Ball Bearing | Fan, 24V, 152CFM, 18 Watts | Delta | AFB1224SHE-6S50 |
| | Power Module Fans | Plastic: Frame + Impeller; Ball Bearing | Fan, 24V, 84.1CFM, 9.6 Watts | Delta | FFB0824EHE-R00 |
| | Circuit Breaker | Molded Plastic | CB, 250A, 65KA, 220V ST | Siemens | HFX3B225MA2REX6 |
| | Sharing Inductor | Carbon Steel/Copper | Inductor, 25uH, 350A | Emerson Network Power | 02-817979-00 |
| | 600V/ 208V Transformer | Carbon Steel/Copper | XFMR 100 KVA 600/220-208V | Emerson Network Power | 02-818033-20 |
| | Fuse | Not specified | Fuse, 550A, 700V | Cooper Bussman | 545230P1 |
| | Power Module | Carbon Steel/ Laminate PWB/ Assembly | 208V/ 400V 15/ 30kVA Power Module | Emerson Network Power | 02351752 |
| | Bypass Module | Carbon Steel/ Laminate PWB/ Assembly | 208V/ 400V Bypass Module | Emerson Network Power | 02351377 |
| | Air Filter | Aluminum/ Polypropolene | High flow Air filter | Emerson Network Power | N/A |
| | HMI Control Board | Laminate PWB + Metal Plate | HMI Control Board | Benchmark Electronics | 03034764 |
| | (Option) Relay Card | Laminate PWB + Metal Plate | Relay Communication Card | Benchmark Electronics | IS-RELAY |
| | (Option) 485/ModBus Card | Laminate PWB + Metal Plate | OpenComms 485 Communication Card | Benchmark Electronics | IS-485L |
| | (Option) Web Card | Laminate PWB + Metal Plate | Web Communication Card | Benchmark Electronics | IS-WEBL |
| Housing / Side Panels | Carbon Steel Cold Rolled 20ga | Panel, Side, Painted 7021 | Emerson Network Power | 603663P1 | |



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Table 4. Summary of Tested Unit Subcomponents ~ cont'd

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| | Sub-Component | Material | Description | Manufacturer | Part No. |
|---|-----------------------|-------------------------------|-------------------------------|-----------------------|-----------------|
| UUT-10 45kVA Bypass Distribution Cabinet | Circuit Breaker | Molded Plastic | CB, 200A, 65KA, 120V ST | ABB | T3S200TW |
| | Circuit Breaker | Molded Plastic | CB, 175A, 65KA, 120V ST | ABB | T3S175TW |
| | Transformer | Carbon Steel/Copper | XFMR 50 KVA 600/220-208V | Emerson Network Power | 02-818036-20 |
| | Breaker (2) | Molded Plastic | CB, 225A, 25KA | Square-D | QDF32225TS |
| | Solenoid Key Release | Copper/Carbon Steel | Solenoid Key Rel w/2 1-in lkg | Kirk Key Interlock | 531347P1 |
| | Housing / Side Panels | Carbon Steel Cold Rolled 20ga | Panel, Side, Painted 7021 | Emerson Network Power | 603663P1 |

| | Sub-Component | Material | Description | Manufacturer | Part No. |
|---|-----------------------|-------------------------------|-------------------------------|-----------------------|-----------------|
| UUT-11 90kVA Bypass Distribution Cabinet | Circuit Breaker | Molded Plastic | CB, 400A, 65KA, 120V ST | ABB | T5N400TW |
| | Transformer | Carbon Steel/Copper | XFMR 100 KVA 480/220-208V | Emerson Network Power | 02-818034-20 |
| | Panelboard | Molded Plastic | Panelboard 400A 54 pole | Square-D | NQM354L4CS |
| | Solenoid Key Release | Copper/metal | Solenoid Key Rel w/2 1-in lkg | Kirk Key Interlock | 531347P1 |
| | Housing / Side Panels | Carbon Steel Cold Rolled 20ga | Panel, Side, Painted 7021 | Emerson Network Power | 603663P1 |



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Table 5. Nomenclature
Liebert APM UPS

| 1-2 | 3 | 4 | 5 | 6 | 7 | 8-9 | 10 | 11 | 12 | 13-15 |
|--------------|--|------------------------|-------------------|--|---|--|--|--|--|---------------|
| Product Line | KVA | Frame size | Redundancy | Input Voltage | Output Voltage | Frame Type | Internal Battery Number / Type | Primary Design Region | Options | Config Digits |
| NR | A = 15 B = 30 C = 45 D = 60 E = 75 F = 90 | 4 = 45KVA 9 = 90KVA | 0 = None 1 = 1 | A = 480 B = 600 C = 208 D = 240 Y = 220 U = 400 | C = 208V D = 240 Y = 220 U = 400 | SA = Single Module SC = Paralleling | 0 = No Battery F: HX100 H: HX150 E: UPS12-100MR G: UPS12-150MR | A = LNA E = LEU I = India C = China | 0 = None 2= Ineternal MBP 3= Top Fan Kit 4= 2 and 3 | 000 |

Notes: 1. Sharing inductor included with the SC (digits 8-9) option on the UPS. 2. Config Digits (digits 13-15) are for internal Liebert use only and do not reflect any further options.

Liebert APM Bypass Distribution Cabinet (BDC)

| 1-2 | 3-4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13-15 |
|--------------|-------------------------|--------------------------|--|------------------------|-----------------------------|---|-----------------------------------|--|----------|---------------|
| Product Line | Maintenance Bypass | Transformer Option | Input Voltage | kVA Rating | Output Voltage | Output Distribution | Mounting Location | Primary Design Region | Options | Config Digits |
| NR | MB = Maintenance Bypass | 0 = None 1= with Xfmr | A = 480V B = 600V C = 208 Y = 220V Q = | 4 = 45KVA 9 = 90KVA | C = 208/120V Y = 220V | 0 = None 1 = (2) 225A Subfeed breaker 2 = (1) 225A PB 4 = (1) 400A PB | R = Right Side S = Stand Alone | A = LNA E = LEU I = India C = China | 0 = None | 000 |

Note: Config Digits (digits 13-15) are for internal Liebert use only and do not reflect any further options.

Test Setup Photos
Liebert APM



Figure 1: UUT-7 15kVA UPS (right) and UUT-11 90kVA BDC (left)
Attachment Method: hard-mount - 1/2" dia bolts to table, angle brackets by Liebert

Test Setup Photos

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Figure 2: UUT-10 45kVA BDC
Attachment Method: hard-mount - 1/2" dia bolts to table, angle brackets by Liebert

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Figure 3: UUT-8 45kVA UPS
Attachment Method: hard-mount - 1/2" dia bolts to table, angle brackets by Liebert

Test Setup Photos
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Figure 4: UUT-9 90kVA UPS
Attachment Method: hard-mount - 1/2" dia bolts to table, angle brackets by Liebert