



# IMPORTANT CONSIDERATIONS IN UPS TESTING *by John Steele*

When it comes to ensuring the highest level of data center continuity, it's vital to thoroughly test infrastructure systems at the onset of any installation or build-out to develop a baseline of performance parameters. This is especially true when it comes to power equipment and three-phase uninterruptible power supply (UPS) systems. UPSs may be protecting any number of mission critical systems, including computers, data centers, telecommunication equipment, medical diagnostic laboratories or other equipment, where an unexpected power disruption could cause major losses to the business.

When the power goes down, the impact is huge: lost revenue, lost productivity, spoilage, damaged equipment, customer dissatisfaction, safety issues and more. Experience shows that UPS testing and operator training can go a long way in mitigating problems before they start.

In a facility, numerous factors can affect power continuity, such as voltage and frequency fluctuations, harmonic distortion, transients, short circuits, and ground faults-not to mention complete power blackouts. Below are five recommended testing phases that should be considered for today's mission critical data center.

## 1. FACTORY TESTING

Some UPS manufacturers have sophisticated testing labs that perform real-world electrical-load testing, as well as performance and efficiency analysis under varying conditions. Tests may include the following:

- Short-circuit test
- AC Input failure and recovery
- Unbalanced-load test
- Output-transfer test
- Efficiency tests
- UPS-overload tests

When these tests are performed before the installation, they assure customers and their consultants that the installation and commissioning of the UPS will be seamless. Pre-installation assessments can include simulated loads designed to mimic actual working environments as well as worst-case scenarios that facilitate a holistic evaluation of the UPS equipment and the related infrastructure without interfering with ongoing operations. This approach can give

users the highest level of confidence that all will go well when their new systems go live.



## 2. ONSITE TESTING

Onsite specification and performance testing includes but is not limited to the following:

- Battery run-down evaluation to determine whether the connections are correct and that all cells are performing as expected
- Battery-capacity testing to verify that batteries are sized correctly
- Load-bank testing to ensure that loading between phases is balanced correctly
- Harmonics testing on the input side of the UPS to ensure that distortion is not being fed back to the utility, potentially affecting nearby equipment

## 3. INSTALLATION AND STARTUP

A variety of companies such as electrical contractors can facilitate installation and startup; using factory certified staff from the UPS manufacturer, however, is generally the best way to ensure proper startup procedures and adherence to warranty protocols. This service includes powering up the UPS and running it through a series of checks and balances. It's not a matter of just flipping a switch and turning on the UPS. Collecting startup and factory-testing data is an important first step in developing a performance-data baseline.



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### 4. COMMISSIONING TESTING

This step includes putting the UPS load under test. It's an important test, as it lets you see the UPS performance under actual load with varying conditions before you introduce the UPS to the other equipment in your facility. It's also the time to ensure that loads will be balanced correctly across phases to enable the most-efficient operation. UPS burn-in, battery run-down and capacity tests are also conducted during this phase. Collection of this test data enables you to establish a solid baseline of the UPS operation and then the ongoing tests to view performance trends. For example, you can see from the data how the UPS performed in the lab and how it's operating at your facility, as well as readily determine whether it's moving away from specifications. If there is a problem, it's oftentimes a configuration issue. Having a clear baseline can aid in troubleshooting throughout the product life cycle.

### 5. INTEGRATED SYSTEMS TESTING

This phase is the first time the UPS is introduced to your facility. You're testing the UPS again, but equipment such as automatic transfer switches (ATSs), power-distribution units (PDUs) and cooling are tested as one complete system. This step is absolutely critical to confirm proper "handshaking" of the equipment. Sometimes the UPS and generator won't get along, or the ATS and generator won't communicate with each other properly. Testing as one unified system confirms that the individual equipment will work correctly together.

### MAINTENANCE AND TRAINING

In addition to the five UPS testing considerations above, ongoing predictive-maintenance programs, preventative maintenance and training programs can enhance system reliability, performance and operator safety over the lifetime of the equipment.

Preventative maintenance is normally performed twice a year to ensure that all operational parameters are within tolerance, and it includes maintenance to determine the health of the system. Identifying excess wear and tear on the components and batteries is important to mitigate any failures. Thermal imaging can also aid

Most UPS manufacturers also offer training as part of their service programs. Training takes place at either the manufacturer's training facility or, in custom format, at the customer's site. Training topics include operational and first-responder familiarization. Typical classes focus on combining theory, product familiarity, safe operation, hands-on application and applied learning.

Another consideration is to ensure that your UPS provider has factory-authorized service technicians that provide the type of startup services discussed here including performing planned maintenance, monitoring and problem diagnostics, along with the ability to respond to emergencies 24x7x365 days a year. Most authorized service centers can respond to UPS service issues within four hours or less at sites located within 100 miles.

In summary, proper testing, maintenance and training are vital to keeping UPS systems ready for the next power problem.