CPN POWER

*White Paper #12*

# UPS PROTECTION FOR CARDIOLOGY LAB APPLICATIONS

## Cath Labs • IR Labs • Angio Labs • EP Labs
## Hybrid OR Suites • Vascular Labs • Special Procedure Rooms







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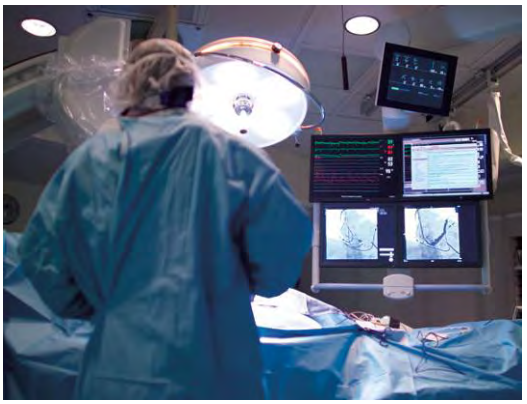
# UPS Protection for Cardiology Lab Applications



Four score and … actually, ten years ago … it was common to power one or two Cardiology Labs from the critical power branch within the hospital. The remaining labs might be placed onto the normal (non-essential) branch of power distribution. In a few facilities, most or all of the Cardiology Labs were placed on the emergency power circuit (backed by the generator). At that time, the interpretation of national codes had been that some percentage of Labs required protection from the emergency generator critical branch. In the past, it was very **uncommon** to protect Cardiology Lab(s) with a UPS System. UPS Systems required dramatic oversizing in order to support the peak momentary current demands of the Cardiology Lab and still maintain reasonable voltage regulation. This oversizing requirement led to very large, costly UPS Systems that were commonly avoided.

Over the past 10 years, the use of UPS systems to protect Cardiology Labs and other invasive procedures against power outages has been on the rise. It has become very common practice to support all Cardiology Labs and IR Labs on the critical branch of the emergency generator. Whether the application is a Cath Lab, EP Lab, Angio Room, Special Procedure Room, or Vascular Lab—the need for protection is the same. The requirement is to ensure that the cardiologist or interventional radiologist can properly guide the catheter through the arteries, heart, or brain. These procedures generally carry on for several hours. The fluoro mode of the Cardiology Lab allows the cardiologist to see the catheter position within the arteries or vascular circulatory system using a low resolution, low energy fluoro image. This image allows the cardiologist to properly maneuver the catheter through the vascular network. The fluoro mode also allows the cardiologist to see blood flow through the arteries after a dye has been injected into the vascular system.

At times, a higher resolution image is required to better view a particular area of interest, such as narrowing or blockage in the arteries. Cine is the industry term used to describe high dose rapid sequencing of the X-Ray generator to capture the high resolution images. Full power operation of the X-Ray generator is required in order to capture a high resolution image. It is common to capture high resolution images multiple times during a given procedure. The high resolution image requires a tremendous amount of power for a very short period of time, namely 100-200 kVA for 16 milliseconds (1 cycle). The power varies depending on the medical equipment manufacturer. As mentioned earlier, older UPS systems had to be over-sized in order to support this peak momentary power demand. At the time, UPS System design was not capable of maintaining tight voltage regulation during these non-linear load events. However, today CPN Power UPS Systems can achieve ±1% voltage regulation during these peak momentary events.

Cath and Angio Labs are referenced under NEC Article 517.33(A.8) as requiring emergency system power for task illumination, selected receptacles, and selected power circuits. Because this statement is somewhat ambiguous, it leaves room for interpretation. With that said, it is usual practice today to support most, if not all,

***There are several reasons why it is important to assure continued operation of the Lab.***

- ***Patient Safety*** *– If the Lab goes down, then the cardiologist can no longer see where the catheter is located. This presents a risk that is increasingly unacceptable to Cardiologists.*
- ***Patient Safety again*** *– Heart and Neurovascular cases can be very complex procedures. Some of these procedures require that the catheter be moved in order to avoid a stroke during a power outage. If the Lab is down due to a power outage, then the cardiologist or neurologist is working blindly when moving the catheter.*
- ***Liability*** *– Once a procedure is impacted by a power outage, then potential liability exists.*
- ***Voltage instability*** *and power outages create equipment issues over time. Those equipment issues often manifest during a power outage.*

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Cardiology and Interventional Radiology Labs on the emergency generator distribution. Some states, such as California, are moving toward a mandate that requires invasive procedures, such as Cardiology Labs, to be protected by the emergency circuit and must ensure continued operation of the Lab. Placing the Lab on the emergency generator without a UPS does NOT meet this requirement. When a power outage occurs, it takes 10 seconds for the emergency generator to deliver power to the Lab. Due to the power outage, the Lab has already shut down. Most Labs on the market today require ≈8-10 minutes to reboot, if everything goes as planned. That time period is just too long for many procedures, especially heart and neurovascular cases.

*Today, it has become very common to apply UPS Systems to support Diagnostic Imaging applications.*

Due to the concerns noted above, the medical equipment manufacturers developed Fluoro-only-hybrid UPS Systems. The Fluoro UPS system is typically rated for 15-40 kVA. These UPS systems ensure that the Lab can operate in a fluoro mode for several minutes. This design does not allow for high resolution images. The Fluoro UPS CANNOT support the high momentary current inrush associated with the high resolution X-Ray. The Fluoro UPS protects the X-Ray generator **only** during the transition to the emergency generator **or** during the outage, if there is no emergency generator. *During normal day-to-day operation of the Lab, the X-Ray generator is NOT protected from power disturbances.*

The Fluoro UPS System provides constant UPS power to the Power Distribution Cabinet for backup of the controls. During a power outage, the transfer switch (packaged with the Fluoro UPS) transfers the X-Ray generator onto the Fluoro UPS. A control interface limits the X-Ray generator to operate in Fluoro mode only when supported by the Fluoro UPS System. These Fluoro UPS Systems do not provide constant power conditioning to the entire Lab. One advantage of this approach is that a small UPS can be applied that requires a small footprint. The Fluoro UPS can also be less expensive than the full UPS. One of the many disadvantages of the Fluoro UPS is that it is limited to operate with a specific equipment manufacturer. The Fluoro UPS also provides limited protection. In some applications, however, the Fluoro UPS can be the correct solution.

THE MULTI-MODALITY / MULTI-VENDOR APPROACH WAS PIONEERED BY CPN POWER – THE LEADER IN CENTRAL UPS FOR DIAGNOSTIC IMAGING

Today, it is much more common to provide a complete UPS System to protect the entire suite. Rather than supporting just one suite, today's approach takes advantage of the great load diversity associated with Diagnostic Imaging applications. A Central UPS is a much more effective solution for many installations. Whether protecting 2, 5, 10, 20, or more suites, the Central UPS approach offers dramatic cost and space savings. The Central UPS also provides protection for **all modalities** ensuring more reliable operation and reduction of long-term accumulative component damage.

Today Hospital Design Teams, MEP Consulting Engineers, Architects, and Medical Equipment Planners usually design around UPS support for 70% - 90% of Diagnostic Imaging equipment in Radiology, Cardiology, Nuclear Medicine, and ED Departments. Five years ago, a project with a total of 10 suites might only consider UPS protection for 2-3 of the 10 total suites. In that era, they provided individual UPS Systems on a per modality basis. Today, a similar project would likely have 12 -13 Suites and require UPS protection for at least 10 of the 12-13 total suites. It no longer makes sense to protect 10 suites with individual UPS Systems. In most cases, a Central UPS protecting 10 suites can in fact protect 12 or 14 suites. This is due to the great load diversity with Diagnostic Imaging equipment. Even General Rad Rooms that were once analog have moved into digital design. Those digital Rad Rooms are much more susceptible to power problems resulting in equipment problems. *So, there is a shift toward protecting all modalities in today's world of Diagnostic Imaging.*

The one-line diagram on the following page displays a typical 300 kVA UPS supporting suites in a Cardiology application, Radiology application, and Radiology/Cardiology mixed application. Of course, it could be a mix of other modalities, such as, Oncology, Hybrid OR Suites, Nuc Med, or Women's Health (Mammography, DEXA).



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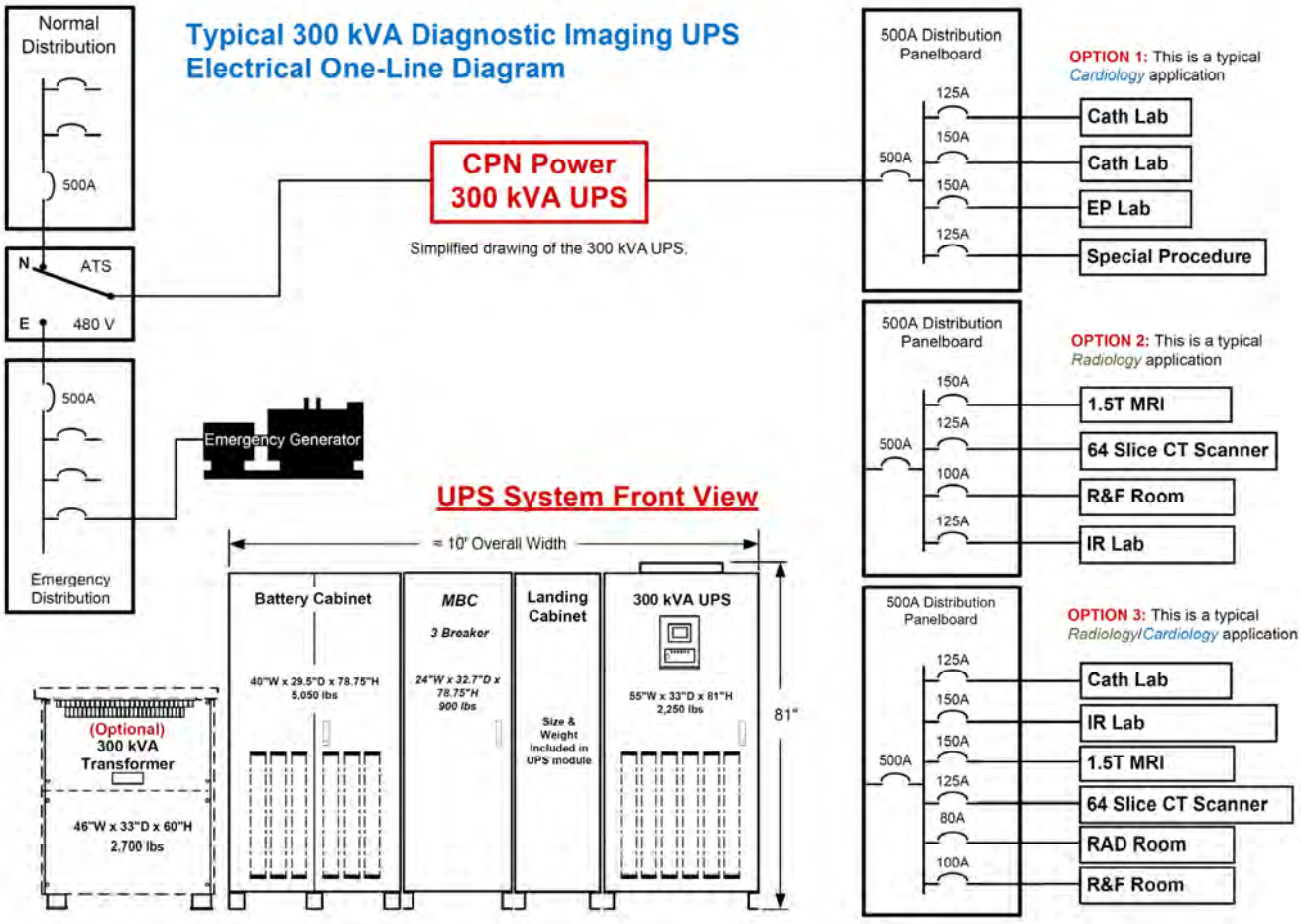


## The CPN Power Total System (Central UPS) offers Significant Advantages:

- The Total System UPS provides continuous, clean regulated power to all system components within the Lab or multiple modalities.
- The Total System UPS ensures tight voltage regulation of ±1% during high resolution image capture. Tight voltage regulation ensures no loss of data (high image quality).
- The Total System UPS ensures more reliable operation over the life of the equipment.
- The Total System UPS ensures far fewer service calls.
- The Total System UPS also ensures fewer nuisance service calls for unexplained events.
- The Total System UPS protects the Labs (including the X-Ray generator) during the monthly generator tests.
- The Total System UPS protects the Labs and/or other modalities from all power anomalies, not just power outages.
- The Total System UPS ensures that the cardiologist can obtain high resolution images at all times, even when operating on UPS power *(not true with the Fluoro UPS).*
- Common practice today dictates UPS protection for 70% – 90% of the imaging devices.
- The Total System Central UPS will protect Multi-Modality and Multi-Vendor Suites.
- The CPN Power Central UPS is vendor neutral allowing the hospital to change medical equipment over time without changing the UPS.
- The Central UPS can be located in the electrical/mechanical space, thereby providing more space in the imaging suite area.
- The CPN Power Central UPS offers tremendous energy savings over multiple individual UPS Systems.
- The CPN Power Central UPS provides for a much lower Total Cost of Ownership (TCO).

**Many healthcare institutions have benefited from complete, long-term protection of the entire Lab, and/or other Imaging Modalities, via a Multi-Modality, Multi-Vendor Central UPS System.**

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