

Eagle Eye Application Note – AN053

Calculating the Power for a UPS System

2023-08-23 Revision 01.00

Target Audience

This Application Note is intended for End Users and businesses that rely on critical electronic equipment, and that are looking to add an Uninterruptible Power Supply Unit (UPS) to protect their electronic equipment. If you are looking to ensure uninterrupted power supply in case of power outages, surges, or fluctuations, then start with a thorough review of this Application Note.

For more information in installation best practices, make sure to read AN039: Best Practices for Eagle Eye Networks Bridge/CMVR Installations.

Introduction

A UPS is an electrical device intended to deliver a temporary and consistent power source when the primary power supply experiences interruptions or irregularities. The UPS device includes several essential components, including batteries (internal and/or external), an inverter, and a rectifier. Batteries get charged from the primary power supply utilizing the rectifier to convert incoming Alternating Current (AC) to Direct Current (DC). In the event of a power outage or irregular voltage phases, the inverter converts the stored DC power within the batteries to AC power for supplying to the connected electronic devices.

UPS Requirements

Initial requirements of a UPS involve considering various critical factors to ensure an efficient and reliable power backup solution. These factors include:

1. **Load Assessment:** Assess the total power consumption or load of connected electronic devices. The load is usually reflected in Watts (W) or Volt-Amperes.
2. **Operating Voltage:** Electrical voltage present at a specific location, or site. Voltage levels can vary between countries and regions around the world:
 - 120V/240V: used in North America
 - 220V/380V or 230V/400V: commonly used in Europe, Africa, and parts of Asia.

- 100V/200V: used in certain countries like Japan and some parts of Asia.
3. **Runtime Expectations:** Determine the desired runtime during a power outage before initiating a safe shutdown or restoring primary power. If longer runtimes are desired, they require larger battery packs and capabilities from the UPS.
 4. **Mounting Options:** This depends on the type of UPS and usage considerations. Some of the mounting options include, Tower-mount, Rack-mount, or Wall-mount, etc.
 5. **Future Expansion Plan:** Before selecting the UPS, try to anticipate for potential future expansion of the equipment.

Calculating UPS Capacity and Runtime

To determine the UPS capacity, you need to consider the total power consumption or load of the connected electronic devices and the desired runtime during anticipated power outages. UPS capacity is the minimum capacity of the UPS required to support the connected load, following the formula for UPS Capacity:

UPS Capacity (in VA or KVA) = Load (in Watts)/Power Factor

Where:

- Load is related to total power consumption of all the connected devices in Watts.
- The Power Factor refers to the ratio of real power (in Watts) to apparent power (in VA) drawn from the UPS by connected equipment. UPS units are designed to have a power factor close to 1. A typical Power Factor value is 0.7 or 0.8.

To calculate the required UPS runtime, you will need to consider the duration of runtime needed, which is the UPS supply power during an electricity outage. Longer runtimes involve implementing larger battery capacity. The runtime is calculated as below:

UPS Runtime (in Minutes) = UPS Battery Capacity (in VA or KVA)/Total Load (in Watts)

Conclusion

Properly sizing the UPS ensures that your critical equipment remains protected and operational during power disturbances. Proper maintenance helps extend the lifespan of the UPS. Good maintenance will include, but is not limited to regular inspections, batteries maintenance, load testing, proper environmental conditions, and cleaning.

Generally, UPS batteries have a lifespan ranging from 3 to 5 years on average. This is based upon several factors including battery type, usage patterns, and maintenance. To accurately determine the UPS capacity required for business needs, it is recommended to consult with a qualified electrical or UPS specialist.