UPS System Capacity Management Configuration Utility

This document provides an overview of the StruxureWare™ Power Monitoring 7.0 (SPM 7.0) UPS System Capacity Management Configuration Utility, including software components and configuration workflow.

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Hazard Categories and Special Symbols

Read these instructions carefully before trying to install, configure, or operate this software.

The following special messages may appear throughout this bulletin or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of either symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

**DANGER**

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

**WARNING**

WARNING indicates a potentially hazardous situation which, if not avoided, can result in death or serious injury.

**CAUTION**

CAUTION indicates a potentially hazardous situation which, if not avoided, can result in minor or moderate injury.

**CAUTION**

CAUTION, used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, can result in property damage.

**PLEASE NOTE**

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

Do not base your maintenance or service actions solely on messages and information displayed by the software.
About the UPS System Capacity Management Configuration Utility

The UPS System Capacity Configuration Utility allows you to create, edit, and manage one or more UPS systems that will be used for reporting on the power capacity of those systems. The UPS Capacity Configuration Utility window contains a grid area and an editor area. The grid area is empty initially but will be populated with entries you create. The editor area displays the configuration diagrams and allows you to define and modify the configurations.

The UPS System consists of UPS groups, modules, and loads. The configuration utility provides a way to organize the components of the system graphically and define properties for each component.

UPS System Redundancy Types

You can create a UPS System to achieve power redundancy for IT equipment loads in different ways, depending on how the UPS units are grouped together and how they are connected to the equipment power supplies. This configuration tool supports several industry standard configurations.

The UPS System supports the following redundancy design types:

- N
- N+1
- N+2
- 2N
- 2(N+1)
- 2(N+2)

Before a UPS Capacity Report can be produced, you need to define a UPS System in the UPS System Capacity Management Configuration Utility.
The following image is an example of the UPS Capacity Configuration Utility with a UPS system selected.

**Buttons**

- **Help** – Opens the help for the utility.
- **New** – Creates a new entry in the grid.
- **Delete** – Deletes the selected entry from the grid.
- **OK** – Saves all changes and exits the Configuration Utility.
- **Cancel** – Exits the utility without saving changes.
- **Apply** – Saves all changes and leaves the utility open.

**Grid Area Columns**

- **Modified** – Displays a status symbol for the record:
  - + (plus) – A new entry.
  - * (asterisk) – An existing entry has been modified.
  - ! (exclamation mark) – The entry is in error.
- **System** – Displays the system name.
- **Type** – Displays UPS system type, such as N, 2N, N+2, etc.
- **Description** – Displays a description of the system.
Redundancy Types

N Type

The N System Configuration is for one or more UPS modules which work together to supply power to the IT load. There is no redundancy, except optionally to the second power supply of each piece of equipment.

Each UPS System with an N configuration can have multiple UPS Groups, where each group is connected to a different load. The number of modules within each UPS Group can be different. Within each group, all UPS Modules must have the same Derated Nameplate Rating value (kW).
**N+1 Type**

The N+1 System Configuration is for one or more UPS modules that work together to supply power to the IT load. There is simple module redundancy in that one of the modules can fail or be taken off-line. The load is spread among all UPS modules, but the peak load is such that if one module fails, the others will be able to assume its load. Another way to look at it is, N UPS modules will be able to support the peak IT load. If the peak IT load is more than N can support, then system design redundancy will be lost.

There is the option to connect the system of modules to the second power supply of each piece of equipment, but both power supplies are connected to the group of UPS modules.

Each UPS System with an N+1 configuration can have multiple UPS Groups, where each group is connected to a different load. The number of modules within each UPS Group can be different. The modules within a UPS Group must have the same Derated Nameplate Rating value (kW).
N+2 Type

The N+2 System Configuration is for a group of UPS modules that work together to supply power to the IT load. There is simple module redundancy in that any two of the modules can fail or be taken off-line. The load is spread among all UPS modules, but the peak load is such that if two modules fail, the others will be able to assume their load. Another way to look at it is, N UPS modules will be able to support the peak IT load. If the peak IT load is more than N can support, then system design redundancy will be lost. An example of an N+2 system is five UPS modules connected to the IT load, but the peak IT load never exceeds the capacity of three of the UPS modules.

There is the option to connect the system of modules to the second power supply of each piece of equipment, but both power supplies are connected to the group of UPS modules.

Each UPS System with an N+2 configuration can have multiple UPS Groups, where each group is connected to a different load. The number of modules within each UPS Group can be different. The modules within a UPS Group must have the same Derated Nameplate Rating value (kW).
The 2N System Configuration is for two or three groups of UPS modules that supply power to two different power supplies in each IT load. For redundancy, an entire UPS Group can fail or be taken off-line, and the IT equipment will still be supplied with power. It also means that either one of the two power supplies in an IT load can fail. The load is spread among all UPS modules, but the peak load is such that if an entire group’s worth of modules fail, the remaining modules will be able to assume their load. Another way to look at it is, N UPS modules will be able to support the peak IT load. If the peak IT load is more than N can support, then system design redundancy will be lost.

Each UPS System with a 2N configuration can have two or three UPS Groups. If there are two groups, both of them must be connected to the same load. If there are three groups, then there are three separate loads and each group is connected to two of the loads. The number of modules within each UPS Group in a UPS System must be the same in a 2N configuration. Additionally, all UPS modules within a UPS Group must have the same Derated Nameplate Rating value (kW).

In the first example, there are two groups with four UPS modules each. In a 2N configuration, one group can fail and the system will still have the designed redundancy. Therefore, the value for N is four. So, the total IT load cannot exceed the Derated Nameplate Rating of four of the UPS modules.
In the second example, there are three groups with four UPS modules each. In a 2N configuration, one group's worth of UPS modules can fail and the system will still have the designed redundancy. Therefore, the value for N is eight. So, the total IT load (for all three IT load groups shown below) cannot exceed the Derated Nameplate Rating of eight of the UPS modules.
2(N+1) Type

The 2(N+1) System Configuration is for two or three groups of UPS modules that supply power to two different power supplies in each IT load. The redundancy provided means that an entire group of UPS modules, plus one more module from the remaining groups, can fail or be taken off-line, and the IT equipment will still be supplied with power. It also means that either one of the two power supplies in an IT load can fail. The load is spread among all UPS modules, but the peak load is such that if an entire group’s worth of modules fail, plus one more from each other group, the remaining modules will be able to assume their load. Another way to look at it is, N UPS modules will be able to support the peak IT load. If the peak IT load is more than N can support, then system design redundancy will be lost.

Each UPS System with a 2(N+1) configuration can have two or three UPS Groups. If there are two groups, both of them must be connected to the same load. If there are three groups, then there are three separate loads and each group is connected to two of the loads. The number of modules within each UPS Group in a UPS System must be the same in a 2(N+1) configuration. Additionally, all UPS modules within a UPS Group must have the same Derated Nameplate Rating value (kW).

In the first example, there are two groups with four UPS modules in each group. One group plus one UPS module from the other group can fail, and the system will still have the designed redundancy. Therefore, the value for N is three. So, the total IT load cannot exceed the Derated Nameplate Rating of three of the UPS modules.
In the second example, there are three groups with four UPS modules in each group. One group plus one module from each of the other two groups can fail and the system will still have the designed redundancy. Therefore, the value for N is six. So, the total IT load (for all three IT load groups shown below) cannot exceed the Derated Nameplate Rating of six of the UPS modules.
2(N+2) Type

The 2(N+2) System Configuration is for two or three groups of UPS modules that supply power to two different power supplies in each IT load. The redundancy provided means that an entire group of UPS modules, plus two more modules from the remaining groups, can fail or be taken off-line and the IT equipment will still be supplied with power. It also means that either one of the two power supplies in an IT load can fail. The load is spread among all UPS modules, but the peak load is such that, if an entire group fails, plus two more from the other group, the remaining modules will be able to assume their load. Another way to look at it is, N UPS modules will be able to support the peak IT load. If the peak IT load is more than N can support, then system design redundancy will be lost.

Each UPS System with a 2(N+2) configuration can have two or three UPS Groups. If there are two groups, both of them must be connected to the same IT load. If there are three groups, then there are three separate loads and each group is connected to two of the loads. The number of modules within each UPS Group must be the same. All UPS modules within a group must have the same Derated Nameplate Rating value (kW).

In the first example, there are two groups with four UPS modules each. One group can fail, plus two more UPS modules from the other group and the system will still have the designed redundancy. Therefore, the value for N is two. The total IT load cannot exceed the Derated Nameplate Rating of two of the UPS modules.
In the second example, there are three groups with four UPS modules each. One group plus two modules from each of the other two groups can fail, and the system will still have the designed redundancy. Therefore, the value for $N$ is four. So, the total IT load cannot exceed the Derated Nameplate Rating of four of the UPS modules.
Define UPS Systems

The UPS System is the logical system configuration that will be used for reporting power capacity.

To start the UPS System Capacity Management Configuration Utility, either:

- Double-click the **UPS Capacity Configuration Utility** icon on the desktop, or
- Click **Start > All Programs > Schneider Electric > UPS Capacity > UPS Capacity Configuration Utility**.

To define a new UPS system:

1. Click **New**. The Edit System: New System area appears below the grid.

![Edit System: New System window](image)
2. Click anywhere in the editor area. The Properties screen appears.

```
<table>
<thead>
<tr>
<th>Properties for 2N-Type UPS System</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Name:</td>
</tr>
<tr>
<td>2N Type UPS System</td>
</tr>
<tr>
<td>Description (optional):</td>
</tr>
<tr>
<td>This is a sample 2N-type UPS System</td>
</tr>
<tr>
<td>Redundancy Type:</td>
</tr>
<tr>
<td>2N</td>
</tr>
<tr>
<td>Groups:</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>Modules Per Group:</td>
</tr>
<tr>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Properties for N-Type UPS System</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Name:</td>
</tr>
<tr>
<td>N Type UPS System</td>
</tr>
<tr>
<td>Description (optional):</td>
</tr>
<tr>
<td>This is a sample N-type UPS System</td>
</tr>
<tr>
<td>Redundancy Type:</td>
</tr>
<tr>
<td>N</td>
</tr>
<tr>
<td>Groups:</td>
</tr>
<tr>
<td>2</td>
</tr>
</tbody>
</table>
```

3. Complete the details for the UPS system:
   a. **UPS System Name**: Enter a name for the UPS system. Each UPS system must have a unique name.
   b. **Description**: Enter a description for the UPS system. This field is optional.
   c. **Redundancy Type**: Select the redundancy type for the UPS system. The different redundancy types are explained in Redundancy Types.
   d. **Groups**: Shows the number of UPS groups contained in the UPS system. Click **Add** to add groups to the UPS system. Click **Remove** to delete groups.
   e. **Modules Per Group**: Shows the number of UPS modules in each group in the system. Click **Add** to add UPS modules to the group. Click **Remove** to delete modules.
      This property is only available when the system redundancy type is 2N, 2(N+1) or 2(N+2). To define the number of modules for a system with redundancy type N, N+1 or N+2, use the UPS Group properties. See Define UPS Groups for more information.

4. Click **Done** to save the UPS system.

Now you can configure the other components of the system:

- Define UPS Groups
- Define UPS Modules
- Define UPS Loads
Define UPS Groups

A UPS Group represents a logical grouping of UPS modules. The system contains at least one group and can contain multiple groups. Depending on the system type, the group properties may be different, as shown below. See Configuration Restrictions for more information.

To define the properties for a UPS group:

1. Click on the group object border. The Properties screen appears.

2. Complete the details for the UPS group:
   a. **Group Name**: Enter a name for the group. Each UPS group must have a unique name.
   b. **Description**: Enter a description for the group. This field is optional.
   c. **Modules Per Group**: Click Add to increase the number of UPS modules in the group. Click Remove to decrease the number. This property is available only for system redundancy types N, N+1 or N+2.

3. Click Done to save the UPS group.
Define UPS Modules

A UPS Module represents an actual UPS device in the data center. A group contains at least one UPS module and can contain multiple modules. For some system types, each group must contain the same number of UPS modules. See Configuration Restrictions for more information.

To define a UPS module:

1. Click on the module object border. The selected module will be highlighted in blue and the Properties screen appears.

![Properties for: A1](image)

2. Complete the details for the UPS module:
   a. **UPS Module Name**: Enter the name for the module. This name must be unique for each UPS module in the system.
   b. **Description**: Enter a description for the module. This field is optional.
   c. **Data Source**: Select the meter source in StruxureWare™ Power Monitoring 7.0 (SPM 7.0) where load data is logged for the UPS module. The source must be unique for each UPS module.
   d. **Nameplate Rating (kVA)**: Enter the maximum output power (kVA) of the UPS module. This value must be greater than zero.
   e. **Derated Nameplate Rating (kW)**: Enter the maximum power capacity (kW) that the UPS module is expected to support. This value must be equal or less than the nameplate rating value, and greater than zero.

3. Click **Done** to save the UPS module.
Define UPS Loads

A UPS Load represents the logical load attached to a UPS group. This logical load has no functional purpose in the calculations for power redundancy. The UPS Load is used only to provide a more complete diagram representation for the UPS system.

To define a UPS load:

1. Click the UPS load element in the system diagram. The Properties screen appears.

![Properties for: load 1](image)

2. Complete the details for the UPS load:
   a. **Load Name**: Enter a name for the load.
   b. **Description**: Enter a description for the load. This field is optional.

3. Click **Done** to save the UPS load.
Configuration Restrictions

The configuration tool enforces certain rules when you create a UPS system:

1. **UPS System**
   a. Name must be unique.
   b. One or more systems are allowed.

2. **UPS Groups**
   a. Name must be unique.
   b. At least one group must be present in each system.
   c. A maximum of three groups are allowed in each system.
   d. For N, N+1, and N+2 system types:
      — Each group in the system may have a different number of UPS modules.
      — Each UPS module in the group must have the same nameplate rating (kVA) value.
      — Each UPS module in the group must have the same derated nameplate rating (kW) value.
      — Each group is connected to one load only. No other group can be connected to the same load.
   e. For 2N, 2(N+1) and 2(N+2) system types:
      — All groups must have the same number of UPS modules.
      — All UPS modules in the groups must have the same nameplate rating (kVA) value.
      — All UPS modules in the groups must have the same derated nameplate rating (kW) value.
      — Depending on the number of groups present in the system, a load may be shared by two groups. See the UPS System Redundancy Types for more information.

3. **UPS Modules**
   a. Name must be unique.
   b. At least one module must be present in each group.
   c. A maximum of 12 modules is allowed in each group.
Configure and Run the UPS Capacity Management Report

The UPS Capacity Report data depends on the selections you make while configuring the report and the contents of the StruxureWare Power Monitoring 7.0 (SPM 7.0) database. See Capacity Measurements for more details on report data.

To configure and run a report:

1. Log in to the SPM 7.0 web application.
2. Click the Reports icon.

The report template appears.

4. Complete the details for the report:
   a. **Title**: Enter a title for the report.
   b. **Facility Name**: Enter the name of your data center facility.
   c. **Facility Location**: Enter a name for your data center facility location. This field is optional.
   d. **Report Data**: Select one or more system configurations to use in the report:
— Click **Select UPS Systems**. The Selector screen appears with the UPS systems you set up in the Configuration Utility.

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![Selector screen](image)

---

— Select one or more UPS systems.
— Click **OK** to save your selection.

**e. Reporting Period:** Set the reporting period for the report. Also select whether you want the report timestamps to be in Server Local Time or UTC (Universal Time).

**f. Aggregation Period:** Set the interval frequency for aggregating the report data.

**g. Include Data Table:** Select **Yes** to include a section for capacity data in the report. Select **No** to exclude capacity data.

**h. Include Data Warnings:** Select **Yes** to include data warnings in the report. Select **No** to exclude data warnings from the report.

5. Click **Generate Report** to create the UPS Capacity Report.

After you generate the report, you can save it with some or all of the inputs defined. See **Save a Report** for more information.
Save a Report

After you generate a UPS Capacity Report, you can save it with some or all of the inputs defined.

To save a report:
2. Enter a name for the report in the Name field.
3. In the Location box, select the location for the saved report, or click New Folder to create a new folder for it. Note that you cannot nest one folder inside another.
4. Select the checkboxes for the inputs you want to save with the report. The next time you generate the saved report, you must specify the inputs that were not saved.
5. Click OK. The report is saved with the inputs you selected.
Capacity Measurements

The UPS Capacity Report uses a priority table to determine which measurement to use for querying power data for a UPS module.

The table is stored in the StruxureWare Power Monitoring 7.0 (SPM 7.0) database, and consists of a list of measurement IDs with a priority value for each measurement. When the report is querying for data, it iterates through the measurement list according to the priority and queries the database for load data. Once data is found, it is returned in the report.

By default, the table GEN_CapacityMeasurement holds 4 known measurements:

<table>
<thead>
<tr>
<th>Priority</th>
<th>Measurement ID</th>
<th>Measurement Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>116</td>
<td>Active Power Sliding Window Demand Delivered</td>
</tr>
<tr>
<td>2</td>
<td>107</td>
<td>Active Power Sliding Window Demand Delivered-Received</td>
</tr>
<tr>
<td>3</td>
<td>128</td>
<td>Active Power Mean</td>
</tr>
<tr>
<td>4</td>
<td>193</td>
<td>Active Power</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measurement ID</th>
<th>Devices Found</th>
</tr>
</thead>
<tbody>
<tr>
<td>116</td>
<td>ION7650, Modbus device: BCPM, CM2000, CM3000, CM4000, Micrologic A and E (for CompactNSX breakers), EM5000, Micrologic E, H, P (for Masterpact breakers), PM1200 and PM800</td>
</tr>
<tr>
<td>107</td>
<td>ION7650, Modbus device: BCPM, CM2000, CM3000, CM4000, Micrologic A and E (for CompactNSX breakers), EM5000, Micrologic E, H, P (for Masterpact breakers), PM1200, PM800, Sepam 40 series and Sepam 80 series</td>
</tr>
<tr>
<td>128</td>
<td>ION7650, Modbus device: BCPM, CM2000, CM3000, CM4000, Micrologic A and E (for CompactNSX breakers), EM5000, Micrologic E, H, P (for Masterpact breakers), PM1200, PM800, Sepam 40 series and Sepam 80 series</td>
</tr>
<tr>
<td>193</td>
<td>ION7650, Modbus device: BCPM, CM2000, CM3000, CM4000, Micrologic A and E (for CompactNSX breakers), EM5000, Micrologic E, H, P (for Masterpact breakers), PM1200, PM800, Sepam 40 series and Sepam 80 series</td>
</tr>
</tbody>
</table>
Calculations

Use the following calculations to determine the Number of Modules Required for Redundancy Limit, Redundancy Design Limits, Derated Nameplate Ratings, and Peak Load and Available Capacity.

Number of Modules Required for Redundancy Design Limit

The system configuration defines N, or the number of modules required for Redundancy Design Limit. This number is required for calculating Redundancy Design Limit, which is part of the graphical and tabular output in the UPS Capacity Report.

The formulas for N that apply to a UPS system are as follows:

For N Redundancy Type

\[ N = \text{Total number of modules} \]

For N+1 Redundancy Type

\[ N = (\text{Total number of modules}) - 1 \]

For N+2 Redundancy Type

\[ N = (\text{Total number of modules}) - 2 \]

For 2N Redundancy Type

\[ N = \left(\frac{\text{Total number of modules}}{\text{number of groups}}\right) \times (\text{number of groups} - 1) \]

For 2(N+1) Redundancy Type

\[ N = \left(\frac{\text{Total number of modules}}{\text{number of groups}} - 1\right) \times (\text{number of groups} - 1) \]

For 2(N+2) Redundancy Type

\[ N = \left(\frac{\text{Total number of modules}}{\text{number of groups}} - 2\right) \times (\text{number of groups} - 1) \]

Redundancy Design Limits

The calculated value for Redundancy Design Limits will be represented as a red line in the Load Charts of the UPS Capacity Report:

For UPS Systems:

For all Redundancy Types, except N Type:

\[ \text{Redundancy Design Limit of System (kW)} = N \times (\text{Derated Nameplate Rating value of a single UPS Module in the system}) \]

For N Redundancy Type

\[ \text{Redundancy Design Limit of System (kW)} = \text{Derated Nameplate Rating of System (kW)} \]

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For UPS Groups:

For all Redundancy Types, except N Type:

\[ \text{Redundancy Design Limit of Group (kW)} = N \times \left( \frac{\text{Redundancy Design Limit of Module (kW)}}{\text{number of modules in the group}} \right) \]

For N Redundancy Type

\[ \text{Redundancy Design Limit of Group (kW)} = \text{Derated Nameplate Rating of Group (kW)} \]

For UPS Modules:

For all Redundancy Types, except N Type:

\[ \text{Redundancy Design Limit of Module (kW)} = \left( \frac{\text{Redundancy Design Limit of System (kW)}}{\text{number of modules in the system}} \right) \]

For N Redundancy Type

\[ \text{Redundancy Design Limit of Module (kW)} = \text{Derated Nameplate Rating of Module (kW)} \]

Derated Nameplate Ratings

The calculated value for Derated Nameplate Rating will be represented as a black line in the Load Charts of the UPS Capacity Report:

For UPS Systems:

\[ \text{Derated Nameplate Rating of System (kW)} = \left( \frac{\text{Derated Nameplate Rating value of a single UPS module in the system}}{\text{number of modules in the system}} \right) \]

For UPS Groups:

\[ \text{Derated Nameplate Rating of Group (kW)} = \left( \frac{\text{Derated Nameplate Rating value of a single UPS Module in the system}}{\text{number of modules in group}} \right) \]

For UPS Modules:

\[ \text{Derated Nameplate Rating of Module (kW)} = \text{Derated Nameplate Rating value for the UPS Module} \]
Peak Load and Available Capacity

The calculated value for Peak Load and Available Capacity will be represented as a dark green column and a light green column respectively, in the Load Charts of the UPS Capacity Report:

For UPS Systems:

\[ \text{Peak Load of System (kW)} = \text{Peak value, by the aggregation period, from all the UPS Modules in the system over the user selected reporting period. This is determined by aggregating the power values at each interval for all the system’s UPS Module meters} \]

\[ \text{Available Power Capacity of System (kW)} = \text{Redundancy Design Limit of System (kW)} - \text{Peak Load of System (kW)} \]

For UPS Groups:

\[ \text{Peak Load of Group (kW)} = \text{Sum of the loads of the UPS Modules in the UPS Group coincident with the System Peak Load timestamp} \]

\[ \text{Available Power Capacity of Group (kW)} = \text{Redundancy Design Limit of Group (kW)} - \text{Peak Load of Group (kW)} \]

For UPS Modules:

\[ \text{Peak Load of Module (kW)} = \text{Load of the UPS Module coincident with the System Peak Load timestamp} \]

\[ \text{Available Power Capacity of Module (kW)} = \text{Redundancy Design Limit of Module (kW)} - \text{Peak Load of Module (kW)} \]