
PDI PowerPak Power Distribution Unit

Guide Specifications (Revision 002, 6/1/2017)

1 General

1.1 Summary

These specifications describe requirements for a power distribution unit (PDU) distributing power to sensitive loads.

1.2 Standards

The PDU shall be certified through ETL for the following standards:

- UL 60950-1 (PDU Standard)
- CS 22.2

In addition, the PDU shall be designed, manufactured, tested, and installed in compliance with the following standards:

- UL67
- UL50
- UL489
- UL891
- UL 1561
- UL1950
- NFPA
- IEEE 519-1991
- ANSI C33.4
- NEMA ST-20
- NEMA AB-1
- NEMA-PB-1
- NEC
- ISO 9001
- CS 57.12.91
- IBC 2010, seismic zone 4, California standard

The PDU shall comply with the latest FCC Part 15 EMI emission standard for Class A computing devices.

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1.3 System Description

1.3.1 Environmental Requirements

The PDU shall have the following environmental requirements for operation and storage:

- Acceptable temperature ranges:
 - Storage temperature shall be between -36°C and +70°C (-33°F to 158°F).
 - Operating temperature shall be between 0°C to 40°C (32°F to 104°F).
- Relative humidity range from 0% to 95% non-condensing.
- Operating altitude to a maximum of 6,600 ft. For operating the PDU at altitudes over 6,600 ft. (2,000 m.), the user shall consult the factory for de-rating information.
- Storage and transport altitude: Up to 40,000 ft. (12,200 m) above Mean Sea Level.
- Audible noise: The audible noise level shall comply with the NEMA-ST-20 transformer standard.

1.3.2 Electrical Requirements

kVA

The PDU shall have a kVA rating of (50-300) kVA.

Input

The PDU input frequency shall be 60 Hz \pm 5 Hz or 50 Hz \pm 5 Hz.

The PDU shall accept a 3-phase, 3-wire plus ground nominal input source voltage from among these standard voltages:

- @ 50 Hz: 380VAC or 415 VAC
- @ 60 Hz: 600, 575, 480, or 208VAC

Output

The PDU output voltage shall be one of the following standard nominal voltages, 3-phase, 4-wire plus ground:

- @ 50 Hz: 415/240VAC 380/220VAC
- @ 60 Hz: 600/346, 575/332, 480/277, or 208/120VAC

Nonstandard Voltages

The PDU shall optionally accept a non-standard voltage for input and/or shall provide a non-standard voltage for output within the range 208-600VAC @50 Hz or 60 Hz if the PDU transformer is custom-designed for these non-standard voltages.

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Neutrals and Ground

Neutral: The PDU shall have the following computer grade neutrals for subfeeds and panelboards:

- 200%-rated neutral busbars
- 173%-rated panelboard neutrals

Ground: The PDU shall have a computer-grade single point safety ground in conformance to the requirements of the NEC. The PDU shall optionally have an isolated ground.

1.4 Documentation

1.4.1 Drawings

The manufacturer shall furnish PDU 1-line electrical drawings and outline or other mechanical drawings after receiving a Purchase Order. For quoting, sample submittal drawings with features for 50-300 kVA PDUs shall be available.

1.4.2 Installation and Operations Documentation

An *Installation and Operations* manual shall be furnished. Points lists (Modbus register maps) for monitoring the PDU board (including the source main input feed, transformer, and contractor board), output subfeeds, and panelboards with their subfeeds shall be available for downloading from the manufacturer's website or by calling the manufacturer's service number.

1.4.3 Spare Parts

A list of recommended spare parts shall be made available at customer request.

1.4.4 Contact List

A contact list shall be provided for customer interface functions, such as Service and Accounting.

1.5 Warranty

The manufacturer shall provide a 12-month warranty against defects in material and workmanship for 12 months after initial startup or 18 months after shipping date, whichever comes first.

1.6 Quality Assurance

The PDU shall be designed and manufactured according to internationally recognized quality standards, including those listed in section **1.2 Standards**. The manufacturer shall be ISO 9001:2015 certified.

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The PDU shall be factory tested before shipment. Testing shall include at minimum:

- Quality control checks specific to the unit and its configuration, including function testing to determine that the unit functions as designed.
- Hi-Potential Test at two times the unit's rated voltage plus 1000 volts, per UL 60950-1 requirements.
- Minimum one-half hour of PDU burn-in at a typical load or longer burn-in at customer request.
- Calibration tests for monitoring.
- Tests for alarm annunciation as designed and/or as the customer requests.

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2 Product

2.1 Components: Enclosure

2.1.1 Enclosure Specification

The PDU shall consist of a main cabinet enclosure with optional sidecars and/or cabinet extensions. The cabinet enclosure(s) and sidecars shall be constructed in a modular configuration to NEMA-1 standards and shall meet IP20 requirements.

The PDU shall optionally include the following sidecars:

- 21" front-facing and/or side-facing side car
- 9" side-facing side car
- 12" side-facing side car for Square D I-Line panelboards

The enclosure shall include cabinet extensions and/or spacers where needed to accommodate the PDU configuration.

The PDU **enclosure dimensions** shall be the following as determined by the PDU configuration:

Main Cabinet (with < 200 kVA transformer)	36.5"W x 32.75"D x 74.75"H*
Main Cabinet (with 200–300 kVA transformer)	36.5"W x 39.00"D x 74.75"H*
21" Front-Facing/Side-Facing Side Car add-on	21.00"W x 32.75"D x 74.75"H*
9" Side-Facing Side Car add-on	9.00"W x 32.75"D x 74.75"H*
12" Side-Facing Side Car (I-Line Panelboards) add-on	12.00"W x 32.75"D x 74.75"H*
Main Cabinet extension for 1200A I-Line Panelboards	46.75"W x 32.75"D x 74.75"H*

* Includes height of PDU with casters.

Enclosure weight shall vary according to enclosure size, transformer specifications, and configuration.

Cooling The unit shall be convection cooled and shall have no fans. Heat rejection shall be through ventilation openings. Convection cooling shall be sufficient for full load operation.

Paint The cabinet enclosure shall be primed and painted inside and out with a suitable powder coat enamel. The paint color shall be PDI Black or IBM Pearl White or “computer hardware off-white” to match other PDI equipment in appearance. Customer may specify alternate color(s) that must be reviewed and approved by the manufacturer’s Engineering department.

Enclosure modifications Line and match requirements with static switches shall be met through modification of the static switch enclosure.

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2.1.2 Mounting Options

The PDU shall have heavy duty casters that can support the weight of the PDU and stabilizing feet.

The PDU shall be suitable for installation on both fixed floor or on a floor stand in a raised floor environment.

For mounting in a raised floor environment, the PDU shall optionally have a floor stand that matches the height of the installation's raised flooring. Floor stands shall be available in heights from 8" to 76". The PDU alone or the PDU with floor stand shall conform to seismic zone four requirements, California standard, per **IBC 2010**.

The PDU shall optionally have a magnetic skirt or kick plate providing air closure around the base of the PDU.

2.1.3 Clearances

The PDU shall require the following clearances:

- Service: 36" front, 36" rear (unless transformer is rotated 180°), 36" side for side cars with side access.
- Ventilation: 6" minimum rear and both sides required and 18" overhead recommended.
- Cabling: 12" underfloor recommended if bottom cable entry or exit is used.

2.1.4 PDU Access

Doors and physical access controls The PDU shall have the following physical access controls:

- Front outer lockable split doors on main cabinet to reduce door swing.
- Outer lockable doors on side cars with transparent viewing windows over circuit breakers.
- Dead front panels over panelboards and subfeeds. The dead front panels shall allow screw-on or snap-in filler plates to cover unused breakers positions.
- Dead panels on front-facing transformer.
- Access to operator display and controls from front of PDU with doors closed.
- Separate controls compartment containing Color Monitor and monitoring PCBs accessible from interior front panel door (some monitoring PCBs may be located in other PDU compartments).

Panels All removable PDU panels shall use non-captive screws and shall either lift off or incorporate ¼ turn latches.

2.2 Components: Electrical Construction

All wiring shall be rated per the National Electrical Code (NEC).

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The PDU shall include a computer grade single point ground in accordance the requirements of the NEC. Each distribution output section shall have a ground bus bar for distribution output subfeeds. The PDU shall optionally include an isolated ground.

The PDU shall have a copper bus connection with 200% neutral that is cabled to the transformer and bolted to the PDU bus, which can be implemented variously, as follows:

- All 200% neutral can be on one side of the transformer.
- Both sides of the transformer can each allow 100% neutral.
- Both sides of the transformer can each allow 200% neutral (optional).

The PDU shall have a 200%-rated neutral copper bus bar as standard in each distribution subfeed section or shall have a smaller percentage rated neutral as specified by the customer, subject to approval by the manufacturer's Engineering department.

Panelboards shall have 173%-rated neutrals.

2.2.1 Input Power Cable Entry

The PDU shall allow input power cable entry in the main cabinet as follows:

- Bottom rear cable entry: Three pilot holes shall be provided for conduit to be enlarged as appropriate by the installer.
- Bottom front cable entry: Solid plate shall be provided and conduit cutouts shall be made by the installer.
- Top cable entry: Solid plate shall be provided and conduit cutouts shall be made by the installer.
- Cable entry trays or plates shall be removable.

If the PDU is configured as part of a Primary System with a WaveStar® Static Transfer Switch (STS), side cable access to the Static Transfer Switch shall be provided.

2.2.2 Distribution Cable Exit

The PDU shall have top or bottom cable exit panels or trays sufficient for the distribution cabling in the main cabinet, main cabinet extension, and side cars. Cable exit trays for panelboards shall have pre-punched ½" knockouts. Cable exit panels for subfeeds shall be solid plate.

2.3 Components: Transformer

The PDU shall be fed from an integral 3-phase, copper-wound or optionally aluminum-wound, high isolation standard transformer rated between 50 kVA and 300 kVA. The transformer shall be specifically designed for the PDU and its applications and shall provide voltage transformation, voltage adjustment, high isolation, conditioning, and electrostatic shielding. The transformer shall be mounted on isolation pads.

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2.3.1 Standard Transformers

Standard transformers shall be available with K-factor K13 that comply with DOE2016 efficiency requirements. Other transformers shall be available with the specifications and options shown in Table 1.

Non-DOE2016 transformers shall be available for non-USA customers and certain exempt categories in the USA.

Table 1 Standard Transformer Specifications and Options

Parameter	Standard Transformer	Options
Input Voltage	480V Delta	208 – 600V
Output Voltage ¹	208 /120V Wye	208 – 600V
Frequency	60 Hz	50 Hz
Impedance	3 – 5%	Up to 6%
Efficiency	DOE2016 (USA)	Non-DOE2016 for certain exempt US categories, CEC, CSA, TP1 (CSA), NEMA Premium, or the highest efficiency international standard
K-Factor	K13	K4, K9, K20
Conductor Material	Copper (CU)	Aluminum (AL)
Inrush	8 – 10x	5x
Taps ²	+2 x 2.5% -4 x 2.5%	No taps; custom taps available, percentage subject to physical location
Temperature Rise	150°C	115°C, 130°C
Vector	Delta-Wye	Delta Zig-Zag Delta Quad-Wye
Average sound level	NEMA ST-20	
Applicable Standard	DOE2016, UL-1561 IEEE Standard C57.12.01	IEC 60076, CSA22.2 No 66, CEC 400
Insulation	UL 1446 Class S (240°C)	

¹ Multi-Output Transformer Option allows the PDU output voltage to be field-reconfigurable to alternate voltages.

² Conventional transformer taps are not available if the Multi-Output Transformer Option is installed.

2.3.2 Voltage Compensation Taps

The standard transformer shall have six (6) full load two and one-half percent (2 1/2%) compensation taps (two [2] above and four [4] below). Transformer taps shall face the rear of the PDU cabinet.

2.3.3 Front-Facing Transformer

For front-only PDU service access, the transformer shall be rotated 180° so that voltage compensation taps face forward.

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When the transformer taps face the front of the PDU, all distribution shall be mounted in side cars. No devices shall be mounted in front of the transformer, which would obstruct infrared scanning of the transformer and access to voltage compensation taps. However, a half-height component mounting plate shall be optionally available for the main cabinet that allows mounting a single 42-pole 250A panelboard or three (3) 250A subfeeds while allowing access to taps and infrared transformer scanning from the front of the PDU.

2.3.4 Multi-Output Transformer Option

The Multi-Output Transformer Option shall enable the single output voltage of the PDU to be reconfigured in the field for these alternate voltages at 60 Hz:

- 208/120VAC
- 415/240VAC
- 480/277VAC

PDUs with the Multi-Output Transformer Option shall have large voltage bus bar taps that allow the transformer output to be reconfigured from the rear of the PDU. To access the busbar taps, the PDU shall require 36" rear or side service clearance or the PDU must be moved to reconfigure the taps.

The following features shall not be available with the Multi-Output Transformer Option:

- Conventional transformer voltage compensation taps
- Front-facing transformer option
- Manual Dual PDU Option

2.3.5 Scan Window

The PDU shall optionally have a 3" infrared scan window on a side or the rear of the PDU for transformer thermal scanning.

2.3.6 Transformer Testing

The PDU transformer shall be tested to the C57.21.91 standard.

2.3.7 Transformer Temperature Monitoring

The standard transformer shall have six (6) thermal overload devices to monitor core temperature in each winding.

The first set of thermal devices shall be calibrated to 180°C, the warning threshold. If any winding reaches 180°C core temperature, the thermal overload protection device shall close a set of contacts for remote annunciation of a potential over-temperature condition.

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The second set of thermal devices shall be calibrated to 200°C, the shutdown threshold. If any winding reaches 200°C core temperature, the thermal overload protection device shall close a set of contacts for remote annunciation of an over-temperature condition and shall initiate an automatic PDU shutdown. A shutdown threshold of 195°C shall be available as an option.

2.4 Power Configurations

All PDU power configurations and enclosure layouts shall be subject to review and approval by the manufacturer’s engineering or application engineering department.

2.4.1 Main Input Circuit Breaker

The main input circuit breaker shall be manually operated and appropriately sized for the PDU’s transformer kVA rating and input voltage in compliance with the NEC:

- For transformers < 225 kVA, the standard main input circuit breaker shall be a thermal magnetic circuit breaker rated 80% at 480VAC with 35 kAIC.
- For transformers 225 – 300 kVA the standard main input circuit breaker shall be a fixed (non-adjustable) electronic trip circuit breaker rated 80% at 480VAC with 35 kAIC.
- Alternate circuit breakers shall be available in voltages, amperages, kAIC ratings, and trip settings matched to customer configuration and requirements.

2.4.2 Input Power

The main input bus shall also be compatible with a main lug only (MLO) power feed—that is, without a main breaker.

The input AC voltage termination from the main input to the transformer primary shall be cabled.

The ground conductor shall connect to an insulated ground busbar.

2.4.3 Distribution Output Subfeeds

Subfeed circuit breakers shall be rated 600V. The PDU shall allow 250A and 400A subfeeds, which must all be of the same frame type per subfeed column. The PDU shall have the following physical subfeed configuration capacity by enclosure type, if permitted by transformer capacity and other configuration limitations:

Enclosure	250A Subfeeds	400A Subfeeds
Main cabinet	6	4
9" Side-facing side car	6	4
21" Front-and-side facing side car	9	4
Maximum total PDU capacity	12	8

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Output subfeed circuit breakers shall be available with optional control wiring for these features:

- Auxiliary status
- Trip alarm
- Shunt trip

2.4.4 Distribution Output I-Line Subfeeds

The PDU shall allow 225A and 400A I-Line subfeeds in specially designed I-Line enclosures in the capacities given in the following table, if permitted by transformer capacity and other configuration limitations:

Enclosure	225A Frame Circuit Breakers	400A Frame Circuit Breakers
800A MLO (12" side-facing side car)	10	Not Available
1000A MLO (12" side-facing side car) (includes underfloor power junction box)	11	8
1200A MLO (requires 46.7"W main cabinet front-facing extension frame)	11	8

2.4.5 Distribution Output Panelboards

Each panelboard shall be protected by a 3-pole secondary main circuit breaker.

The PDU shall accommodate 225A and 400A panelboards at the capacities given in the following tables, if permitted by transformer capacity and other configuration limitations:

Enclosure	225A Panelboards at 208VAC	400A Panelboards at 208VAC
Main cabinet	2	2
9" Side-facing side car	2	2
21" Front-and-side facing side car	4	2
Maximum total PDU capacity	8	6

Enclosure	225A Panelboards at 480VAC	400A Panelboards at 480VAC
Main cabinet	1	1
9" Side-facing side car	1	1
21" Front-and-side facing side car	0	0
Maximum total PDU capacity	3	3

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2.5 PDU Power Features

2.5.1 Emergency Power Off

An optional EPO feature shall be available that provides a guarded illuminated EPO button positioned next to the operator display.

The PDU shall contain an internally powered 120VAC or 24VDC shunt trip mechanism to operate a local Emergency Power Off (EPO) and effectively interface with the WaveStar® monitoring system. Each PDU shall have a common EPO circuit, designed to accept a normally open (NO) dry contact signal.

A 24VDC, 24VAC, or 120VAC remote shunt trip signal shall be available to interface with Remote Emergency Power Off (REPO) stations.

2.5.2 Manual Restart

The PDU shall contain a manual restart circuit to protect the connected load during a system restart sequence. A switch shall be provided to allow this feature to be set in the field for manual or automatic restart.

2.6 Optional Power Features

2.6.1 Manual Dual PDU

The PDU shall optionally allow manual switching between two input power sources using a make-before-break Trapped Key Interlock or Kirk Key Interlock system with a sync-check relay. The Manual Dual PDU Option shall also allow a secondary dry contact signal or a 120VAC applied voltage signal that remotely enables the synchronization and switching process.

2.6.2 Surge Protective Device(s)

The PDU shall optionally include a Surge Protective Device (SPD) (or Transient Voltage Surge Suppressor (TVSS)) rated 100 kA or 200 kA surge current dissipation per phase on the primary and/or secondary sides of the transformer. The SPD shall comply with ANSI/UL1449 3rd edition and shall incorporate a remote signaling dry contact providing OK/Not OK device status.

2.6.3 Power Junction Box

The PDU shall optionally have a power junction box (J-Box) providing an intermediate connection point between building or other power source and the PDU's main input circuit breaker of up to 800A. The J-Box shall be sized appropriately for the amperage of the main input circuit breaker and the wire and conduit size between the J-Box and the circuit breaker. The J-Box shall be located within six (6) feet of the PDU. If the back of the PDU is against a wall, the J-Box shall require 36" service clearance.

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2.7 Monitoring

The PDU shall incorporate a PDI WaveStar® Monitoring package that can interface to the WaveStar® Color Monitor, a Building Management System (BMS), Data Center Infrastructure Management (DCIM) system, or an independent WaveStar® monitor such as a BCMS Hub.

2.7.1 Color Monitor

The PDU shall mount a WaveStar® Color Monitor, a 7" diagonal color touchscreen on the front of the Monitoring Compartment.

The Color Monitor shall be capable of displaying monitoring information from the main input power source, transformer, PDU Board, Contractor Board, distribution subfeeds, and panelboards with their secondary main circuit breakers. Monitoring information shall include circuit measurements, alarm display, alarm clearing, audible alarm, and audible alarm silencing. When the Manual Dual PDU Option is installed, the Color Monitor shall include a sync screen for trapped key release.

With the display, the PDU shall also have an annunciation panel with audible alarm and summary alarm indicator showing no alarms, warning condition, or alarm condition.

2.7.2 Color Monitor Protocols

For network communications upstream of the Color Monitor, the Monitor shall communicate using any of the following protocols, which can be used simultaneously:

- Modbus RTU (2-wire or 4-wire)
- Modbus TCP/IP
- TCP/IP (for Color Monitor web pages only)
- SNMP Version 1

Add-in cards shall not be necessary for the Color Monitor to communicate upstream in any of these protocols.

2.7.3 Color Monitor Web Pages

If the PDU has an appropriately configured Ethernet connection from the customer network to the Color Monitor, web pages showing PDU monitoring data and optional BCMS monitoring data from points lists shall be available remotely using TCP/IP.

2.7.4 Monitoring PCBs

The PDU shall monitor the transformer and input or output circuits using the following installed PCBs with appropriate current transformer (CT) and voltage connections:

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- (1) PDU board allowing monitoring input and output from the transformer and voltage connections (standard).
- (1) Basic Contractor Board (standard) or Enhanced Contractor Board (optional).
- Enhanced Subfeed (“Resistor”) Boards allowing large subfeeds to be monitored (14 ABC circuits, or 10 ABCN circuits), provided as needed (with optional BCMS subfeed monitoring).
- Branch Circuit Monitoring System (BCMS) boards (with optional BCMS monitoring) as necessary to monitor PDU subfeeds and panelboards with their secondary main feeds.

The monitored data points shall be those included in the points list or Modbus register maps installed for the monitoring PCBs and measured with current transformers (CTs) and voltage connections.

2.7.5 Current Transformers

For monitoring, the PDU shall mount appropriately sized current transformers (CTs) for the transformer secondary phases. The PDU shall also optionally mount appropriately sized CTs for output subfeeds and panelboard CT strips with solid-core CTs. Individual panelboard split-core CTs shall also be available.

2.7.6 Contractor Boards

All Remote Emergency Power Off, building alarms, output relays, communication ports, and other control wiring shall be terminated onto a Contractor Board which is an integral component within the PDU itself.

The Basic Contractor Board shall contain the following:

- Remote emergency power off (REPO) connections
- Four (4) Relay Contacts (NO contacts) (including summary alarm)
- Four (4) Building alarm contacts
- Remote monitoring connection ports (Modbus RTU Protocol, RS-422/485)

The optional Enhanced Contractor Board shall contain the following:

- Remote emergency power off (REPO) connections
- Eight (8) Relay Contacts (NO contacts) (including summary alarm)
- Eight (8) Building alarm contacts
- Remote monitoring connection ports (Modbus RTU Protocol, RS-422/485)
- Local monitoring of PDI devices (Modbus RTU Protocol, RS-422/485)

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2.7.7 Branch Circuit Monitoring System (optional)

The PDU shall optionally mount BCMS PCBs, allowing monitoring of 42-pole panelboards with their main feeds.

The following BCMS points lists (Modbus register maps) shall be available:

- Normal, allowing alarm customization for each individual panelboard circuit
- KWH, allowing KWH accumulation for each individual panelboard circuit.
- IEC, formatted for IEC panelboards.
- Enhanced subfeeds (ESF), for output subfeeds.

2.7.8 BCMS Panelboard Monitored Values

BCMS shall monitor the current and voltage of the main feeds and individual panelboard circuits if the correct optional CTs are installed. Measurements shall require installed CTs for current measurements and vary according to installed BCMS points lists.

The Color Monitor shall display the following BCMS measurements and warning or alarms by circuit number or panelboard total for connected BCMS devices:

For Normal, KWH, and IEC points lists:

- Total panelboard current ABCNG
- Panelboard percent load, for user-specified maximum load value
- Total current both panelboards
- Panelboard voltage:
 - Line-to-neutral
 - Line-to-line
 - Frequency
- Panelboard power measurements by phases ABC and total:
 - KW
 - KVA
 - KVAR
 - Power factor (PF)
 - KWH total since last reset
- Individual circuit values:
 - Circuit breaker amperage rating
 - Last current reading
 - Minimum current read

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- Maximum current read
 - Current on circuit has dropped to zero after reading minimum current
 - Warning outstanding on circuit
 - Alarm outstanding on circuit
- In addition, the KWH and IEC points lists shall provide the following measurements by individual circuit:
 - KW
 - KVA
 - KVAR
 - Power factor (PF)
 - KWH total since last reset

Alarm values shall be set globally for panelboards and individual circuits. Warning values shall be set by default to 70% of circuit breaker rating. Alarms values shall be set by default to 80% of circuit breaker rating.

Alarm values for each individual panelboard circuit shall be user-adjustable if the Normal points list is used. Alarm values shall be adjustable through the USB BCMS setup application or through a Building Management System or Data Center Infrastructure Management System (DCIM) connected to the Color Monitor through an appropriate link.

2.7.9 BCMS Subfeed Monitored Values

The following points for subfeeds and Square D I-Line subfeeds shall be monitored and displayed on the Color Monitor:

- For individual subfeed circuits (per phase) with correctly installed CTs:
 - Circuit breaker amperage rating
 - Last current reading
 - Minimum current read
 - Maximum current read
 - Current on circuit has dropped to zero after reading minimum current
 - Warning outstanding on circuit
 - Alarm outstanding on circuit
 - KW
 - KVA
 - KVAR
 - Power factor (PF)
 - Crest factor
 - Total harmonic distortion (THD)

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- KWH total since last reset
- Measurements common to all circuits:
 - Voltage (phase-phase) (phase-neutral) (common to all circuits)
 - Frequency
- Various alarms and warnings

Alarm lists for the PDU and optional BCMS devices shall be provided in the *Installation and Operations* manual.

Alarm values shall be set globally by the user for all subfeeds associated with a points list. Warning values shall be set by default to 70% of circuit breaker rating. Alarms values shall be set by default to 80% of circuit breaker rating.

2.7.10 Points Lists

Points lists (Modbus register maps) shall be available for downloading from the manufacturer's website or by calling the manufacturer's service number for assistance.

2.7.11 Alarm Status

The Color Monitor shall display a count of outstanding alarms and warnings for its downstream devices on monitoring screens. Individual alarms shall be viewable on the alarm page. The Color Monitor shall also activate a dry contact summary alarm if any downstream device has an alarm.

2.7.12 Dry Contacts

The PDU shall have a dry contact network providing input and output signals as given below, if the specified device is installed:

Output:

- Monitor: Summary alarm, if an alarm is outstanding for any downstream monitored device.
- PDU Contractor board: 4-8 remote relays with assignable meaning (Enhanced Contractor Board required for > 4 remote relays)
- Surge Protective Device: SPD OK/Not OK signal.
- Subfeed Circuit Breakers: Breaker trip alarm, auxiliary contacts signaling change of breaker state.

Input:

- PDU: Four (4) digital inputs with assignable meanings.
- PDU and Contractor Board: 4-8 Building Alarms (Enhanced Contractor Board shall be required for > 4 Building alarms)

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- Subfeed circuit breakers: Circuit breaker trip signal.

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3 Execution

3.1 Factory Witness Test

The manufacturer shall allow the customer to witness the factory testing of each unit. The factory shall perform its standard witness test to demonstrate that the unit meets the manufacturer's PDU specifications.

3.2 Certified Test Report

A certified factory test report shall be provided for each unit.

3.3 Installation

Customer shall be responsible for site preparation and correct installation of the PDU in accordance with provided product data, final shop drawings, and manufacturer's written recommendations and installation instructions.

3.4 Start-Up

A manufacturer-authorized representative shall validate correct installation and operation of the PDU at initial PDU start-up.