PDI Modular Compact Remote Power Panel

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

1 GENERAL

1.1 Summary

These specifications describe requirements for a remote power panel (RPP) distributing power to sensitive loads. These specifications apply to the North American market.

1.2 Standards

The PDI Modular Compact RPP shall be certified through ETL for the following standards:

- UL 60950
- UL 891
- CS 22.2

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

- NFPA and specifically NFPA-70E
- UL67
- UL50
- UL489
- UL891
- IEEE 519-1991
- ANSI C33.4
- NEMA ST-20
- NEMA AB-1
- NEMA-PB-1
- NEC
- ISO 9001

The PDI Modular Compact RPP shall comply with the latest FCC Part 15 EMI emission standard for Class A computing devices.

1.3 System Description

1.3.1 Environmental Requirements

The Modular Compact RPP shall have the following environmental requirements for operation and storage requirements:

- Temperature ranges:
  - Storage: -67° to +185°F (-55° to +85°C)
  - Operation: +32° to 104°F (0° to 40°C)
- Relative Humidity: 0% to 95% non-condensing
- Operating altitude: Up to 6,600 ft. (2,000m) above Mean Sea Level; the unit is de-rated if operated above this altitude.

- Audible noise: The audible noise level less than 45 dBA.
- Storage and transport: Up to 40,000 ft. (12,200 m) above Mean Sea Level.

1.3.2 Electrical Requirements

The Modular Compact RPP shall accept input power rated at 225A, 400A, and 450A.

At 60 Hz, input/output voltages shall be 3-phase, 4-wire plus ground AC at 208/120V, 60 Hz; or 400/230V, 60 Hz; or 415/240V, 60 Hz; or 480/277V, 60 Hz.

At 50 Hz (IEC), input/output voltages shall be 3-phase, 4-wire plus ground AC at 380/220V, 50 Hz; or 400/230V, 50 Hz; or 415/240V, 50 Hz. Input and branch circuit breakers shall allow 4-poles enabling neutral as an optional requirement.

1.4 Documentation

1.4.1 Drawings

Modular Compact RPP 1-line electrical drawings and outline drawings shall be furnished.

1.4.2 Installation and Operations Documentation

A Modular Compact RPP Installation and Operations manual shall be furnished. Points lists (Modbus register maps) for panelboard and main feed monitoring shall be available for downloading from the PDI website.

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 for PDI functions, such as Service and Accounting, shall be provided.

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 PDI Modular Compact RPP 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 certified.

The PDI Modular Compact RPP 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-Pot Test at two times the unit's rated voltage plus 1000 volts, per UL 60950 requirements.
- Calibration tests for monitoring.
- Tests for alarm annunciation as designed and/or as the customer requests.

2 PRODUCT

2.1 Components

2.1.1 Enclosure

The cabinet enclosure shall be constructed of steel. The cabinet shall be a NEMA Type 1 enclosure and shall meet IP20 requirements.

Front maintenance only The Modular Compact RPP shall require only front access for service and all routine maintenance. Adding or replacing power distribution cables and circuit breakers shall require only front access. Replacing monitoring components or wiring communications shall require only front access.

Cabinet dimensions Enclosure dimensions shall be 23.75" W x 84" H x 12.68" D, including doors. The unit footprint shall be 12" x 24" and shall allow a back-to-back two-unit modular cluster to fit in a 24" x 24" floor tile opening.

Weight Modular Compact RPP weight shall be approximately 225 lbs. for a typical unit. Maximum weight shall be 300 lbs.

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

Clearances The Modular Compact RPP shall require the following clearances:

- Front: 36" (service and ventilation)
- Top: 18" (ventilation)
- Underfloor 12" (cabling clearance if bottom entry)

Compartments The Modular Compact RPP enclosure shall have three (3) compartments that are separately accessible from the front. Low- and high-voltage components shall be segregated into separate compartments.

- The top (input) compartment shall allow 1 or 2 main feeds to panelboards or main lugs only connections, optional circuit breaker locks for a manual dual system, and an optional Surge Protective Device (SPD) (or Transient Voltage Surge Suppressor (TVSS)).
- The middle (display/control) compartment shall contain low-voltage components, including an optional color touchscreen display on the front door with monitoring components in the interior. The door of this compartment shall have an optional USB port for configuring monitoring software. Optional Kirk Key® synchronization components shall be in this compartment and the input compartment.
- The bottom (output) compartment shall allow (1) 84-pole or (2) 42-pole panelboards. The bottom compartment shall alternatively allow 36-pole or 72-pole IEC panelboards.

Doors Each compartment shall have its own lockable hinged door on the front of the unit. Each compartment's door shall be able to be opened independently of the other doors. The doors shall be hinged on the left or the right, which must be selected at time of order. Input and output compartment doors shall be made of Lexan. The display/control compartment door shall be made of steel.

Colors The color of the enclosure and metal external and internal doors shall be PDI Black or IBM White.

Cable entry/exit The Modular Compact RPP shall allow both top and bottom cable entry/exit. Top and bottom cable entry panels shall be easily removable and shall be interchangeable in the field. The top panel shall be solid, allowing customers to make their own cutouts. The bottom plate shall have (84) pre-punched knockouts with (2) conduit knockouts as follows:

- 60 knockouts for 1/2" conduit (0.88" dia.)
- 24 double knockouts for 3/4" conduit (1.09 dia.) and 1/2" (0.88" dia.) conduit.
- 2 x main-feed conduit knockouts, which can be enlarged up to 4".

2.1.2 Modular Clusters

The Modular Compact RPP shall be physically configurable into modular cluster patterns, as follows:

- Single unit: Modular Compact RPP shall require back support or secure attachment to floor or floor tile stringers and is not free-standing.
- Side-by-side: units shall be bolted together at the sides and shall require attachment to back support or secure attachment to floor or floor tile stringers.
- Back-to-back: units shall be bolted together at the back, shall be able to fit on a single 24" x 24" floor tile, and shall require secure attachment to the floor or floor tile stringers.
- Back-to-back plus one side: the back of one unit shall attach to one side of the back-to-back configuration.
- Back-to-back plus two sides: the backs of two units shall attach to the sides of the back-to-back configuration.

The internal configuration of each unit shall be independent of the configuration of other units in a modular cluster. However, a single optional Color Monitor can monitor up to seven adjacent units.

2.1.3 Electrical Construction

All wiring shall be rated per the National Electrical Code (NEC 2014).

The Modular Compact RPP shall include a single point ground in accordance with FIPS Pub 94 and the requirements of the NEC.

The Modular Compact RPP shall have a 200%-rated neutral copper busbar.

2.1.4 Input Power

Input 3-phase power shall connect to the panelboard main feed circuit breaker(s) or to main panelboard busbars in a main-lugs-only configuration.

The input neutral conductor shall connect to a 200%-rated neutral copper busbar.

The ground conductor shall connect to a parity-sized insulated ground busbar.

Standard main feed circuit breakers shall be

- 225A thermal-magnetic circuit breaker, 80% rated, 65kAIC @ 240VAC, or
- 400A electronic trip circuit breaker, 80% rated, 65 kAIC @ 240VAC.

Main feed circuit breakers shall be available as 80%-rated or 100%-rated.

2.1.5 Distribution Panelboards

The output compartment shall have top (section A) and bottom (section B) sections that can be separately configured with 42-pole panelboards or 36-pole IEC panelboards or configured together (A+B) as an 84-pole panelboard or 72-pole IEC panelboard.

- Square D panelboards shall be standard and shall require Square D bolt-on circuit breakers.
- ABB Proline 84-pole panelboards with finger-safe circuit breaker replacement shall be available as options.
- Distribution circuit breakers shall be offered in 80% ratings (standard) and 100% ratings.
- Panelboard branch circuit breakers shall be available with up to 100A ratings.

Distribution panelboards shall each be protected by a UL-listed and IEC-rated circuit breaker rated at 80% or 100% of the panelboard's rated amperage.

2.1.6 Power Configurations

The unit shall allow the following power configurations:

Single source power configuration

- 400A maximum input, one 400A panelboard circuit breaker, one 84-pole panelboard or one IEC 72-pole panelboard
- 450A maximum input, two 225A panelboard circuit breakers, two 42-pole panelboards or two 36-pole IEC panelboards (An external junction box may be necessary if an optional SPD (TVSS) is installed in this configuration.)

Two source power configuration

- Two inputs, maximum 225A per source, maximum 225A per main feeds to panelboards, two 42-pole panelboards or two 36-pole IEC panelboards.
- Two inputs, maximum 400A per source, maximum 400A main feeds to panelboards, two 42-pole panelboards or two 36-pole IEC panelboards. In this configuration, the Modular Compact RPP shall require an external 500A junction box under some conditions.

Manual dual power configuration

- Two inputs, maximum 225A per source, maximum 225A per main feeds to panelboards, two 42-pole panelboards or two 36-pole IEC panelboards with Kirk-Key system.
- Two inputs, maximum 400A per source, maximum 400A per main feeds to panelboards, two 42-pole panelboards or two 36-pole IEC panelboards with Kirk-Key system.

2.2 Optional Components

2.2.1 Surge Protective Device

As an optional feature, the Modular Compact RPP shall include a single Surge Protective Device (SPD) or Transient Voltage Surge Suppressor (TVSS) rated 100 kA or 200 kA on the input to the panelboard. The SPD shall comply with ANSI/UL1449 3rd edition and shall incorporate a remote signaling dry contact. SPD status lights shall be visible through the front doors.

2.2.2 Current Transformers

For monitoring, the Modular Compact RPP shall optionally mount current transformer (CT) strips on the sides of the panelboards with high-accuracy 100A current transformers. The Modular Compact RPP shall also optionally mount appropriately sized CTs for main feeds.

2.2.3 Branch Circuit Monitoring System

Each unit shall optionally mount a BCMS PCB, allowing monitoring of up to two 42-pole panelboards with their main feeds or two 36-pole IEC panelboards or one 84-pole panelboard or one 72-pole IEC panelboard.

The following 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.

The front of the display/control compartment door shall have an optional USB port for configuring monitoring software.

2.2.4 Trapped Key Interlocks (Kirk Keys®)

As an optional feature, the Modular Compact RPP shall allow a make-before-break Trapped Key Interlock or Kirk Key Interlock system with a sync-check relay on dual input systems.

2.2.5 Color Monitor

The Modular Compact RPP shall optionally mount a WaveStar® Color Monitor, a 7" color touchscreen.

One Color Monitor shall be capable of monitoring BCMS information from up to seven (7) units that have installed BCMS, collecting monitoring data from up to fourteen (14) 42-pole panelboards or 36-pole IEC panelboards or up to seven (7) 84-pole or 72-pole panelboards.

The unit shall have pre-cut cable holes with installable bushings supplied by the vendor. Cable holes shall match between adjacent units, providing an integrated wire path for Modbus RTU wiring between units.

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

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

For other than Modbus RTU, the Color Monitor shall require a customer Ethernet connection to the customer network.

2.2.7 Color Monitor Web Pages

If the unit has an Ethernet connection from the customer network to the Color Monitor, web pages showing BCMS monitoring data shall be available remotely using TCP/IP.

2.2.8 BCMS Monitored Values

BCMS shall monitor the current and voltage of the main feeds and individual panelboard circuits if optional CTs are installed. Measurements shall require installed CTs for current measurements and vary by installed BCMS points lists. The optional 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:
    - 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

- 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 setup application or through a Building Management System connected to the Color Monitor through an appropriate link.

2.2.9 Alarm Status

The Color Monitor shall display a count of outstanding alarms and warnings on its downstream devices on monitoring screens.

2.2.10 Dry Contacts

The Modular Compact RPP shall optionally provide the following dry contact alarms, if the specified device is installed:

- Color Monitor: Summary alarm, if an alarm or warning is outstanding for any downstream monitored device
- SPD (TVSS): Signal for SPD OK/Not OK.

2.2.11 Factory Witness Test

PDI 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 PDI's Modular Compact RPP specifications.

2.2.12 Certified Test Report

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