SECTION 1 - INTRODUCTION

OVERVIEW

The INFI 90 OPEN Modular Power System II supplies 5, 15, -15, 25.5, 48 and 125 VDC power to an INFI 90 OPEN cabinet. This power system replaces the Network 90 power system or the INFI 90 OPEN modular power system. Figure 1-1 shows a front view of a typical power system. The modules used in the power module chassis will vary according to user requirements. The Modular Power System II fits in the same cabinet space as an INFI 90 OPEN modular power system with a power

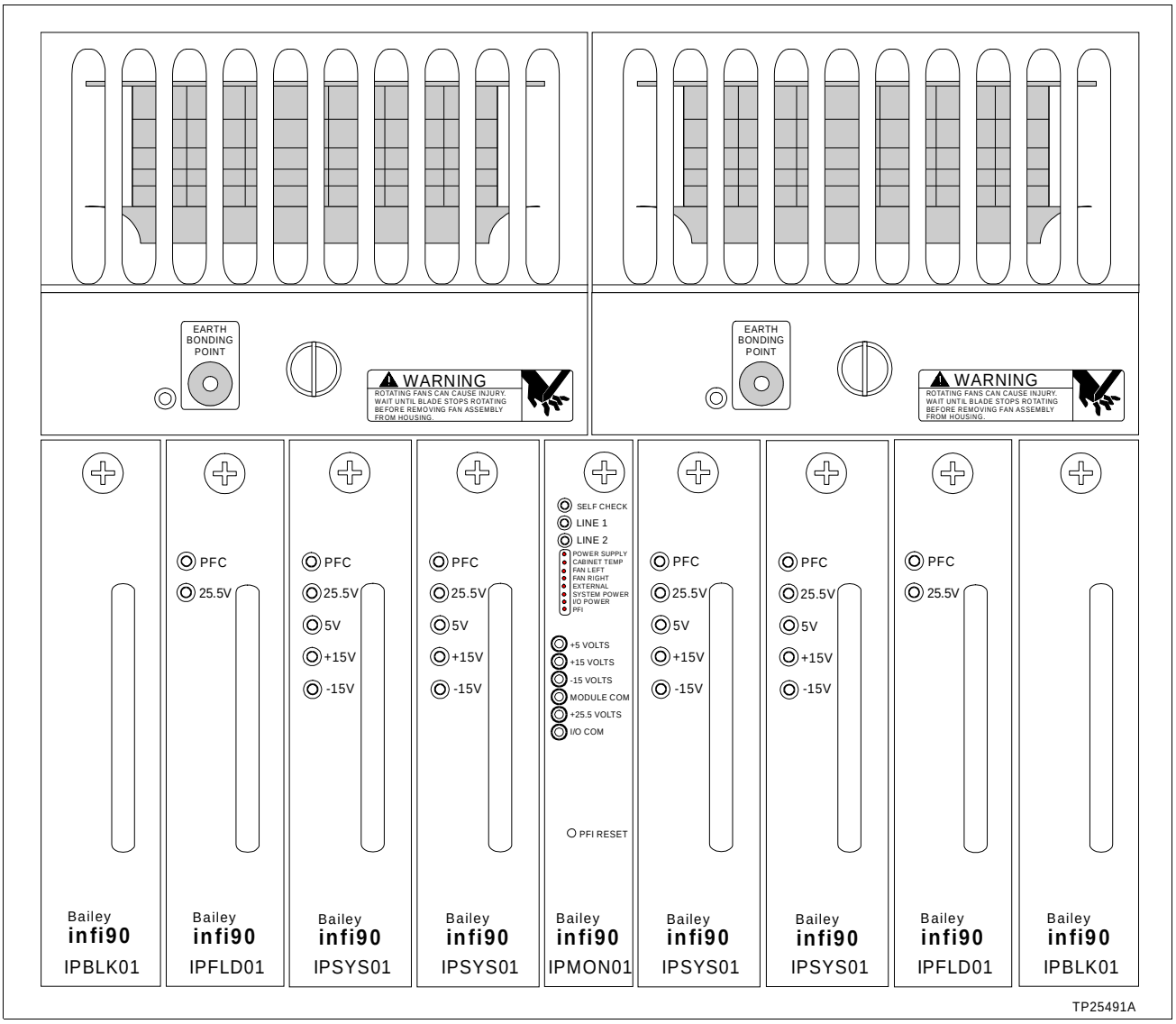

Figure 1-1. Modular Power System II Front View (Typical)

mounting unit. Components of the Network 90 power system and INFI 90 OPEN modular power system cannot be used with components of the INFI 90 OPEN Modular Power System II. This system is designed to operate in several configurations of power module redundancy (N, N+1, N+x or 2N). Benefits of the INFI 90 OPEN Modular Power System II are:

- Power factor correction.
- On-line replaceable components.
- Improved monitoring functions.
- Directly accepts 125 VDC inputs.

INTENDED USER

This instruction is written for engineers, technicians and system designers as a source of technical information on the INFI 90 OPEN Modular Power System II. This instruction should be used by those planning to purchase, install, operate, troubleshoot, maintain or replace this power system. Those working with the power system should have experience working with and know the precautions to take around AC/DC power. A knowledge of how to use basic electronic test equipment (digital multimeter), and electrical and electronic principles is also required.

POWER SYSTEM DESCRIPTION

The INFI 90 OPEN Modular Power System II consists of a power module chassis, fan chassis, power entry circuit breakers or switches, system fans, system power modules, field power modules and a power monitor module.

System Power Module

The IPSYS01 System Power Modules are rack mounted circuit boards that supplies 5, 15 and -15 VDC system voltages, and 25.5 VDC I/O power to an INFI 90 OPEN cabinet. The system power module can accept 120/240 VAC or 125 VDC input power. The AC inputs have active power factor correction to greater than 0.95. Current sharing circuitry enables the system power modules to equally share output current. The module monitors the DC/DC converters and power factor corrector and displays the status on five red/green faceplate LEDs. The system power module mounts in one power module chassis mounting slot.

Field Power Modules

The IPFLD01 and the IPFLD24 Field Power Modules are the same as the system power module except that they output 25.5 VDC field I/O power only at 143 watts and 286 watts respectively. The IPFLD48 and IPFLD125 field power modules output

49.1 VDC and 125.6 VDC respectively. The field power modules have the same power factor correction and internal monitoring circuitry. There are only two red/green LEDs on the field power modules: one for the DC to DC converter status and one for the power factor corrector status. The field power module mounts in one power module chassis mounting slot.

> **NOTE:** IPFLD48 and IPFLD125 field power modules cannot be installed in the same IPCHS01 power module chassis.

Power Monitor Module

The IPMON01 Power Monitor Module monitors system level and status input functions, which include:

- All system bus voltages (5, 15, -15 VDC) and I/O bus voltage (25.5 VDC, 48 VDC and 125 VDC).
- Two selectable auxiliary inputs for 24, 48 or 125 VDC external sources.
- Two cabinet temperature monitor inputs.
- One power fail interrupt (PFI) alarm that can be configured for latching or nonlatching.
- Two logic level status inputs. These contact logic inputs can be selected to accept normally open (N.O.) or normally closed (N.C.) contact inputs.
- Three isolated outputs for bus alarm, power alarm, and I/O alarm.
- One power system status output for use on Plant Loop or INFI-NET® communication networks.
- Two fan status inputs.
- One power supply status signal from each power module.
- The status of power monitor module internal circuitry.

This power monitor module mounts in the center power module chassis slot. The power monitor module faceplate has three red/green LEDs to indicate power monitor module status and AC/DC input power lines status. Eight additional LEDs are used to show the state of status inputs. There are six test points that accept a voltmeter probe for checking 5, 15, -15 and 25.5 VDC bus voltages (two test points are system common and I/O common). The power fail interrupt (PFI) reset pushbutton is used to reset a PFI signal when the PFI latched option is enabled.

Power Module Chassis

The IPCHS01 Power Module Chassis provides power input, power output bus bars, and various terminals for status inputs, outputs and mounting of up to eight power modules and one power monitor module. There are nine mounting slots total. The center slot is dedicated to the power monitor module. Four slots on each side of the power monitor module hold power modules and have isolated power inputs. All the power module outputs share the same bus. System power for the cabinet is made available at bus bars on the power module chassis backplane and at one of the terminal strips (for ±15 VDC). Cables connect the bus bars and terminals to the system power bus bar for distribution to the cabinet. Power modules and the power monitor module can be removed from the power module chassis and replaced while the system is on-line. Only IPSYS01, IPFLD01, IPFLD24, IPFLD48 or IPFLD125 power modules and the IPMON01 power monitor module can be mounted in the power module chassis.

NOTE: The IPFLD48 and the IPFLD125 power modules cannot be mixed in the same power module chassis at the same time.

Power Entry Circuit Breaker or Switch

The IPECB11 or IPECB13 Power Entry Circuit Breaker and IPESW11 or IPESW13 Power Entry Switch terminate the AC/DC power input lines and provide line filtering before feeding power to the power module chassis backplane. These devices are mounted on the rear of the power fan chassis. One circuit breaker or switch is used on N, N+1, or N+x redundant systems (Fig. 1-2); two are used on 2N redundant systems (Fig. 1-3). The isolated inputs on 2N redundant systems allow use of mixed power inputs (i.e., 125 VDC and 120/240 VAC) because two separate power entry circuit breakers or switches feed isolated power inputs to the power module chassis.

Fan Chassis and System Fans

The IPFCH01 Power Fan Chassis mounts two system power fans. There are three types of fans in the INFI 90 OPEN Modular Power System II structure:

- IPFAN11 Power System Fan (120 VAC).
- IPFAN12 Power System Fan (240 VAC).
- IPFAN13 Power System Fan (125 VDC).

The fan chassis provides a power connection, fan monitoring, and control via a cable connection to the power module chassis backplane.

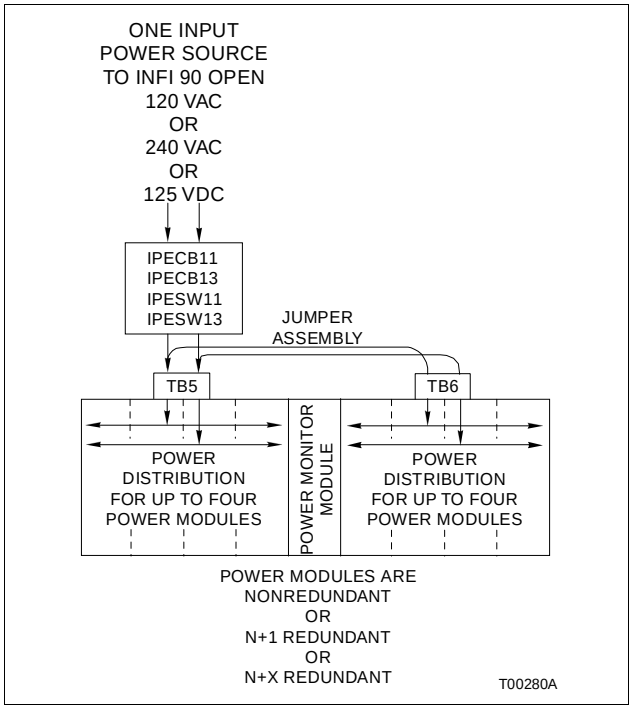

Figure 1-2. Block Diagram of Input Power for N, N+1 and N+x Redundant Systems

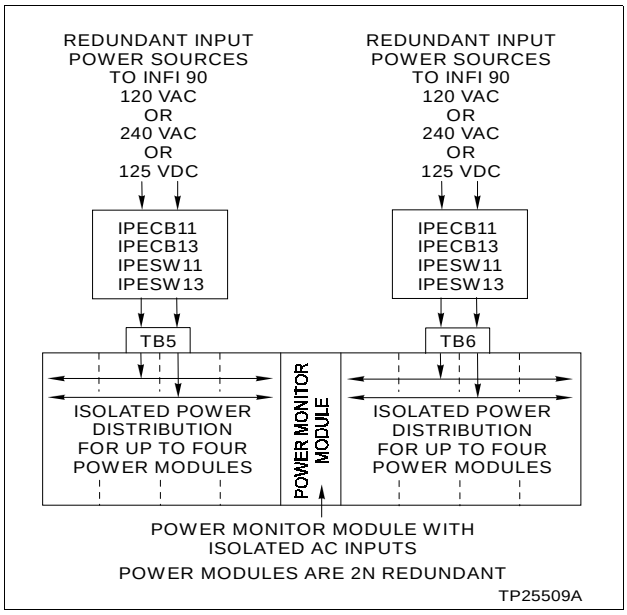

Figure 1-3. Block Diagram of Input Power for 2N Redundant Systems

The power system fans mount side-by-side in the fan chassis. Hall effect sensors on the power system fans provide fan speed information to the power monitor module. Fan speed is controlled as a function of cabinet temperature. One fan is capable of cooling the cabinet and a failed fan can be replaced while the system is on-line.

FEATURES

- 2N or N, N+1 or N+x redundancy increases availability.
- Accepts 120/240 VAC or 125 VDC input power.
- The high output capacity of each power module means fewer modules are required.
- Active load sharing by the power modules insures all power modules equally share the load.
- Input power factor correction on all power modules lowers upstream investments such as electrical distribution and uninterrupted power supply (UPS).
- Redundant fans are on-line replaceable.
- Power monitoring of AC/DC power input, system bus and I/O bus voltages, cabinet temperature, power system fan speed, auxiliary channels, and contact inputs.

INSTRUCTION CONTENT

This instruction is divided into eight sections and three appendices. Read this instruction before installing or operating the INFI 90 OPEN Modular Power System II. A summary of section content follows:

Introduction Contains general information and technical specifications.

Description and Operation Uses block diagrams, schematics and text to explain power system operation.

Installation Covers the preliminary steps to install the system components and prepare for operation. It covers dipswitch and jumper settings, mounting, wiring and preoperational checks.

Operating Procedures Provides information on daily use, power monitor module and power module LED states, PFI reset pushbutton and test points.

Troubleshooting Explains the meaning of LED indicators and contains troubleshooting procedures.

Maintenance Contains scheduled maintenance tasks and procedures.

Repair and Replacement Procedures Contains procedures that explain how to replace power system components. It also has a spare parts list with Elsag Bailey part numbers for related parts, cables and fuses.

Support Services Explains the services and training that Elsag Bailey makes available to their customers.

Appendices Provides a quick reference of power monitor module dipswitch and jumper settings, LED states, sizing the power system and wiring diagrams.

HOW TO USE THIS INSTRUCTION

Read this instruction before handling the INFI 90 OPEN Modular Power System II. Refer to a specific section for information as needed.

1. Read the operating procedures section before installing the power system.

2. Do the steps in the installation section.

3. Refer to the troubleshooting section to resolve problems if they occur.

4. Refer to the maintenance section for scheduled maintenance requirements.

5. Refer to the repair and replacement procedures to replace a part or find a part number.

6. Use the support services section for information on ordering parts and warranty information.

7. Refer to the appendices for a quick reference of power monitor module dipswitch and jumper settings, and module LED states, power system sizing procedures and wiring diagrams.

REFERENCE DOCUMENTS

Table 1-1 lists documents that contain information relevant to the INFI 90 OPEN Modular Power System II.

Table 1-1. Reference Documents

Number	Title
I-E96-500	Site Planning and Preparation

GLOSSARY OF TERMS AND ABBREVIATIONS

Table 1-2 contains those terms and abbreviations that are unique to Elsag Bailey or have a definition that is different from standard industry usage.

Table 1-2. Glossary of Terms and Abbreviations

Term	Definition
PFI	Power fail interrupt. A signal that causes active controller or processor modules (MFCs or MFPs) to reset and the communication system to be bypassed, when generated in the INFI 90 OPEN system by an out of tolerance bus voltage.
Termination Module	Provides input/output connection between plant equipment and the INFI 90 OPEN/ Network 90 modules.
Termination Unit	

NOMENCLATURE

Table 1-3 lists INFI 90 OPEN Modular Power System II nomenclatures.

Table 1-3. Nomenclature

Nomenclature	Description
IPBLK01	Power blank faceplate
IPCHS01	Power module chassis
IPECB11	Power entry circuit breaker (120/240 VAC input)
IPECB13	Power entry circuit breaker (125 VDC input)
IPESW11	Power entry switch (120/240 VAC input)
IPESW13	Power entry switch (125 VDC input)
IPFAN11	Power system fan (120 VAC input)
IPFAN12	Power system fan (240 VAC input)
IPFAN13	Power system fan (125 VDC input)
IPFCH01	Power fan chassis
IPFLD01	Field power module (25.5 VDC output, 120/240 VAC and 125 VDC input)
IPFLD24	Field power module (25.5 VDC output, 120/240 VAC and 125 VDC input) (twice the maximum capacity of the IPFLD01)
IPFLD48	Field power module (49.1 VDC output, 120/240 VAC and 125 VDC input)
IPFLD125	Field power module (125.6 VDC output, 120/240 VAC and 125 VDC input)
IPMON01	Power monitor module
IPSYS01	System power module (5, 15, -15 and 25.5 VDC outputs, 120/240 VAC and 125 VDC input)

SPECIFICATIONS

Table 1-4 lists INFI 90 OPEN Modular Power System II specifications.

Table 1-4. Specifications

<table>
<tr><th>Property</th><th>Characteristic/Value</th></tr>
<tr><td>MPS II inputs
Input voltage</td><td>
<table>
<tr><th rowspan="2">External Ambient Temp.</th><th colspan="2">Input Voltage</th></tr>
<tr><th>Nominal</th><th>Operating Range</th></tr>
<tr><td rowspan="3">0° - 55°C
(32° - 131°F)</td><td>120 VAC</td><td>102 - 132 VAC</td></tr>
<tr><td>240 VAC</td><td>204 - 264 VAC</td></tr>
<tr><td>125 VDC</td><td>102 - 144 VDC</td></tr>
</table>
Input current
Peak inrush current
Frequency
Total harmonic distortion
Efficiency
Power factor</td><td>20 A max. per side
15 A per power module for 100 msecs max. for AC or DC input power
47 to 63 Hz
Less than 5%
60% at full rated load
Actively corrected to 0.95 min. at input currents greater than 0.5 A</td></tr>
<tr><td>Power module inputs (IPSYS01, IPFLD01, IPFLD24, IPFLD48, IPFLD125)
Input voltage
Input current</td><td>102 to 264 VAC
102 to 144 VDC
<table>
<tr><th rowspan="2">Module</th><th colspan="3">Full Load Input Current (A)</th></tr>
<tr><th>120 VAC</th><th>240 VAC</th><th>125 VDC</th></tr>
<tr><td>IPSYS01</td><td>4.3</td><td>2.0</td><td>4.3</td></tr>
<tr><td>IFLD01</td><td>2.2</td><td>1.0</td><td>2.2</td></tr>
<tr><td>IPFLD24</td><td>4.7</td><td>2.4</td><td>4.7</td></tr>
<tr><td>IPFLD48</td><td>4.4</td><td>2.2</td><td>4.4</td></tr>
<tr><td>IPFLD125</td><td>4.7</td><td>2.4</td><td>4.7</td></tr>
</table></td></tr>
<tr><td>Power module outputs (IPSYS01, IPFLD01, IPFLD24, IPFLD48, IPFLD125)</td><td>
<table>
<tr><th>Module Outputs</th><th colspan="4">IPSYS01[1]</th><th>IPFLD01
IPFLD24</th><th>IPFLD48</th><th>IPFLD125</th></tr>
<tr><td>Nominal voltage (VDC)</td><td>5.09</td><td>15.10</td><td>-15.10</td><td>25.50</td><td>25.50</td><td>49.1</td><td>125.6</td></tr>
<tr><td>Minimum voltage (VDC)</td><td>5.04</td><td>14.95</td><td>-14.95</td><td>24.35</td><td>24.35</td><td>48.5</td><td>124.2</td></tr>
<tr><td>Maximum voltage (VDC)</td><td>5.25</td><td>15.75</td><td>-15.75</td><td>26.80</td><td>26.80</td><td>49.6</td><td>127.1</td></tr>
<tr><td>Maximum ripple and noise (mV_{pp})</td><td>100</td><td>150</td><td>150</td><td>250</td><td>250</td><td>600</td><td>1000</td></tr>
<tr><td>Full load current (A)</td><td>17.00</td><td>1.80</td><td>1.80</td><td>5.60</td><td>5.60/11.2[2]</td><td>5.45</td><td>2.3</td></tr>
</table>
NOTES:
1. Total module power output cannot exceed 260 W.
2. 11.2 A for IPFLD24 module.</td></tr>
</table>

Table 1-4. Specifications (continued)

<table>
<tr><th>Property</th><th>Characteristic/Value</th></tr>
<tr><td>Power module outputs (IPSYS01, IPFLD01, IPFLD24, IPFLD48, IPFLD125) (continued)</td><td></td></tr>
<tr><td>Load sharing</td><td>Current shared equally between modules within 5% (highest current load to lowest current load) at full load</td></tr>
<tr><td>Line regulation</td><td>±0.5% of the nominal output voltage over the input voltage range</td></tr>
<tr><td>Load regulation</td><td>Within specified minimum and maximum outputs from 0% to 100% load</td></tr>
<tr><td>Hold up time</td><td>20 msecs following loss of power</td></tr>
<tr><td>Power monitor module (IPMON01) power input</td><td></td></tr>
<tr><td>Input power</td><td>0.3 A at 120 VAC
0.2 A at 240 VAC and 125 VDC</td></tr>
<tr><td>Frequency</td><td>47 to 63 Hz</td></tr>
<tr><td>Power monitor module (IPMON01) status signal inputs and outputs</td><td></td></tr>
<tr><td>System bus voltage monitor trip points</td><td>
<table>
<tr><th rowspan="2">Voltage Bus Nominal (VDC)</th><th colspan="2">Low Trip</th><th colspan="2">High Trip</th></tr>
<tr><th>Min</th><th>Max</th><th>Min</th><th>Max</th></tr>
<tr><td>5</td><td>4.75</td><td>4.80</td><td>NA[1]</td><td>NA[1]</td></tr>
<tr><td>15</td><td>14.50</td><td>14.70</td><td>NA[1]</td><td>NA[1]</td></tr>
<tr><td>-15</td><td>-14.50</td><td>-14.70</td><td>NA[1]</td><td>NA[1]</td></tr>
<tr><td>25.5</td><td>24.20</td><td>24.50</td><td>NA[1]</td><td>NA[1]</td></tr>
<tr><td>25.5 (aux)</td><td>21.40</td><td>21.60</td><td>27.00</td><td>27.40</td></tr>
<tr><td>48 (aux)</td><td>42.50</td><td>43.35</td><td>54.00</td><td>54.60</td></tr>
<tr><td>125 (aux)</td><td>113.05</td><td>115.05</td><td>142.75</td><td>144.75</td></tr>
</table>
NOTE: 1. Power module provides overvoltage protection.
</td></tr>
<tr><td>Input voltage monitor trip points</td><td>
<table>
<tr><th rowspan="2">Input Voltage (Nominal)</th><th colspan="2">Low Trip[1]</th></tr>
<tr><th>Min</th><th>Max</th></tr>
<tr><td>120 VAC</td><td>88</td><td>90</td></tr>
<tr><td>240 VAC</td><td>176</td><td>180</td></tr>
<tr><td>125 VDC</td><td>88</td><td>90</td></tr>
</table>
NOTE: 1. The MPS II system will operate at voltages as low as the input voltage monitor low trip point, however operation below the minimum system input voltage specification is not recommended.
</td></tr>
<tr><td>Logic status inputs</td><td>2 inputs, logic 0 = fault
Logic 0 ≤ 0.8 VDC at 10 mA sink current
Logic 1 ≥ 3.1VDC at 80 µA source current</td></tr>
<tr><td>Fan status inputs</td><td>2 inputs for fan speed monitoring of low fan speed (fan speed controlled as a function on internal cabinet temperature)</td></tr>
<tr><td>Power fail interrupt (PFI)</td><td>1 output, open collector driven (nonisolated), logic 0 = power failure
Logic 0 ≤ 0.8 VDC at 10 mA sink current
Logic 1 ≥ 4.75 to 5.25 VDC at 80 µA source current</td></tr>
</table>

Table 1-4. Specifications (continued)

Property	Characteristic/Value
Power monitor module (IPMON01) status signal inputs and outputs (continued)	
Status out	1 output, open collector driven (nonisolated), logic 0 = fault Logic 0 ≤ 0.8 VDC at 10 mA sink current Logic 1 ≥ 4.75 to 5.25 VDC at 80 µA source current
Bus alarm	1 output, opto-isolated open collector driven (24 V), logic 1 = fault Logic 0 ≤ 1.2 VDC at 150 mA sink current Logic 1 ≥ 5 to 30 VDC at 80 µA source current
Power alarm	1 output, opto-isolated open collector driven (24 V), logic 1 = fault Logic 0 ≤ 1.2 VDC at 150 mA sink current Logic 1 ≥ 5 to 30 VDC at 80 µA source current
I/O alarm	1 output, opto-isolated open collector driven (24 V), logic 1 = fault Logic 0 ≤ 1.2 VDC at 150 mA sink current Logic 1 ≥ 5 to 30 VDC at 80 µA source current
Power module chassis (IPCHS01) capacity	
Input power capacity	20 A max. per side
Output bus capacity	85 A at 5.1 VDC max. 15 A at ±15.1 VDC max. 85 A at 25.5 VDC max. 12 A at 48 VDC max. 12 A at 125 VDC max.
Power entry circuit breaker and switch (IPECB11/13 and IPEWS11/13)	
Input voltage IPECB11 and IPEWS11 IPECB13 and IPEWS13	 102 to 264 VAC 102 to 144 VDC
Input current	20 A max.
Voltage drop across breaker and switch	2 V drop at 20 A nominal
System fans	
Input power IPFAN11 IPFAN12 IPFAN13	 0.6 A nominal at 120 VAC 0.4 A nominal at 240 VAC 0.7 A nominal at 125 VDC
Frequency	47 to 63 Hz
Environmental	
Electromagnetic/radio frequency interference	Meets IEC 801.3, level 3, 80 MHz to 1 GHz with no loss of function or false status information for all units. **NOTE:** Do not use RFI sources producing 10 V/m at 84.9 MHz within 2.2 m (7.2 ft) of the MPS II system
Fast transient/burst susceptibility	Meets IEC 801.4, level 3, mains 2 kV at 2.5 kHz, outputs 1 kV at 5.0 kHz with no loss of function or false status information
Transient surge	Meets IEC 801.5, level 3, 2 kV with no loss of function or false status information
Electrostatic discharge	Meets IEC 801.2, level 3 with no loss of function or false status information

Table 1-4. Specifications (continued)

<table>
<tr><th>Property</th><th>Characteristic/Value</th></tr>
<tr><td>Environmental (continued)</td><td></td></tr>
<tr><td>Temperature
Operating enclosure (internal)
Operating enclosure (external)
Storage and transport</td><td>
0° to 70°C (32° to 158°F)
0° to 55°C (32° to 131°F)
-40° to 85°C (-40° to 185°F)</td></tr>
<tr><td>Relative humidity
Operating</td><td>20% to 90% up to 55°C (131°F) noncondensing
20% to 45% at 55° to 70°C (131° to 158°F) noncondensing</td></tr>
<tr><td>Altitude
Operating
Storage and transport</td><td>
Sea level to 3,048 m (10,000 ft)
Up to 9,144 m (30,000 ft)</td></tr>
<tr><td>Air quality</td><td>Noncorrosive per ISA S71.04 class LA, LB, LC severity level 1</td></tr>
<tr><td>Weight and dimensions</td><td>
<table>
<tr><th>Component[1]</th><th>Weight kg (lb)</th><th>Height mm (in.)</th><th>Width mm (in.)</th><th>Depth mm (in.)</th></tr>
<tr><td>IPBLK01 Power Blank Faceplate</td><td>0.89 (1.95)</td><td>218.40 (8.60)</td><td>48.30 (1.90)</td><td>444.50[2] (17.50)</td></tr>
<tr><td>IPCHS01 Power Module Chassis</td><td>7.55 (16.60)</td><td>223.50 (8.80)</td><td>482.60 (19.00)</td><td>444.50 (17.50)</td></tr>
<tr><td>IPECB11/13 Power Entry Circuit Breaker</td><td>2.55 (5.60)</td><td>114.30 (4.50)</td><td>193.04 (7.60)</td><td>162.56 (6.40)</td></tr>
<tr><td>IPESW11/13 Power Entry Switch</td><td>2.55 (5.60)</td><td>114.30 (4.50)</td><td>193.04 (7.60)</td><td>162.56 (6.40)</td></tr>
<tr><td>IPFAN11/12/13 Power System Fan</td><td>3.23 (7.10)</td><td>152.40 (6.00)</td><td>210.82 (8.30)</td><td>444.50 (17.50)</td></tr>
<tr><td>IPFCH01 Power Fan Chassis</td><td>10.20 (22.40)</td><td>203.20 (8.00)</td><td>482.60 (19.00)</td><td>472.44 (18.60)</td></tr>
<tr><td>IPFLD01 Field Power Module</td><td>2.36 (5.20)</td><td>218.40 (8.60)</td><td>48.30 (1.90)</td><td>444.50[2] (17.50)</td></tr>
<tr><td>IPFLD24 Field Power Module</td><td>2.49 (5.46)</td><td>218.40 (8.60)</td><td>48.30 (1.90)</td><td>444.50[2] (17.50)</td></tr>
<tr><td>IPFLD48 Field Power Module</td><td>2.55 (5.62)</td><td>218.40 (8.60)</td><td>48.30 (1.90)</td><td>444.50[2] (17.50)</td></tr>
<tr><td>IPFLD125 Field Power Module</td><td>2.55 (5.62)</td><td>218.40 (8.60)</td><td>48.30 (1.90)</td><td>444.50[2] (17.50)</td></tr>
<tr><td>IPMON01 Power Monitor Module</td><td>0.71 (1.56)</td><td>218.40 (8.60)</td><td>35.56 (1.40)</td><td>401.32 (15.80)</td></tr>
<tr><td>IPSYS01 System Power Module</td><td>2.55 (5.60)</td><td>218.40 (8.60)</td><td>48.30 (1.90)</td><td>444.50[2] (17.50)</td></tr>
</table>
NOTES:
1. The total system weight is 48 kg (106 lb) maximum.
2. Dimension includes the handle.
</td></tr>
<tr><td>Installation category</td><td>IEC 1010-1
Category III, for mains
Category II, for mains to the IPCHS01 chassis
Category I, for outputs</td></tr>
<tr><td>Vibration</td><td>13.2 to 100 Hz, 0.7 Gs
2 to 13.2 Hz, 12 mm (0.47 in.) peak-to-peak displacement</td></tr>
</table>

Table 1-4. Specifications (continued)

Property	Characteristic/Value
Certification	
CSA C22.2, No. 142	Certified for process control equipment in an ordinary (nonhazardous) environment
FM	Class I, Division 2, Groups A, B, C, D

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.