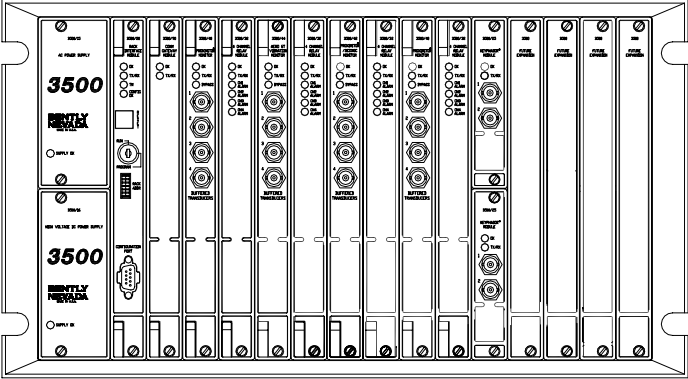


Operation and Maintenance Manual

Bently Nevada™ Asset Condition Monitoring



3500/15 AC and DC Power Supplies

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Contact Information

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Fax	1.775.215.2873
Internet	www.ge-energy.com/bently

Additional Information

Notice:

This manual does not contain all the information required to operate and maintain the product. Refer to the following manuals for other required information.

3500 Monitoring System Rack Installation and Maintenance Manual (Part Number 129766-01)

- General description of a standard system
- General description of a Triple Modular redundant (TMR) system
- Instructions for installing and removing the module from a 3500 rack
- Drawings for all cables used in the 3500 Monitoring System

3500 Monitoring System Rack Configuration and Utilities Guide (Part Number 129777-01)

- Guidelines for using the 3500 Rack Configuration software for setting the operating parameters of the module
- Guidelines for using the 3500 test utilities to verify that the input and output terminals on the module are operating properly

3500 Monitoring System Computer Hardware and Software Manual (Part Number 128158-01)

- Instructions for connecting the rack to a 3500 host computer
- Procedures for verifying communication
- Procedures for installing software
- Guidelines for using Data Acquisition / DDE Server and Operator Display Software
- Procedures and diagrams for setting up network and remote communications

3500 Field Wiring Diagram Package (Part Number 130432-01)

- Diagrams that show how to hook up a particular transducer
- Lists of recommended wiring

Product Disposal Statement

Customers and third parties, who are not member states of the European Union, who are in control of the product at the end of its life or at the end of its use, are solely responsible for the proper disposal of the product. No person, firm, corporation, association or agency that is in control of product shall dispose of it in a manner that is in violation of any applicable federal, state, local or international law. Bently Nevada LLC is not responsible for the disposal of the product at the end of its life or at the end of its use.

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1. Receiving and handling Instructions

1.1 Receiving Inspection

Visually inspect the module for obvious shipping damage. If you detect shipping damage, file a claim with the carrier and submit a copy to Bently Nevada LLC.

1.2 Handling and Storage Considerations

Circuit boards contain devices that are susceptible to damage when exposed to electrostatic charges. Damage caused by obvious mishandling of the board will void the warranty. To avoid damage, observe the following precautions in the order given.

Application Advisory
Machinery protection may be lost when you remove this module from the rack.

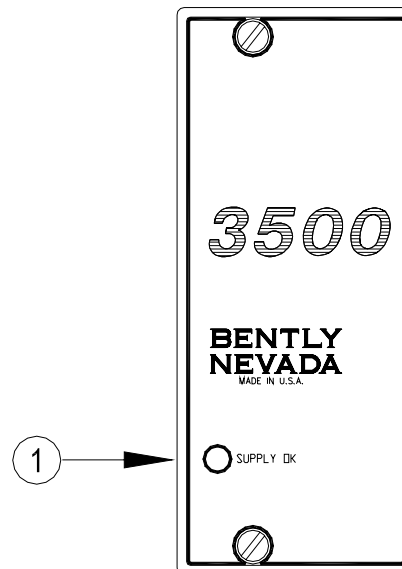
- Do not discharge static electricity onto the circuit board. Avoid tools or procedures that would subject the circuit board to static damage. Some possible causes of static damage include ungrounded soldering irons, nonconductive plastics, and similar materials.
- Use a suitable grounding strap (such as 3M Velostat® No. 2060) before handling or performing maintenance on a printed circuit board.
- Transport and store circuit boards in electrically conductive bags or foil.
- Use extra caution during dry weather. Relative humidity less than 30% tends to multiply the accumulation of static charges on any surface.

When performed properly, you may install this module into or remove this module from the rack while power is applied to the rack. Refer to the *Rack Installation and Maintenance Manual* (part number 129766-01) for the proper procedure.

2. General Information

The 3500 Power Supplies are half-height modules that you must install in the specially designed slots at the left side of the rack. The 3500 rack can contain 1 or 2 ac or dc power supplies in any combination. Either supply can power a full rack. If installed, the second supply acts as a backup for the primary supply. Removing or inserting a power supply module will not disrupt operation of the rack as long as a backup supply is installed.

The 3500 Power Supplies accept a wide range of input voltages and converts them to voltages acceptable for use by other 3500 modules.



1. The Supply OK LED on the front of each power supply module indicates if all of the output voltages from that supply are within specification.

Figure 2-1: Power Supply OK LED

2.1 Power Supply Versions

The 3500 Monitoring System offers 3 power supply versions:

1. the AC Power Supply,
2. the High Voltage DC Power Supply, and
3. the Low Voltage DC Power Supply.

The 3500 AC Power Supply uses 2 versions of the Power Input Module (PIM) to accept 2 ranges of ac input voltages. The High Voltage AC PIM accepts inputs from 175 to 264 Vac rms. The Low Voltage AC PIM accepts inputs from 85 to 132 Vac rms.

The High Voltage DC Power Supply supports dc inputs from 88 to 140 Vdc. The Low Voltage DC Power Supply supports dc inputs from 20 to 30 Vdc.

2.2 Single Power Supply

The 3500 will operate under fully loaded conditions with a single power supply. If your installation will use a single power supply, we recommend that you install the supply in the upper power supply slot.

2.3 Redundant Power Supplies

When you install 2 power supplies in a rack, the supply in the lower slot acts as the primary supply and the supply in the upper slot acts as the backup supply. If the primary supply fails, the backup supply will provide power to the rack without interrupting rack operation.

Each supply provides power on an independent power distribution network. This ensures that any failure in one power distribution network (e.g., a short in +5 volt supply) will not affect the other supply.

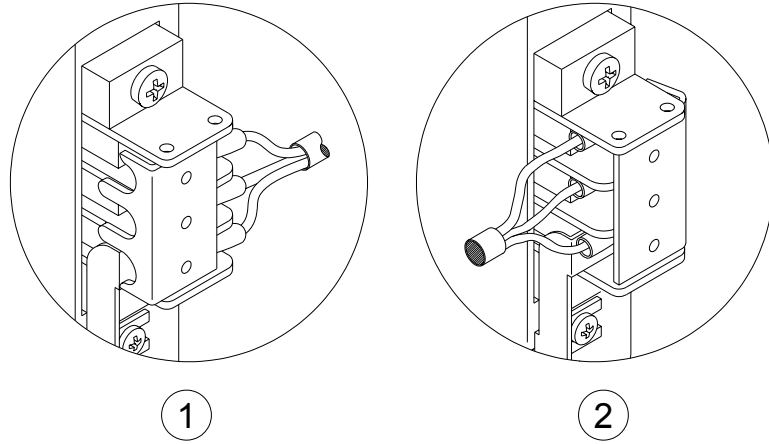
Application Advisory
Triple Modular Redundant (TMR) applications require redundant power supplies.

2.4 CE Compliance Information

For systems installed in areas that must comply with EN61000.3.2, the equipment shall only be used in industrial environment with a connection to the industrial power supply network. If the system is connected to the public power supply mains, the system must meet EN61000.3.2 by using a 3rd-party device that provides power factor correction.

2.5 Low Voltage Directive Compliance

To comply with EN 61010-01 Low Voltage Directive the PIM Connector Shield should be orientated properly. If the shield is not installed as in Figure 2-2, carefully remove the shield and replace it in the correct orientation. Failure to correctly place the connector shield will make the power terminals accessible to an operator.



1. Connector shield standard rack
2. Connector shield bulkhead rack

Figure 2-2: EN61010-01 Connector Shield Orientation

3. Configuration Information

Configuration is the process of identifying the type of Power Supply and setting operating parameters. To configure a Power Supply, use this section to gather configuration information and then use the Rack Configuration Software to set the options and download the settings to the rack. The *Rack Configuration and Utilities Guide* explains how to connect a computer to a rack and run the Rack Configuration Software.

3.1 Software Configuration Options

The Power Supply configuration field is on the option screen of the Rack Interface Module, as shown in Figure 3-1.

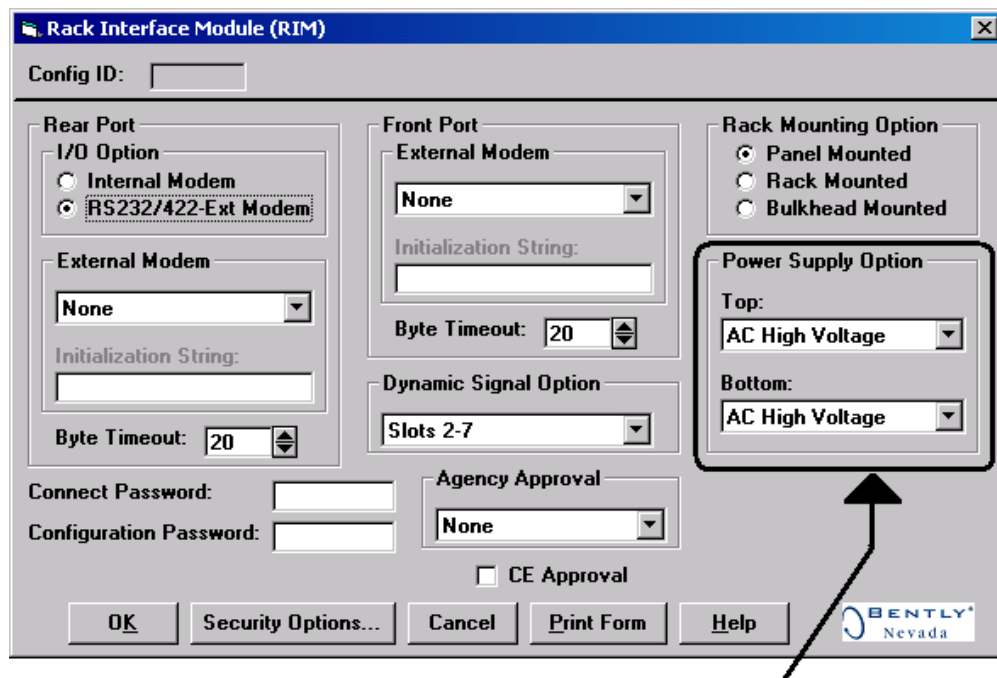


Figure 3-1: Power Supply Configuration (Option) Field

You can use any combination of the following Power Supply options in the upper and lower slots of the rack:

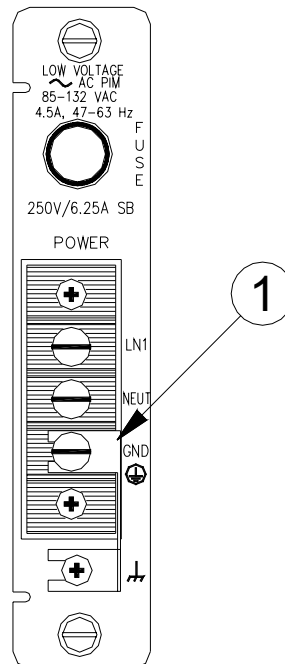
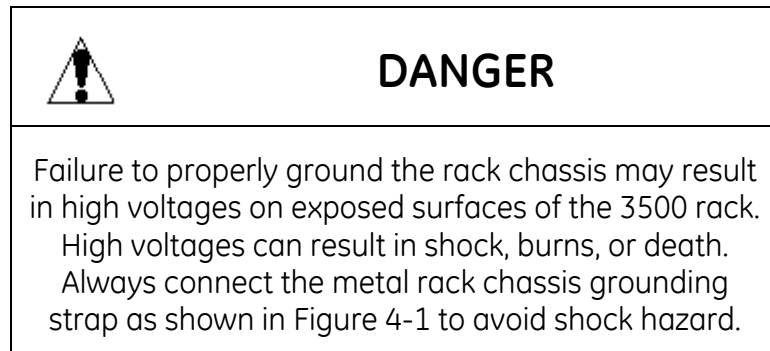
- None (if you select one of the following options for the other slot)
- AC High Voltage
- AC Low Voltage
- DC High Voltage
- DC Low Voltage

4. Power Input Module Information

The Power Input Module (PIM) is a half-height module that connects the power source to the power supply. Install the Power Input Module behind the power supply (in a rack mount or a panel mount rack) or above the power supply (in a bulkhead rack). For example, if you install the power supply in the upper slot then you must install its Power Input Module in the upper slot. Removal or insertion of a Power Input Module will not disrupt operation of the 3500 rack as long as the other power supply and its associated Power Input Module are installed.

4.1 AC Power Input Module (Low Voltage Version)

Use the low voltage AC Power Input Module, shown in Figure 4-1, when you will use low voltage ac (85 to 132 Vac rms) to power the rack.




1. Chassis grounding strap (see Safety Notice)

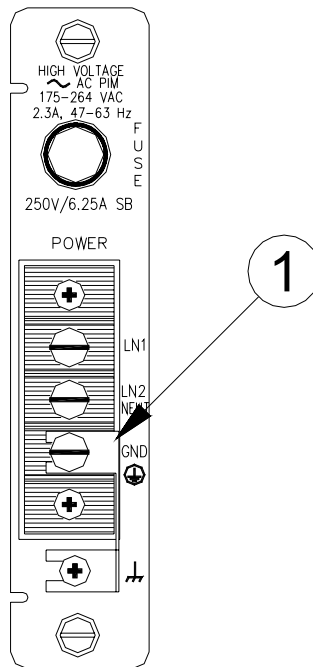
Figure 4-1: Low Voltage AC Power Input Module

Refer to the *3500 Field Wiring Diagram Package* for specifics on connecting power to this Power Input Module.

4.2 AC Power Input Module (High Voltage Version)

Use the high voltage AC Power Input Module, shown in Figure 4-2, when you will use high voltage ac (175 to 264 Vac rms) to power the rack.

	DANGER
<p>Failure to properly ground the rack chassis may result in high voltages on exposed surfaces of the 3500 rack. High voltages can result in shock, burns, or death. Always connect the metal rack chassis grounding strap as shown in Figure 4-2 to avoid shock hazard.</p>	



1. Chassis grounding strap (see Safety Notice)

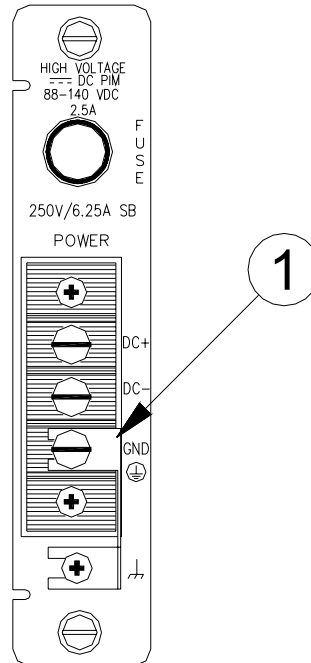
Figure 4-2: High Voltage AC Power Input Module

4.3 DC Power Input Module (High Voltage Version)

Use the high voltage DC Power Input Module, shown in Figure 4-3, when you will use high voltage dc (88 to 140 Vdc) to power the rack.

**DANGER**

Failure to properly ground the rack chassis may result in high voltages on exposed surfaces of the 3500 rack. High voltages can result in shock, burns, or death. Always connect the metal rack chassis grounding strap as shown in Figure 4-3 to avoid shock hazard.



1. Chassis grounding strap (see Safety Notice)

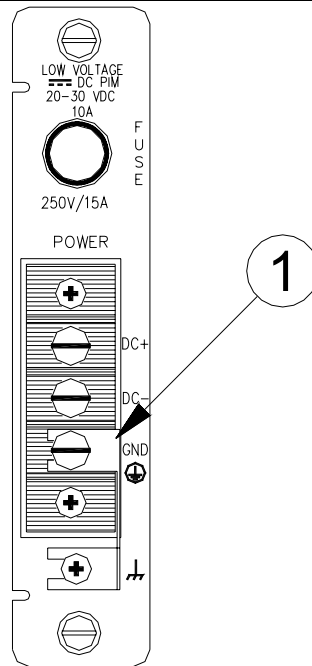
Figure 4-3: High Voltage DC Power Input Module

4.4 DC Power Input Module (Low Voltage Version)

Use the high voltage DC Power Input Module, shown in Figure 4-4, when you will use low voltage dc (20 to 30 Vdc) to power the rack.

**DANGER**

Failure to properly ground the rack chassis may result in high voltages on exposed surfaces of the 3500 rack. High voltages can result in shock, burns, or death. Always connect the metal rack chassis grounding strap as shown in Figure 4-4 to avoid shock hazard.



1. Chassis grounding strap (see Safety Notice)

Figure 4-4: Low Voltage DC Power Input Module

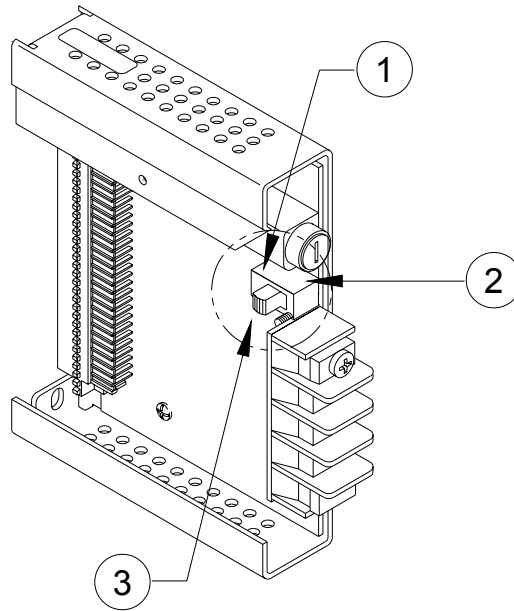
4.5 Connecting Single-Point Ground

To avoid ground loops, the system must provide a single point ground. The Power Input Modules provide a switch that lets you control where your system is grounded. If your rack uses 2 power supplies then you must set both switches to the same position. A CLOSED switch grounds the system through the GND terminal on the terminal strip connector. If you ground your system at another location, such as when using internal/external barriers, you must ensure that the switch on each Power Input Module is OPENED. Figure 4-5 shows you how to set the switch to the desired position. For most racks the switch will be set to CLOSED at the factory. If Internal Barriers are installed at the factory the switch will be set to the OPENED position.



DANGER

High voltages can persist on the power supplies and Power Input Modules for several minutes after you remove the modules from the rack. High voltages can result in shock, burns, or death. Always wait several minutes after disconnecting power before attempting to handle the power supplies or Power Input Modules.



1. When the switch is moved to this side (towards the rack) the switch is in the CLOSED position.
2. When the switch is moved to this side (away from the rack) the switch is in the OPENED position.
3. Grounding switch. Depending on model, this switch could be located directly above or below the input connector.

Figure 4-5: Power Input Module Grounding Switch

NOTE

For systems with internal/external barriers, refer to the *3500 Field Wiring Diagram Package* for grounding requirements.

1. Remove the line cord protection cover from the terminal strip connector.
2. Remove the Phillips screw that holds the sheet metal cover on the Power Input Module from the side of the module.
3. Loosen the 2 screws that hold the chassis ground clip below the Terminal Strip connector. Remove the chassis ground clip.
4. Disengage the sheet metal tab on the bottom of the sheet metal cover and slide the sheet metal cover over the Terminal Strip connector.
5. Slide the chassis grounding switch to the desired position.
6. Replace the cover and the chassis ground clip on the Power Input Module.

5. Maintenance

This section shows how to verify that the power supplies and Power Input Modules are operating correctly.

When performed properly, you may remove this module from the rack while power is applied to the rack. Refer to the *Rack Installation and Maintenance Manual* (part number 129766-01) for the proper procedure.

If the system detects a problem with a power supply or that you have removed or installed a power supply, the system will enter one of the following messages in the System Event List:

Table 5-1: System Event Messages

Message	Description
Supply OK / Installed	A Power Supply has been installed or a Power Supply has gone from a Not OK condition to an OK condition.
Supply Faulted / Removed	A Power Supply has been removed or a Power Supply has gone Not OK.

6. Troubleshooting

This section describes how to troubleshoot a problem with the power supply or the Power Input Module.



DANGER

High voltages are present on power input lines. High voltages can result in shock, burns, or death. Remove power and avoid contact with power input terminals while servicing the power supply and Power Input Module.



WARNING

The power supply and Power Input Module shields may become very hot during rack operation. Contact with hot shields may cause burns. Exercise caution when touching or handling power supplies and Power Input Modules.

If the Power Supply OK LED is off, check the following items:

1. Verify that the supply voltage to the Power Input Module is correct.
2. Verify that the installed Power Input Module type matches the installed power supply (e.g., you are using an AC Power Input Module with the ac version of the power supply).
3. Determine whether the fuse on the Power Input Module is blown. If the fuse is blown, replace it.

A blown fuse may be due to a severe overvoltage on the Power Input Module or a fault within the 3500 Power Supply.

4. If steps 1 through 3 do not solve the problem, install a new Power Supply.



DANGER

High voltages may persist on the ac and dc power supplies for several minutes after you remove the module from the rack. High voltages may cause shock, burns, or death. Always wait several minutes after removing power supplies before attempting to handle them.

If the Power Supply OK LED comes on, the original Power Supply is faulty.

5. If the problem persists, the Power Input Module may be damaged. Contact Bently Nevada LLC.

7. Ordering Information

7.1 3500/15 Power Supply

3500/15-AXX-BXX-CXX

- A:** Power Supply Type (Top Slot)
- 0 1** Low Voltage AC (85 to 132 Vac)
 - 0 2** High Voltage AC (175 to 264 Vac)
 - 0 3** High Voltage DC (88 to 140 Vdc)
 - 0 4** Low Voltage DC (20 to 30 Vdc)
- B:** Power Supply Type (Bottom Slot)
- 0 0** No supply (used when only one supply is required)
 - 0 1** Low Voltage AC (85 to 132 Vac)
 - 0 2** High Voltage AC (175 to 264 Vac)
 - 0 3** High Voltage DC (88 to 140 Vdc)
 - 0 4** Low Voltage DC (20 to 30 Vdc)
- C:** Agency Approval Option
- 0 0** None
 - 0 1** CSA-NRTL/C

7.2 Spares

127610-01

AC Power Supply Module.

125840-01

High Voltage AC Power Input Module (PIM).

125840-02

Low Voltage AC Power Input Module (PIM).

01720025

Replacement Fuse (both ac PIMs).

129486-01

High Voltage DC Power Supply Module.

129478-01

High Voltage DC Power Input Module (PIM).

01720025

Replacement Fuse (High Voltage DC PIM).

133292-01

Low Voltage DC Power Supply Module.

133300-01

Low Voltage DC Power Input Module (PIM).

01720045

Replacement Fuse (Low Voltage DC PIM).

129767-01

Power Supply Module Manual.

8. Specifications

8.1 Inputs

8.1.1 All Power Supply Versions

Out of Range Protection

For all power supply versions, an *undervoltage* will not harm either the supply or the PIM. However, an *overvoltage* will cause the fuse to open on the PIM.

Maximum Input Power

Maximum output power / Minimum efficiency

Maximum Volt-Amps

Maximum input power / Minimum power factor

8.1.2 Low Voltage AC

Input

85 to 132 Vac rms (120 to 188 Vac pk)

Note that installations using AC Power Input Modules (PIMs) prior to Rev. R and/or AC Power Supply Modules prior to Rev. M require a voltage input of 85 to 125 Vac rms

Frequency

47 to 63 Hz

Input Current

4.5 A rms maximum

Input Power

194 W maximum

Efficiency

0.8 minimum, typical

Power Factor

0.5 minimum, typical

Volt-Amps

388 VA, Max

8.1.3 High Voltage AC

Input

175 to 264 Vac rms (247 to 373 Vac pk)

Note that installations using AC Power Input Modules (PIMs) prior to Rev. R and/or AC Power Supply Module prior to Rev. M require a voltage input of 175 to 250 Vac rms

Frequency

47 to 63 Hz

Input Current

2.3 A rms maximum

Input Power

194 W maximum

Efficiency

0.8 minimum, typical

Power Factor

0.5 minimum, typical

Volt-Amps

388 VA, maximum

8.1.4 Low Voltage DC

Input

20-30 Vdc

Input Current

10 A maximum

Input Power

194 W maximum

Efficiency

0.8 minimum, typical

8.1.5 High Voltage DC

Input	88-140 Vdc
Input Current	2.5 A maximum
Input Power	194 W maximum
Efficiency	0.8 minimum, typical

8.2 Outputs

Supply OK LED	Indicates when the power supply is operating properly.
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8.3 Environmental Limits

Temperature	
<i>Operating</i>	-30 °C to 65 °C (-22 °F to 149 °F)
<i>Storage</i>	-40 °C to 85 °C (-40 °F to 185 °F)
Humidity	95 % non-condensing

8.4 CE Mark Directives

8.4.1 EMC Directives

8.4.1.1 EN50081-2

Radiated Emissions	EN 55011, Class A
Conducted Emissions	EN 55011, Class A

8.4.1.2 EN50082-2

Electrostatic Discharge

EN 61000-4-2, Criteria B

Radiated Susceptibility

ENV 50140, Criteria A

**Conducted
Susceptibility**

ENV 50141, Criteria A

**Electrical Fast
Transient**

EN 61000-4-4, Criteria B

Surge Capability

EN 61000-4-5, Criteria B

Magnetic Field

EN 61000-4-8, Criteria A

Power Supply Dip

EN 61000-4-11, Criteria B

Radio Telephone

ENV 50204, Criteria B

8.4.2 Low Voltage Directives

Safety Requirements

EN 61010-01

8.5 Approvals

CSA-NRTL/C

Class I, Division 2, Groups A through D

8.6 Physical

8.6.1 Power Supply Module

**Dimensions (Height x
Width x Depth)**

120.7 mm x 50.8 mm x 251.5 mm (4.75 in x 2.0 in x
9.9 in)

Weight

1.39 kg (3.06 lbm)

8.6.2 Power Input Modules

**Dimensions (Height x
Width x Depth)**

120.7 mm x 25.4 mm x 114.3 mm (4.75 in x 1.0 in x
4.5 in)

Weight

0.34 kg (0.75 lbm)

8.7 Rack Space Requirements

Power Supply Module

2 special half-height slots are located on the left side of the rack. Each slot accommodates 1 power supply. You can fill both slots a power supply at the same time to allow for redundant power supplies.

Power Input Module

Special half-height module located directly behind the associated power supply.

8.8 MISCELLANEOUS

Minimum Loading

The 3500 power supplies require no minimum rack load.