

# NEC

**NEC 500 UPS  
Uninterruptible Power Supply  
100 VAC User's Manual**

990-5021, Revision 1, 12/98

N8580-31

Designed by **APC**

**Important!**

**Please read and save this manual. It provides installation and operating instructions that will help you get the fullest performance and service life from your UPS.**

## **About Your New UPS**

This Uninterruptible Power Supply (UPS) is designed to prevent blackouts, brownouts, sags and surges from reaching your computer and other valuable electronic equipment. This UPS also filters out small AC voltage fluctuations and isolates your equipment from large disturbances by internally disconnecting from the AC voltage, while supplying power from its internal batteries until the AC voltage returns to safe levels.

While running on battery, an internal alarm will sound (periodic beeps). The ON/TEST button may be pressed to silence the UPS alarm for this or any other fault condition.

If the AC voltage does not return, the UPS will continue supplying power to the connected equipment until exhausted. A sustained tone will sound three minutes before the UPS's final low battery shutdown. The interface software provides automatic, unattended shutdown.

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# 1. Safety

## 警告

ご使用および保守の前に、必ず取扱説明書をお読みください。  
また、注意事項は必ずお守りください。



保守員以外はカバーを開けないでください。  
感電のおそれがあります。



異常(異臭、異音)時はENABLEスイッチを  
OFFした後に電源コードを抜いてください。  
火災のおそれがあります。



吸排気口を塞がないように10cm開けてください。  
火災のおそれがあります。



重量物(約28kg)につき取扱いに充分注意して  
ください。  
けがのおそれがあります。



必ずアース線を接続してください。  
感電のおそれがあります。



医療機器など人命にかかわる用途に使用しないで  
ください。

本装置に内蔵されているバッテリーには寿命(5年)があります。  
寿命により、液漏れ・感電・火災のおそれがありますので、  
早めに交換してください。

また、バッテリーの寿命は使用環境により短縮されます。

設置年月日	年	月	日
バッテリー交換日	年	月	日
バッテリー交換日	年	月	日
バッテリー交換日	年	月	日
バッテリー交換日	年	月	日

## 2. Attention from the Safety Point of View



This section contains important instructions that should be followed during installation and maintenance of the NEC 500 and batteries. It is intended for customers who setup, install, relocate, or maintain APC equipment.

### Electrical Safety

- EMC verification is VCCI - A.
- Do not work alone under hazardous conditions.
- High short circuit current through conductive materials could cause severe burns.
- A licensed electrician is required to install permanently wired equipment.
- Check that the power cord(s), plug(s), and sockets are in good condition.
- To reduce the risk of electric shock when grounding cannot be verified, disconnect the equipment from the AC power outlet before installing or connecting to other equipment. Reconnect the power cord only after all connections are made.
- Do not handle any kind of metallic connector before the power has been removed.
- Use one hand, whenever possible, to connect or disconnect signal cables to avoid a possible shock from touching two surfaces with different electrical grounds.
- Connect the equipment to a three wire AC outlet (two poles plus ground). The receptacle must be connected to appropriate branch circuit/mains protection (fuse or circuit breaker). Connection to any other type of receptacle may result in a shock hazard.



### CAUTION! Deenergizing Safety

- If the equipment has an internal energy source (the battery), the output may be energized when the unit is not connected to an AC power outlet.
- To deenergize **pluggable equipment**: first press the Off button for more than one second to switch the equipment off. Next disconnect the equipment from the AC power outlet. Finally, disconnect the battery.
- To deenergize **permanently wired** equipment: set the power switch to standby . Next set the AC circuit breaker to standby . Then disconnect the batteries (including any expansion units). Finally, disconnect the AC power from the building power supply.
- Pluggable equipment includes a protective earth conductor which carries the leakage current from the load devices (computer equipment). Total leakage current must not exceed 3.5 mA.
- Use of this equipment in life support applications where failure of this equipment can reasonably be expected to cause the failure of the life support equipment or to significantly effect its safety or effectiveness is not recommended.



### WARNING! Battery Safety

- **This equipment contains potentially hazardous voltages.** Do not attempt to disassemble the unit. The **only exception** is for equipment containing batteries. Battery replacement using the procedures below is permissible. Except for the battery, the unit contains no user serviceable parts. Repairs are performed only by factory trained service personnel.



**Batteries must be recycled.** Deliver the battery to an appropriate recycling facility or ship it to the supplier in the new battery's packing material. See the new battery instructions for more information.

- Do not dispose of batteries in a fire. The batteries may explode.
- Do not open or mutilate batteries. They contain an electrolyte which is toxic and harmful to the skin and eyes.
- To avoid personal injury due to energy hazard, remove wrist watches and jewelry such as rings when replacing the batteries. Use tools with insulated handles.
- Replace batteries with the same number and type of batteries as originally installed in the equipment.

### Handling Safety

⇒ <18 kg (<40 lb.)



⇒ 32-55 kg (70-120 lb.)



⇒ 18-32 kg (40-70 lb.)

⇒ >55 kg (>120 lb.)



- Be careful. Do not lift heavy loads without assistance.
- Equipment with casters is built to move on a smooth surface without any obstacles.
- Do not use a ramp inclined at more than 10°.
- This equipment is intended for installation in a temperature-controlled (0° - 40° C) indoor area, free of conductive contaminants.

### 3. Attention from the Operational and Maintenance Points of View

#### **Please charge the battery.**

The battery may not be fully charged when your UPS arrives. Please allow four to six hours for charging.

#### **To turn off the UPS, set the Enable switch to OFF.**

Pressing the Off button, does not turn off the UPS. To manually turn it off, set the Enable switch to OFF.

#### **When the UPS has been unused or in storage, charge the battery before use.**

The battery's charge will dissipate with disuse. Allow four to six hours to charge the battery before using.

#### **Be careful in choice of circuit breaker.**

Be careful of voltage sensitivity when setting up a circuit breaker on the input side of the UPS. If there is current leakage from the loads, set the sensitivity higher.

#### **Do not change the frequency of the UPS.**

The frequency setting is either 50 Hz. or 60 Hz. It is preset and should not be changed.

#### **Use reliable input power.**

The AC line voltage to the UPS should be reliable, without large fluctuations.

#### **Set up the environment for the UPS.**

The UPS should be placed in an environment within its temperature and humidity specifications and avoiding direct sunlight.

#### **Allow airflow around the UPS.**

The airflow around the UPS should be adequate to provide cooling.

#### **Replace the battery.**

Replace the battery at the recommended intervals.

#### **Do not operate the UPS with its cover removed.**

Using the UPS without its cover is a safety and electrical hazard.

#### **Exercise caution when changing or adding loads.**

Although loads may be changed or added while the UPS is in operation, care should be taken not to overload the UPS or to create an electrical hazard.

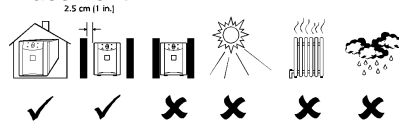
### 4. Before Installing

#### **Inspection**

Inspect the UPS upon receipt. Notify the carrier and dealer if there is damage. The packaging is recyclable; save it for reuse or dispose of it properly.

**Warning: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the warranty.**

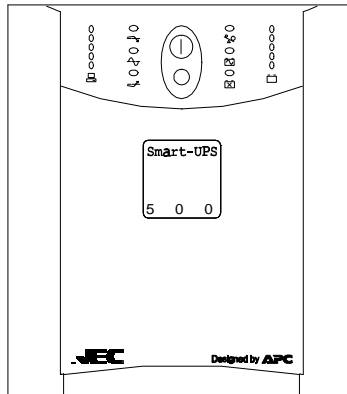
#### **Placement**





Install the UPS in a protected area that is free of excessive dust and has adequate air flow. Do not operate the UPS where the temperature and humidity is outside the specified limits.

## 5. Name and Function of Parts


### 1) Front View



 With the UPS plugged in, press and release the large upper on/test button to supply power to the loads. The loads are immediately powered while the UPS beeps and performs a self-test.

 Press and release the small, lower off button to turn off power to the loads. It may be convenient to use the UPS as a master on/off switch for the protected equipment.


Note: Whenever the UPS is plugged in and utility voltage is present, the charger maintains battery charge.

 The on-line LED illuminates when the UPS is supplying utility power to the loads.

#### Self-test

The UPS performs a self-test automatically when turned on, and every two weeks thereafter (by default). Automatic self-test eases maintenance requirements by eliminating the need for periodic manual self-tests.

During the self-test, the UPS briefly operates the loads on-battery. If the UPS passes the self-test, it returns to on-line operation.

 If the UPS fails the self-test it immediately returns to on-line operation and lights the replace battery LED.

The loads are not affected by a failed test. Recharge the battery overnight and perform the self-test again. If the replace battery LED is still on, replace the battery using the *Replacing the Battery* procedure.

#### SmartTrim

The SmartTrim LED comes on to indicate that the UPS is compensating for a high voltage.

#### SmartBoost

The SmartBoost LED comes on to indicate that the UPS is compensating for a low voltage.

#### Overload

When the UPS is overloaded (when the connected loads exceed the maximum specified in the “maximum load” section under *Specifications*), the overload LED comes on and the UPS emits a sustained tone. The alarm remains on until the overload is removed. Disconnect nonessential load equipment from the UPS to eliminate the overload.

#### On Battery

During on-battery operation, the on-battery LED illuminates and the UPS sounds an audible alarm consisting of four beeps every 30 seconds. The alarm stops when the UPS returns to on-line operation.

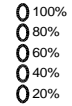
#### Low Battery

When the UPS is operating on-battery and the energy reserve of the battery runs low, the UPS beeps continuously until the UPS shuts down from battery exhaustion or returns to on-line operation.



## Replace Battery

If the battery fails a self-test, the UPS emits short beeps for one minute and the replace battery LED illuminates. The UPS repeats the alarm every five hours. Perform the self-test procedure to confirm replace battery conditions. The alarm stops when the battery passes the self-test.



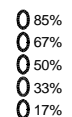
### Battery Charge Bar Graph

The 5-LED display on the right of the front panel shows the present charge of the UPS's battery as a percentage of the battery's capacity. When all five LEDs light, the battery is fully charged. The top LED goes out whenever the battery is not 100% charged. When the lowest LED is flashing, the battery can supply less than two minutes of run time for the load.



## Shutdown Mode

In shutdown mode the UPS stops supplying power to the load, waiting for the return of utility power. If there is no utility power present, external devices (e.g., servers) connected to the computer interface or the accessory slot can command the UPS to shut down. This is normally done to preserve battery capacity after the graceful shutdown of protected servers. The UPS will scroll the front panel indicators sequentially in shutdown mode.



### Load Bar Graph


The 5-LED display on the left of the front panel represents the power drawn from the UPS as a percentage of total capacity. For example, if three LEDs are lit, the load is drawing between 50% and 67% of the UPS's capacity. If all five LEDs light, thoroughly test your complete system to make sure that the UPS will not become overloaded.

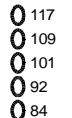


## Cold Start

When the UPS is off and there is no utility power, use the cold start feature to apply power to the loads from the UPS's battery.

**Note: Cold start is not a normal condition.**

-  Press and hold the on/test button until the UPS beeps.
- Release the on/test button during the beeps and the loads are powered within 4 seconds.



### Utility Voltage Bar Graph

This UPS has a diagnostic feature that displays the utility voltage. With the UPS plugged into the normal utility power, press and hold the on/test button to see the utility voltage bar graph display. After approximately four seconds the 5-LED display on the right of the front panel shows the utility input voltage. Refer to the figure below for the voltage reading.



The display indicates that the voltage is between the displayed value from the list and the next higher value. For example, with three LEDs lit, the input voltage is between 101 and 109 VAC.

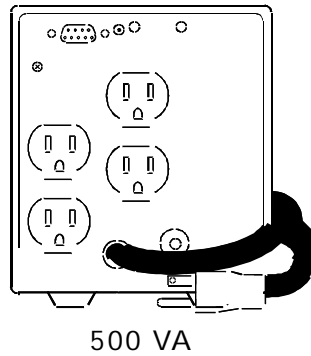
If no LEDs come on and the UPS is plugged into a working AC power outlet, the line voltage is extremely low.

If all five LEDs come on, the line voltage is extremely high and should be checked by an electrician

**Note: The UPS starts a self-test as part of this procedure. The self-test does not affect the voltage display. The utility voltage bar graph has a margin of error of  $\pm 4\%$ .**



## 2) Rear View



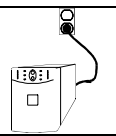
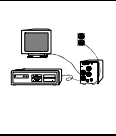
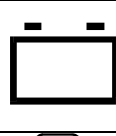


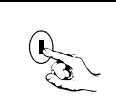
### Computer Interface Port

Power management software and interface kits can be used with this UPS. Use only kits supplied or approved by the manufacturer. If used, connect the interface cable to the 9-pin computer interface port on the back panel of the UPS. Secure the connector's screws to complete the connection.

### Ground Leads to TVSS Connector



The UPS features a convenient screw for connecting the ground lead on “transient voltage surge-suppression” (TVSS) devices such as telephone and network line protectors. The TVSS connector provides grounding through the UPS's power cord ground conductor. To make a connection to the TVSS connector, loosen the screw and connect the surge suppression device's ground lead. Tighten the screw to secure the lead.

## 6. Installation

	<p>1. Install the UPS</p> <ul style="list-style-type: none"> <li>Plug the power cord into the UPS and into the AC voltage.</li> </ul>
	<p>2. Connect the Equipment</p> <ul style="list-style-type: none"> <li>Do not power laser printers through the UPS.</li> <li>Use your equipment's power cords to connect to the UPS.</li> <li>Turn on all connected equipment.</li> </ul>
	<p>3. Charge the battery</p> <ul style="list-style-type: none"> <li>The UPS charges its battery whenever it is connected to utility power. The battery will charge fully during the first 4 hours of normal operation. Do not expect full runtime during this initial charge period.</li> </ul>
	<p>4. Connect the Computer Interface Port</p>
	<p>5. Connect the Ground Leads to the TVSS Connector (Optional)</p>
	<p>6. Power the Equipment</p> <ul style="list-style-type: none"> <li>With the UPS plugged in, press and release the large upper on/test button to supply power to the equipment plugged into the switched outlets.</li> </ul>

**Note: The UPS will not power up initially unless the AC voltage is in the normal operating range.**

## 7. Operating Instructions


-  With the UPS plugged in, press and release the large upper on/test button to supply power to the loads.
-  Press and release the small, lower off button to turn off power to the loads.

**Note: Whenever the UPS is plugged in and utility voltage is present, the charger maintains battery charge.**

 The on-line LED illuminates when the UPS is supplying utility power to the loads.

### Self-test

The UPS performs a self-test automatically when turned on, and every two weeks thereafter (by default). During the self-test, the UPS briefly operates the loads on-battery. If the UPS passes the self-test, it returns to on-line operation.

 If the UPS fails the self-test it immediately returns to on-line operation and lights the replace battery LED.

### SmartTrim

The SmartTrim LED comes on to indicate that the UPS is compensating for a high voltage.

### SmartBoost

The SmartBoost LED comes on to indicate that the UPS is compensating for a low voltage.

### Overload

When the UPS is overloaded (when the connected loads exceed the maximum specified in the “maximum load” section under *Specifications*), the overload LED comes on and the UPS emits a sustained tone.


### On Battery

During on-battery operation, the on-battery LED illuminates and the UPS sounds an audible alarm consisting of four beeps every 30 seconds.

### Low Battery

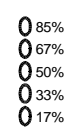
When the UPS is operating on-battery and the energy reserve of the battery runs low, the UPS beeps continuously until the UPS shuts down from battery exhaustion or returns to on-line operation.

### Battery Charge Bar Graph

 The 5-LED display on the right of the front panel shows the present charge of the UPS's battery as a percentage of the battery's capacity.





### Load Bar Graph

 The 5-LED display on the left of the front panel represents the power drawn from the UPS as a percentage of total capacity.



### Utility Voltage Bar Graph

 With the UPS plugged into the normal utility power, press and hold the on/test button to see the utility voltage bar graph display. After approximately four seconds the 5-LED display on the right of the front panel shows the utility input voltage.

 The display indicates that the voltage is between the displayed value from the list and the next higher value.

#### Notes:

**The UPS starts a self-test as part of this procedure. The self-test does not affect the voltage display.  
The utility voltage bar graph has a margin of error of  $\pm 4\%$ .**

**Whenever the UPS is plugged in and utility voltage is present, the charger maintains battery charge.**

## 8. Function

### Self-test

The UPS performs a self-test automatically when turned on with the enable switch (by default). Automatic self-test eases maintenance requirements by eliminating the need for periodic manual self-tests. During the self-test, the UPS briefly operates the loads on-battery. If the UPS passes the self-test, it returns to on-line operation.

If the UPS fails the self-test it immediately returns to on-line operation and lights the replace battery LED. The loads are not affected by a failed test. Recharge the battery overnight and perform the self-test again. If the replace battery LED is still on, replace the battery using the *Replacing the Battery* procedure.

### Automatic Voltage Regulation

A transformer with a winding that can be switched to boost or trim the AC line voltage is used to correct for low or high input voltage without using the battery continuously.

#### *Boost*

AC Line to Boost	Boost to AC Line
92 V $\pm$ 2%	96.5 V $\pm$ 2%

#### *Trim*

AC Line to Trim	Trim to AC Line
108 V $\pm$ 2%	104 V $\pm$ 2%

## 9. Abnormal Conditions and Protection Functions

### Smart Boost / Smart Trim

The SmartBoost LED comes on to indicate that the UPS is compensating for a low voltage.

The SmartTrim LED comes on to indicate that the UPS is compensating for a high voltage.



When the UPS is overloaded (when the connected loads exceed the maximum specified in the “maximum load” section under *Specifications*), the overload LED comes on and the UPS emits a sustained tone. The alarm remains on until the overload is removed. Disconnect nonessential load equipment from the UPS to eliminate the overload.



During on-battery operation, the on-battery LED illuminates and the UPS sounds an audible alarm consisting of four beeps every 30 seconds. The alarm stops when the UPS returns to on-line operation.

### Low Battery

When the UPS is operating on-battery and the energy reserve of the battery runs low, the UPS beeps continuously until the UPS shuts down from battery exhaustion or returns to on-line operation.



If the battery fails a self-test, the UPS emits short beeps for one minute and the replace battery LED illuminates. The UPS repeats the alarm every five hours. Perform the self-test procedure to confirm replace battery conditions. The alarm stops when the battery passes the self-test.

### Battery Disconnected

The UPS checks for proper connection of batteries. If this check fails, the UPS emits an audible alarm, the replace battery LED illuminates, and the battery charge bar graph turns off.

### Service

**If the UPS requires service do not return it to the dealer!**

Follow these steps:

1. Use the *Troubleshooting* section to eliminate common problems.
2. Verify that no circuit breakers are tripped. A tripped circuit breaker is the most common UPS problem!
3. Note the model number of the UPS, the serial number, and the date purchased. A technician will ask you to describe the problem and try to solve it
4. If the problem persists, call customer service.

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<b>Telnet:</b> 8-23-29721 <b>Fax:</b> 8-23-29739
<b>Internet:</b>
<b>E-mail:</b>

## 10. Troubleshooting

Use the chart below to solve minor UPS installation problems. Contact NEC Technical Support Staff for assistance with complex UPS problems.

Problem and Possible Cause	Solution
<p><b>UPS will not turn on.</b></p> <ul style="list-style-type: none"> <li>• On/test button not pushed.</li> <li>• UPS not connected to AC voltage.</li> <li>• UPS input circuit breaker tripped.</li> <li>• Very low or no utility voltage.</li> <li>• Battery not connected properly.</li> </ul>	<p>Set the UPS enable switch to 1. Set the Auto/Local switch to Local. Then press the on/test button once to power the UPS and the loads.</p> <p>Check that the power cable from the UPS to the power supply is securely connected at both ends.</p> <p>Reduce the load on the UPS by unplugging equipment and reset the circuit breaker (on back of UPS) by pressing the plunger back in.</p> <p>Check the AC power supply to the UPS with a table lamp. If very dim, have the utility voltage checked.</p> <p>Confirm the battery connections.</p>
<p><b>UPS will not turn off.</b></p> <p>Internal UPS fault.</p>	<p>Do not attempt to use the UPS. Unplug the UPS and have it serviced immediately.</p>
<p><b>UPS operates on-battery although normal line voltage exists.</b></p> <ul style="list-style-type: none"> <li>• UPS's input circuit breaker tripped.</li> <li>• Very high, low, or distorted line voltage. Inexpensive fuel powered generators can distort the voltage.</li> </ul>	<p>Reduce the load on the UPS by unplugging equipment and reset the circuit breaker(on back of UPS) by pressing the plunger back in.</p> <p>Move the UPS to a different outlet on a different circuit.</p> <p>Test the input voltage with the utility voltage display. If acceptable to the load, reduce the UPS's sensitivity. Consult the UPSC documentation for procedures.</p>
<p><b>UPS beeps occasionally.</b></p> <p>Normal UPS operation.</p>	<p>None. The UPS is protecting the load.</p>
<p><b>UPS does not provide expected backup time.</b></p> <ul style="list-style-type: none"> <li>• The UPS's battery is weak due to recent outage or is near the end of its service life.</li> <li>• The UPS is overloaded.</li> </ul>	<p>Charge the battery. Batteries require recharging after extended outages. Also, they wear faster when put into service often or when operated at elevated temperatures. If the battery is near the end of its service life, consider replacing the battery even if the replace battery indicator is not yet lit.</p> <p>Check the UPS's load display. Unplug less needed equipment, such as printers.</p>
<p><b>All indicators are flashing and UPS emits a sustained tone .</b></p> <p>Internal UPS fault.</p>	<p>Do not attempt to use the UPS. Turn the UPS off and have it serviced immediately.</p>
<p><b>All indicators are off and UPS is plugged into wall outlet.</b></p> <p>The UPS is shut down and the battery is discharged from an extended outage.</p>	<p>None. The UPS will return to normal operation when the power is restored and the battery has a sufficient charge.</p>
<p><b>The replace battery light is on.</b></p> <ul style="list-style-type: none"> <li>• Weak batteries.</li> </ul>	<p>Do another self test to see it clears.</p>
<p><b>The replace battery light is flashing.</b></p> <ul style="list-style-type: none"> <li>• Replacement batteries not connected properly.</li> </ul>	<p>Confirm the battery connections. If the problem persists after recharging, replace the batteries.</p>

## 11. Maintenance and Checks

### Storage

#### *Storage Conditions*

Store the UPS covered and upright in a cool, dry location, with its battery fully charged. Before storing, charge the UPS for at least 4 hours.

#### *Extended storage*

- At -15 to +30 °C (+5 to +86 °F), charge the UPS's battery every 6 months.
- At +30 to +45 °C (+86 to +113 °F), charge the UPS's battery every 3 months.

### Daily Check

Check the front bezel LEDs and the temperature of the room in which the UPS resides.

### Scheduled Check

Once a year check the UPS for discoloration anywhere, frayed cables or power cords, or other signs of deterioration. Check that the air flow around the UPS is adequate and that the vent is clear.

### Battery Life

Temperature	Battery Life	Change Battery After
20 °C	5 years	4.5 years
30 °C	4 years	3.5 years
40 °C	2.5 years	2 years

## Specifications

	<b>N8580-31 500 VA</b>
Acceptable input voltage	0 - 160 VAC
Output voltage	90 - 110 VAC
Input Protection	Resettable circuit breaker
Frequency limits (on-line operation)	50 or 60 Hz, +2%, -4%
Transfer time	2 ms (normal) 4 ms (maximum)
Maximum load	500 VA / 320 W
On-battery output voltage	100 VAC
On-battery frequency	50 or 60, $\pm 0.1$ Hz; unless synchronized to utility during brownout.
On-battery waveshape	Low-distortion sine wave
Protection	Overcurrent and short-circuit protected, latching shutdown on overload.
Noise Filter	Normal and common mode EMI/RFI suppression, 100 kHz to 10 MHz
Battery type	Spill proof, maintenance free, sealed lead-acid
Typical battery life	life varies; typical 2 years, depending on number of discharge cycles and ambient temperature
Typical recharge time	2 to 5 hours from total discharge
Operating temperature	0 to +40 °C (+32 to +104 °F)
Storage temperature	-15 to +45 °C (+5 to +113 °F)
Operating and storage relative humidity	5 to 95%, non-condensing
Operating elevation	0 to +3,000 m (0 to +10,000 ft)
Storage elevation	0 to +15,000 m (0 to +50,000 ft)
Electromagnetic immunity	IEC 801-2 level IV, 801-3 level III, 801-4 level IV
Audible noise in dBA at 1 m (3 ft)	< 45
Size (H x W x D)	15.8 x 13.7 x 35.8 cm. (6.2 x 5.4 x 14.1 in.)
Weight - net (shipping)	11.6 (12.9) kg. 25.5 (28.5) lb.
Safety approvals	Listed to UL 1778
EMC verification	VCCI Class 2

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990-5021, Revision 1, 12/98

N8580-31