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TECHNICAL INFORMATION AND PRODUCT SOLUTIONS

ON Series® UPS - Functional Overview

In addition to providing battery backup for loss of utility power, ONEAC's ON Series Uninterruptible Power Supply (UPS) contains the full ONEAC Low Impedance Power Conditioner, this is the reason for the weighty transformer in each unit. We believe that it is critical to protect sensitive modern electronic equipment from electrical noise that is present in all unconditioned power lines.

The ON Series UPS can operate in four different modes which are illustrated below.

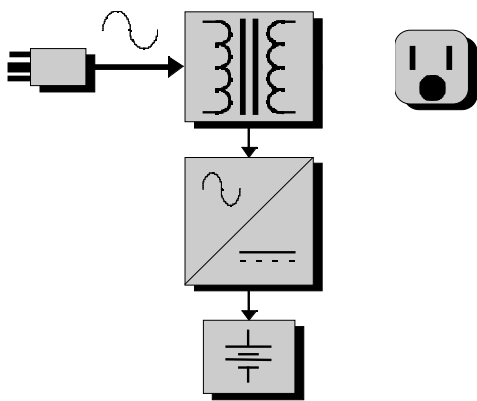


Figure 1 Charge mode - the UPS is powered on, but the ON/OFF switch is in the OFF position. The output is disabled, but the UPS is charging the batteries as long as there is adequate AC voltage at the UPS inlet.

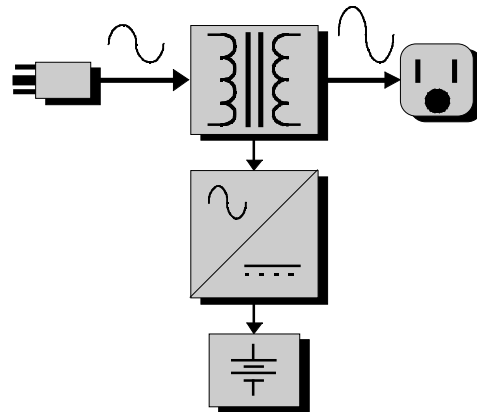


Figure 2 Normal mode - the UPS is powered on and the ON/OFF switch is in the ON position. The output is enabled and the UPS is charging the batteries. Battery backup power is available.

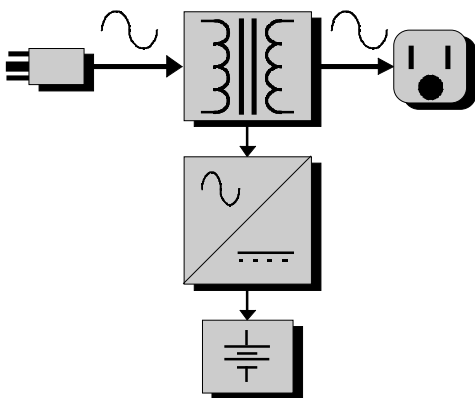


Figure 3 ONBoost® mode - similar to Normal mode except the output voltage is boosted due to low input voltage. Battery backup power is available.

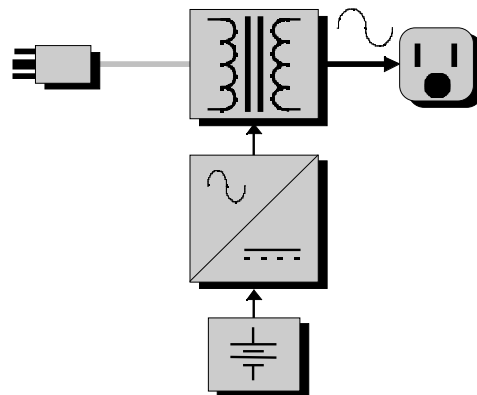


Figure 4 Battery backup mode - input voltage is not sufficient to power the load. Power for the load is provided from the batteries through the inverter.

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TT0304 Rev. -

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Features

The following paragraphs describe some of the technical features of the ON Series UPS that make it a reliable source of clean AC power at all times.

Clean Power

While all UPS's provide battery backup power when the input power fails, the ON Series UPS provides clean power to the load all the time. Load power is sourced from the output of a transformer based AC filter that reduces Normal Mode noise to a very low level and effectively eliminates Common Mode noise altogether by reconnecting the output neutral and ground conductors. The Virtual Kelvin Ground® formed at the output of the transformer acts as a low impedance absorber for noise that is generated by loads on the UPS output. This stops noise generated by one load from coupling into the other loads present on the same UPS.

Regulation

The UPS provides output voltage regulation appropriate for modern switch-mode power supplies (SMPS) that are capable of operating over a wide input range. The job of the utility power company is to provide the specified nominal voltage (e.g. 120 V for North America, 230 V for Europe) to all residences and businesses. However, for reasons that are sometimes beyond the control of the utility company, the power fluctuates above and below the specified nominal voltage. Most electronic equipment cannot operate properly when voltage levels drop to less than 83% of the specified nominal voltage (e.g. <100 V for a 120 V nominal) . In the same vein, electronic equipment can be damaged by voltages above 113% of the specified nominal voltage (e.g. 260 V in a 230 V nominal). The ON Series UPS protects equipment from both of these problems. It boosts the voltage level to the equipment when the utility power gets too low, and it provides backup power, within acceptable voltage levels, when the utility power gets too high.

Combined Inverter/Charger

An important feature of the ON Series is that the power stage of the inverter forms a part of the battery charging circuit. Due to the self discharge characteristic of batteries they require an almost constant charging. The batteries will be charged provided utility power is present at the input to the unit. The ON/OFF switch has no influence on battery charging. The charging circuit is constantly monitored to ensure that is operating correctly (an alarm is enabled if a fault occurs). So at the critical time when the input power fails, the inverter is ready to go and the batteries are in a known good state, thus providing a reliable power source.

Hot-swappable Batteries

All ONEAC UPS products feature user replaceable, hot-swappable batteries. When the batteries need replacement simply unplug the old batteries and plug in a new pack. All models use a single, polarized connector to attach the battery pack. It is impossible to connect the pack incorrectly. Instructions for replacing the battery are located in the user manual.

Interface Port

The interface is built in to the ON Series UPS and provides communication to external devices via a DB-9 RS232 connector located on the rear panel of the UPS.

The function of the interface port is to enable the UPS to communicate information about the UPS to the equipment that is plugged into it. Via the interface, the UPS communicates with a file server in a Local Area Network (LAN) environment or with a computer in a stand-alone environment such as UNIX.

In most instances, the interface is used to communicate basic information to the file server or computer. It lets the server or computer know when AC utility power has failed, and when the battery pack is nearing depletion. This information allows the file server or computer to begin an orderly shutdown. This action prevents corrupted files and lost data.

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Some interfaces have capabilities for providing more advanced information to the file server, such as when the batteries in the UPS need replacing, when the internal temperature of the UPS is too high, and more. This type of information allows a central authority, responsible for the status of the LAN, to perform network management functions. Network management allows the central authority to remotely monitor the nodes on the LAN (work station, etc.) and take a proactive approach to replacing batteries and performing other maintenance-related functions.

Additionally, the interface can be used to adjust some of the operating characteristics of the ON Series UPS. These include output voltage range, buzzer enable, restart delay and notification delay.

Optional Interface Slot

In addition to the built in interface port, the ON Series UPS products have an interface slot that can accept a variety of optional interface cards. The cards can be either factory installed or purchased and installed by the user at a later date.

The interface slot connection bus is proprietary to ONEAC and does not conform to any industry standards. Only interface cards manufactured by ONEAC should be installed in the slot.

Intuitive Front Panel Display

The front panel display will show the percent (%) load in 1% increments during Normal and ONBoost modes. During Battery backup mode the display will show the percent (%) battery power left. If the processor senses a problem, a status code will be indicated to alert the user to take corrective action. The function of each mode may be altered if the UPS is displaying a condition code on the front panel display.

The front panel contains three lights and a digital display. The lights and the display work together to communicate the status of the UPS to the user. The lights indicate the type of information shown in the display. For example, when the % LOAD light is on, the number shown in the display relates to the load. When the % BATTERY light is on, the number relates to the battery pack. And when the SYS. CODE light is on, the display presents a System Status Code.

% LOAD Light

Under normal operating conditions, when AC utility power is present, the % LOAD light is on and the display shows the percentage of the unit's load, or capacity, that is currently being used. The percentages are shown in 1 percent increments. When the UPS is operating at full load, the display shows 99.

% BATTERY Light

When the UPS is operating in battery backup mode, such as during a power failure, the % BATTERY light is on. The display shows the percentage of available battery backup time remaining. For example, when 60 % of the battery pack's capacity is depleted, the display will show 40.

SYS. CODE Light

The SYS. CODE (System Status Code) light comes on when a condition exists that requires attention; the UPS may not be operating under normal conditions. System status codes are displayed for two seconds, alternating with normal % LOAD or % BATTERY displays. If more than one condition exists at the same time, each status code will be displayed for two seconds.

System Status Codes	Description
c0	Battery test in progress. (No sound.)
c1	Rear panel input circuit breaker open. (Tone sounds every 60 seconds.)
c2	Battery disconnected. Or battery fuse blown. (Tone sounds every 60 seconds.)
c3	Over temperature, unit is too hot. (Continuous tone.)
c4	AC line returned, battery charging. (No sound.)

System Status Codes	Description
c5	Backup time is significantly degraded. (Tone sounds hourly.)
c6	Battery failure detected. Replace battery! (Tone sounds every 60 seconds.)
c7	On inverter due to sustained overvoltage. (Tone sounds every 60 seconds.)
c8	Output overload – Inverter disabled. (Tone sounds every 60 seconds.)
c9	Output will shut down due to severe overload.

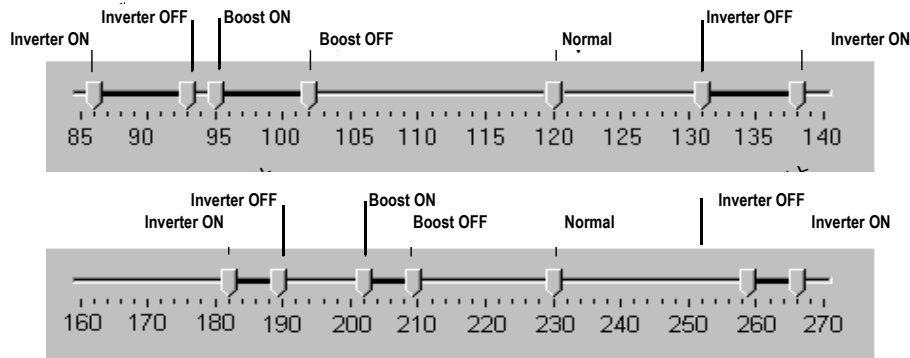
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Audible Alarm

The UPS has an audible alarm that is used in conjunction with the front panel display to alert the user when the UPS needs attention.

The audible alarm can be enabled and disabled via the interface port.

ON Series Switching Points



The ON Series UPS products are normally shipped with a default output range of 95 to 138 Vrms (202 to 266 Vrms). Output range is effectively the output regulation range that the UPS will maintain. If the input voltage changes such that the output voltage will exceed the defined output range, the UPS will use first the ONBoost® and then battery backup to keep the output voltage within the specified range. The output range is user settable through the interface port.

Figure 5 trip points for 120 V & 230 V models

The actual voltages at which the ONBoost and inverter will be switched in and out are derived from the output range chosen. For example, if the output range is 95 to 138 the Onboost will be engaged if the input voltage falls below 95 Vrms. In order to avoid unnecessary switching due to load changes, the ONBoost will not be disengaged until the input voltage is more than 7 Vrms greater than the engagement voltage. In the case of the 95 to 138 default output range, the ONBoost would be disengaged at $95 + 7 = 102$ Vrms. The same is true for switching to and from battery backup mode. Figure 5 illustrates the actual voltage trip points used by the UPS for the default output range. The dark bands indicate the hysteresis.