Office Equipment: Smart Power Strips

The modern office is full of energy-using equipment—computers, printers, copiers, task lights, fans, and other devices—much of which is left on, unnecessarily, throughout the workday and, in some cases, for 24 hours a day, 365 days a year. The U.S. Environmental Protection Agency (EPA) estimates that 80 percent of the printers used in offices, 70 percent of copiers, and 20 to 30 percent of computer monitors and task lights are left on overnight. The result is wasted money for building owners and operators.

To reduce energy consumption, "smart" power strips use a variety of monitors, timers, and sensors to turn unused equipment off, saving enough electricity to enable payback periods of less than two years in many cases. Smart power strips can be used to control a variety of devices that can be turned off when not in use, including calculators, coffee warmers, space heaters, and computer monitors. Devices that must stay on—fax machines, modems, computer central processing units, and certain printers—can simply be plugged into outlets that are not controlled by smart power strips.

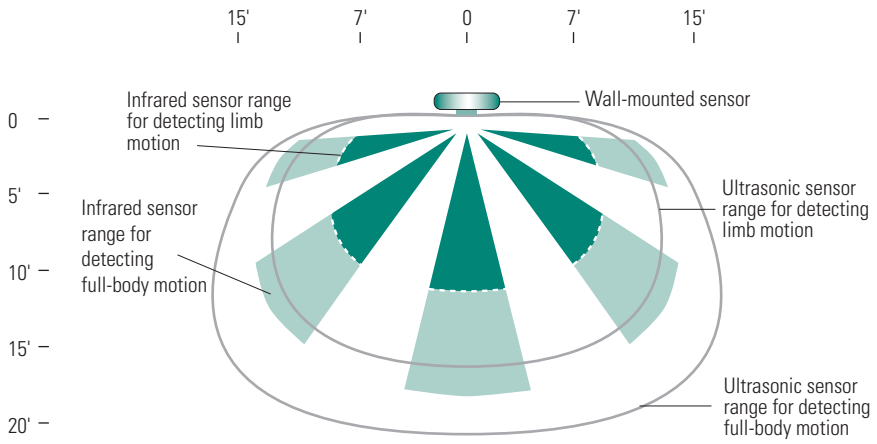
What Are the Options?

Here are some of the main features you'll encounter when shopping for smart power strips:

Occupancy sensors. These products sense the presence or absence of office workers and turn the attached equipment on and off accordingly. Passive infrared (PIR) sensors are the most common type of occupancy sensor and are able to "see" heat emitted by occupants. The sensor is triggered when a change in infrared levels is detected, such as when a warm object moves in or out of view of one of the sensor's "eyes." PIR sensors are quite resistant to false triggering. They are best used within a 15-foot range for two reasons: There are potential "dead" spots between their wedge-shaped sensory patterns that get wider with distance (see **Figure 1**) and, being passive, they do not send out any signal; instead, they depend on the intensity of the heat output of the moving part of the subject, which drops with the square of the distance.

Figure 1: Sensor coverage diagram

Ultrasonic sensors can detect motion at any point within the contour lines. Passive infrared sensors see only in the wedge-shaped zones, and they don't generally see as far as ultrasonic units. The ranges are representative; actual sensors may be more or less sensitive.



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Ultrasonic sensors emit a high frequency signal (over 20,000 cycles per second), above human and animal audibility ranges, and listen for a change in frequency of the reflected signal. By emitting a signal instead of only receiving it, they are able to cover larger areas than PIR sensors and are noticeably more sensitive. They are also more prone to false triggering. For example, air motion created by a person running past a doorway or the on/off cycling of an HVAC system can cause false triggers.

Timers. Smart power strips can turn office equipment on and off based on the calendar or clock time, in addition to occupancy sensors. However, timers are especially effective in cases where it does not make sense to control equipment based on occupancy. For example, if an infrequently used laser printer or copier requires a long warm-up period and is kept in an area that lacks frequent foot traffic, the productivity lost while people waited for the printer or copier to warm up would quickly negate the savings from reduced energy use. Turning the device on and off based on a simple clock would ensure energy savings overnight, and a calendar function would enable weekend and holiday savings as well.

Monitors. Other smart power strips determine when equipment is in use or in an idle state by monitoring equipment activity—for example, the flow of data to a printer—or by monitoring the flow of current to the equipment. If the equipment is idle for a length of time specified by the user, it will be shut off and awakened when activity resumes. Some strips monitor the current from one device, such as a computer, to determine when to shut off or turn on all devices connected to the strip. This allows the strip to automatically shut off all peripheral equipment, such as monitors and printers, when the computer is shut off. These options can also be used together: a clock might turn a printer on at the same time each morning, and an activity monitor or occupancy sensor might turn it off when activity stops at the end of the day.

Bundled together or add-on power strips. Some products come with the power strip and occupancy sensor as an integral unit. These products also often provide two sets of outlets: one controlled by the occupancy sensor, the other uncontrolled. This configuration allows equipment that must be kept on all the time, such as fax machines, to be plugged into the same strip. Other products feature a sensor and a relay device that can be plugged into a separate power strip to cover multiple devices. For companies that already own power strips, this could be the best choice.

How to Make the Best Choice

Determine if smart power strips are cost-effective. Many buyers base their purchase decision on a simple visual observation that office equipment is left on longer than necessary. But to determine whether or not an investment in this type of equipment will really be cost-effective, buyers can monitor particular groups of equipment to see how much power they draw, how many hours they are left on, and how often they could be turned off. One company offers a device for measuring plug load power draw. Data from this device can be combined with a sensor to track energy usage and occupancy and estimate the savings that can be achieved through control of plug loads. Energy loggers can also be used to determine office equipment power draw and time of use. Once the equipment power draw, times of use, and occupancy schedules are known, a simple calculation, such as that shown in the sidebar, can be performed to determine the payback period of a smart power strip.

Pick the right type. Smart power strips equipped with ultrasonic or PIR occupancy sensors will work in a typical office setting if they are installed carefully, as described below. However, each type has limitations. Ultrasonic sensors are more sensitive to movement than PIR devices, but they're also more prone to false triggering. PIR sensors experience dead spots but are generally a better choice in a typical workstation, where the line-of-sight requirement of a PIR sensor can be easily met. In low-occupancy areas, strips that use equipment activity monitors or timers might be a better solution.

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Calculating Payback on Smart Power Strips

Although prices vary, the average smart power strip could add a premium of about $20 to the cost of a regular power strip with equivalent surge protection. If the strip controlled 50 watts worth of task lights and a monitor using 100 watts, and electricity cost an average of 10 cents per kilowatt-hour, the device would pay for itself after preventing about 1,333 hours of operating time—a matter of less than two months if equipment would otherwise be left on 24 hours a day. How did we get this number? By dividing the cost premium by the product of the power saved (in kilowatts) multiplied by the energy rate: $20 ÷ (0.15 kW x $0.10/kWh) = 1,333 hours.

To determine how long it would take to eliminate 1,333 hours of operating time, first determine how many hours a day a smart power strip might prevent that equipment from operating. For example, a typical workday might be 9.5 hours long, during which monitors are inactive for 5.5 hours. Assume that the equipment is turned off at night and that the occupancy sensor time delay adds a half hour per day of operating time before the equipment is turned off. Then the smart power strip would save about five hours per day of operating time and pay for itself in 267 working days, or just over one year. If equipment is otherwise left on nights and weekends, the savings would be 145.5 hours per week for a payback of less than 10 weeks.

Decide on an area of coverage. Some smart power strips come with small-range occupancy sensors that only sense a presence in the workstation; others cover a wider area and detect the presence of people in the office around the workstation. Choose the latter if you want equipment to turn off less frequently and turn on sooner.

Install sensors carefully. As is the case for wall- and ceiling-mounted occupancy sensors, the sensors that come with smart power strips are easily visible and can potentially be improperly adjusted, stolen, vandalized, or fooled into perceiving a human presence when a space is unoccupied. For continued energy savings, users should take the following precautions:

- Involve building personnel in planning for the sensors.
- Train maintenance personnel and office occupants to keep sensors operational rather than disconnecting them when problems occur.
- Position sensors carefully so that they only see the area that you want them to see; the biggest cause of false triggering is incorrect sensor positioning.

Pick a product with an adjustable time delay. Smart power strip products may come with either adjustable or factory-set time delays that determine how long a period of nonoccupancy or inactivity must be before the equipment is turned off. A product with an adjustable time delay allows adjustment of the smart power strips to suit individual work habits.

What's on the Horizon?

The next step for smart power strips is integration into a total workspace controller. One company recently moved in that direction with a product that consists of an occupancy sensor, an infrared transmitter, and controls for outlet switching and fluorescent dimming. It not only controls office equipment based on occupancy, but it also allows occupants to control a variety of circuits themselves without leaving their seats. It can operate with any of the company's smart power strips, enabling the user to start or stop any device that is plugged into a controlled outlet. It can also be used to dim overhead fluorescent fixtures linked to an infrared controller.

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