Powerful battery saver

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In many devices that use batteries -- such as portable radios and flashlights -- you don't use just one cell at a time. You normally group them together in a serial arrangement to increase the voltage or in a parallel arrangement to increase current. The diagram shows these two arrangements. The upper diagram shows a parallel arrangement. The four batteries in parallel will together produce the voltage of one cell, but the current they supply will be four times that of a single cell. Current is the rate at which electric charge passes through a circuit, and is measured in amperes. Batteries are rated in amp-hours, or, in the case of smaller household batteries, milliamp-hours (mAH). A typical household cell rated at 500 milliamp-hours should be able to supply 500 milliamps of current to the load for one hour. You can slice and dice the milliamp-hour rating in lots of different ways. A 500 milliamp-hour battery could also produce 5 milliamps for 100 hours, 10 milliamps for 50 hours, or, theoretically, 1,000 milliamps for 30 minutes. Generally speaking, batteries with higher amp-hour ratings have greater capacities. The lower diagram depicts a serial arrangement. The four batteries in series will together produce the current of one cell, but the voltage they supply will be four times that of a single cell. Voltage is a measure of energy per unit charge and is measured in volts. In a battery, voltage determines how strongly electrons are pushed through a circuit, much like pressure determines how strongly water is pushed through a hose. Most AAA, AA, C and D batteries are around 1.5 volts. Imagine the batteries shown in the diagram are rated at 1.5 volts and 500 milliamp-hours. The four batteries in parallel arrangement will produce 1.5 volts at 2,000 milliamp-hours. The four batteries arranged in a series will produce 6 volts at 500 milliamp-hours. Battery technology has advanced dramatically since the days of the Voltaic pile. These developments are clearly reflected in our fast-paced, portable world, which is more dependent than ever on the portable power source that batteries provide. One can only imagine what the next generation of smaller, more powerful and longer-lasting batteries will bring. For more information on batteries and related topics, check out the links below. Originally Published: Apr 1, 2000 Related Articles Sources American Chemical Society. "History of the Battery." National Historic Chemical Landmarks. 2005. (June 23, 2011) Batteries." Intro to Physical Computing, New York University. April 19, 2011. (June 23, 2011) Mike, Shannon Neaves, and Emily Smith. "Museum of Electricity and Magnetism." National High Magnetic Field Laboratory. 2011. (June 25, 2011) Kenneth. "How Do Batteries Store and Discharge Electricity?" Scientific American. May 29, 2006. (June 23, 2011) . 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(June 25, 2011) Farhad. "Better Batteries Will Save the World." Slate. June 21, 2011. (June 23, 2011) Saqib. "Will Lithium-Air Battery Rescue Electric Car Drivers from 'Range Anxiety?'" The New York Times. May 7, 2010. (June 22, 2011) Neil. "Batteries That Breathe." DiscoveryNews. Feb. 8, 2011. (June 22, 2011) of Hawaii HAM Club. "Batteries in Fact and Fiction." August 1999. (June 22, 2011) Power smaller devices with your batteries from cameras, remotes, GPS that won't turn on because they are too weak. This clock/calendar/thermometer uses a 3V watch type battery. It lasted 4 years until the battery drained to 2.44 volts. New batteries come with even more voltage, for example the new AA 1.5 batteries measures 1.59 volts. So the clock will run well within 2.5-3.1 volts. Cost: Free Savings: $6.27 (source: newark.com) I measured the soldering iron usage with my Kill-A-Watt. My 30 watt iron used 28 watts for 8 minutes and didn't even register 0.01 kwh so it cost less than 1 cent.1. Find a device that takes less power than your camera. The clock only needs to run the lcd and simple electronics. The lcd is very low power because it does not have a backlight, lots of segments, or color. Find something that takes 2 AA batteries or less or even smaller batteries.Check your old batteries for ones that have a good voltage with a volt meter. I ended up using two AA batteries at 1.44 volts and 1.39 volts. They won't run a bigger device but in series they have 2.82 measured volts. The clock will run down to 2.5 volts.1. Strip wires for attaching to batteries and device. I used extra cat-5 Ethernet cable cut to 6" and stripped at both ends. 2. Tin the wire and battery separately then quickly solder together. Do Not solder watch sized batteries, another website says they explode, you also do not want to heat up the batteries long so make connections quickly.1. Twist the battery wires together in parallel and connect to a lead that connects to the device. The clock had tabs for the battery so it was easy to crimp them on with needle-nose pliers. If you solder them, do not overheat the circuit board of the device. 2. Close it up or tape it so the wires don't touch. The clock has a slot for a screwdriver to pry open the door so I just ran the wires through the space.I just twisted and taped the leads so they don't touch and I can easily replace single batteries later on. You could secure the connections better by soldering and containing them. There is enough room in the clock body pencil holder to hold the batteries but I like the mad scientist look of the wires. Combine or Not?In many devices, such as a flashlight, the batteries are wired in series. In these devices you may be able to combine the voltages with a single battery substitute connector and power supply that provides only the total voltage, hence one AA = 1.5 votls, so 2 x AA = 3 volts..In other, more sophisticated devices like cameras the batteries may be wired, or look like they are wired, in series but the series connection between them may be tapped or non-existent. If you are making a battery substitute power connector for one of these devices then you might have to make separate 1.5 volt battery substitute connectors and supplies for each battery the device will use.External Power SourcesA portable external power supply can be made using a bank of external cells wired in parallel to keep your device going all day. If you don't need portability as with studio type work a wall wort type power adapter with a minimum rating of 1 amp can be made using a transformer, bridge rectifier and a voltage regulator. Most regulators will handle a supply of up to 36 volts so a wide range of transformers can be used. A large micro farad capacitor with various other circuit refinements can be incorporated to provide power that is smooth. A circuit diagram based on the 78xx voltage regulator series is shown below.The other options are to purchase a used 1.5 or 3 volts power adapter at a thrift store or a new one from Radio Shack or Wal-Mart for a little more cash. Multiple output voltage adapters, if they have a 1.5 or a 3 volt output, can be used as well but may be more expensive. Be sure you have one that is rated for at least 1 amp output. Otherwise your device will probably not operate or will at some point do the very thing you are trying to over come, which is to shutdown.I opted for a wall wort type power supply from Radio Shack because one was sitting in my drawer. (Its only rated at .3 amps so I replaced it with a bigger one.) For the Battery Powered contest, we're making an audio-responsive LED Cloud decoration. It looks like a cloud but the LED's pulse to the beat of whatever song you're listening to.Arduino Uno Solder Breadboard LED Strip Glue gun glue sticks 12V Battery PLA Structural material clothes hangerIn order to CAD the structure, which would be the foundation of the design, many different measurements were taken. The measurements of our cylindrical base would have to be taken to CAD them and create brackets to connect them.For the circuitry, there were some very basic calculations done to find the voltage needed to provide consistent power to the electronics. Ohm's Law equation was used to determine those values. These were all taken into account and a proper circuit was assembled.After designing the brackets and printing them, I attach them to the cylindrical structure pieces and zip tie a piece of corkboard to act as a base for the Arduino. I then screw the Arduino components into the corkboard and use a wire clothing hanger to create a place to hook the whole structure.The code in the first image is used to individually increment the intensity of each LED color to create a wide variety of colors that will flash. The code in the second image displays a method used to increase and slow down the speed at which the lights using digital output from our sound sensor.Participated in the Battery Powered Contest

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