StayOnline®

The Power Cord Manufacturer

POWER CORD BEST PRACTICES

Choose your power cord carefully

Remarkable energy savings can be obtained by choosing the right length, gauge shielding and jacket material for your application

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Topic: **Best Practices for Power Cords**

The much overlooked AC Power Cord can offer remarkable energy savings, environmental friendly options, and time savings. Carefully selecting length, gauge, color, shielding, jacket material, and plug/connector angle can impact the efficiency of your equipment.

1) Length

Energy dissipates over distance due to capacitive resistance and to a degree skin effect. Skin effect results because Alternating Current (AC) tends to flow on the outer surface of a conductor. Underwriter Laboratories (UL) determines that every 50 feet a conductor's ampacity has deteriorated to the point where a thicker gauge (AWG) is required to maintain the original amperage. The devaluation at 51' is approximately 25%.

On shorter runs the aggregate annual loss can be equally significant. A server with redundant 250 watt power supplies can be operated more efficiently with shorter cords. Estimated annualized savings based upon 40 cords for 20 servers using 18 AWG cord and at a rate of 10₵ per kilowatt hour. Actual results may vary.

Length	MilliWatt (mW)	Annual Cost
1 foot	57.60	$2.02
3 foot	172.80	$6.05
6 foot	345.60	$12.11

Length also affects airflow in data cabinets because longer cords block air passages. In Data Centers most cords are connected on the 'hot aisle' side and should not create blockage against air evacuation. Poor air evacuation translates into higher cooling costs and resultant hot spots can damage equipment. http://www.stayonline.com/iec-c13-to-c14-sjt.aspx

2) Gauge

Thicker gauged cords carry energy more efficiently. Larger AWG has less resistance. Remember AWG is counter intuitive so the lower the number the thicker the wire. This table shows consumed Milliamps over 6 feet of cord with 3 different AWG at 3 amps with a Power Factor efficiency of 75%.

Amp	18 AWG	16 AWG	14 AWG
3.0	6.40 mΩ	4.00 mΩ	2.50 mΩ

*Amperage Squared Resistance - I^2R

Undersized AWG makes cords run hotter thus further taxing air cooling systems. Using a cord that is undersized for the amperage requirements is also a fire hazard. Thicker gauge cord can also "future proof" your rack for new equipment. http://www.stayonline.com/iec-c13-to-c14-15-amp.aspx

Copper is a valuable commodity so if you are taking a large number of power cords out of service call the local recycling companies and you will find someone happy to take the cords off your hands for free.

3) Color

It is a simple concept but seldom employed. If you have redundant power paths then use different color power cords. This will make tracing power distribution easier and more importantly prevent inadvertent disconnections when moving equipment. Color can also be used to identify critical equipment so a "never unplug color xx" rationale can be put in place. http://www.stayonline.com/c14-c13-white.aspx or http://www.stayonline.com/c14-c13-orange.aspx or http://www.stayonline.com/c14-c13-grey.aspx

4) Shielding

Ethernet connections are primarily made with Unshielded Twisted Pair (UTP) grade cable. The operative word is unshielded which often is laid next to unshielded power cords which are emitting Electro Magnetic Interference (EMI). A shielded data patch cable scheme is arduous as the entire structured wiring system from building entry to work station jack needs to be

properly shielded. Shield the AC cords instead and you may find many of the intermittent data problems that have been plaguing you will go away.

5) Jacket Material

The European Union (EU) has been pushing this effort through **R**estriction **o**f certain **H**azardous **S**ubstances (RoHS). Virtually all cords now comply with this ecological standard. A new goal on the horizon is Low Smoke Zero Halogen (LSZH) free wire jackets. Outer jackets will use TPE material and be 100% PVC free which will reduce the poisonous gas emitted when burned.
http://www.stayonline.com/static/docs/g/rohs_compliance.pdf

6) Plug/Connector Angle

A tight entry for your connections both decreases probability of disconnects and improves air flow. Up, Down, Left, Right and even 45 degree angle options enhance tidy connections.
http://www.stayonline.com/iec-c13-to-c14-angled-cords.aspx