

Automotive 12V Technology

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In today's world, a wide array of automotive 12 volt plug-in cord sets, 12v-plugs and 12v-sockets are presented to designers of electronic systems and products. Some are hardly up to the challenges presented by the ever-increasing multitude of electronic devices like cell phones, iPods and portable navigation devices that have become as commonplace as tires on a vehicle.

Market Outlook: Automotive 12 volt cord sets are normally made with twin copper wires and in lengths typically from three to fifteen feet. Some use heavy gage copper wire in longer lengths and are greatly affected by changes in the market. Copper prices have been predicted to rise 34% this year by economists, and long lengths of heavy gage wires suffer twice because of higher freight costs. Freight prices have already risen by 4-6% this year, and are expected to continue rising along with the economic recovery. Our expectation is leaning towards a mid-year mild price rise for products containing copper wire or phosphor bronze contacts.

Vibration. Heat. Shock. Humidity. Corrosion. Pressure. These real-world conditions cause device failures and higher support costs for suppliers. Without a reliable and continuous supply of current, an electronic device's operation will be interrupted and the system might be damaged. Repeated, forceful insertions and removals by consumers could cause stress fractures of plastic or metal components and wires.

Automotive plug-in cord set designs are traditionally full of trade-offs: size and weight constraints versus durability, ease of insertion and removal versus ability to retain the plug under rigorous conditions, and durability of materials versus component cost, to name a few. The increasing demand for ruggedness of portable devices has made the balancing act of 12v-plug design even trickier.

Retention: An automotive 12v-plug needs to be able to retain itself into the socket even under significant vibration, shock, and torque. Failure to properly hold the connection, even for a matter of microseconds, can result in an interruption of power and device malfunction. A well-designed 12v-plug will resist shock and vibration, while remaining easy to remove without tools.

Durability: Depending on the use, a device could have its 12v-plug inserted hundreds or even thousands of times throughout its lifespan. Because of the retention issues described above, an automotive plug must hold its connection securely. However, this results in extra wear upon the contacts as the same high grip which secured the 12v-plug causes increased wear under the



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stresses of removal and insertion. Thus, it is important to insure that 12v-plug materials be durable enough to withstand stresses that could cause dangerous fractures.

Corrosion Resistance: When components are exposed to humidity, airborne pollutants, extreme temperatures, and other environmental conditions, corrosion can result. Over time, this corrosive build-up can cause loss of electrical contact. The use of corrosion resistant contacts is particularly necessary for portable devices, where protection from the elements cannot be guaranteed.

Contact Conductivity: The choice of metals in 12v-plug sets determine how easily electricity will flow from the automobile to the device. Some types of platings are subject to oxidation and thus the resulting increase in electrical resistance. More conductive metals that resist oxidation, such as gold, allow high conductivity, meaning lower resistance, which allows for slightly quicker charging during short trips.

Fuses: A safety item that every automotive cord set should have but frequently do not. Many assume that the current in automobiles is not subject to voltage changes. An automobiles electrical system can have very high voltage spikes, for instance when the starter stops a minus 200 volt spike can occur, and large positive spikes can also occur. The battery does a good job as a filter because it acts like a large capacitor to absorb these spikes, but a fuse is an inexpensive insurance, especially in a product having worldwide distribution and use.

Big changes for large automotive cord sets are already occurring as plug-in hybrids and pure electric vehicles enter the market. Product categories include new plugs, sockets, flexible power cords, charging stations and vehicle connectors. Product safety testing will have to address connectors, stationary and portable electric vehicle cables and personal protection circuitry.



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