



The Dangers Of Counterfeit Battery Packs: Answers To Reader Questions

The continuing growth of portable handheld devices has spawned a healthy selection of aftermarket battery pack suppliers. Yet aftermarket vendors may resort to activities that compromise the end-user experience or safety to make the battery packs inexpensive and attractive to those placing purchase orders for replacements. An analysis of several counterfeit batteries revealed a variety of manufacturing and design problems, and we can use these examples to answer common questions.

What is the most common problem with aftermarket batteries?

Bad welds are by far the most commonly observed problem in aftermarket battery packs, and they can serve as a warning signal for general quality issues. Soldering or welding problems should be caught in a next-step inspection process. Problems that are present in a battery pack that goes out to the market are a strong indication that the manufacturer's quality processes are not sufficient (see the figure). Blown welds, with a burned appearance, are also common. In addition, an overabundance of welds is an indication that the weld process is sub-optimal.

Are there reliable suppliers for aftermarket batteries?

Yes. Many OEMs endorse or license specifically chosen third-party suppliers. These companies can help the OEM produce batteries in the volumes that a vigorous market demands. Sometimes an OEM will provide the encryption key to the third party for a battery pack and host device that features the protection of authentication. Legitimate third-party suppliers will sell through conventional channels.

What is the most common method of battery identification currently used in batteries?

Until recently, most battery packs did not include an authentication scheme. However, some manufacturers who found themselves the target of counterfeit batteries chose to implement a simple resistor identification system. Today, SHA-1 authentication is increasingly common for batteries and other accessories.

In this system, the challenger, which is the host, sends a command to read the ID from the responder, which is the battery. The host checks the validity of the data and determines how the system should react based on that validity. Security requires a secret that is shared between the host and the peripheral, a good random input, and an algorithm for generating an output that is difficult to predict based on the input. This algorithm also shouldn't be easily analyzed.

The algorithm itself does not need to be a secret, though. In fact, because SHA-1/HMAC is a public domain algorithm,



These insufficient welds aren't fully on their respective tabs, indicating poor quality processes. Bad welds are the most common problem in aftermarket battery packs, followed by blown welds.


it is preferred. It has been reviewed by a large group of people who have determined that the secret cannot be deduced from the output.

If I already have a fuel gauge in my pack, do I need further hardware for authentication?

Today's smart batteries often incorporate many features, from conditional charging to warranty information, and authentication is sometimes offered as a feature in the battery fuel gauge. Texas Instruments' popular Impedance Track fuel gauges offer SHA-1 authentication and communicate with the host system via an SMBus. If you have chosen one of these fuel gauges, no other hardware needs to be implemented.

What is the most dangerous design flaw that has been observed in counterfeit battery packs?

Many dangers are associated with the poor manufacturing practices used by aftermarket suppliers. Some of the more notable issues included sharp nickel strips that were not insulated and thermal fuses that were misplaced. The most dangerous situations observed occur when the vent holes of the cells are blocked. This situation is particularly dangerous because the vent holes allow excess gas to escape if thermal runaway occurs. If the gases are trapped, excess pressure could cause an explosion. Caulking material like silicone is difficult to control and should be avoided because it can cover vents.

It's important to protect yourself as a consumer against the dangers of knockoff battery packs. As an electronic design engineer, you have to protect your company from the aftermarket packs as well. Fortunately, many options are available to design in protection against aftermarket batteries. 

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