SERVICEMAN'S LOG

Two crook MacBook Pro laptops

Dave Thompson*

A failing battery pack is a fact of life for laptops once they're more than a few years old. Most aging batteries simply fail to hold a charge but some can fail catastrophically and damage the laptop's case in the process.

Items Covered This Month

- Battery problems in a MacBook Pro laptop
- Vintage AWA B&W TV set
- Denon twin-drawer CD player
- Fan cooling for a Sony LCD TV

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A few weeks ago, a long-standing customer called to ask if I would have a look at a couple of malfunctioning Apple Mac laptops belonging to his daughters. While he knows I focus mainly on Windows-based computers, he was enquiring on the off-chance that I might at least give them a quick once-over and perhaps even get them working again.

As this chap is a loyal customer of mine, I couldn't really say no and one of his daughters duly brought the two computers in to the workshop. Both were Apple MacBook Pro laptops and one of them looked as if it had been run over. I immediately assumed (even though I know assuming makes an "ass" out of "u" and "me"), that it had been dropped and I opened the conversation with that observation.

The young lady, who was the worried owner of the bent MacBook, was adamant it hadn't suffered any such event. This puzzled me, so I asked for more information. She told me that she was working with it the day before and it had just stopped working by turning itself off. She had managed to get it going again but when it booted, an error dialog popped up stating that the date and time were incorrect. It then died again but not before she'd observed that it hadn't automatically logged onto their WiFi network, which it usually did on start-up.

I IMMEDIATELY ASSUMED...

After that, she couldn't get it going again and thinking that the battery might be flat, she put it on charge and went out to do some chores. When she returned just a couple of hours later, the laptop's case was twisted and distorted and the touchpad assembly was protruding from its enclosure, as if it had been punched out from the inside.

The other machine belonged to her sister and it too had ceased working properly, though this one had the infamous Mac grey screen of death, indicating an issue with either the operating system or the hard drive.

The two machines were identical devices around four or five years old and apart from the obvious damage to one machine, both appeared to have been very well looked after. By now, I was keen to find out what had happened to them, especially the damaged one. That one had really piqued my interest.

One of my initial thoughts was some kind of paranormal event. OK, I'm just kidding but it did fit – a laptop goes from happily working to physically ruined within a matter of hours, without anyone so much as touching it. And there's even a teenager or two in the house to act as a "focus" so what else could it be?

Of course, in the real world there's a rational explanation for everything and I'll wager that many readers have already guessed what had happened here. I'd heard of it many times in the past but had never previously encountered an actual "live" case in the workshop. And that's surprising, given the number of years I've been doing this stuff.

As with all Macs, the internal circuitry is accessed by first removing the plate aluminium back (or base). True to form, there were a dozen tiny (but different-sized) screws holding the base on and one has to take note of their positions and be careful not to swap them around during re-assembly.

Unfortunately, because the base on this laptop was twisted and seriously puffed up, removing the screws was an act in itself. I had assumed that as soon as the tension on the screws caused by the warped case overcame the strength of the remaining threads holding the screws in, everything would let go and the threads would be stripped or otherwise damaged. So, to counter-act this force (and prevent further damage), I maintained a lot of downwards pressure on the screws with the driver until I felt them clear the threads. Only then was the case allowed to slowly pop open.

However, after the first couple of screws had been removed this way, instead of the pressure decreasing, the warped back was putting even more tension on the remaining screws. As a result, I now used elephant tape (I'm assured no elephants were harmed in the making of this tape) to bind the case together and take the tension while I removed the remaining screws, adding a strip of tape as each screw came out.

With the back off, it was patently

obvious what had happened; the battery, which takes up almost the entire bottom third of the area inside of the case, had become seriously distended. In fact, the plastic case that usually held the individual cells together had completely ripped open, with a couple of the cells inside the opened package looking like small pillows.

These two cells are usually about 4mm thick; now they measured 40mm! They were at the centre of the 6-cell package and it appeared that they were the only ones that had failed in this manner and had caused all the internal pressure.

The chassis of this laptop is made from cast aluminium, while the case components are sheet aluminium and plastics. When these are sandwiched and screwed together, the result is a very strong unit but when the cells began expanding, they had nowhere else to go but outwards.

Basically, they took the path of least resistance, which explains the distorted chassis and pillowed bottom. Furthermore, because the touchpad assembly sat immediately above the battery, when the cells beneath swelled, the touchpad simply popped straight up and out through the hole it usually sits in.

Battery mounting

The plastic frame of the battery locates into the chassis with embedded tabs along one side, while three screws on the other side secure it in place. A sticker warns users not to remove the battery, something a bit tough to comply with in this case!

Since the battery's plastic enclosure had no chance of containing the innards when they "went off", it simply snapped apart at the weakest points. The mounting lugs had broken off from the case and were all still held fast to the chassis, left behind when the rest of the plastic case went west. To make matters just that bit more complicated, the screws were those annoying anti-tamper types that many manufacturers love so much.

If you want to work on Apple products, then you'd better have a good set of specialised screwdrivers. That's because Apple uses lots of different anti-tamper "security" screw types. In this instance, the screws holding the back on (and those used in other locations inside the device) are tiny and appear to be a type of Frearson-head screw, similar to a very narrow Phillips style head. A small Phillips driver can usually remove them without making too much of a mess of the screw.

By contrast, the anti-tamper screws used to hold the battery in are a variation of the Tri-wing type, called a Y1. I've seen cases where people have mangled Tri-wing screws by using non-Tri-Wing bits to get them out, so it's obviously better to use the correct bit, especially if they are in as tightly as these ones were. It amazes me that they deemed it necessary to hold the battery in with this type of fastener but that's Apple for you.

As an aside, sets of security drivers are inexpensive from the likes of Ali-Express and are a valuable addition to any serviceman's toolbox. It really is staggering to think of the number of anti-tamper screws one comes across during servicing. I've seen them used in all sort of products, including Blu-ray players, kettles, mobile phones and garden blowers; in short, anywhere the manufacturer doesn't want Joe Lunchbox messing around with their products.

Of course, determined DIYers won't let anti-tamper screws stop them from getting in and I've even seen cases where bloody-minded individuals have opted to physically break the case open rather than kowtow to these manufacturer-imposed restrictions. Either that, or they've completely mangled the screws while attempting to extract them.

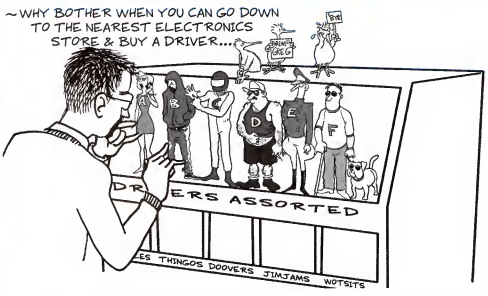
In the past, I'll admit to having "seen the red mist" where such screws are concerned, because not having the correct bit to remove them really kills the natural flow of working on a job. The silly part is that I can always jump in the van and go and get a suitable bit. They are usually readily available, which defeats the purpose of using anti-tamper screws in the first place.

OK, back to the chase. Once the battery was out of the machine and stored safely outside, I began checking out the collateral damage. Fortunately, the thin aluminium back cover was easily coaxed back into shape with some careful manual tweaking and though the metal had stretched a little, it would sit flat enough once all the screws were back in.

These photos show the battery as it appeared inside the case (top) and after it had been removed from the case. It had swelled enough to distort the chassis and the back.

More worrying was the cast aluminium chassis. I assume that it's cast and then machined to add threaded holes and other anchor points. Of course, it could also have been C&C machined from a single billet of aluminium (I wouldn't put it past Apple) but I think that casting is more likely. There's no doubt the manufacturers make a beautiful job of making components for these machines and of course, this is one of the alluring features of Apple products.

The downside is that it makes them expensive to repair if any spare parts are required. To straighten out the warped chassis, someone would have to have the gear to remove the lateral twists and then the skills and tools to panel-beat things back into shape. However, no matter how good someone was at this, any repair would still be



obvious (and it would be expensive), making replacement of the chassis the only feasible repair option.

Touchpad repair

Repairing the touchpad was fiddly but successful. The assembly is self-contained and is mounted into the chassis using an aluminium locating tab on one side and two wafer-thin spring-steel strips on the opposite side, to provide a "button" feel for the device. A microswitch is mounted at the bottom centre of the touchpad and spring tension keeps the pad raised until someone presses on it to activate the button (Macs use a single-click system so there are no complicated twin-button assemblies to worry about).

The expanding battery had forced the touchpad assembly out of its chassis aperture, easily overcoming the resistance of the two thin steel hinges (or strips) which had partly folded back on themselves as the pad was ejected. These steel strips were each removed by undoing two extremely small screws and the spring steel then gently pushed back into shape.

Fortunately, no hard bends had been made in them. If there had been, they would have simply broken when straightened.

Once the spring strips had been reformed, they were refitted and the touchpad screwed back into place again. Some minor fettling then saw it operating properly again.

Buying spare parts from the local Apple agents is expensive and there is no need to do so. All the Mac parts one could ever want are available from our eastern friends via the Internet. As an example, a battery (an original Apple part) from a Chinese vendor cost me US$80 including shipping, roughly one-third the cost for the same part here. The chassis was a bit more expensive but still remarkably cheap compared to one from the local supplier.

Fortunately, nothing else was amiss and once these items had later been replaced, the owner was back "Instagramming" and "Facebooking" to her heart's consent. It really was just a matter of fitting the parts and making sure that all the different screws went back in the right place. Fortunately, a screw map is available from Apple to help with this.

Fixing the second machine

The second MacBook Pro machine was a bit more interesting but I'm not going to relate the boring resolution of the grey screen issue. The relevant thing here is that I initially decided to swap in the hard drive from the first machine (ie, the one with the battery problem). That way, I could quickly get this second machine going again. I could then replace the hard drive and the parts in the first machine when they arrived from overseas.

Anyway, I swapped the drive in and fired up this second machine with the back still off, to make sure it worked. It booted OK but the battery indicator showed only 10% remaining. Fortunately, the owners had supplied one of their chargers, so I plugged it in and went about my work.

My intentions were that once it had charged and was operating properly, the client could come and grab that one. Unfortunately, it didn't quite work out that way. I was sitting at my desk doing some important YouTube research when I suddenly heard an almighty CRACK! It sounded as if a machine had fallen from the bench and smashed the LCD panel but an anxious glance towards the direction of the noise soon revealed that it was still in place.

Mind you, that's difficult to tell at the moment as my workshop looks like a bomb has gone off in it. That's because I'm in the process of renovating my garage/workshops while I'm trying to run the business. Normally, I'm very neat and tidy.

On closer inspection, the charging MacBook was sitting at a funny angle and when I turned it over, I could see why. Its battery had just blown out its last set of cells and the cracking noise had been the battery's plastic frame giving way, similar to the first machine. After a quick underwear check, I whipped the charging lead off and removed the battery, before placing it outside with the other one.

I immediately suspected the charger but a call to the client quickly revealed that this wasn't the charger used with the first MacBook. What's more, a check with my multimeter indicated that the output voltage from the charger was spot on. So it looked like the charger was in the clear.

I began to smell a rat with the batteries. Fortunately, this laptop hadn't been damaged as badly as the first because with the back off, the "exploding" battery had somewhere to go. The touchpad still suffered but the chassis wasn't as warped as the first one.

I repaired the touchpad and got everything ready for when the spares finally arrived. It was all rather frustrating though, because it meant that neither machine could be repaired until the spare parts arrived.

A week later, while I still had those two MacBooks in the workshop, I got a call from a new client. She told me that she had just fired up her MacBook and it had given her a time and date warning and wouldn't connect to the WiFi. My alarm bells immediately rang

and I advised her not to charge it but to give it to me (or someone else) so that the battery could be checked.

When she brought it around, a quick check of the back panel confirmed that it too had a swollen battery. It was enough of a coincidence for me to send a warning to my email database, recommending that owners of three to 5-year-old MacBook Pro laptops have the batteries checked out. It might just save them a lot of grief.