# What is that horrible grinding noise coming from my floppy disk drive?

devblogs.microsoft.com/oldnewthing/20110714-00

July 14, 2011

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Wait, what's a floppy disk drive? For those youngsters out there, floppy disks are where we stored data before the invention of the USB earring. A single floppy disk could hold up to *two seconds* of CD-quality audio. This may not sound like a lot, but it was in fact pretty darned awesome, because CDs hadn't been invented yet either. Anyway, if you had a dodgy floppy disk (say, because you decided to fold it in half), you often heard a clattering sound from the floppy disk drive as it tried to salvage what data it could from the disk. What is that sound? That sound is recalibration. The floppy disk driver software kept getting errors back from the drive saying "I can't find any good data." The driver figures, "Hm, maybe the problem is that the drive head is not positioned where I think it is." You see, floppy drives do not report the actual head position; you have to infer it by taking the number of "move towards the center" commands you have issued and subtracting the number of "move towards the edge" commands. The actual location of the drive head could differ from your calculations due to an error in the driver, or it could just be that small physical errors have accumulated over time, resulting in a significant difference between the theoretical and actual positions. (In the same way that if you tell somebody to step forward ten steps, then backward ten steps, they probably won't end up exactly where they started.) To get the logical and physical positions back in sync, the driver does what it can to get the drive head to a known location. It tells the hardware, "Move the drive head one step toward the edge of the disk. Okay, take another step. One more time. Actually, 80 more times." Eventually, the drive head reaches the physical maximum position, and each time the driver tells the hardware to move the head one more step outward, it just bumps against the physical boundary of the drive hardware and makes a click sound. If you issue at least as many "one more step outward" commands as there are steps from the innermost point of the disk to the edge, then the theory is that at the end of the operation, the head is in fact at track zero. At that point, you can set your internal "where is the drive head?" variable to zero and restart the original operation, this time with greater confidence that the drive head is where you think it is. The amount of clattering depends on where the drive head was when the operation began. If the drive head were around track 40, then the first 40 requests to move one step closer to the center would do exactly that, and then next 43 requests would make a clicking noise. On the other hand, if the drive head were closer to track zero already, then nearly all of the requests result in the drive

head bumping against the physical boundary of the drive hardware, and you get a longer, noisier clicking or grinding sound. You can hear the recalibration at the start of this performance. Bonus floppy drive music.

**Bonus reading**: Tim Paterson, author of DOS, discusses all those floppy disk formats.

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