**COOL CHARGING FOR A SMART WATCH**

*Many smart watches are charged with an inductive charging disk. On hot days, your author's smart watch stopped charging long before it reached the 80% charge level.. Learn why that happened, and low-tech ways to prevent that. Suggestions for cool charging of smartphones and tablets are provided too.*

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## Introduction

During the month of June 2025 in my region close to the Potomac River, we had some days when the outside temperature reached or surpassed 100 degrees F, and many more above 90 degrees F. I was very glad that I had our central air conditioning upgraded earlier in the year. My central air conditioning keeps the indoor temperature tolerable on such days.

Our home, built in the late 1940s, still has the small air ducts of that era. Those ducts are adequate for distributing heat from the furnace in the basement, but are not ideal for distributing cold air provided by the central air conditioning from the basement. A simple improvement would be to place the air conditioning distribution system in the attic, because cold air falls easily in small ducts.

My bedroom and charging setup are on the top floor, the warmest part of the house in the summer. I have a window air conditioner unit in my bedroom to supplement the central air conditioning, as well as a box fan in the bedroom to circulate the cool air.

I have delivered presentations about duration-based charging to limit the high level of the lithium-ion battery charge in smart watches and Pluggable Hybrid Electric Vehicle (PHEV) to 80%. That number, 80%, is where rapid high-efficiency charging ends and slow charging begins. Charging is slower because much electricity is converted to heat inside the battery. You will find links to prior presentations at the bottom of this article.

Smartphones and tablets have a Settings option, which you should always use, to cut off charging automatically when the high charge level reaches 80% or 85%. That cut off option, though not adjustable, helps extend your battery life by avoiding that battery heating.

That automatic cut off option apparently does not yet exist on smart watches. Managing the duration of smart watch charging is the best option for now.

## I learned my smartwatch battery can overheat during charging

Two times during the hot days in June 2025, at the end of the smart watch charging duration I chose, I expected my smart watch to be charged to about 80% of the battery capacity. To my surprise, my smart watch had not even come close to the 80% high

charge level. The first time, I found the watch battery was at 55% at the time point when I expected it to be at about 80%. I had no explanation for that anomaly.

The second time, the smart watch screen said it had stopped charging, because **the smart watch battery was too hot**. The watch stopped charging so the battery could cool off.

During those very hot June days, I was charging in the lithium-ion battery middle sub-range, 20% to 80%. That sub-range is where lithium-ion batteries charge very quickly and with little heat generated internally. In short, I knew **the battery was *not* heating itself**. The room temperature was warmer that I wanted, but far less so than outside.

**Inductive charging disk heat**

The other source of heat is the inductive charger disk used to charge the smart watch.

II have noticed many times that the inductive charging disk for my smart watch heats up when in use. While charging, the charging disk contacts the back of the smart watch. Some of the charging disk heat enters the watch battery.

The charging disk heats up because induction by itself is not 100% efficient. Some of the electricity entering the induction coil of the charging disk heats that induction coil.

I minimize that induction coil heat by using an inexpensive USB 5 watt (1 amp) charger block to power the charging disk. The 5-watt charger blocks sell for less than $8 on Amazon. The watch charges more slowly than it would if I used a 2 amp or 3 amp charging block, such as the fast charger blocks I bought before I learned how batteries are ruined by heat. Those higher-wattage charging blocks also create greater heat in the inductive charging disk.

Charging with a 5-watt charging block is a trade-off, reducing charging speed and extending battery life.

During the June heat waves, it appeared that the 5-watt charger block by itself was not enough to avoid excess heat from the charger disk entering the watch battery.

Another several hot days arrived in late July. While I was doing final edits on this article for publication by PATACS. My guess is that summer daytime temps around 100 degree F will become more frequent for at least the next few years.

Fortunately, I found an inexpensive way to cool the inductive charging disk.

**Charging a smart watch using a bottle**

In **illustration 1**, you see a photo of my 2024 charging rig for my smart watch. Note the empty bottle, chosen because its diameter was just enough to keep some tension on

the elastic wristband. That tension pressed the smart watch and the charging disk against the bottle. That pressure ensures that the smart watch and charger disk stay aligned for charging.

It is important to keep the watch and the charging disk centered on each other during charging. If the disk slips off-center, then the charging is even less efficient, so charging takes longer. The elastic wristband helps keep the watch and disk together. Below you will learn an alternate approach that does not depend on an elastic watchband.

Apple created a tech known as Mag Safe using magnets in the Apple watch and charging disk to keep them centered.

Recently I have seen advertised some charging stands that include magnets to keep non-Apple smart watches centered on the inductive charging surface.

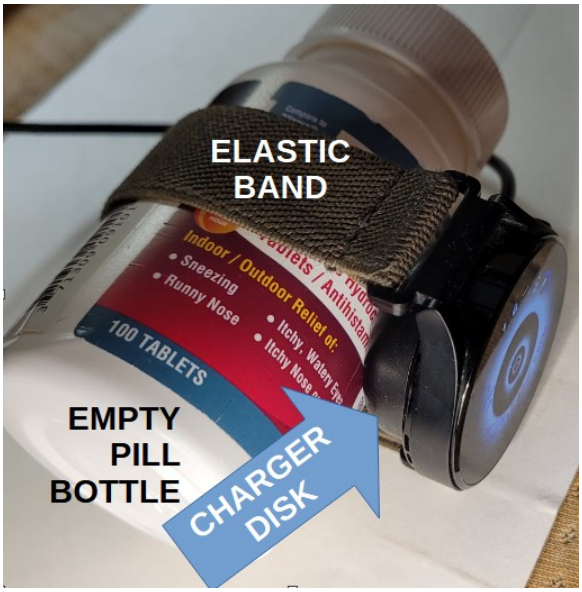


***Illustration 1***

**Cool water in the bottle**

My solution to minimize induction coil heat, if you will pardon the pun, is to fill the bottle with cool water.

I replaced that non-watertight pill bottle depicted with one which has a threaded lid and roughly the same bottle diameter. That replacement bottle is watertight. I fill the replacement bottle with cool water. To maintain its low water temperature, I keep the water bottle in my refrigerator when not charging my smart watch.

Now I think it is amusing that my 2024 photo labeled the bottle as empty. Learning never ends.

When charging, the charging disk is in contact with the water bottle. Part of the charging disk heat is absorbed by water in the bottle. The water does not absorb all of the charging disk heat, but does absorb enough heat so that the smart watch battery does not heat up past the temperature at which the smart watch halts charging.

Most prescription pill bottles are not watertight. The kid-proof lids are to blame for that.

I admit that charging on the top floor, the warmest floor of my home on summer days, may not be best. I always assume someone else may have a similar problem and welcome a published solution.

**Hot water rises, colder water sinks**

When the watch and charging disk are atop the water bottle, water is heated by the charging disk. That heated water is also at the top of the bottle and cannot circulate away. The heated water stays close to the watch and charging disk. Over time, cooling becomes less effective.

My latest wrinkle is, when charging, to place my watch face down on the table, so that the charging disk is above the watch and the bottle is above the charging disk. Within the bottle, the water closest to the charging disk heats up, expands and is therefore a bit more buoyant that the colder water around it. The hot water moves up and away from the charging disk inside the bottle. Cooler water sinks and replaces the heated water adjacent the charging disk.

The heat source, the charging disk, produces only modest heat, so the circulation is small and slow. The circulation does happen and improves removal of heat from the charging disk compared to when the disk was above the bottle.

If an ice cube can be put in the water bottle, then that might further improve the cooling behavior during charging.

Sometimes low tech is appropriate tech.

**An extreme cooling approach**

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I own several power bank batteries. Some are quite large. The newest are pocket-size, roughly 4 inches by 1 inch by 1 inch. Each has a USB input socket for charging the power bank battery, and one or more USB-A or USB-C output sockets for charging digital portables like smartphones, tablets, and smart watches.

Charging using a power bank battery can be done anywhere.

I could put the power bank battery, bottle, charger disk, and watch inside my refrigerator during charging. That is a cold environment in every home. In my case, the refrigerator tells me that the temp in its freezer is 0 degrees F and 38 degrees F in the rest of the refrigerator. I have not yet found a need to try that. I think 0 degrees F is possibly below the best temperature range for charging a lithium-ion battery but I have not researched that.

In my bedroom, my USB 5-watt charging block is connected to a smart plug. I control the charging duration using the smart plug app on my smartphone or tablet. That app has a timer feature associated with each smart plug it control.

By using a power bank instead, inside the refrigerator, my smart plug is not in the charging circuit, and I have no automated way to cut off charging after a duration I choose. Therefore, I consider charging inside the refrigerator to be a second-best

solution. I can use the Clock app timer feature on my smartphone to remind me to cease charging.

I will keep this refrigerator option in mind if the outside temperature gets much higher than 100 where I live.

Higher summer heat outside does happen in some southern parts of the US. Phoenix Arizona is famous for high temps exceeding 100 for weeks during summertime. I experienced that for a day or two when visiting Phoenix in June 2024.

Southern Arizona is not unique.

I took my family to visit Chattanooga Tennessee on a summer day in roughly 2001. A bank clock there told us the local outside temperature was 115 degrees F at about 5 PM ET. I was astounded and I took a photo of the bank clock.

**Cooler charging on the go?**

When I drive long distances in the summertime, I keep a cooler for drinks and food in my car.

If I wanted to do cool charging on such journeys, I would use a cooler with a dry top tray above the ice, drinks and meltwater. I would put my charging devices in that tray, along with power bank batteries. Doing so with the lid closed also keeps the hot sun off the charging devices. When charging inside a car, consider shading the digital portables so the sun does not heat them.

**Smartphones and tablets**

If a smartphone or tablet reports battery overheating during charging, then consider charging a digital portable inside a refrigerator, on a power bank battery. Water bottle cooling is less feasible for those devices.
Consider removing the case from the smartphone or tablet when charging in a refrigerator. The case is an insulator, lessening the contact of cold air with the surface of the digital device.


***Illustration 2***

**What if you do not use an elastic watch band?**

First of all, try this water bottle charging technique only if you have noticed that the

watch takes a very long time to charge on hot days. If that does not happen, then consider yourself lucky.

If overheating does happen, then use a rubber band to hold the charging disk, watch and water bottle together. **Illustration 2** shows a way to place the rubber band to do that. When you use a rubber band, you do not even have to fasten your watch band around the bottle.

Sometimes, low tech is the appropriate tech.

**Related prior meeting presentations**

These are links to PDF slide decks shown during the presentations for my user group. These you can read at your own pace. Videos of the presentations,including the slide decks, and Q&A with the audience can be seen on the PATACS.org Recent Meetings page chronological list of past presentations: **www.patacs.org/recentmtgspat.html**

**Extend the life of your cell phone battery** 1/20/24

**Extend your lithium-ion battery life using a smart plug** 12/14/24

**The Dr. Prius /Dr. Hybrid app for smart charging your PHEV battery** 6/21/25

The following YouTube recording of an APCUG presentation is essentially a copy of the January 2024 PATACS presentation with some additional material added. This was posted in May 2024 by APCUG and features your author:
**https://www.youtube.com/watch?v=RUsRVQBdlwA**