Holiday Audio Stream

- Tis the Season! Holiday tunes are originating from my home computers once again.
- This year, the audio stream comes to you from a Raspberry Pi 5 running the Raspian (Debian) Linux operating system and VLC to do the audio streaming.
- The streaming URL: **http://96.255.127.175:18283**
- Do NOT use this URL in a Web browser.

SAVE THIS SLIDE IMAGE FOR EASY REFERENCE

Windows	Key combo **tap WIN+PRTSCR**	save image in folder **Pictures/Screenshots**	Macintosh	Key combo **tap CMD+SHIFT+3**	saves image in folder **Desktop**

Holiday Audio Stream

- Use the URL in an audio streaming app such as VLC on any digital device or VRadio on a portable device
- To learn how to use audio receiver apps for listening to this audio stream, see my August 2022 presentation, specifically Part 2.
- **https://www.patacs.org/pdf/jk_streaming_audio_vlc_220820.pdf**

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Windows Key combo **tap WIN+PRTSCR** save image in folder **Pictures/Screenshots**

Macintosh Key combo **tap CMD+SHIFT+3** saves image in folder **Desktop**

You can also listen using Windows Media Player

- I delivered a presentation on that music stream listening technique in June 2024 for the Arlington VA meeting of PATACS.
- Here is the URL of that presentation slide deck PDF file:

www.patacs.org/pdf/jk_wmp_internet_radio_stations.pdf

EXTEND YOUR LITHIUM-ION BATTERY LIFE
Part 1. Introduction To Smart Plugs

by John Krout

For PATACS+OPCUG

December 14, 2024

PART 1 AGENDA

- What is a smart plug?
- Why smart plugs are useful to you
- Smart plugs were first available in the early 1980s
- Smart plugs control apps
- Mixing brands of smart plugs
- Other forms of smart devices
- Smart Plugs while on the go

What is a smart plug?

Smart plug features

- An **AC plug** for connecting to an AC outlet
- An **AC socket** for connecting any AC-powered device: Lamps, TVs, etc.
- An LED indicating on/off status
- A power switch for manually turning the smart plug on and off
- WiFi communications for remotely turning a smart plug on and off, using a smartphone or a personal computer
- Most smart plugs can turn on/off a 15-amp power draw.

Smart Plug Prices

- BSR X-10 Smart plugs in the 1980s cost about $20 each and provided two-prong AC sockets. X-10 still exists.
- Today smart plugs cost roughly $6 to $10 each in a 2-pack and provide 3-prong AC sockets for added safety.
- Low-cost integrated circuits (ICs) and competition have radically reduced consumer pricing since the 1980s.
- Brands include GE Cync, Westinghouse, Energizer, Leviton, Roku, TP-Link Kasa, Tuya and many others.

Smart Plug Hubs

- X-10, ZigBee, Z-Wave and some other smart plug communication schemes use a central hub instead of WiFi.
- Often the communications hub was adopted a long time ago because Wifi was not yet available
- What is that significant? The hub itself is an extra expense, adding to your cost.
- If the hub breaks down, that failure disables access to all your smart devices tied to the hub.
- I recommend avoiding any brand requiring purchase of a hub

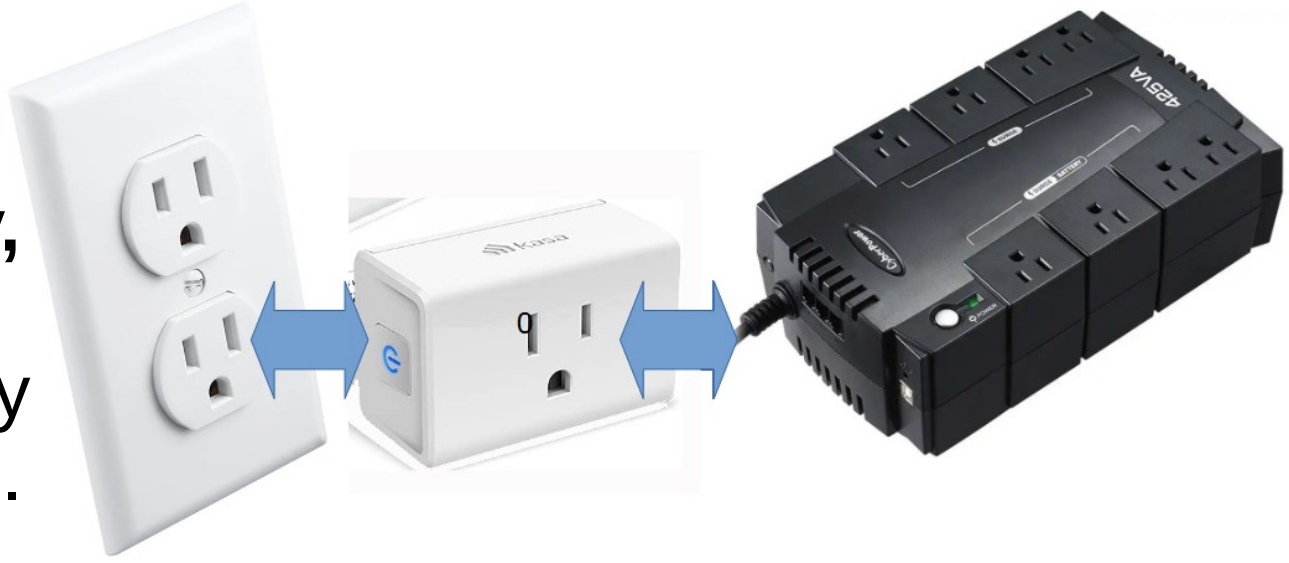
Uses of Smart Plugs

- **Morning wake-up:** Use the smart plug app to schedule your morning coffee maker startup and, during winter, space heater startup.

- The blue arrows show AC power connections.

Uses of Smart Plugs

- **Thunderstorm prep:** for each electronics group, put a smart plug between the AC outlet and the group power strip or the Uninterruptible Power Supply (UPS) and surge protector.
- You can turn off each group faster **remotely,** using the smart plug app, than by physically running to each group.



- Replacing a surge-damaged smart plug is MUCH less costly than replacing a surge-damaged UPS.

What is an electronics group?

Examples in my home:

- **Top floor:** TV, sound bar, Roku box, Blu Ray player, network switch, all powered by a power strip
- **Basement:** Tower Computer, Monitor, Printer, network switch, and two Raspberry Pi computers, all powered by a power strip
- **Living Room:** Router and NAS powered by a UPS
- Anything **expensive** such as a **major appliance**: dish washer, clothes washer, clothes dryer

Use the app to define a smart plug group

- In the app, you can define a group of smart plugs to be **controlled in unison**.
- The app provides a **group switch** you can use to turn on or off the group of smart plugs.
- After defining a switch group including the electronics group smart plugs then, during a storm approach, shutdown takes only a single button tap.

More Uses of Smart Plugs

- **Vacation:** Use the smart app to schedule automatic **“simulated occupancy”** while you are on vacation, remotely turning on and off lights, TVs and so on.
- Remote monitoring of power use by major appliances, so you can tell when an appliance finishes its work.
- **Holiday outdoor lights:** turn on and off on a schedule. Apps even provide a sunset to sunrise schedule option.
- **Smart charging** to extend battery life in a smart watch, laptop, smartphone, tablet, and a Pluggable Hybrid Electric Vehicle (PHEV)

Smart Plugs and Apps

- Many but not all brands of smart plugs now use WiFi to communicate.
- Most brands using WiFi also develop their own communications protocol for sending commands via WiFi.
- Most publish a zero-cost smart plug control app for Android and Apple portable devices.
- A Brand A app will not control Brand B smart plugs, and vice versa, due to incompatible protocols
- Exception: Tuya, HBN, Alastech and other smart plug brands use the **Tuya protocol** and can work with the same app.

Zero-cost apps control smart plugs

- Zero-cost smart plug apps provide:
- A way to create a zero-cost brand account
- A way to activate every new smart plug of that brand
- Basic smart plug remote on/off control
- Smart plug countdown timer on/off control
- Remote advanced scheduled smart plug on/off control (for your coffee maker, space heater, outdoor lights)

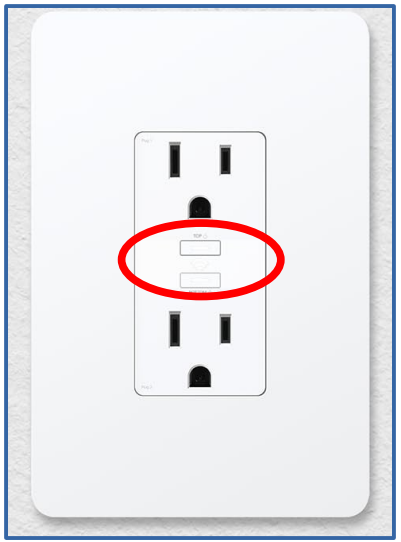
Sunrise and Sunset

- Both of the smart plug apps you will see today, Kasa and Smart Life, allow you to schedule a turn-on or turn-off event at a specific time.
- Both apps also allow you to schedule an event for local sunrise or local sunset, with the option to add an offset interval.
- You either tell the app your zip code, or allow the app to use location services, so the app can determine sunrise and sunset times each day.

Third-party apps

- Third parties have published computer applications for controlling certain brands of smart plugs. Check the Microsoft Store.
- Some smart devices are compatible with voice assistants such as Alexa, Hey Google, or Siri.
- Integration methods have been developed to control multiple smart plug brands: **Thread, Matter, IFTTT, Apple HomeKi**t, and **Samsung SmartThings**.
- Look for compatibility logos on the smart plug box.

Other Smart Devices



Dual smart plug built into wall socket. Local on/off buttons are circled.

Outdoor grade dual smart plugs with local on/off buttons.

Smart wall switch including dimmer and local on/off buttons.

Smart light bulb with dimming and color control. No local switch.

Even more


TUE 10:00AM
56%
72
70 78
Hold 70 / 78 Until 10:23PM
vine


3 USB Ports
6 Individually Controlled Outlets
Surge Protection

Smart plug apps on earlier portable devices

Portable make and model	Operating system	Kasa app version	Smart Life app version
Samsung Galaxy Tab A9+	Android 14	3.3.700	5.17.1
Samsung Galaxy S20 FE	Android 13	3.3.700	5.17.1
Samsung Galaxy S10	Android 12	3.3.700	5.17.1
Samsung Galaxy S7	Android 8	3.3.700	5.17.1
Samsung Galaxy S5	Android 6	3.3.700	5.17.1
iPhone 11	IOS 18.0.1	3.3.701	5.17.3
iPhone X	IOS 16.7	3.3.701	5.17.1
iPhone 5	IOS 10.3	3.2.0	3.34.0

Windows: Win+PRT SCR image file in Pictures/Screenshots

Macintosh: Shift+Command+3 image file in: Desktop

Smart Plugs while on the go

Control smart plugs while away from home?

- I developed a simple test. I disconnected my smartphone from home Wifi, so its digital service was through a cell tower nearby.
- I call this the **Cell Tower Test.**
- I was able to turn my Alastech smart plugs on and off using the Smart Life app on my smartphone during the test.
- I was able to turn my Kasa smart plugs on and off using the Kasa app on my smartphone during the test.

Control home smart plugs while on vacation?

- The smartphone you take along can control those home plugs only while on WiFi or cell tower digital service.
- WiFi and cell towers are not available everywhere.
- Consider installing the smart plug app on something you leave at home, a tablet or retired smart phone.
- Let that home device control your home plugs and simulate occupancy. Make sure the device is connected to charger power.

Take smart plugs with you?

- I brought both Kasa and Smart Life smart plugs from home to connect to OLLI-members WiFi at Tallwood.
- The **Alastech** plug connection to OLLI-members WiFi and took about 30 seconds using the Smart Life app.
- The **Kasa** plug connection to OLLI-members using the Kasa app took careful reading of the app instructions and required typing the OLLI-Members password. Not so easy.
- The Alastech plug re-connection to my home WiFi was also effortless.
- The Kasa plug re connection to my home WiFi took the same level of effort as it did to connect at Tallwood.

The Alastech model YSP102 smart plug

- This is the model that I bought first. It uses the **Tuya communications protocol** for control via WiFi.
- I connected my smartphone to the TA1 OLLI-Members WiFi. I plugged in the smart plug. I ran the Smart Life app and it recognized the YSP102 plug within 10 seconds. The app sent the Wifi name and password to the smart plug via Bluetooth without any prompting from me. Total reconfig time was about 30 seconds. Then my app turned it on and off.
- Its ease of reconfig outside the home is due to the YSP102 plug's Bluetooth for configuration via the smart phone app.

https://smart-life-app.com/

- That web site includes a list of brands and models of smart devices compatible with the app.
- All use the Tuya communications protocol.
- The list is not 100% complete. Alastech is not included.
- Price competition for similar models.
- Some brands and models might not include Bluetooth for configuring the smart plug.

Choose a smart plug brand

- **Decide what you want to do with smart plugs**. That might involve multiple uses. Choose a brand with the smart devices you decide you need.
- **Read reviews of the smart plug apps**. Are the apps reliable? Do the apps stay connected to their smart plugs? Do the apps auto-reconnect after a power outage?
- If you use a voice assistant (Alexa, Google, Siri), then make sure the smart plug models you buy work with the voice assistant you use.

THE END
of Part 1

EXTEND YOUR LITHIUM-ION BATTERY LIFE

Part 2. Duration-based active charging management

Agenda

- In this Part 2, we will look at the Duration-oriented method for controlled charging to extend lithium-ion battery life.
- A simple ten-minute battery charging test for calculating the **battery charging rate**.
- Use the charging rate, the starting battery charge level, and the desired high charge level to calculation **charging duration**.
- Learn how to use two smart plug apps to control charging duration via a smart plug.

Duration-based charging

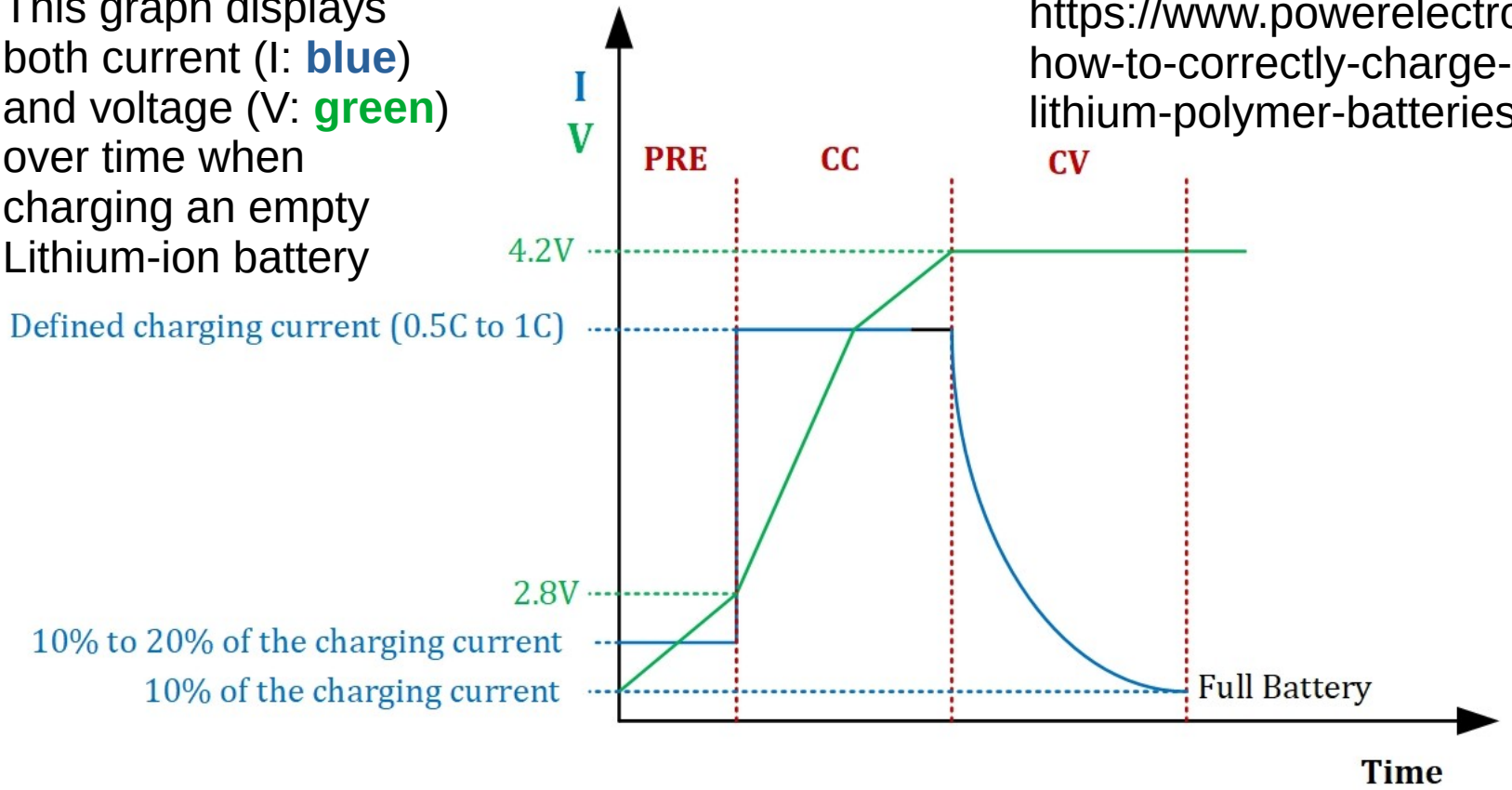
Lithium-ion batteries

- These batteries are widely used in smartphones, tablets, smart watches, and even EVs and PHEVs.
- The mortal enemy of a lithium-ion battery is **heat**.
- Normal charging in the range of 0% to 20% is slow and the unused electricity heats the battery.
- Normal charging in the range of 80% to 100% is slow and the unused electricity also heats the battery.
- In my January 2024 presentation, I showed you that some Android phones and iPhones have built-in optional limiters to prevent charging in the 80%+ high range.

Lithium-ion battery charging curve

This graph displays both current (I: **blue**) and voltage (V: **green**) over time when charging an empty Lithium-ion battery

Source: https://www.powerelectronicsnews.com/how-to-correctly-charge-the-lithium-ion-lithium-polymer-batteries/



Advantages of duration-based charging

- The software to control duration-based charging exists and costs nothing.
- The software is independent of the brand, model and the operating system of the device being charged.
- Anything that can be charged and that reports its charge level can be charged to a desired high charge limit.
- You can carry around the smartphone or tablet running the software, so you can see when the charging countdown finishes.

Definitions

- A **Battery Alarm app** informs you when your device battery charges to a configurable high level or discharges to a configurable low level
- A **Battery Management app** informs you but also stops battery charging at a configurable high level and starts charging at a configurable low level.
- Both app types sleep for several minutes to minimize their impact on the battery, wake up to perform the battery status check, do notifications and charger control if necessary, and then sleep to repeat the process.
- Some apps also let you configure the sleep duration.

Charging options for my Samsung Galaxy Watch 4

- There is no *built-in* option to stop smart watch charging at the high end.
- There is a configurable alarm app pair: one for my watch, one for my smartphone.
- There is **no active battery management app**, to stop charging automatically when the battery charges to a high level.
- Both may become available in the long run. Alarm apps are very similar to active battery management apps.

How can a smart plug app help?

- Smart plug apps I have tested include the ability to run a **countdown timer** for a smart plug, and turn off the smart plug at the end of the countdown.
- Through observation of my smart watch charging, I found that my smart watch can charge at a rate of **0.70% per minute.**
- My watch face displays the battery charge level so I know when I have to start charging.
- That duration does vary a bit. Why? Primarily the position of the wireless charger disk relative to the smart watch induction coil. Off-center slows down charging time.

Smart Plug app features

- Both the Kasa brand app and the Smart Life app provide a **countdown timer** control for each smart plug activated with the app.
- You can start a countdown timer for one smart plug, and then start a separate countdown timer for another smart plug using the same app.
- The apps also provide configurable time-of-day Events to turn on and off smart plugs automatically.
- The apps provide Sunset and Sunrise Events, ideal for turning on and off outdoor decoration lights.

Find your Charging Rate

- The charging rate is meqsured in units of battery charge level % per minute.
- Check the starting charge level %, charge for 10 minutes, and check the ending charge level %.
- My smart watch charges 20% to 80% in about 85 minutes, so the rate is 60% / 85 = **0.70% / minute**
- My Windows laptop charges at a rate of **1.25%/minute**
- My Pluggable Hybrid Electric Vehicle (PHEV) charges at a rate of **0.25%/minute** on my portable AC-powered charger. The rate will be different on Level 2 chargers.

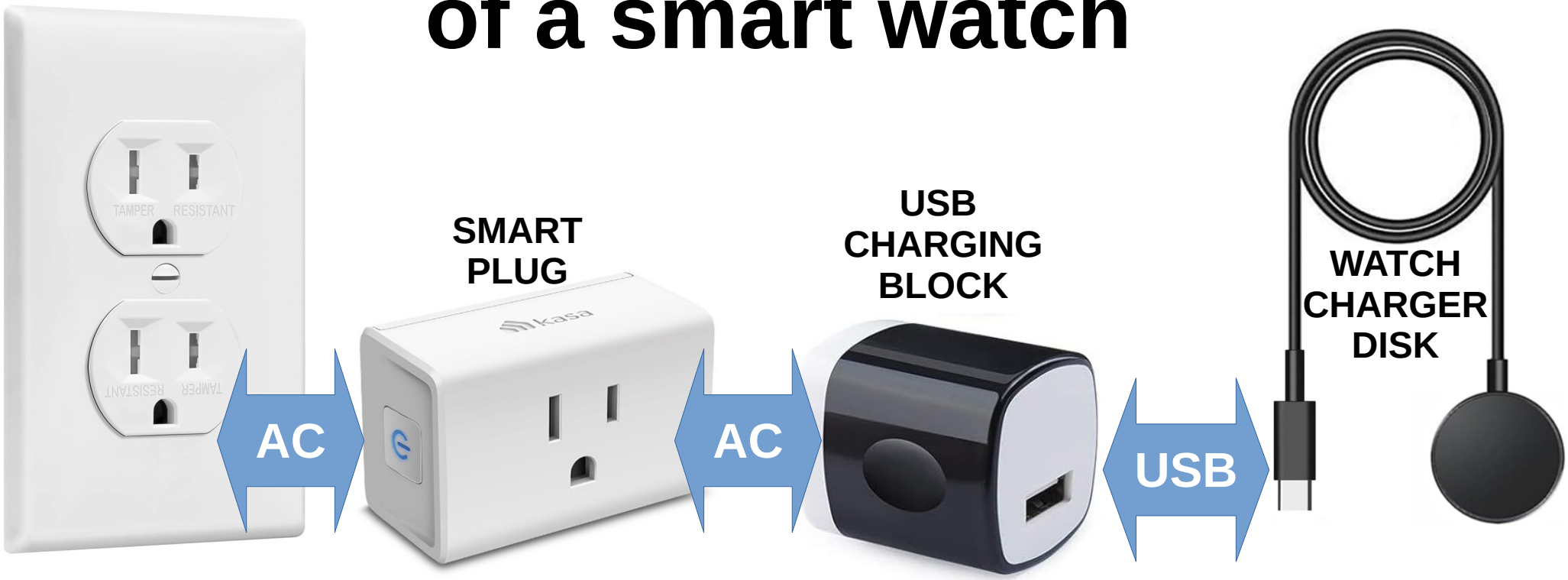
Figure out your Charging Duration

Use the charging rate to figure charging duration

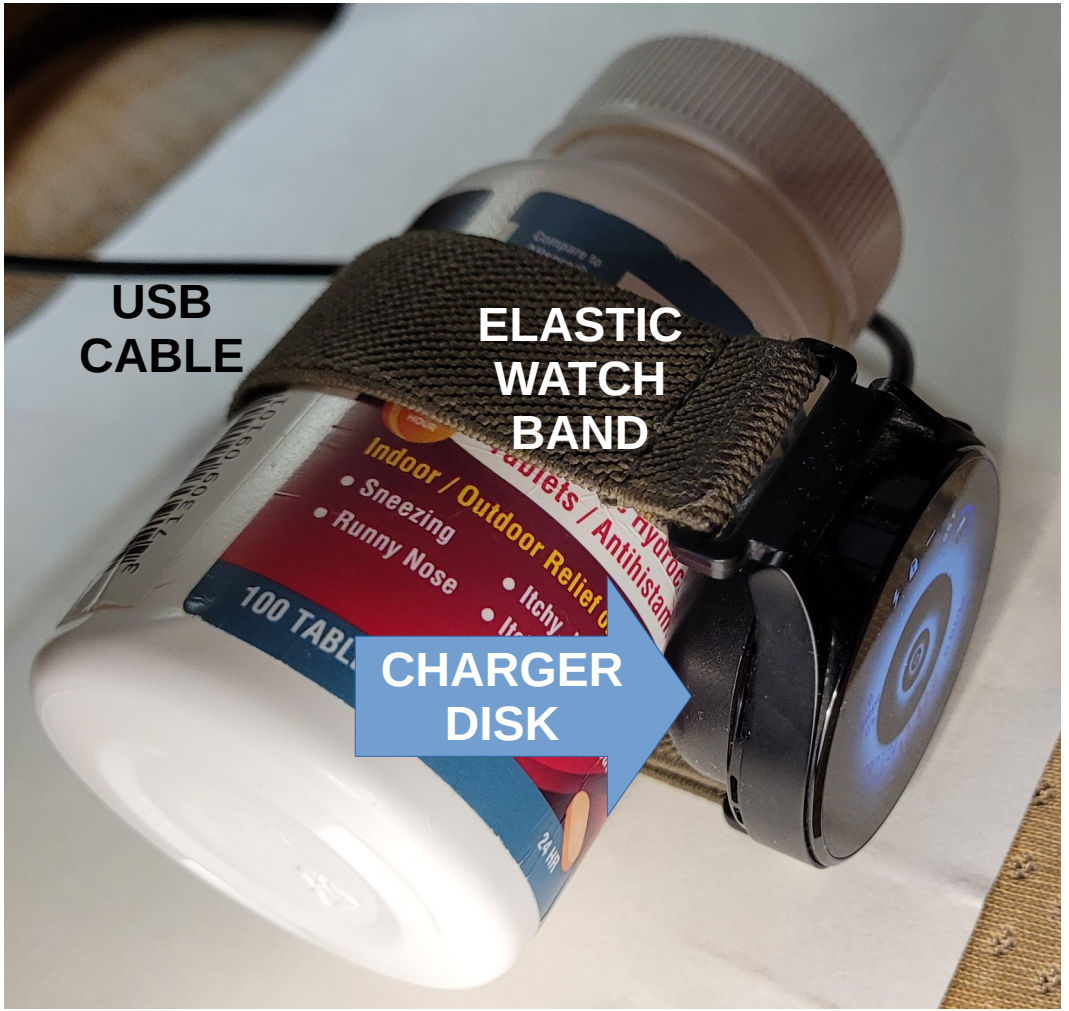
- Duration in minutes = (End % - Start %) / rate
- **Smart watch:** charging **from 50% to 80%** will take (80 - 50) / 0.70 = 30 / 0.70 = **42 minutes**
- **Windows 10 laptop:** charging **from 35% to 75%** will take (75 - 35) / 1.25 = 40 / 1.25 = **32 minutes.**
- **PHEV:** charging **from 30% to 80%** will take (80 – 30) / 0.25 = 50 / 0.25 = **200 minutes.**

Charging using a Smart Plug

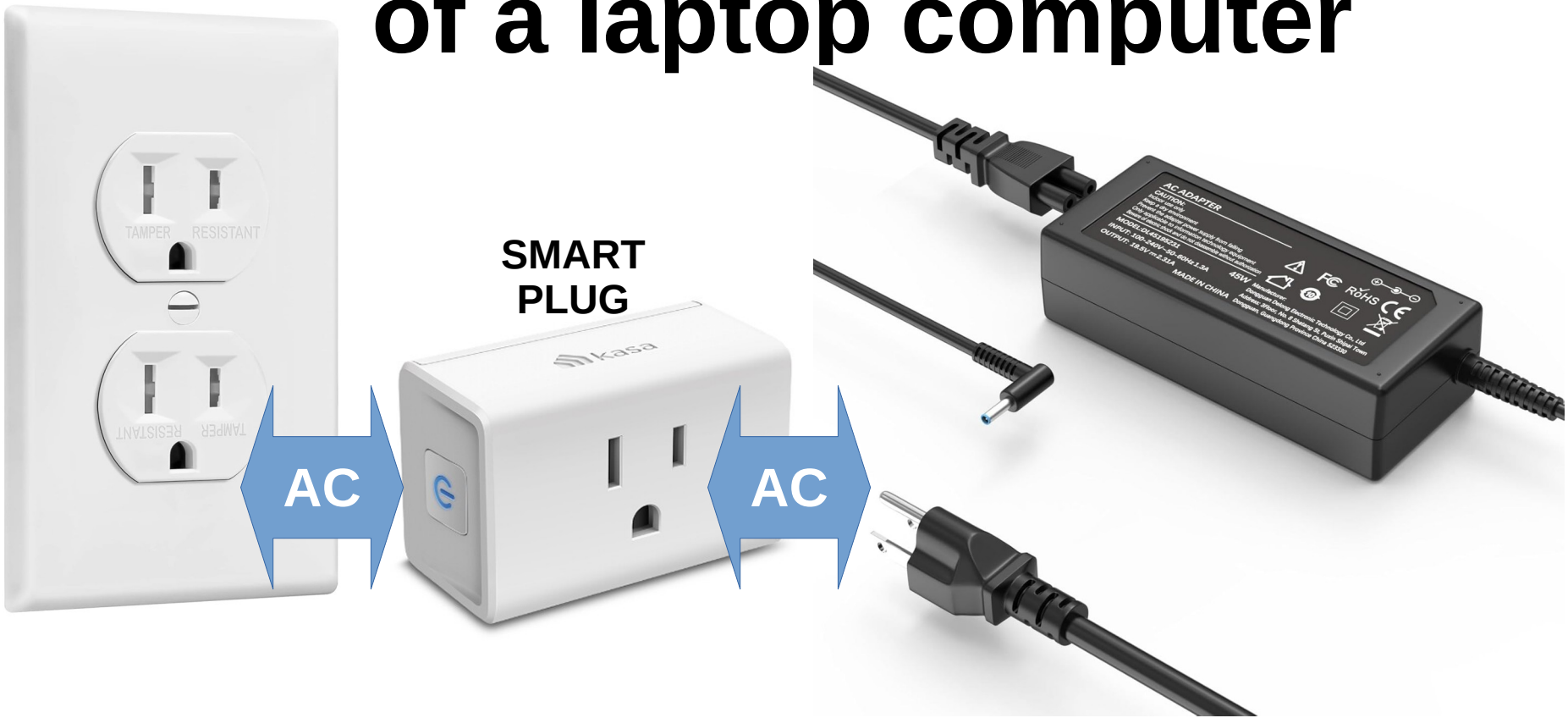
Hardware connections for duration-based charging of a smart watch



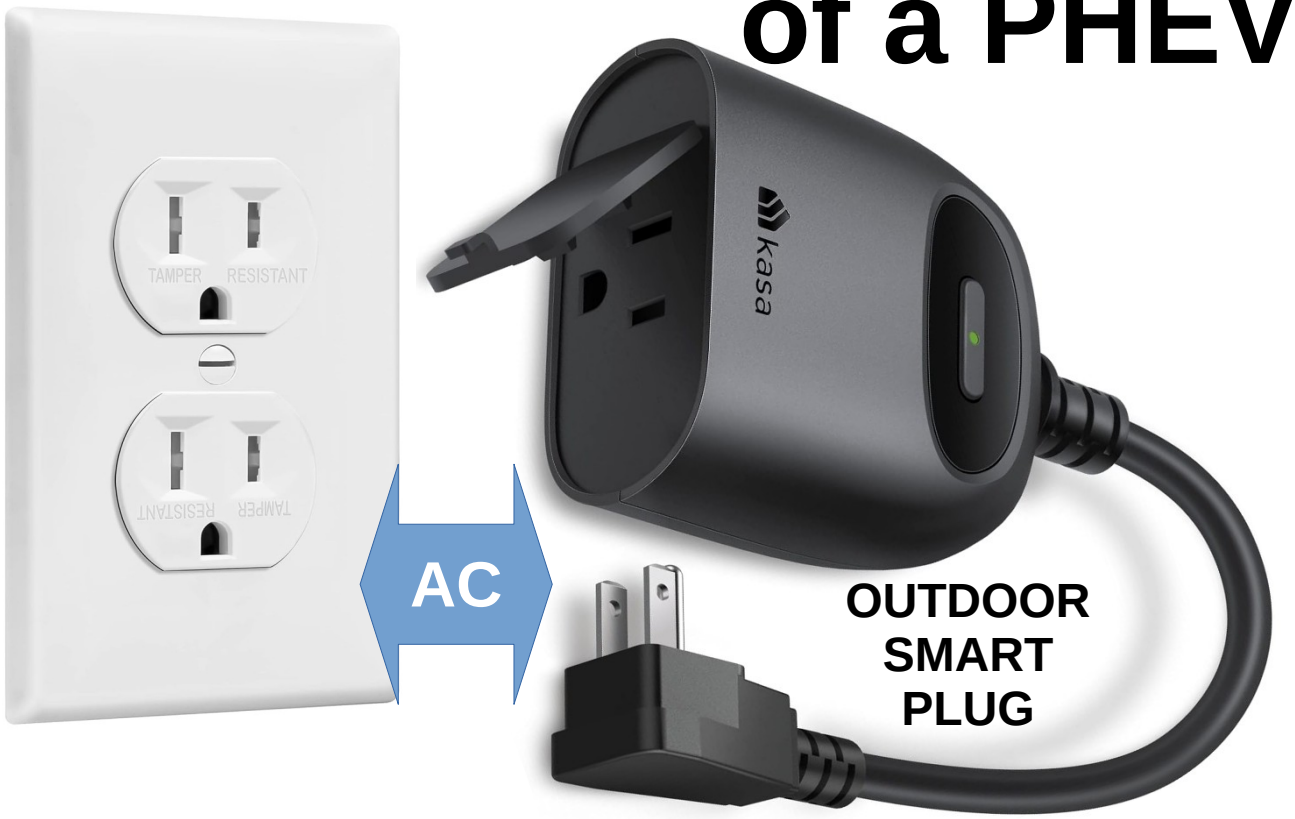
My smart watch charging rig



Hardware connections for duration-based charging of a laptop computer



Hardware connections for duration-based charging of a PHEV

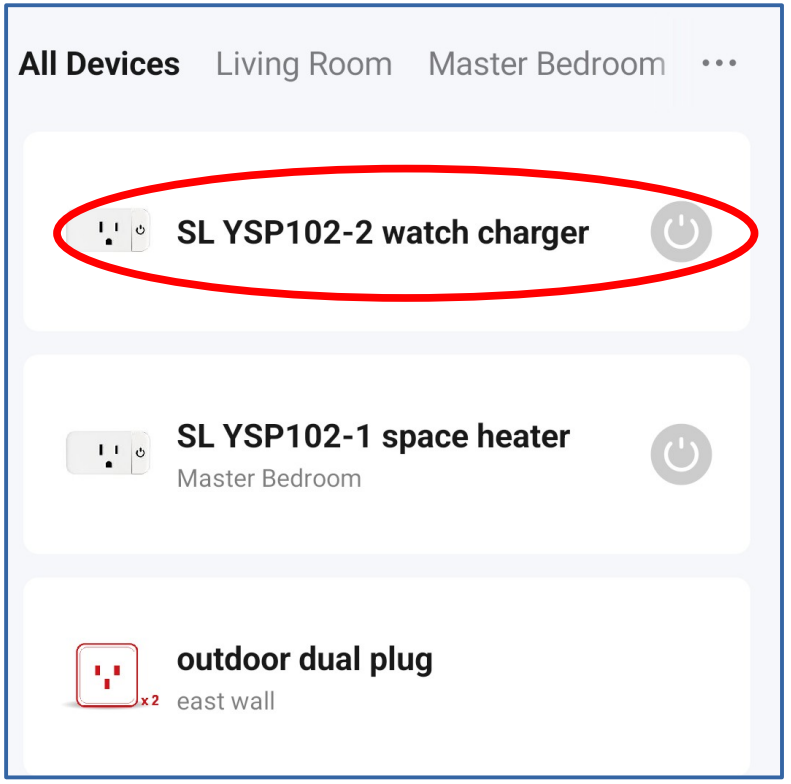


Before you purchase an outdoor smart plug, check the spot where you intend to use the smart plug. Make sure your WiFi signal reaches that spot.

Control charging duration using the Smart Life App for Tuya-compatible smart plugs

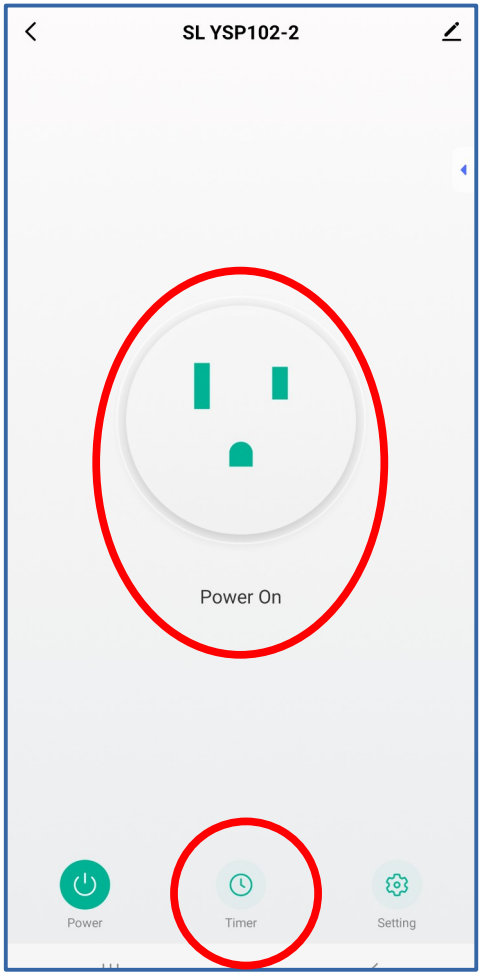
Smart Life App main screen

- Displays a list of all smart devices activated using the app and your app account.
- Each device has a user-defined name.
- Tap the smart plug used for charging your device. A screen specific to that smart open opens, with a countdown timer option.



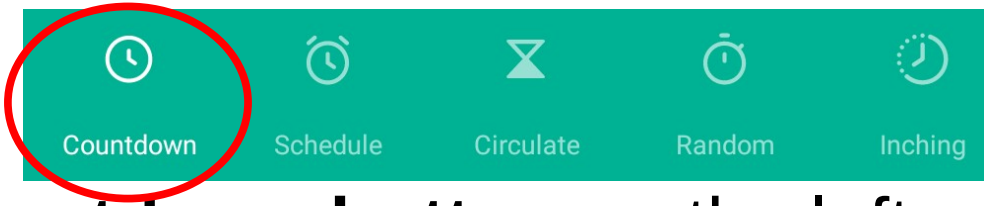
The Smart Plug Screen

- The main screen tap opens the Smart Plug screen
- The screen enables you to turn on or off the smart plug remotely using the **big Power button in the center**.
- Turn the smart plug ON ***before*** setting the countdown timer.
- The **Timer button at the bottom center** provides access to automation controls.



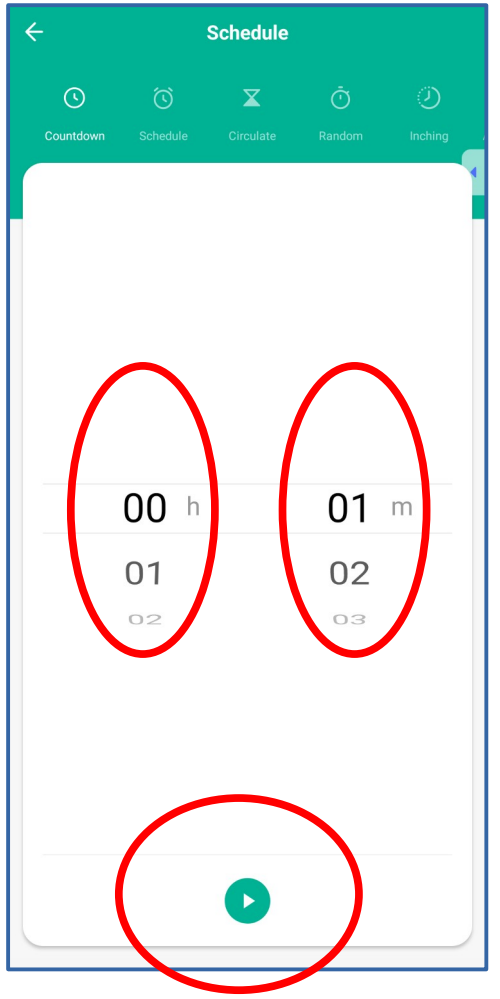
The Timer screen

- The timer screen has buttons across the top for using various automation features.



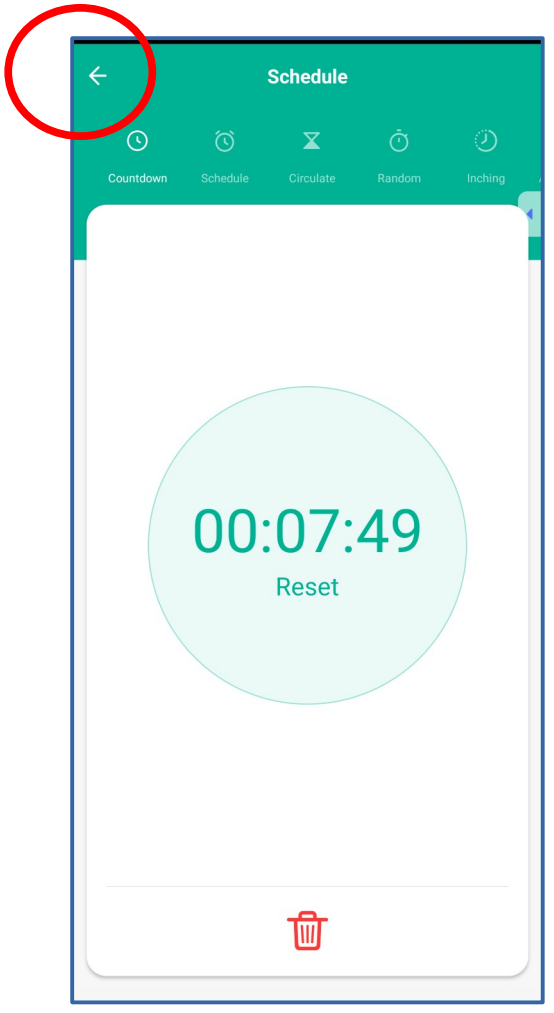
Tap the **Countdown button** on the left.

- The screen displays an **Hour dial** and a **Minute dial**. Drag them up or down to set the countdown duration.
- FINAL STEP: tap the START button at the bottom.



The Timer screen

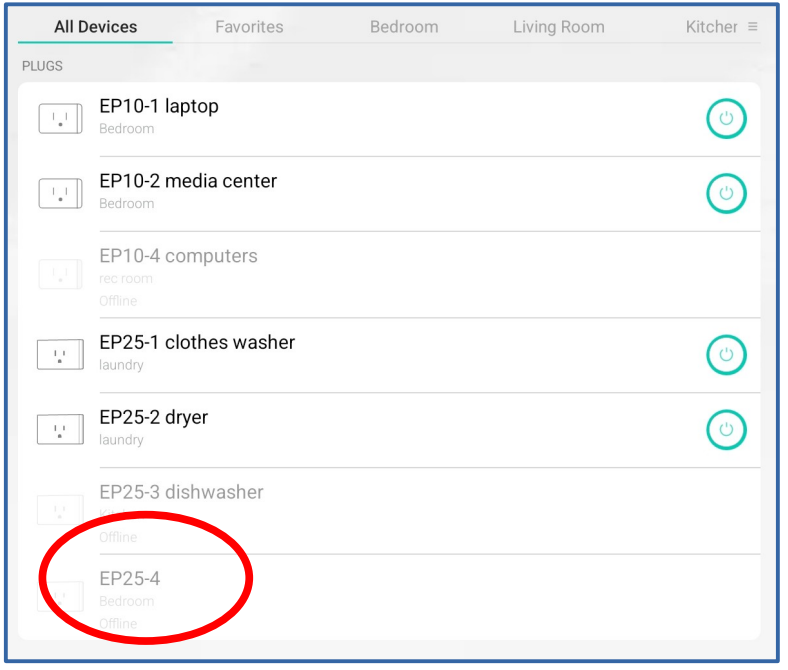
- A **countdown clock** replaces the dials.
- The screen has options to reset the countdown and to stop the countdown (red trashcan icon at the bottom).
- Because you turned on the smart plug first, the app will ***turn off*** the smart plug at the end of the countdown.
- If you wish, you can tap the left arrow at the top left of the screen to return to the main screen and work with a different smart plug.



Control charging duration using the Kasa app

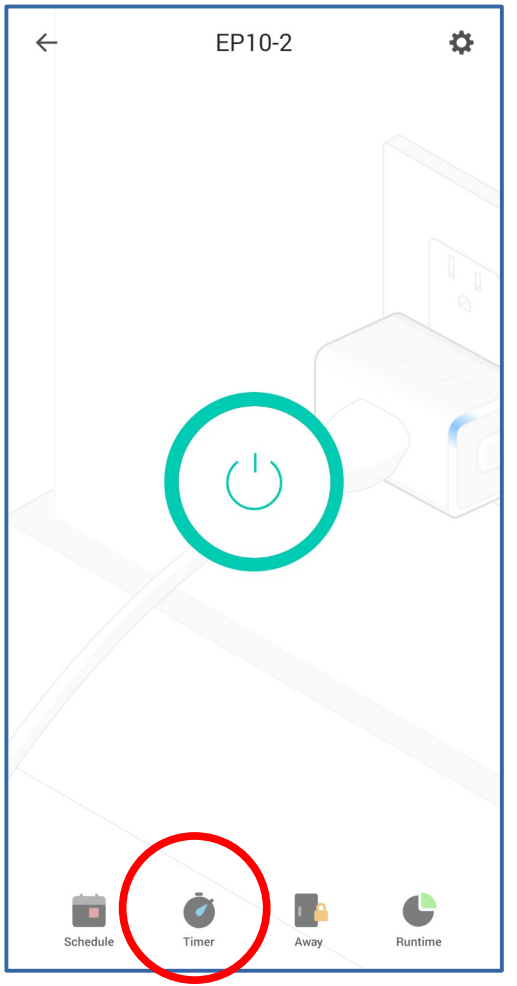
Kasa app main screen

- Displays a list of all smart devices activated using the app and your app account.
- Each smart device has a user-defined name.
- The green circle to the right indicates the smart plug is ON.
- Tap the smart plug used for charging your device. A screen opens for control options for that smart plug, including a countdown timer.



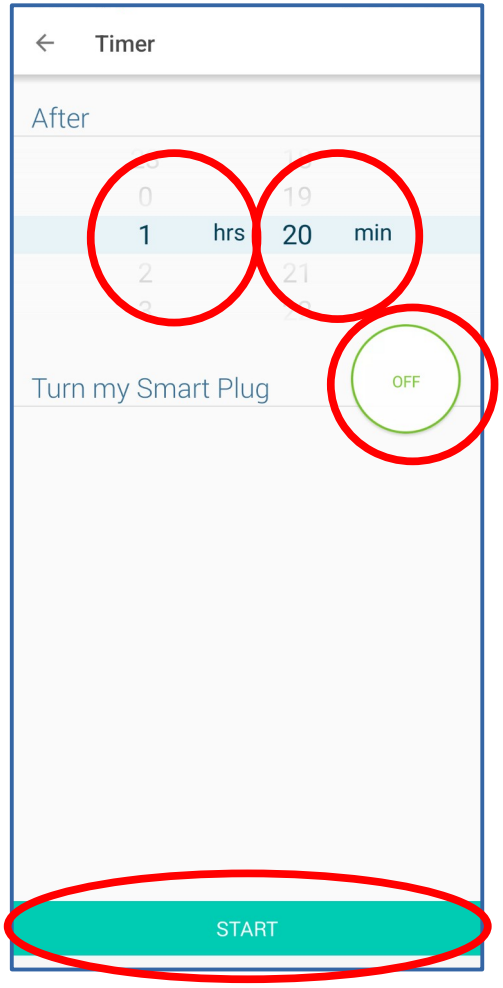
The Smart Plug screen

- The big button in the center displays smart plug ON/OFF status. The big green circle says this one is ON.
- Tap that big button to turn the smart plug OFF or ON.
- Turn it ON to begin charging.
- Tap the Timer button at the bottom.



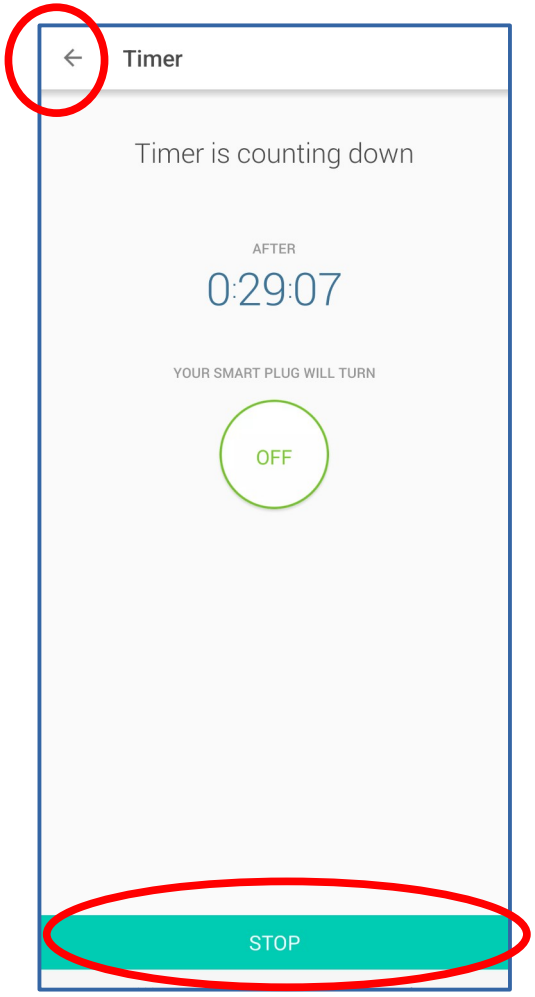
The Timer screen

- Tap set timer duration, drag the Hours dial and the Minutes dial up or down.
- Below that, tap the Circle to tell the app what to do when the countdown is done. Each tap toggles between ON and OFF.
- As depicted, the smart plug will be turned OFF.
- FINAL STEP: Tap the START button at the bottom of the screen.



The Timer screen

- The screen displays a countdown clock and the action to be done when the countdown is finished.
- As depicted, the action is to turn the smart plug OFF.
- If you want to stop the timer, tap the STOP button at the bottom of the screen.
- Tap the back-arrow at the top left to select another smart plug and set its timer.



Other app behaviors

- Both apps require you to create a **zero-cost app account**. The account has at least two benefits.
- Your account prevents people who break into your Wifi from detecting or controlling the smart plugs.
- You can install the app on tablets and retired smartphones, and use the same account in the app on those devices. The app on each device will then automatically show you all the same smart plugs you activated with that app.
- The accounts allow the brand's server farm to relay info between you on the road and your smart plugs at home.

The Kasa app

- A zero-cost app for Apple and Android portables.
- Control Kasa brand smart plugs and other smart devices.

Windows: tap **Win+Prt Scr**
Saves screen image to **Pictures/Screenshots**

Macintosh: tap CMD+Shift+3
Saves screen image to **Desktop**

The Smart Life app

- Zero-cost app for Apple and Android portables.
- Works with all brands and models of smart devices that use the **Tuya** communications protocol.
- Includes sunset and sunrise scheduling features.

Windows: tap **Win+Prt Scr**
Saves screen image to **Pictures/Screenshots**

Macintosh: tap CMD+Shift+3
Saves screen image to **Desktop**

Kasa EP10 Smart Plug prices on Amazon 12/13

- Kasa EP10 is the #1 best selling smart plug on Amazon
- Because of that popularity, developers create custom Windows or Mac software for controlling EP10
- Single EP10: $7.99
- Box of two EP10s: $12.99 (6.50 per EP10)
- Box of four EP10s: $22.99 (5.75 per EP10)

THE END