



JUUL2 refill hacking result

JUUL2's pods refilling hack



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This article has been written for educational purposes and in fact it lacks the workaround to bypass the device protection system that prevents the pod can be refilled and used longer than its factory designed life-span. Bladerunner's Nexus-6 replicates had less fortune about extending their life, except one of them and here we are!

JUUL2 INTRODUCTION

The JUUL2 is a vaping micro-device that is well-known in the UK and UAE but it cannot be found in Italy. It is a quite old device compared to others but it is a fascinating piece of technology that aged very well.

In the UK, the device is sold for £9.99 with two 1.2 ml pods (*) while two pods are priced £6.99 or four for a little less £12.99. In Euros, it is currently +19%

more expensive. To have a fairer conversion, the real-life cost index is better.

You might argue that it is quite costly also compared to ElfBar which is true. However, considering the prices of cigarettes in the UK, the whole market included all the devices which are an alternative for cigarettes are not cheap (**).

Because the JUUL2 is a fascinating piece of technology, it deserves being hacked.

Notes about prices and business

- (*) The starter kit price may vary, between **£9.99 and £5.00**, and also the price for the pods can vary between **£5.99 and £6.99** which is much lesser discounting compared to the starter kit. This shows that the JUUL2 business is strongly related with the pods supply rather than with the device selling. Therefore a hack that allows their users to refill their pods, it might seem a direct and feral attack to their core business but, it is not at all. In fact, reading the next note, it is possible to get aware about WHY people choose to use JUUL2 and stay stick to its original expensive pods despite there being way cheaper refilling alternatives.
- (**) It is interesting to note that 10 ml of e-liquid at 18 mg/ml nicotine rate can be bought in the UK for **£1.49 - £2.99** which is a lot less than ElfLiq in Italy €3.79 - €7.00. So, we need to ask ourselves why people in the UK are paying hugely more for the JUUL2 and its pods rather than buying an **Elfbar ELFX Pod Kit at £14.99** and save a lot with compatible liquids. Mainly because JUUL2 is a nice piece of tech and it works beautifully plus their liquid tastes wonderful (aka best in class) and secondly because we can buy it and immediately use it, without reading instructions nor dealing with any liquid, refilling and learning how to vape.

Despite, it seems obvious how to operate an ElfX to every vaper and how to aspire from a 30W device, it is not obvious at all for those who are used to smoking cigarettes. Instead, JUUL2 is the nearest alternative for traditional smokers. Plus, it is concealable as a USB dongle.

The only reason to recharge their pods remains that JUUL2 can be concealed as a USB dongle which can be useful for those vapers that are keen to use a more sophisticated refillable solution but they cannot carry with them or use it everywhere.

In particular, the best home-made e-liquid that I managed to create cannot beat their original pods wonderful taste - I love their Crispy Menthol taste - and factory made e-liquid do not perform better than mine own specific recipe into JUUL2 refilled pods.

However, if you found an e-liquid or achieved a comparable result in this domain of knowledge, please let me know. In particular, like JUUL2 Crispy Menthol pods taste or alternatively like Heisenberg by Vampire Vape but for JUUL2 pods refilling.

JUUL2 A MIGHTY DEVICE

The device is very light and with the full pod weights 16 gr. which is great. The battery is a 328 mAh but in the £9.99 is included a very fashionable and practical USB charger plus two pods that would cost £6.99 by themselves.

Its USB-A charger is a small platform 18 x 18 mm with a magnetic attachment to catch the device recharging it by two pins/plates connections. You can see the recharging plates at the bottom of this image in attachment.

The JUUL2 device size is 7 x 16 x 97 mm including the pod attached. Its shape is not a perfect rectangle because at its top the size is a 1 mm smaller each size. Reading this claim, you might argue that the difference between 7 x 16 mm and 6 x 15 mm cannot be noticed at all but if you look at the image, it makes the device look sleekly sharp.

This special attention in its design, tells more than you think to the customers but also to those who are able to appreciate these details as much as the colors used: business gray with a good feeling touch for the aluminium body and charcoal black for the pod which becomes transparent in front of a light.

Extremely classic and at the same time looking like some kind of worry-less USB device in the parents' eyes.

It comes with mini multi-colors 4-led strip and bluetooth connectivity, both controlled by an internal accelerometer. Its software is very good with little space for improvement. The device can be locked when not used or also for child protection. It also has a mobile app for this stuff.

- **Name:** JUUL2
- **Producer:** JUUL Labs, since 2015 in US
- **Generation:** the 2nd, since Q3/2021 in the UK
- **Size:** 7 x 16 x 97 mm with a pod attached
- **Weight:** 14 gr. + 1 pod = 16 gr.
- **Display:** 4 multi-colors led strip
- **Battery:** 328 mAh, rechargeable
- **UI/UX:** driven by its internal accelerometer
- **Connectivity:** Bluetooth activated by a shaking sequence
- **Charging:** by its included USB adapter with magnetic grip

Despite the software being very good in terms of UI/UX, I managed to block it, putting the device out of order. Fortunately, it does a reset after the battery has been completely discharged and this fixed the issue. Nice of it!

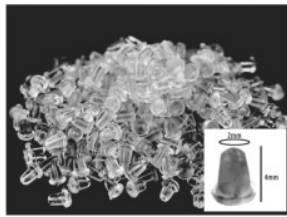
JUUL2 PODS REFILLING

Long story in short: JUUL2 device deserves being hacked. The pod refilling which implies by-passing the software limitation, it is the primary one. Apart from the "software workaround" everything else is about doing real stuff in a real world.

1st step: dig a hole

To refill the pod, it is necessary to open a circular 2 mm hole without damaging the pod nor let the plastic enter in it or we will smoke it. For such a task a Lafayette soldering station for fine electronics makes the magic.

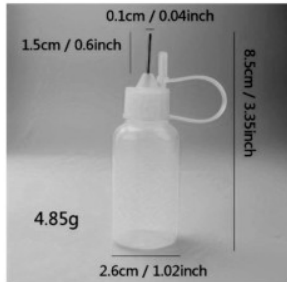
JUUL2 REFILL KIT & MANUAL



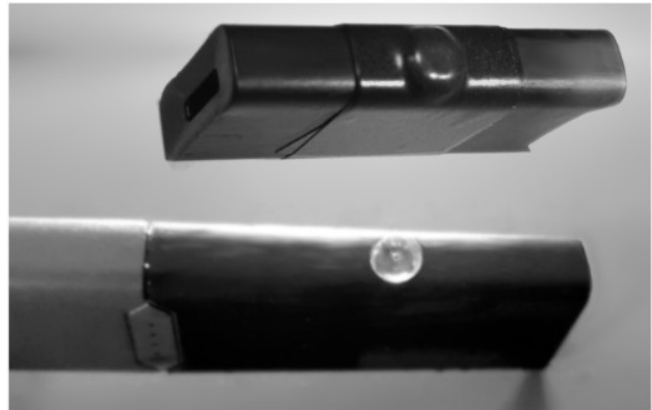
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0,89€ (€2) 3,79€ (€)
Free shipping on all orders | Limited time offer
Quantity: 2pcs 4 Pcs 6pcs 12pcs 2pcs-Soft



JUUL2 Refill Kit & Manual

This kit costs €3.76 and contains the indispensable tools for repeatedly doing this task. However, considering deploying a refilling hack for each pod, then it is possible to provide 500 hacks for €3.99. Instead, for applying the hack, the tools are depicted in the image in the header at the top of this article.

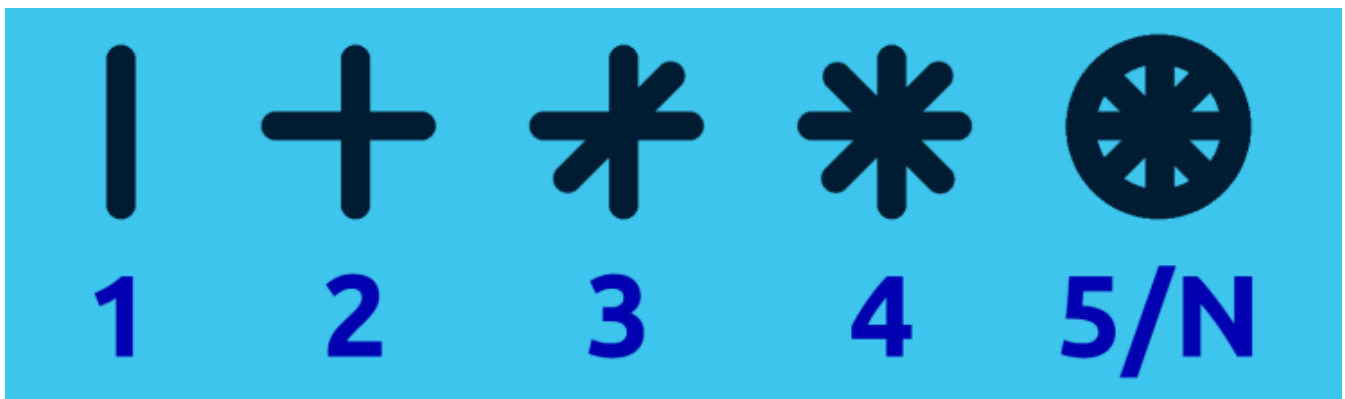
2nd step: seal the hole

Closing that hole to prevent the liquid leaks is the second step. Fortunately, Chinese mini ears-plugs cost nothing and fit fine in the role. A black insulating duct tape was my first temporary choice for keeping the small cap in place and preventing leaks. It showed to be re-usable because its glue lose some

grip with the svapo liquid and the tape gets softer but for these reasons it becomes even more suitable for the role. Lucky me!

3rd step: keep a log

Adding a narrow UV-fluorescent band will help to find the device in a dark room plus it adds the space for keeping a refills log adding bars for concentrating the information:



Compact notation for refill counting log

When the first star is completed, a second one can be added. In this way a single character space keeps 4 refill counts. How many times does the same pod can be refilled before the need of changing it? Usually 4 refills: just a star into a log. Two stars are 8 refills. Circle the stars and they are gone and the next pod in place.

4th step: the proper liquid

Providing ourselves with a proper liquid is essential because the multiple-times JUUL2 pods refilling is not just a proof-of-concept but it should be functional, also. Hence, due to the peculiarity of this device, using a specific liquid is strongly suggested.

The ElLiq works but it is not cheap and moreover, are we hacking the JUUL2 and using for its pods refilling just a competitor branded costly factory-tuned liquid instead of creating our own blend? Really? I do not think so!

In general a 50:50 mix of VG:PG seems working. Due to the relatively small quantity of the vapor produced, a high nicotine salts rate is also suggested. Like 14 mg/ml (original 18 mg/ml) and also using a double concentration of aroma. In fact, the great taste of the original pods relies on the liquid despite their very tiny internal resistance performances.

We can agree that the JUUL2 pods 1.6 Ω micro svapo resistance is also a tiny piece of cake but it has NOT been designed to be reused nor used for a long time. The 1st JUUL generation pods had 0.7 ml of liquid. After 4 refills, it lasted 8.5x times more its life-span design time. After 8 refills, it had served 9.6 ml in total.

5th step: the liquid recipe

Tiny things require tiny solutions and moreover simplicity is a key factor which can bring some money saving also. After all, mixing a lot of components makes sense in creating large quantities of liquid (e.g. 100 ml) which is not good for testing experimental recipes.

First of all we can notice that 10 ml at 20 mg/ml makes 200 mg and the nearest integer to the square root of 200 is 14 by a 2% error. This means that we can add 4 ml to 10 ml nicotine booster in order to get a 14 ml liquid at 14 mg/ml. The second aspect is about balancing the VG/PG ratio to reach something as near as possible to 50:50.

- 10 ml salt nicotine 20 mg/ml in 70:30 VG:PG solution
- 2 ml of your favorite aroma in PG equivalent to 14% dilution
- 2 ml of menta-ice-menthol aroma in PG equivalent to 14% dilution
- few crystals of real menthol for sauna/humidifier as bonus

It is easy to check that 7 ml VG + 3 ml PG + 2x2 ml PG is a perfectly 50:50 balanced liquid and this liquid will make popping sounds like the JUUL2 original pods liquid.

6th step: dosing the liquid

Because an insulin syringe usually contains 1 ml, as you can imagine you can use it for a preparation of 7 ml of this receipt. Also dosing half of a syringe is still comfortable, hence you can try with a 3.5 ml of liquid.

Just notice a few but relevant of facts about the needle:

- preferably, provide the insulin syringe with an additional 15-18 Ga flat needle
- the flat needle will protect you and also the pod internal from accidental puncture
- the flat needle cannot be too small, its internal diameter for a 18 Ga is 0.84 mm
- the flat needle should be smaller than the 2 mm hole, and 15 Ga is 1.83 mm
- liquid sucking from the bottle, then air expulsion from the pod are key factors

Hence, in case you have to buy new, the best matches are 16-17 Ga flat needles:

Needle Size	Ext.D. (mm)	Int.D. (mm)	N.Walls (mm)	N.Dead Volume (μ L / mm)
18 gauge	1.270	0.838	0.216	14.011 / 25.4
17 gauge	1.473	1.067	0.203	22.715 / 25.4
16 gauge	1.651	1.194	0.229	28.444 / 25.4
15 gauge	1.829	1.372	0.229	37.529 / 25.4

Syringe Needles Specification Table

7th step: menthol in crystals

Using a special liquid additionated with real menthol from crystals, the number of refills doubles. Why? The menthol has the tendency to create deposits and these deposits clogs the most common e-cigarettes aspiring sensor conduct. This cannot happen in the JUUL2 pods. Instead the menthol sediments are preventing the cotton pyrolysis which is the humid part of the vaping resistance embedded in the pod.

However, some people can have a kind of reaction to real menthol and they might not know about it because the e-cigarettes liquid does not use it for the menthol flavor but something that mimics its taste which is the perception of one of the menthol actions. Hence, be very very careful in dealing with menthol in crystals. It is not for kids, even as passive smoking.

Moreover, with a conservative experienced dosing, putting a few tiny crystals in 10 ml can be fine. Being precise with small and smaller volumes of liquid becoming hard and harder. Hence in doing the 3.5 ml tries add the menthol after having put it into a liquid base.

Imagine that you wish dosing menthol at 25 mg/ml, then you have to put 5.5 gr = 5.500 mg into 10 ml of pure PG then you have 550 mg/ml concentration. A pure PG drop is about 0.04 ml which at this concentration brings in 22 mg.

- Hence four drops (0.04 ml each) in 3.5 ml are 88 mg in 3.5 ml = 25 mg/ml
- Four drops brings in about 0.16 ml in PG to 3.5 ml liquid, which is 4.5% unbalance.

8th step: making a special aroma

The best solution is creating a specific aroma that contains the correct amount of menthol in such a way that there will be no relevant variation in dosing nor any unbalance among components. Which is not the main problem rather than 0.04 ml for drop is a poor precision accounting. For example:

- 6 ml of your favorite aroma in PG
- 6 ml of menta-ice-menthol aroma in PG
- 750 mg of crystal menthol (*)

Please notice that real menthol at 25 mg/ml is a concentration 2x stronger (*) than the average. Which is fine on this special liquid in which every concentration {nicotine, aroma, menthol, etc.} is 2x stronger than the average liquid for vaping. After all, 1.6Ω provides 2x lesser vaping volume than the most common impedance 0.8Ω used.

The volume of 12 ml has been chosen because it is an integer number of 4 ml doses but you can choose to prepare 8 ml of aroma with 500 mg or 4 ml with 250 mg. In order to deal with an under-gram precision, we need a weight scale with 1/100 gr precision. Unfortunately these kinds of cheap electronics weight scales' firmware is buggy and we need to pay attention about [this](#) and [this](#). In short: weight many times, not just once and each independently to the others.

9th step: tune your own recipe

(*) At this concentration the liquid becomes denser than supposed to be for a 50:50 mix, hence it would be necessary to add some more PG, at least 1 ml in the final 10 ml product which is equivalent to use 5 ml instead of 4 ml but with the same menthol 750 mg absolute quantity. The menthol concentration in the mixed-aroma will be lighter but more aroma will be added in order to add more PG to the final product.

Everything all above considered, it cannot be provided a final recipe because it is a matter of taste, plus our taste is going to develop along the time. However, the general principles are always the same: balancing the components in a way that it is easy and practical to mix among them without making relevant mistakes.

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