

The Cove Key

User guide

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A guide to your recovery keys in Cove Wallet: what they are, how to write or stamp them, where to keep them, and how they bring your assets back.

> **The example key in this guide is public.** Every row shown here comes from a published test key. Never use it, and never put assets in a wallet whose key you've seen printed, photographed or shared anywhere.

1. Why your keys matter

Cove Wallet is **self-custody**: your assets are controlled by keys that are created on your phone and your Cove Card, and only you hold them. Cove (the company) never has them. That means nobody at Cove can freeze your assets, and nobody at Cove can recover them for you either.

So if your phone is lost, broken or stolen, what brings your assets back is **something you keep yourself**: your Cove Card, and your recovery keys written on paper or stamped in metal.

2. The keys in your Cove Wallet

Key	What it's for	Where it lives	Do I write it down?
Wallet recovery key	Restores your wallet (Spend) on a new phone, and is half of what can move Save without the card	Made on your phone, shown once	**Yes, always**
Save recovery key	With your phone (or the wallet recovery key), moves Save if your card is lost	Made on your phone when you set up Save, shown once	**Yes, always**
Save's own key ("card backup")	The key inside your Cove Card. It counts as your card: **with your phone, or with your Save recovery key, it can move Save**; alone it can't. It can also make a backup card	Made by the card itself, shown once during Save setup	**Yes, recommended**: cards can be lost or damaged
Duress wallet key (optional)	Restores the duress wallet on its own	Made on your phone, shown on request	Optional: your Cove Card can also bring the duress wallet back

Your **Cove Card** is a key too, kept inside the card's secure chip behind its own PIN. The card shows it once during Save setup, as Save's own key (above), for you to write down; Cove never stores it.

Two keys during Save setup. Setting up Save can show you two keys, one after the other, and they're easy to mix up:

1. **Save's own key** ("KEY 1 OF 2"): the card's key. Anyone with it has your card, so treat it exactly like the card: with your phone or your Save recovery key it moves your savings. Write it down: with your wallet recovery key and your Save recovery key that's three keys, each kept in a different place. You can skip it, but it can't be shown again.
2. **Your Save recovery key** ("KEY 2 OF 2", or the only one): the lost-card key, made by your phone. It can't move anything alone; with this phone (or your wallet recovery key) it moves Save to Spend if your cards are gone.

When Save is ready, Cove lists what you're keeping and what each one can do on its own.

Keep your keys apart. Each one is harmless on its own, but any two of your wallet recovery key, your Save recovery key and Save's own key can move your savings (Save needs two of your card, your phone and your Save recovery key, and these keys stand in for them). Store them in different places, never in the same envelope, drawer or photo. With a co-signer, none of them can move Save without your co-signer too.

3. What a Cove Key is

A recovery key is 24 words from a standard list of 2,048 words (the BIP-39 list, used by most wallets). Cove writes those same 24 words in a shorter, sturdier form: the **Cove Key**.

Each word on the list has a number, 0 to 2047. Written in hexadecimal (the digits `0-9` and the letters `A-F`), every number is exactly three characters, from `000` to `7FF`. The Cove Key puts two words on each row, with a two-character **check** at the end:

```
row   word  word  check
 1    345   1E7   85
 2    559   223   BD
 3    124   1CF   7A
 4    559   450   BB
 5    65C   71B   13
 6    595   0CC   76
 7    347   297   9E
 8    326   6F9   B0
 9    43C   1F1   9F
10    418   7EB   D4
11    63A   39B   43
12    1CF   400   94
```

The public example key. 12 rows × 2 words = all 24 words.

- **It's the same key, not a new one.** The Cove Key is your 24 words written as numbers. It restores the same wallet as the words, in Cove or in any XRP Ledger wallet that accepts a 24-word phrase.
- **It's shorter and easier to get right.** 96 characters instead of about 130 letters, using only 16 different characters, with every row the same length, so a missing character is obvious.
- **Every row checks itself.** The check is calculated from the row number and its two words. If you mistype a character, or even two, swap two characters, or put two rows in the wrong order, Cove tells you **which row** is wrong, as soon as you type it, instead of just "the key is wrong".
- **You never need Cove to read it.** Anyone with the public BIP-39 English word list can turn it back into the 24 words (section 7).

When Cove shows you a new key, it also offers the **24 words**, for other wallets. Write down one form or the other; both restore the same wallet.

4. Writing it down

1. **Make sure no one can see your screen.** Cove shows each key once. Screenshots and screen recordings of it are blocked.
2. **Write all 12 rows in order, with their row numbers,** all 8 characters of each. Check every row twice against the screen.

3. **Confirm it.** Cove asks for three rows it picks at random (or, if you wrote down the 24 words, the six words in those rows), typed on Cove's own keyboard: never your phone's keyboard, so no keyboard app can record them. You can leave out a row's two check characters here. Tick **Verify complete key** to type back the whole key (all 12 rows, or all 24 words) and prove every character of your copy.
4. **Store it safely and offline** (section 6). Cove never shows the key again and never keeps a copy you can read.

Re-typing three rows proves you have the key in front of you. It can't prove every row was copied correctly: **Verify complete key** does. Without it, the row checks are the backstop: if a row was miscopied, Cove names it when you restore, so check each row carefully now.

5. Stamping it in metal

Paper burns, floods and fades. A key stamped into a steel plate survives a house fire. An 8 × 4 inch (203 × 102 mm) plate and a metal stamping kit are enough for one key.

You need:

- a **stainless steel plate**, 8 × 4 inches (203 × 102 mm), about 1–1.5 mm thick, used upright (4 inches wide, 8 tall). Stainless steel survives fire; aluminium and brass can melt;
- a **stamping kit with digits 0–9 and letters A–F**. 1/8 inch (3 mm) or 5/32 inch (4 mm) characters fit a row across the 4-inch width; 1/4 inch (6 mm) characters are too wide;
- a **steel bench block** (or an anvil, or a thick steel offcut) to rest the plate on, and a **1–2 lb hammer**;
- **masking tape** and a **fine marker**, to draw guide lines;
- a **scrap piece** of the same metal to practise on.

Photo to come
The plate and stamping kit
`photos/01-plate-and-kit.jpg`

An 8 × 4 inch stainless plate, a 1/8 inch stamping kit, a bench block and a hammer.

Layout. One key per plate, 12 rows down the 8-inch length. At 3 mm characters with a little space between them, a row like `12 345 1E7 85` is about 55 mm wide (about 75 mm at 4 mm characters), inside the 102 mm width. Twelve rows at 12 mm spacing are about 145 mm tall, which leaves room on the 203 mm plate for your mark at the top and generous margins:

```
┌──────────────────────────┐
│  ·                       │   a mark only you understand,
│                          │   so you know which key this is
│   1  345 1E7 85          │
│   2  559 223 BD          │
│   3  124 1CF 7A          │
│          ⋮               │
│  12  1CF 400 94          │
│                          │
└──────────────────────────┘
```

Stamping:

1. **Practise first** on the scrap piece: a few rows of `0-9` and `A-F`, to learn how hard to strike.
2. **Mark guide lines** with masking tape for each row, and dot the character positions with the marker.

> **Photo to come**
> Guide lines on the plate
> `photos/02-guide-lines.jpg`

3. **Check each stamp before you strike.** Most stamps have a notch or line on the side facing you when the character is the right way up. Turn the stamp so you can read the character on its face, then strike once, firmly, with the stamp upright.
4. **Stamp the row numbers too.** The check is calculated with the row number, so rows in the wrong order are caught, but stamping them makes restoring easier.
5. **Watch the look-alikes:** `0` and `D`, `8` and `B`. If you hit the wrong stamp, the row check will catch it when you restore. If you notice a mistake, start a new plate rather than over-stamping.
6. **Compare the finished plate** with the screen, row by row, before leaving the confirmation step in the app.
7. **Remove the tape and marker,** and don't photograph the plate.

> **Photo to come**
> A finished plate
> `photos/04-finished-plate.jpg`

A finished plate, stamped with the public example key. Never photograph a real one.

Labelling. A plate that says "SAVINGS KEY" tells a thief what it is. Use a mark only you understand, so you can tell the wallet key from the Save key.

You need two plates for the two keys you must keep (section 2), stored in two different places.

6. Where to keep your keys

- **Offline.** Never type a key into a website, an email, a notes app, a password manager or a chat. Never photograph it. Cove will only ever ask for it on its own Restore screen.
- **Apart.** Keep the wallet recovery key and the Save recovery key in different places. Keep your card away from both, and its PIN in your head.
- **Whole.** Don't cut a key into pieces kept in different places, such as rows 1–6 here and 7–12 there. Half a key, plus the other half's check characters, is far easier to guess than you'd think. Treat the **whole** sheet or plate as secret, check characters included.

- **Known to someone you trust,** if you want your assets to be reachable should something happen to you. Tell them where the keys are, not what they say.

7. Restoring with your Cove Key

- **A new phone:** install Cove Wallet, choose **Restore a wallet**, and type your wallet recovery key, row by row on Cove's keyboard. A row that doesn't check out is named, so you can fix just that row. Your Spend account, and your place on Save, come back. Home shows **Save found** with its balance: tap **Add card** and hold your Cove Card to the phone to link Save again.
- **A lost card:** in Cove on your phone, go to **Settings → Lost your card?** You'll type your Save recovery key, and your phone and that key together move Save's assets to Spend (**Move Save funds to Spend**; with a co-signer, they approve it too).
- **Phone and card both lost:** restore with your wallet recovery key on a new phone, then use your Save recovery key the same way.
- **Lost phone, card in hand:** choose **Lost phone? Recover with Cove Card**. The card brings everything in your old Spend, and a duress wallet it protects, back to the new phone. For Save you also type your Save recovery key: Save needs two of your card, your phone and that key, so a card on its own can't take it (that's what keeps a stolen card useless).

Without Cove. Every Cove Key can be turned back into 24 words by hand:

1. Take one 3-character group, for example `345`.
2. Convert it from hexadecimal to an ordinary number: 3 × 256 + 4 × 16 + 5 = **837**. (In hexadecimal, A=10, B=11 … F=15.)
3. Add 1 (word lists number their lines from 1): line **838**.
4. Line 838 of the BIP-39 English list is **hamster**.
5. Repeat for all 24 groups, in order: row 1's two words, then row 2's, and so on. Ignore the check characters.

The result is a standard 24-word phrase that works in other XRP Ledger wallets. Use the **English** list: other languages' lists have different words at the same numbers.

8. How safe is it?

- **Exactly as safe as the 24 words.** A Cove Key holds the same secret: 256 bits, more possibilities than there are atoms in the universe. The check characters add nothing an attacker can use against a complete key.
- **Mistakes are caught.** A typo, two wrong characters in the same row, two characters swapped, or two rows in the wrong order: always caught, and Cove names the row. Only a row with three or more mistakes could ever get past both checks (about once in 60,000 such rows, the limit of any 2-character check), and even then it doesn't open your wallet: it opens a new, empty one, so a zero balance tells you to look at your key again. **Verify complete key**, when you write the key down, rules even that out: every row is checked against the screen.
- **Anyone who has the whole key has that wallet,** with no password, phone or Cove needed. Guard it like cash.

- **One key alone can't empty Save.** Save needs the card, or two keys together. That's why the two recovery keys must be kept apart.

9. Questions

Can Cove show my key again? No. It's shown once and Cove never keeps a readable copy. If you've lost a written key but still have your phone and card, your assets are safe for now. To be covered again, make a new wallet (and write down its keys) and move your assets into it.

Should I write down the 24 words or the Cove Key? Either. The Cove Key is shorter and checks itself; the 24 words work directly in other wallets. Both are the same key.

Do I need to stamp the check characters? Yes. They let Cove tell you which row is wrong. Without them, a mistake is only caught for the key as a whole.

Is the Cove Key encrypted? No. It's an encoding, like writing a page number instead of copying out the page. That's why it must be kept as secret as the words.

What if someone forces me to unlock my phone? Set up a duress wallet: a second PIN that opens a small, separate wallet. Using it also locks your real wallet on that phone for three days. See the Getting Started guide.

Cove Technology LLC. For the full design and the arithmetic behind every number here, see "The Cove Key: design and proofs" in Cove's documentation.