Lockpicking!

Picking Basics

To pick a basic pin tumbler lock you will need a tension wrench and a pick. Insert the short end of your tension wrench into the bottom of the keyway and apply a light turning pressure with your finger. Now, insert your pick. Lift each key pin to it's proper height, and the lock will open for you.

But how do you know what the proper height is? Or what order the pins set in? The solution will be unique each time. There is no set answer or specific order that will open every lock you face, instead, each lock has it's own binding order and pattern of pin heights.

Locks are riddled with tiny manufacturing defects, usually minor enough that we wouldn't notice them with the naked eye, but each difference injects vulnerability into the lock. Maybe the pins aren't perfectly deburred or have simply worn unevenly from regular use. These imperfections cause one pin to bind before all of the others. The weirdest pin out in whichever direction we are turning.

Your job is to find that first, weirdest pin. So, with tension applied, insert your pick into the lock and lift up on a keypin. If you feel it springing right back down at you, that is not your binding pin, keep moving. When you feel a pin resist you, carefully lever it up until you feel it stop. Once that pin has reached the shear line the plug *will rotate*, just a little bit, and the next weirdest pin will bind. The driver pin you've just set will sit on the shoulder of the plug that has turned beneath it.

Repeat this process for every pin in the lock. When the last driver pin crosses the shear line, the plug will turn freely for you.

Understanding why lockpicking works also reveals 3 important tips:

1) The binding order is random, your job is to discover it. If a pin is just springing back at you, that isn't the one you should be working on. Move on!

2) Changing the direction you apply tension will change the binding order!

3) Light tension! Very light tension. Think about it this way: if you apply a lot of force to the tension wrench, you'll bind several pins at once, just as though the lock were perfect. We want just enough tension to bind the weirdest pin, and not touch any of the other ones.

Even a poorly made lock can become a challenging pick if the heights of the key pins are dramatically different than one another. Conversely, if you have very little variation, your lock will usually be easier to pick. One of the most difficult problems in lockpicking is setting a very shallow pin that is right behind a very long pin. While setting the shallow pin, the shaft of your pick will often over set the long pin. The further back the high-low change is in the lock, the more difficult it will be to set.

Next up we'll look at some common pick profiles, then we'll cover tension options, feedback exercises, speed picking strategies and security pins.

HOOKS

Hooks are meant to manipulate a single pin at a time, allowing you to move methodically through the lock. With enough practice and armed with just a tension wrench and a hook, you'll be able to open most locks you come across.

Medium Hook | 
The first tool many pickers will use is your basic medium hook. This is a perfect beginner tool because it's a bit clunky inside the lock and doesn't require a great deal of skill to get the best use out of it. However, despite its simplicity it remains very effective and often enjoys a place in the primary kit of any picker as their skill advances to the intermediate stage.

Gonzo | 
Unlike the medium hook, the Gonzo has a rounded tip, allowing it to move smoothly through the lock. The tip also extends a bit higher, allowing it to better manipulate tricky high-low bittings. The Gonzo is beloved among many advanced pickers and has a prominent place in their kits.

Long Hook | 
The long hook is a beast. It is difficult to move through many keyways, can get caught inside the lock mid-pick and can be uncomfortable to work with. However, the extreme curved tip that causes all of those problems also allows it to set the most ridiculous high-low bittings. Though this pick rarely sees regular use, it has proved itself to be invaluable in a few specific situations, so some pickers keep it around.

Deep Curve | 
The deep curve is the most widely borrowed member of a family of tools called the Falle Curves. The deep curve is my favorite part of the larger system and makes an excellent solo tool. By allowing the belly of the curve to run along a low point in the keyway & rocking the pick into the lock, following the line of the pick head, you get a great sense of control and can easily manipulate difficult to reach pins in the back of the lock.

Notched Hooks | 
The most common notched hooks tend to fall somewhere between the medium hook & the long hook in height. However, you can carve a notch into any pick you like and enjoy the benefits. Simply, the notch makes it easy to locate each pin inside the lock and in the rare situation where heavier-than-normal force is required you don't risk slipping off of the pin you are working on as you would with the Gonzo or medium hook. Finally, in locks with oddly shaped pins, such as Medeco's chisel tipped pins, the notched hook allows you to manipulate them in more specific ways, such as rotating them.

DeForest Diamond and Ball | 
These days the picks named for Bill DeForest are more likely to be sold under the name "offset diamond" or "offset ball," but I think it's worth keeping the traditional names in circulation. The DeForest diamond is usually my second pick in a lock, right after the Bogota, which is covered in the rakes section. The angled end of these picks gives the deforest a deeper reach than your typical hooks and the added shape to the tip, whether ball or diamond, allow you some additional manipulation options. My primary use of the Deforest is to defeat high-low bittings. The Deforest moves through a lock with ease, unlike the long hook, but can set the more extreme high-lows that the Gonzo can't quite reach. Though you will rarely find them in starter sets, a Deforest should be one of the first picks you make or acquire after you get comfortable with your initial tools.

RAKES

Rakes are a contentious topic. They are meant to manipulate several pins at once and as a result they can often open locks very quickly, but rakes lack the consistency and range of hooks. Some people think of rakes as a shortcut, but I believe in learning how to use any tool you may come across. A word of caution, though. When you first start picking, try not to rely on rakes. The more you develop your single-pin-picking (SPP), the better you'll perform with any pick.

C Rake |
The ever-popular "snake rake" or "c" rake. This diminutive, narrow profiled rake that is found in nearly every starter set, is all but useless against decent locks. It will pop Master Lock #3s like magic, but that's about it. Eventually, once you learn to use and love the other tools on this list, it will fall into disfavor and out of your primary kit.

S Rake | 
A lot of pickers love the S rake. It's not my go-to, but it may give the best feedback of the rake family. With only 2 peaks there isn't much extraneous information being fed to your fingers. The angled sides and valley of the pick profile allow it to move very smoothly through the lock. However, the sharp angle just before the pick head makes it weak and prone to snapping by heavy handed pickers.

Large S | 
Less common, but a whole lot more interesting is the Large S. It is best used with very light tension and a quick pushing motion. "Push, Push, Open!" as I was told by the German picker who convinced me to buy my first. You may find you prefer a different approach, but no matter how you use it, the Large S will set a wider variety of bittings than either the C or S.

L Rake | 
The L Rake is the longest of the bunch and will likely interact with every pin in your lock at once. The L rake can pop locks all on it's own, but I've used it to great effect in speed picking difficult bittings. I apply light tension & rake low in the keyway to hopefully set some of the longest pins, then, I increase tension a little bit and go back in with a Gonzo or Deforest diamond to finish the shallower pins off. A basic, but very effective speed picking strategy.

Bogota | 
The Bogota rake is the sole creation of Raimundo, though his pick has been poorly reproduced by many of the major manufactures in the last few years. The classic instructions for this pick are to hold it like a tiny gun, then shake it in the lock like you've been drinking too much coffee. Personally, I employ a more delicate touch, but whatever way you use it, the Bogota will open a wider range of locks than any other rake I've ever seen. When I compete, this is my first pick in the lock.

BALLS AND DIAMONDS

Half Diamond | 
The half-diamond is one of the only tools that remains wholly unchanged in a pickers primary kit from the day they learn how a lock works to the day they win their first competition. Half-Diamonds can be found in 3 basic sizes, small, medium and large. The small diamond will fit through very narrow keyways with ease, but won't effect much inside, the large diamond's long, ramped sides can be incredibly useful, but near impossible to move in tight keyways. Right between them, then, we have the medium diamond, which moves through the lock well and has enough of a slope to be quite useful.

They move so smoothly across the pins, and are wide enough to manipulate 2 at once, but still have a defined tip that can move a single pin at a time. But, the real value of the half-diamond comes from the sloped sides. In situations where you need to move a pin very little, or when you have to apply lighter tension than normal, a half-diamond is your best friend.

Balls | 
Balls come in a few different shapes. Most popular is the half-ball, followed by the snowman, or double ball. All of these picks are most commonly used on wafer tumbler locks . The gentle curves of the ball family are ideal for moving smoothly along the hard right angles of the wafers. A half-ball will be used against a single-sided wafer lock, and a double-ball or full ball will often be used against a double sided wafer lock.

PROFILE PICKS

Profile picks are an altogether different concept. Rather than actively manipulating the pins, the profile picks set all of them to a specific configuration, then test the lock. This is the brute force attack of lockpicking and as such, the strength of the attack comes down to the size of your pick set.

"High Tech" or "Computer Generated" | 
The Majestic "High Tech" pick set has 16 individual heads, each of which can be used in either orientation in the lock, giving you 32 profiles to work with. By bouncing (applying and releasing) tension while you slowly move these picks in a figure 8 motion in the lock, you may well find the shear line. By trying the profiles at different heights and angles you'll cover a huge range of bittings, one of which is likely to match the original key.

King and Queen | 
On the other end of the spectrum you have the King & Queen. These 2 pick heads can only be used in one orientation, so you are limited to 2 profiles. Used by themselves they are incredibly ineffective. However, their profiles are so dramatic that they make a great addition to a well rounded pick set. When you are up against a very aggressive bitting that is proving too difficult to pick with conventional tools, try taking a run at the lock with the King or Queen. It's the hail Mary pass of lockpicking, and when it works, it's amazing. Never be tempted to rake with profile picks of any sort, as their sharp angles and dramatic variations in height make them prone to catch and even snap inside the lock. Be gentle with this attack.

TENSION OPTIONS

With so many picks to choose from, people often forget how important tension is.
While a standard bottom of keyway tension wrench can get you far, it's worth exploring other options. Even adding a twist to a standard wrench changes how it behaves. If you need firm, even pressure, use a simple, 90 degree bent wrench. Add a twist and you add flexibility, which allows you to apply a wider range of force to the lock.

Feather wrenches go a step past the twist and put a spring before the head of the wrench which dissipates most of the force you apply. The idea is to provide the lightest tension possible, which some pickers prefer when attacking security pins.

While you won't find them from any manufacturer, some pickers modify their wrenches into a stepped pattern that fits more snugly at the very bottom of a keyway, without colliding with the

housing which can give a false sense of binding.

Top of Keyway (ToK) wrenches are similarly hard to find from any major pick maker, but are essential to any picker's kit. This tension wrench has a shorter head than the common bottom of keyway wrench, as you don't want it interacting with the first pin in the lock. I would also suggest adding small serrations to the edge, which will help keep the wrench firmly entrenched in the keyway. Applying tension at the top of the keyway provides a more central turning action on the plug, which will improve feedback from the pins, and it gives you much more room to work with your pick, as you aren't cluttering up the open portion of the keyway.

When it comes to applying tension, experiment. Always start light, but changing the amount of tension you apply will change what you feel in the lock with the pick.

WHAT TO LOOK FOR IN PICKS

The number of pick manufacturers has ballooned in recent years, and as a result there has been both exciting innovation and an influx of terrible, cheap tools. Here are a few tips for buying your first, or next, set of picks.

Handle Material

The recent trend of plastic and rubber handles should be avoided. The more directly your finger contacts the plain metal of the pick, the better you can feel what's happening inside the lock. That feedback is essential, and most of the tips here will be concerned with maximizing feedback. While you may find a bare metal pick is too painful on your fingers to use indefinitely, I would recommend you suck it up, develop the calluses and embrace bare metal. However, failing that, at least use metal handles. Even thickening up the handle of the pick with a sandwiched metal plate can make the pick dramatically more comfortable. A good homebrew option is applying some heat shrink tubing — available at most hardware stores— to a bare metal pick. This will be much more comfortable on your fingers, but won't deaden feedback too badly.

Metal Selection

What matters most is that the manufacturer cares about the metal they use in their picks. If it seems like they haven't put any thought into it, be wary. Generally you want spring or stainless steels, but there are a lot of good options among those two metal types. From Peterson's "Government Steel" to Southern Specialties 1074 Spring Steel picks, what matters is that the pick maker cares enough to get the metal right. If your picks have no shape memory —if they don't return to their original form when bent— they're going to be all but useless.

Full Body Tang

As any chef or sword fighter knows, when it comes to blades, the tang —the part of the blade that extends into the handle— has to run all the way through the handle. If the blade of the pick doesn't continue unbroken all the way through the handle, you'll lose feedback. There are a number of picks being made now, such as the SouthOrd MAX Yield line, with plastic or rubberized handles where the blade only occupies .5-1" of the handle.

Finishing Your Picks

Whether making your own picks or buying commercial picks, you should take some time polishing them with sandpaper before you use them. The smoother the pick is, the easier it will move through the lock and the clearer the feedback you'll get from the pins. Even just using some metal polishing steel wool can make a dramatic difference.

There are many more picks out there, but most are just variations on a theme. There are very thin, flexible hooks meant for tight keyways, towering half-diamonds for delicate high-low bittings, and a mind-numbing collection of different rake profiles. Understanding the basics will let you infer the best use of each new pick you come across.

Exercises for Developing Feedback

Feeling what is going on inside of the lock is a skill, and one you have never had to develop before. The tactile feedback you need to discover the topography of a lock as you pick it is extraordinary, but absolutely learnable. The first several times you open a lock, you probably won't know what you did to get it open. That's OK! That's how this works. You'll slowly discover the touch, but if you do these simple exercises early on it will speed up your development.

1: With no tension applied to the plug, take your hook pick and just press up against the key pins. Feel them springing back at you. While it is difficult to convey the feeling of a binding pin, it's very easy to demonstrate what a pin feels like when it is not binding. Repeat this several times on various locks when you are starting out to get the feeling. Then, when you are actually picking and feel that free spring pressure on your pick, you'll know to come back to that pin later and move on to the next.

2: Take a lock with only 2 pins in it (you may have to remove pins from another lock). Apply some light force to your tension wrench and pick the lock, over and over and over again. All you are trying to do is feel the difference between a binding pin, and a free pin. This can also help you get a handle on your tension weight. If you find both pins seem to be binding at once, lighten the pressure on the wrench. You should also try changing the direction you apply tension and see if the order the pins bind in changes.

3: With no tension applied on a fully pinned lock, take a nice hook pick, insert it at the top of the keyway, and run it into the first pin in the lock. Once you've collided with that pin, slide the tip of the pick down the pin, slide forward just enough to lift that pin all the way up, then push forward into the second pin. Do this again to get to the third, fourth and so on. Once you have all of the pins lifted up, slowly pull your pick out of the lock and try to feel as each pin drops off the back of your pick one by one. The goal is to develop a sense of what pin you are working on, and exactly how deep in the lock you are working.

Speed Picking Strategies

If you get to the point of picking competitively, you'll develop your own methods for opening locks quickly. Some of the most talented competitive pickers I know just stick to a tension wrench a few hooks. Watching them pick head to head is mesmerizing, as they tend to be very calm and still, just methodically setting pin after pin, using their technique and touch carry them to victory.

For those of us (myself included) who fail to maintain any sort of composure while picking against the clock, there are some simple strategies worth trying.

Mixed Method Picking

Rakes can be powerful and fast as they manipulate several pins at once, however, there are a lot of locks they just can't open. The more extreme the bitting of your lock, the less likely a rake can open it by itself. However, if you allow the rake to work in the lock for a few seconds under very light tension, then switch to a hook, you may find that the rake did most of the work for you and now you

can finish off the remaining pins quickly with your hook. Switching between tools while keeping tension on the lock is a classic strategy, and for speed picking, one of the most effective.

Cascading Attacks

I like having a variety of tools and techniques at my disposal for speed picking, but more important is having a plan for how I'll employ them. The first competition I ever participated in was the Dutch Open. In the Open you pick in 7 minute rounds, so I developed a 7 minute cascade of attacks.

0:00 Clockwise (CW) tension + Bogota Rake
0:15 Counter-clockwise (CCW) tension + Bogota
0:30 CW tension + mixed method, usually Bogota + DeForest Diamond
1:30 CCW tension + mixed method
2:30 CW/CCW tension + Single Pin Picking
5:30 Mixed method, L or S Rake + Gonzo
6:30 King & Queen

The Bogota manages to open more locks than most other rakes, and it's a joy to pick with, so it is always my first pick in the lock. If the Bogota doesn't open a lock for me immediately, I'll try applying tension in the opposite direction. From there I'll switch to a mixed method attack, starting with a few swipes of the Bogota or L Rake and then going in with a DeForest Diamond or Gonzo to set anything that was left behind. Next, I'll set the rakes aside to focus on single pin picking. This may employ just about any hook or half-diamond in my set. Hopefully by this point I've at least gained a vague sense of the topography of the lock and can use that information to make my methodical picking go a bit faster. After ~3 minutes of this I'll go back to my mixed method picking, employing a few different rakes in the process and, if all else fails, with 30 seconds left on the clock, I'll employ the King & Queen picks.

Having a cascade gives you focus when you are picking, and can stave off frustration. As long as there is always something else to try, I can forgive myself for not opening the lock, yet. Sticking to my cascade helps me keep calm in a tense situation. However, you can't be rigid. If you discover something while picking that makes you want to break rhythm, don't be afraid to follow that instinct. It's those insights, more often than strict adherence to your cascade, that will get you an open lock.

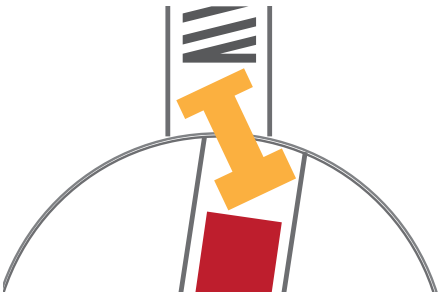
Security Pins

Security pins are an easy way for lock makers to improve their defense against surreptitious entry. Like picks, there are a variety of security pins out there, but we're going to focus most of our attention on the 2 most common, Spool and Serrated pins.

Spool Pins

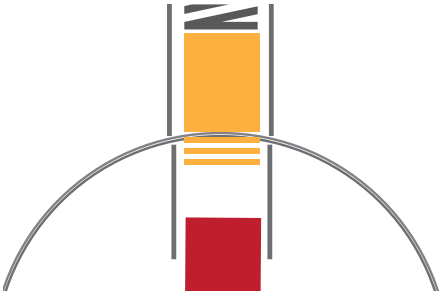
The classic spool pin looks as it is named, like a spool. There is a large section of the middle of the pin that is a smaller diameter than the top or bottom. With that much material missing, the spool pin will typically be the last pin to bind, and when it does, it will feel like you have picked the lock. The middle section of the spool pin will catch on the shear line, as the bottom tries to turn with the plug and the top is stuck up in the bible of the lock. The effect on the picker is that the lock feels like it has opened, then suddenly stops after turning only a few degrees. This phenomenon is called a "False Set."

To overcome a spool pin, you first have to find it. When you enter a false set, lighten your tension, and grab a simple hook pick. Press upward on each pin in turn, if the pin raises up, then stops dead, it is running into the side of the pin chamber, not a spool pin. When you find the spool pin, you'll feel the plug counter-rotate against your tension wrench, slowly turning back to 0 degrees. That is the bottom of the spool pin passing across the shear line. Keep light tension and raise it carefully. If you are lucky, once the bottom of the spool pin has crossed the shear line, the lock will open for you. It is also possible that some of the other pins you had set previously will slip off of the shear line, but so long as you have that spool set, it should be easy to reset the pins that have fallen.



Serrated Pins

Unlike the spool pin, it is not immediately obvious that you have become trapped on a serrated pin, and discovering which pin it is harder as well. If none of your key pins are under spring pressure —if each of them are just resting in the plug, not in contact with their driver pins— but the lock hasn't opened yet, you may be caught on a serrated pin. To test, lighten tension and gently push up on each pin. If you get a distinct "click" out of one of them, but the key pin falls back down again, that is likely the serrated pin moving up one position. Keep tension light, and gently bump that pin up until it has crossed the shear line.



If you have a serrated driver pin sitting above a serrated key pin, it is very easy to push too far and get your key pin irreparably caught on the shear line. The only solution then is to drop tension and start over. In this situation, the half-diamond is your best friend. When you have light tension applied and are moving a pin incrementally, you want as much control over the amount of force being applied to that pin as possible. If you are using a levering motion on a hook, it is hard to regulate that force. With a half-diamond, you can move horizontally through the lock, pushing the pick forward and allowing the key pin to ride up the slope of the diamond. You have much more control and can easily stop yourself from over setting the pin.

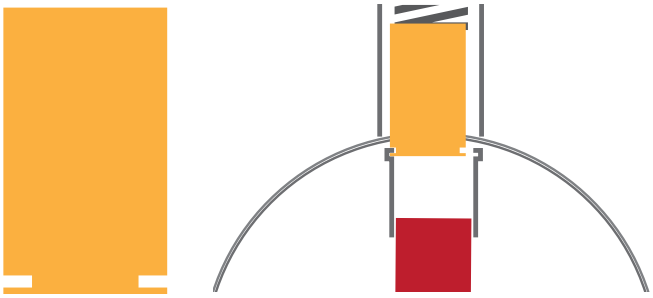
Mushrooms, Donuts, Torpedoes, and More

There are many clever variants of spool and serrated pins. The simplest is the serrated spool, or "spoorated" driver pin that can be found in many American brand padlocks. These look just like traditional spool pins, but have a single serration cut along the bottom of the pin, so that after recovering from a false set, you'll get caught up on the serration.

A common variation on spool pins that you can find in Medeco and MX locks, among others, are Mushroom pins. The material removed from the middle of these pins is tapered, going from a skinny base up to the full width of the pin. Mushrooms aren't as common as spools because they require precise loading in the lock. While a spool pin can be dropped into place out of a hopper and work in either orientation, mushroom pins must be loaded with their taper facing downward. This small difference increases assembly costs, so few manufacturers use them.

Another victim of the high costs of manufacture are DOM's clever Donut Ring pins. DOM started with a simple spool pin, but added a free floating brass ring to it. The feeling of picking past these movable rings is unique and confusing when you first come across them. Unfortunately, compared to a standard pin, or even a normal security pin, the ringed spool was too expensive to produce and DOM have ceased manufacturing them.

Security pins aren't just for drivers, either. Many key pins have similar features, most designed to catch the key pin above the shear line if you accidentally lift it too far. That's the goal of the Torpedo pin, which is the key pin equivalent of a Mushroom. The lip at the top of the pin easily catches above the shear line when overlifted. Recovery at that point is unlikely, and you'll have to release tension, let the pin drop back down, and start over.



ASSA has a brilliant pin that actually interacts with a simple modification to the plug of their Twin Combi locks. In 2 of the pin chambers in the plug there is a small shelf cut into the chamber wall, just below the shear line. Just above the bottom of the driver pin that sits in these chambers there is a small, precise channel milled out along the circumference. When one of these pins binds, and you start pushing it up into the bible of the lock, the channel and the shelf will marry into one another, forming a tight connection. It will feel just as though the pin has set, and discovering it is incredibly difficult, much less correcting for it.

The amount of variation possible within the confines of the simplest pin tumbler lock hints at the depth of mechanical ingenuity to be found in all aspects of lock engineering and lock picking. For each additional security measure a lock maker implements, a new tool or technique is developed to counter it. For each new attack, a new feat of mechanical engineering to restore the security of the cylinder. Both sides of the study of locks provide endless fascination.

But wait...there's more!

Hopefully you enjoyed any of this. Honestly, it wound up being a bigger project than I expected. Of course this isn't absolutely every piece of content I've ever produced, but you can find a lot more by looking for me at the following (reasonably short) links:

All of my material that doesn't translate well to text can be found at:
https://youtube.com/schuylertowne

I don't check in often enough, but I do sometimes try to answer questions at:
http://www.quora.com/Schuyler-Towne/answers

I check r/lockpicking now and then to see if anyone needs a weird lock question answered. You can look through my posts here:
http://www.reddit.com/user/schuylertowne/

I try to get a letter out every now and then via TinyLetter:
http://tinyletter.com/schuyler/letters/

You can also find most of my slide decks here:
http://lock.gd/talks

I'm always up to talk locks on twitter:
http://twitter.com/shoebox

And, of course, you can find my research projects and blog posts at:
http://schuylertowne.com

Thank you for supporting this project so long ago, and thank you for reading through this collection. I hope you've found it interesting!

-Schuyler