Professional Locksmith

Study Unit 7

Opening Locks Without Keys

Preview

Welcome to Study Unit 7 of your Professional Locksmith course! After completing the previous six study units, you've learned a lot of new skills and added considerable knowledge to your locksmithing information base. Be proud of yourself! At this rate, you'll complete your course and move into the professional world of locksmithing in next to no time!

Study Unit 6 provided you with an in-depth look at two locksmithing skills you'll use on a regular basis. First, you learned how to duplicate keys by hand and by machine. Then, you learned how to rekey a lock—how to change the inside of a lock to fit a new key. Now, in this study unit, you'll learn how to open a variety of locks without using any key at all!

This information will be very helpful to you in your professional career. However, you should remember that a responsible professional locksmith uses these special skills with care and discretion. *Never* discuss the techniques of lock opening with anyone other than another professional locksmith!

After completing this study unit, you'll be able to

- Describe the various methods of picking locks
- Explain the type of lockpick to use on a specific lock
- List the steps for picking warded, lever tumbler, disk tumbler, pin tumbler, and cam locks
- Discuss how to make a key using the impressioning method
- Identify the proper tools to use in key impressioning
- List the steps for impressioning a key for a warded, lever tumbler, and pin tumbler lock
- Describe how to "read" a lock
- Explain how to cut a key after "reading" a lock
- Discuss how to force a lock and describe the tools needed to do so

Contents

Opening Locks Without Keys

Do You Know. . .

What is a *tension wrench?*

How is a rake pick used?

What is a *pin impression?*

In these pages, you'll find the answers to these and many more questions about opening various types of locks without a key.

INTRODUCTION

Several times a week in the life of an average locksmith, a customer will come into your shop saying, "I lost my key and I'm locked out." What do you do? Where do you even begin? Well, the locksmith has several options when this happens. There are five basic ways to open a lock without a key. These methods are

1. Picking the lock open
2. Impressioning a new key for the lock
3. Reading the lock
4. Shimming the lock open
5. Forcing the lock open

The method you choose to open a lock in a given situation will depend on several factors. First, what type of lock is involved? Second, how much time does the customer have? Does he or she need to get into the house or car urgently, or is there more time available to work? Third, and perhaps most important to the customer, how much will it cost?

In this study unit, we'll teach you these four basic methods of opening a lock without a key. We'll also teach you how to select the method of lock opening that will be the most efficient and cost effective in a given situation. Let's start with an examination of lockpicking.

LOCKPICKING

Lockpicking Ethics

Before we begin our discussion of lockpicking techniques, we want to remind you of the important ethical considerations that a professional locksmith must always keep in mind. Being able to pick a lock open gives you, the locksmith, a great advantage over other people who can't pick locks. And, you may be surprised at how many people want this advantage!

We'd be willing to bet that the first time you told someone you were taking this course, they said, "Will you teach me to pick a lock?" Please don't! The ability to pick locks (and other sensitive locksmithing skills) should only be in the hands of serious, professional locksmiths. This is an important ethical matter. If a dishonest person were to learn how to pick locks, or any of the other trade secrets of the locksmith profession, no one's property would be safe! In addition, if everyone knew the locksmith's skills, the locksmith wouldn't be needed anymore! So remember, never discuss the special techniques of locksmithing with anyone but another professional locksmith.

In addition, it may sometimes be unwise to pick a lock for legal reasons. For example, suppose a customer calls you to his home after losing his only garage door key. Is it safe to pick the lock and make a new key for the door? Can you be absolutely sure that the home belongs to that person, or that he has the legal right to enter the home? Or, suppose a customer brings an expensive auto stereo to your shop. The stereo system is the type that pulls out of the dashboard, the wiring has been cut, and the system is locked in its case. Is it safe to pick the lock and make a new key for the system?

In situations like these, it's possible that the customers are legitimate. On the other hand, the persons described could be involved in some kind of criminal activities. If you're ever in doubt about any situation, ask the customer to provide proof of ownership of the property. If he or she can't provide such proof, it's better to refuse the customer service than to get yourself into trouble.

The Myths about Picking

As we've already mentioned, the subject of lockpicking holds a great fascination for many people. One popular myth that many people seem to believe is that a locksmith can open locks in a few seconds using a hairpin or some similar object. This is very far from the truth! Probably only the simplest, old-fashioned warded or lever lock could ever have been opened using a small piece of wire, and even then it would take longer than a few seconds. Modern locks are far too secure to be opened with any such methods. While it is true that many locks can be picked open, the time and effort involved in doing so is enormous, and as a result, there are often better methods for getting a lock open than picking. For example, why waste 20 minutes trying to pick a small, cheap padlock when a set of boltcutters would open it instantly?

It takes no great talent to pick a lock. To pick a lock, all you need is an understanding of how the lock works, the proper tools, patience, and time. The real talent is in knowing when to pick and when not to pick.

Sometimes it's inefficient to pick a lock when a more timely and inexpensive method is available. Even the most skilled locksmith may need twenty minutes or more to pick certain types of locks. Time wasted on such a project is time you could be spending on several other jobs. Or, a lock may be so inexpensive that it's not worth spending the time to pick it. In such a case, it might be more advantageous to open the lock some other way and replace it with a new one. To make the most of your time, therefore, know when to try another method to open a lock.

Now, before we get to actual lockpicking procedures, let's take a brief look at the tools you'll need.

Lockpicking Tools

A wide range of lockpicking tools is available to the professional locksmith. The first tool we'll describe is the actual lockpick. Lockpicks come in many different styles and shapes. The style you use for a particular job will depend on the type of lock being picked, and also your personal preference. Some locksmiths feel comfortable with one or two styles of picks, and use them for all kinds of jobs. Others prefer to use a different pick with each type of lock.

Two of the most popular lockpick styles are the feeler pick and the rake pick. Both of these styles are popular with beginning locksmiths. The name of the lockpick refers to the shape of the end of the pick. These two styles, and several others, are shown in Figure 1.

If you wish, you can make your own lockpick by grinding a piece of 0.020-inch cold-rolled flat steel into the proper shape. However, lockpicks are not expensive and can be purchased from any locksmith supply store or lock distributor.

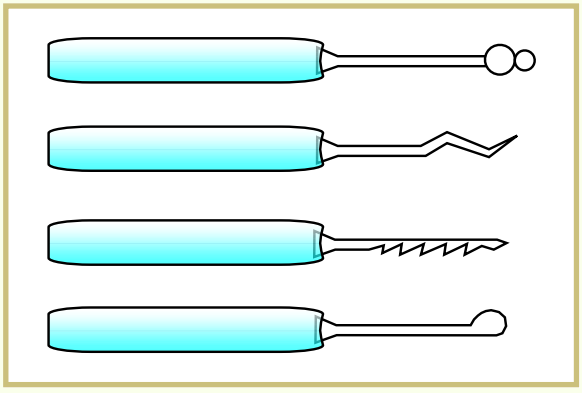
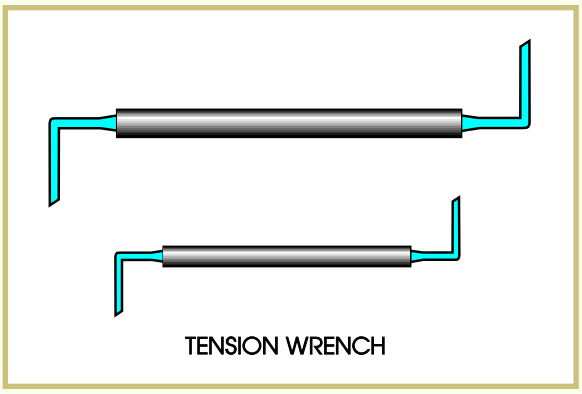


FIGURE 1—Various Styles of Lockpicks

To pick open a lock, a lockpick is first inserted into the lock's keyway. Then, the pick is slid along the keyway, lifting individual pins or disks within the plug. When all the pins or disks are properly lifted to the shear line of the plug, the plug is freed to turn and open the lock.

The second tool you'll need to successfully pick a lock is the tension wrench or torque wrench (Figure 2). A tension wrench is inserted into the keyway of the lock at the same time as the lockpick and is used to apply turning pressure against the lock plug. You use the tension wrench to turn the plug in the same way you would turn a key.

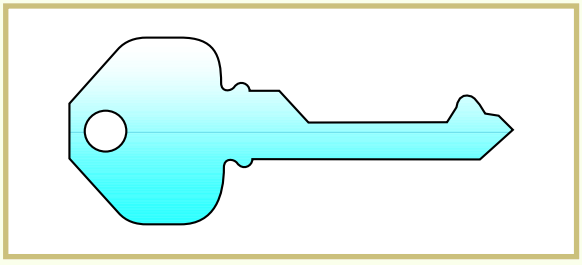
FIGURE 2—Two Types of Tension Wrenches



A tension wrench is made of spring steel, which allows for strength along with great flexibility. The blade of a tension wrench must be very thin (to fit in the keyway) yet be strong enough to apply the needed turning pressure on a lock plug without breaking.

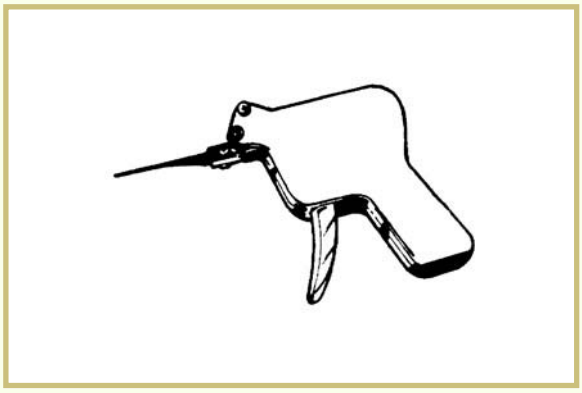
Another tool used to open locks is a key pick (Figure 3). A key pick is a specially ground and cut piece of flat steel that will fit into the keyway of a lock. A projection is left near the tip of the key pick, similar to the shape of a feeler pick. The remainder of the key pick is quite narrow. The key pick is inserted into the keyway, and each pin or disk is lifted into place as the key pick is withdrawn from the plug.

FIGURE 3—A Key Pick



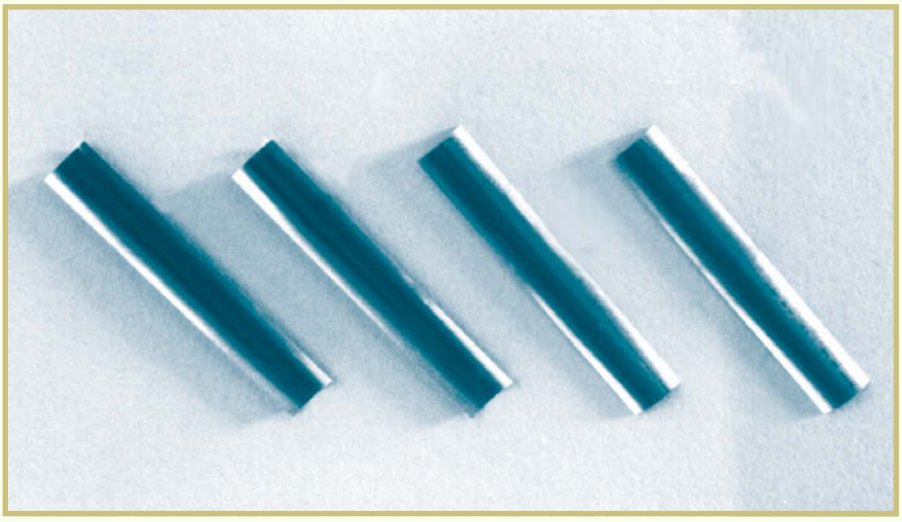
A picking gun (Figure 4) is used by locksmiths for some types of lockpicking. The picking gun has a spring steel pick and a trigger assembly. When the trigger is pulled, the pick is sprung upward within the plug, forcing the pins or disks upward. While the basic operation of a picking gun is simple, it takes practice to actually get one to open a lock!

FIGURE 4—A Picking Gun



Some locksmiths find it very simple to open a lock using shims. Typical shims are shown in Figure 5.

FIGURE 5—Typical shims are shown here.



A shim can be used to open a pin tumbler lock, and are usually used to open mortise and rim cylinder locks. To do so, the shim is placed at the rear of the plug and pushed forward until it strikes the rear most upper pin. Then, a feeler pick or a blank key is used to raise the pin until it reaches the shearline where the shim is advanced to hold the upper pin above the shearline. Once all pins are separated by the shim, the plug can be turned and the lock opened.

Now that you're familiar with the tools you'll need to pick a lock, let's examine some actual lockpicking methods.

Lockpicking Methods

In previous study units, you've learned how various types of locks operate. Lockpicking, in simplest terms, is simply substituting a lockpick and a tension wrench for a key. However, a key will lift all the pins or disks in the lock to the shearline at the same time. A lockpick, on the other hand, can lift only one or two pins or disks at a time to the shear line. This is where the skill comes in!

The method you use to pick a lock depends upon the following:

1. The type of lock you're working on
2. The system of picking that feels most comfortable to you and is the most practical and successful

Simple locks, such as warded, or a basic lever tumbler locks, are easily picked. Often, only a single tools is needed. Pin or

disk tumbler locks, especially those of medium- to high-security, require a much more complex process, additional tools, and practice.

Warded Locks

The security of any given lock depends upon many different physical factors. One of these is the complexity of the lock's internal lock mechanism. Another is the ease with which you can look into the lock to see the mechanism. Basically, the more complex the lock's internal mechanism and the more difficult it is to see inside the lock, the more secure the lock. In both of these cases, the warded lock offers little protection, as its mechanism is generally simple and the keyhole is large enough to see most of the lock's interior. Therefore, the basic warded lock is simple to pick. Three methods are commonly used to pick warded locks.

In the first method, you bend two wires so that they throw the bolt and lift the tumbler to the proper height when they're inserted into the keyhole. This method will be discussed in detail in the next section, Lever Tumbler Locks.

The second, and simpler, method for picking warded locks is to use one of the many available pick keys (Figure 6).

As you can see by the variety of ward cuts on these keys, selecting a pick key and twisting it gently in the lock is a simple matter. When you do this, if you feel an internal ward interfering with the pick key, stop and try a different key. If one

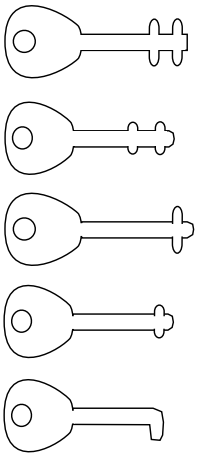


FIGURE 6—Various key picks used to pick warded padlocks are shown here.

of the two pick keys at the top of Figure 6 doesn't work, the third or fourth should. Should all of these keys fail to work because of ward interference, you can make a final attempt with the key that appears at the bottom of Figure 6. This key should be successful.

A third method for picking a warded lock is to actually make a key for the lock by impression. Impressioning is covered in the second section of this text, and is discussed in detail there.

Lever Tumbler Locks

Lever tumbler locks are available in a wide range of security levels. Some high-security lever tumbler locks can have as many as sixteen lever tumblers. These high-security locks are used on some types of bank safe deposit boxes and on some types of public lockers. For the most part, the lever tumbler locks you'll encounter will have between two and five lever tumblers within the lock. However, for this reason, we'll discuss medium-security lever tumbler locks with two to five lever tumblers.

To review the way a lever tumbler lock operates, look at Figure 7. The most important components of the lever tumbler lock to consider when picking this lock are the gate and the post. The saddle must be raised enough to allow the post, which is attached to the bolt, to slide into the rear trap. When

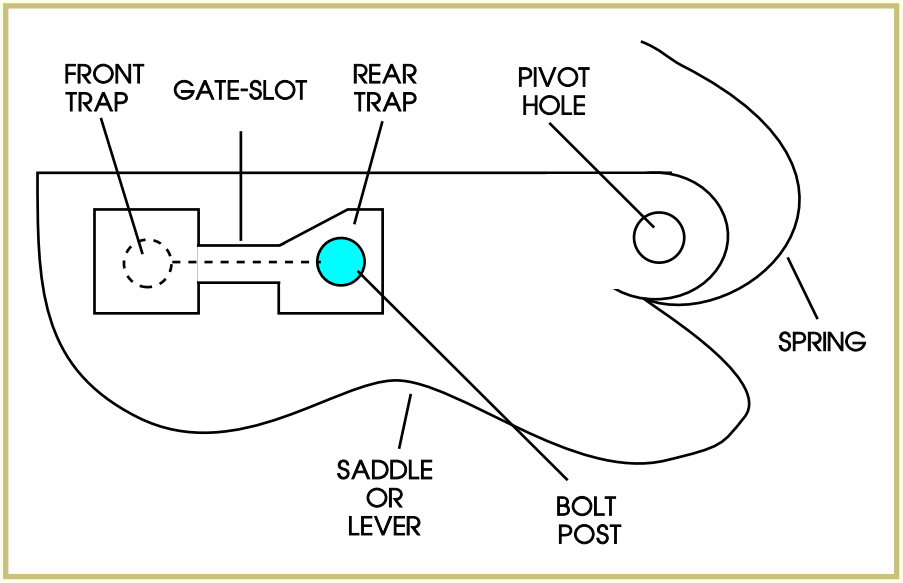


FIGURE 7—Parts of a Lever Lock

this action occurs, the bolt will slide out of the doorjamb, and the door will open.

To successfully pick a lever tumbler lock you must move two items within the lock — the lever tumbler and the bolt. For this reason, you'll need two different tools to pick this kind of lock. The first tool is a tension wrench. The second tool you'll need is a standard lockpick.

The two-step process for picking lever tumbler locks follows:

1. Insert a tension wrench into the lock to put force between the bolt's post and lever tumblers.

2. Lift the lever tumblers with a pick until the gating slots line up with the post, and the bolt opens.

To apply tension to the bolt and lever tumblers, insert the tension wrench into the keyway, small end in. Twist the tension wrench clockwise until you feel it stop. Now, using your pick, lift each tumbler until you feel the tension released from the tumbler. Continue lifting the remaining tumblers until the bolt snaps open.

To get a feel for picking this type of lock, it's a good idea to remove the lock's cover and all of the tumblers except one. Insert your tension wrench and the pick, and pick the lock open. Add a second tumbler and repick the lock. After you've successfully picked the lock with two tumblers, replace the cover and try it again. Continue doing this until you get a feel for how much tension you must apply to the tension wrench and how much tension you need to lift each tumbler. If the lock has additional tumblers, add these, one at a time, and continue picking the lock. One "trick" to picking a lever tumbler lock is to "feel" the tension on each tumbler with your pick and then release the tumbler with the greatest tension first.

Remember, practice makes for efficient locksmithing. In your free time, you should practice picking different types of locks. Practice is the only way to become a journeyman locksmith in lockpicking.

Disk Tumbler Locks

Picking disk tumbler locks is more challenging than picking basic warded or lever tumbler locks. This is because the keyway in warded and lever tumbler locks is relatively open, so you can easily insert your picking tools. In disk tumbler locks, however, the keyway is usually rather small.

To pick a disk tumbler lock, you will use a tension wrench and either a rake pick or a feeler pick. Our first-try system will involve the rake pick.

To begin, insert your tension wrench into the extreme bottom section of the keyway. Exert a small amount of pressure on the wrench. Exert this pressure in the same direction you would use to open the lock with its key. Normally, this direction is clockwise.

FIGURE 8—Hold the tension wrench and the pick as shown here when picking a lock.

With the tension wrench in place, insert the rake pick just above the tension wrench (Figure 8). The rake pick should enter the keyway without lifting any disks. If it interferes with the disks, remove both the pick and the tension wrench, then replace the tension wrench at the top of the keyway.

Hold the pick between your fingers the same way you would hold a pen. Use your little finger to steady your hand against the lock, and use your fingers to move the rake pick gently backwards within the lock. As the disks rise to the shearline, you'll feel a soft "click" in the pick and tension wrench. Don't expect the first pass of the rake pick to lift all of the disks to the point where the plug will turn. Many passes of the rake pick will be necessary, especially on newer locks where wear hasn't loosened the internal components.

If you aren't successful in opening the lock this way, slowly release your pressure on the tension wrench. Listen carefully

as you do this. You may be able to hear the clicks as the springs push the disks back into their slots. If it's a five-disk lock, you may hear three or four clicks. Try again. Remember, it requires practice to pick this type of lock.

A second method of picking a disk tumbler lock uses the feeler pick. In this method, you should place the tension wrench inside the keyway in the same way you did previously. Again, you can place the tension wrench at either the bottom or the top of the keyway, depending upon the position that's most comfortable for you.

With the tension wrench in place, begin lifting the first disk in the plug. Raise the disk just enough to lift it from the lower slot in the shell. If you raise it too much, the disk will enter the upper slot, and the plug won't be able to turn.

When the first disk is properly lifted, you'll feel it being released from the lower slot. At this point, stop lifting the disk. Continue applying a light pressure on the tension wrench while you begin lifting the second disk. When this disk is properly positioned, the plug's slight clockwise motion should hold it in place at the shearline along with the first disk. Continue lifting each of the internal disks until the plug turns and the lock opens.

If the lock doesn't open, you've either lifted one or more of the disks too far or too little. Gently release pressure on the tension wrench while listening for the clicking of the disks reentering the lower slot. Count the clicks to measure your performance. Don't be surprised to find that you only released one or two disks on your first try! It takes a great deal of practice to open a disk tumbler lock in less than five minutes.

The best way to learn how to pick a disk tumbler lock quickly is to remove the plug and take out all but one disk. Replace the plug and use your tension wrench and feeler pick to release the disk and turn the plug. After you've successfully completed this, remove the plug again and try picking the lock with two disks. Once you're confident that you can pick the lock with two disks, add an additional disk and pick it. After opening the lock with three disks and a feeler pick, return the plug to the locked position and try unlocking it with the the rake pick. After opening the lock with both the feeler pick and rake pick with three disks, add another disk and try again with both picks. When done, add the final disk and try once more.

For additional practice, remove the plug and scramble the positions of the disks and try yet again. This practice will help you pick disk tumbler locks quickly and easily.

Another method for picking disk tumbler locks is the bounce method. This method is generally very successful, especially on worn locks. In this method, place the tension wrench in the plug and exert a light turning pressure. Next, insert the rake pick completely into the plug. Pull it quickly from the plug in a straight motion. This action "bounces" the disks upward, where they can get caught out of the slots, thus allowing the plug to turn. Try this method on a disk tumbler lock with two, three, four, and then five disks.

One of the hardest things to determine in lockpicking is the amount of tension you should apply to the tension wrench.

Beginners tend to apply so much tension that the disks bind in the lower slot. Then, the force needed to raise them in the plug is so great that the feeler or rake pick actually bends. This places too much pressure on both tools for them to work properly. If you're having trouble picking a lock, try releasing some of the pressure on the tension wrench. Then try again. Apply just enough pressure so that the lifted disk stays in position as the plug turns, once the disk is free of the lower slot.

Double-Bitted Cam Locks

Double-bitted cam locks are more complex versions of disk tumbler locks. Like the disk tumbler lock, the double-bitted cam lock contains internal disks and slots in its cylinder. Unlike the disk tumbler lock, ten or more disks or wafers can be stacked within the double-bitted cam lock. These disks or wafers are placed between two end plates. The front plate contains a slot for the key, while the rear plate contains a keyway slot that matches the keyway grooves cut into the blank. This rear plate helps align the key within the stack of disks. The entire assembly within the lock is held together by a set of spring steel clamps shaped somewhat like the letter Z.

At first glance, this lock seems very difficult to pick. However, you'll find that using a specially shaped tension wrench and a rake pick can make most double-bitted cam locks or padlocks open rather easily.

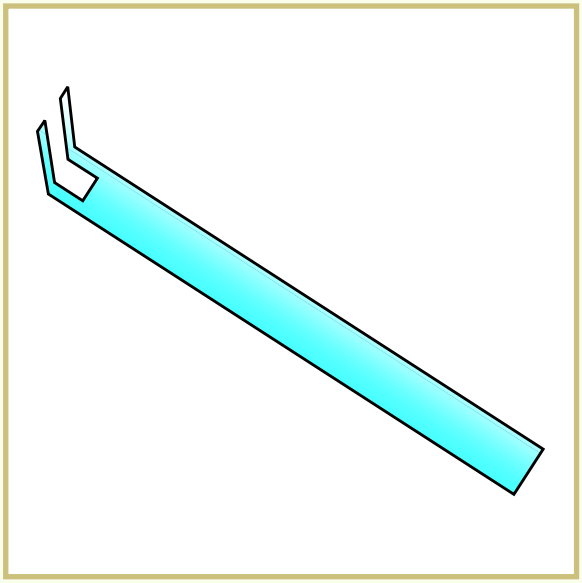


FIGURE 9—A Double-Sided Tension Wrench

To pick this kind of lock, you'll need a double-sided tension wrench like the one shown in Figure 9. This wrench is made of spring steel and has two tangs that enter the upper and lower side of the keyway.

To open this kind of lock, follow these instructions. After seating the tension wrench in the keyway and applying a gentle clockwise turning pressure, insert the rake pick towards the plug's rear. With the rake pick fully inserted, begin picking the lock by gently raking the top slots in the disks or wafers. After raking the upper slots several times, remove the rake pick and turn it upside down. Reinsert it into the keyway and begin raking the lower slots gently until the lock opens. If you have difficulty opening the lock, try it again, this time applying less pressure to the tension wrench.

One trick locksmiths often use in opening double-bitted locks is to use the bounce technique to rake the disks or wafers. In this case, install the tension wrench into the keyway and apply suitable pressure. Insert the rake pick entirely into the lock, then pull it straight out quickly. Invert the pick and perform the same action. Bouncing the discs or wafers this way tends to align them within the lock more quickly than strokes of the rake pick.

Pin Tumbler Locks

Of all the locks covered in this study unit, a pin tumbler lock is the most difficult to pick. This is because the keyway of the lock is relatively small, and the fit of the parts within the lock is somewhat close in tolerance.

As you remember, opening a pin tumbler lock is a matter of raising the upper pins above the plug's shearline. If the pins

aren't raised enough, they'll stay below the shearline. If they're raised too much, the lower pin will block the shearline.

For this reason, you must raise the pins to exactly the right height. Two conditions exist inside pin tumbler locks that help you to pick them. First, the lower pins don't fit tightly within the holes drilled inside the plug. Instead, the presence of a small clearance, roughly a few thousandths of an inch, allows the pins to wobble slightly in the plug's holes. This allows the plug to move slightly when a lower pin is raised to the shearline by your pick. Secondly, the plug's holes normally aren't drilled in a perfectly straight line. This lets you choose the order of the pins to pick.

When picking this kind of lock, insert the tension wrench into the keyway. Once inserted and seated, apply a light pressure in the clockwise direction. Take your feeler pick and begin raising the first lower pin until you feel the tension release from the pin and a gentle turning motion of the plug. The first pin rises, taking the upper pin just above the shearline. Continue this process with each additional pin until the plug turns. If the plug doesn't turn on your first attempt, gently release your pressure on the tension wrench and listen for the number of clicks as the lower pins reseat in the plug.

Don't be surprised to hear only one or two clicks the first time you try to pick a pin tumbler lock. These locks are difficult and require plenty of practice and patience.

A few tricks can help you open these locks quickly when using the feeler pick method. First, use a bright light to look at the pins within the lock. Locksmiths often use a light called an otoscope. This light uses a halogen bulb and lens to concentrate an extremely bright beam of light into the keyway of the lock. Once you can see the heights of the pins, begin by picking the longest pins first, as the longer pins have the shortest space to "travel."

Once the longer pins are lifted, begin raising the shorter pins. Remember how the holes in the plug aren't drilled exactly in a perfect line? Keep this in mind as you lift each short pin gently. The short pin with the greatest tension should be the next pin to lift with your feeler pick. The reason for the extra tension on the pin is shown in Figure 10.

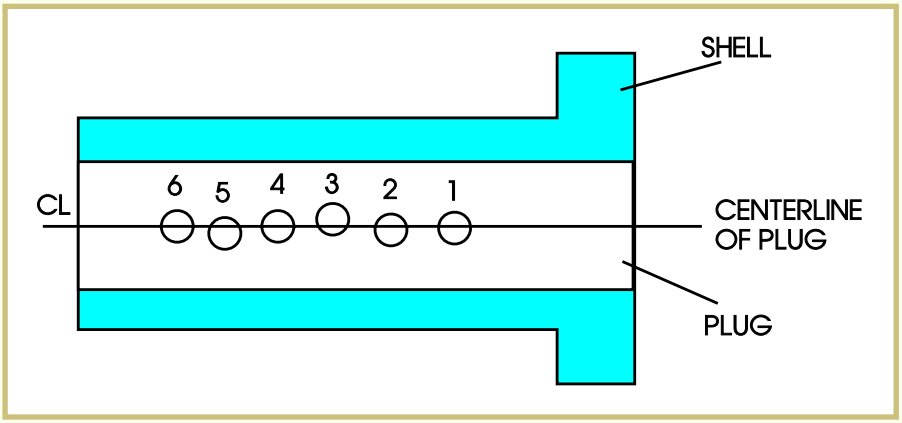


FIGURE 10—Notice how the holes aren't perfectly lined up with the centerline of the plug. If you pick pin three first, you'll get the greatest rotation of the plug.

Since the holes aren't aligned, the short pin with the most clockwise offset will have the greatest force against it. Lifting this pin next will cause the plug to shift the greatest amount when the upper pin reaches the shearline. To continue picking the lock, try the remainder of the short pins; once again, lift the pin with the most tension. Continue this process until all the pins are lifted and the lock opens.

Pin tumbler locks are often opened on a first-try basis by using the rake pick. A common method to use with this pick is to insert the tension wrench and apply clockwise pressure. Then, insert the rake pick and gently rake the lower pins back and forth until the plug turns. On medium-security pin tumbler locks, this method is often successful because the internal fit of the pins is rather loose.

You can also use the bouncing technique by rapidly removing the rake pick on some pin tumbler locks.

Just as you do with disk tumbler locks, it's often best to begin picking pin tumbler locks with some of the pins removed. In the beginning, try picking the lock with only one pin, then two pins, and so on. Increase the number of pins until they're all present and you can pick the lock in under five minutes.

Want a real challenge? Try removing the plug and staggering the lower pins so that they alternate in a long pin, short pin, long pin, short pin fashion. With the pins staggered in such a manner, you'll develop a great talent for getting the "feel" of the pick. You'll be able to reach around the long pins to get at the short pins without even moving the long pins.

The pin tumbler lock is also a good lock to practice on when using a picking gun. The picking gun bounces pins much more violently than the rake pick.

When the picking gun's trigger is pressed, the spring steel pick end snaps violently upwards. It strikes the lower pins, driving the upper pins rapidly up into the cylinder or shell. The action is similar to a hammer hitting a nail. When the hammer hits the nail, the hammer stops, but the nail moves forward. Likewise, when the picking gun's spring pick hits the lower pins, they transfer this energy to the upper pins (Figure 11). The lower pins stop in place and the upper pins fly upwards against the spring pressure. If the proper tension is applied by the tension wrench, the upper pins leave the plug and the lower pins remain in the plug, allowing the plug to turn.

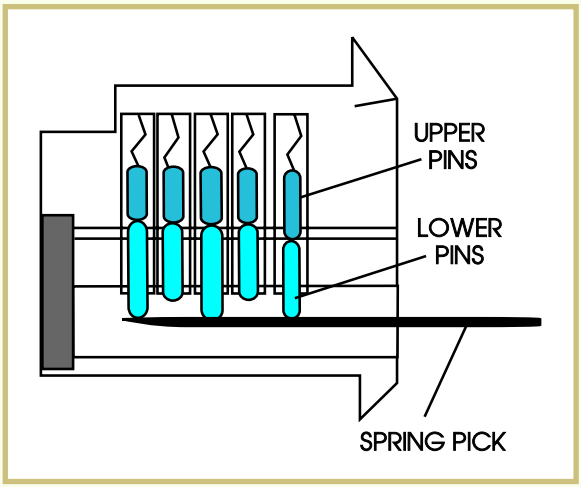


FIGURE 11—After the spring picking gun's trigger is pressed, the lower pins will strike the upper pins driving the upper pins up against their springs.

Some types of pin tumbler locks are constructed to defeat attempts to pick the lock. These locks contain specially formed upper pins that normally jam when lifted by a rake or feeler pick. These pins are shaped like mushrooms or spools as shown in Figure 12.

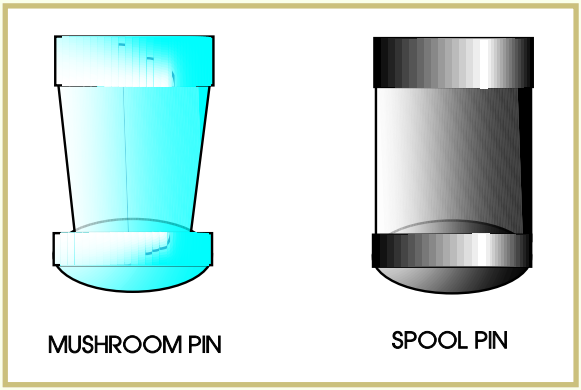


FIGURE 12—Spool Pins

When you begin lifting such pins with a rake or feeler pick, they jam between the plug and the shell as shown in Figure 13.

A picking gun is often the best tool to use in picking locks with mushroom or spool-shaped pins. Exert only a very light pressure on the tension wrench to keep the upper pins from binding. Increase pressure on the tension wrench just after pulling he picking gun's trigger.

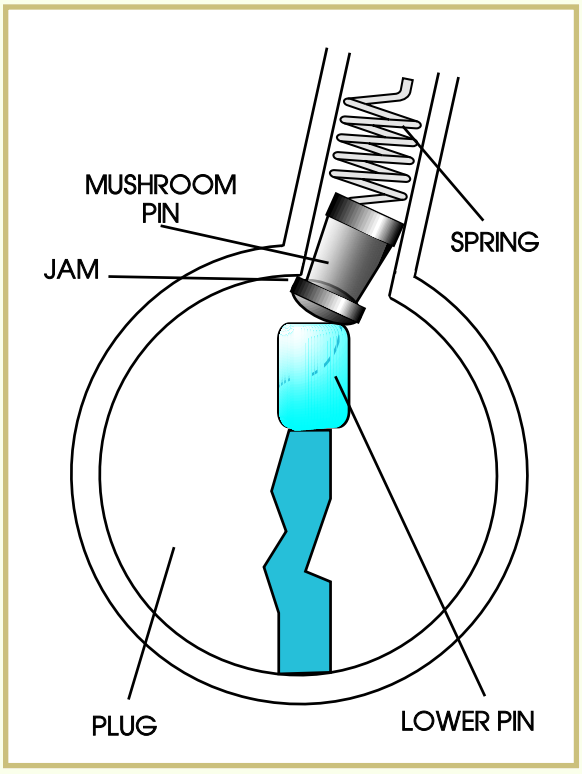


FIGURE 13—If you attempt to pick a lock with mushroom or spool pins, the upper pins can jam as shown here.

Picking the lock takes a lot of practice and exceptional timing of the tension wrench's pressure, so it's a good idea to practice picking this type of lock.

In some cases, the picking of a pin tumbler lock can be very difficult when using a pick and a tension wrench. Another method, called shimming, can be used to open a pin tumbler lock. However, the lock, such as a rim cylinder or mortise cylinder lock, must be removed from the locking mechanism to perform the procedure.

In using the shimming method, a small thin metal shim is inserted between the plug and the cylinder or shell. When the shim is first inserted, it will strike the rear-most upper pin. Each pin is lifted in series from the rear of the lock toward the front, and the shim is advanced forward in the lock, separating the upper pin from the lower pin at the shearline of the plug and cylinder. Once all upper pins are lifted above the shim and the shearline, the plug can be turned and the lock opened.

The actual shim is a piece of thin metal that is about 0.0015 inches or one and one-half thousandths of an inch. It must be this thin to fit between the plug and the cylinder. The shim

FIGURE 14—Shim stock can be formed around a screwdriver handle.

must also be preformed with a bend that matches the plug. You can purchase these shims in lots of 100 or can purchase a sheet of shim stock from a hardware store or a machine shop supply house. You can then cut the shim stock with scissors. Once cut, the shim stock can be formed around a screwdriver as shown in Figure 14.

In using the shim to open a mortise cylinder, rim cylinder, or other type of pin tumbler lock, the shim is placed in the rear of the cylinder as shown in Figure 15. The edge of the shim is placed in the small gap between the plug and the cylinder. Once started, the shim is pressed into the cylinder until it strikes the first upper pin.

FIGURE 15—The shim is placed in the rear of the cylinder.

With the shim pressed gently inward toward the front of the plug, the feeler pick is used from either the front or the rear of the plug to lift the lower pin at the rear of the plug. When the pin is lifted to the proper height, the shim will advance forward, separating the upper pin from the lower pin exactly at the shearline. This action is shown in Figure 16.

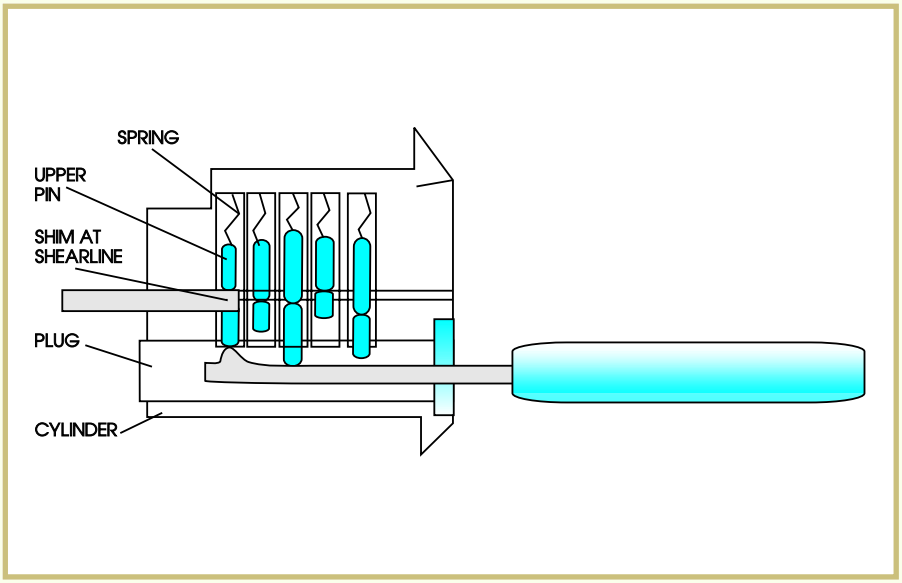


FIGURE 16—When the pin is lifted to the proper height, the shim will advance forward, separating the upper pin from the lower pin at the shearline.

In this illustration, note how the shim holds the upper pin above the shearline of the plug. Also note that when you release the lower pin with your feeler pick, this pin will drop back down into the plug. The shim should have advanced into the cylinder until it strikes the next upper pin. Don't apply too much force on the shim to advance it. You don't want to bend the shim. If a shim is bent, it will require you to remove it from the lock and begin over with a new shim.

The shimming process continues with the lifting of the second lower pin from the rear of the plug. When this pin is raised the proper amount, the shim will slip into place between the upper pin and the plug at the shearline. This is shown in Figure 17.

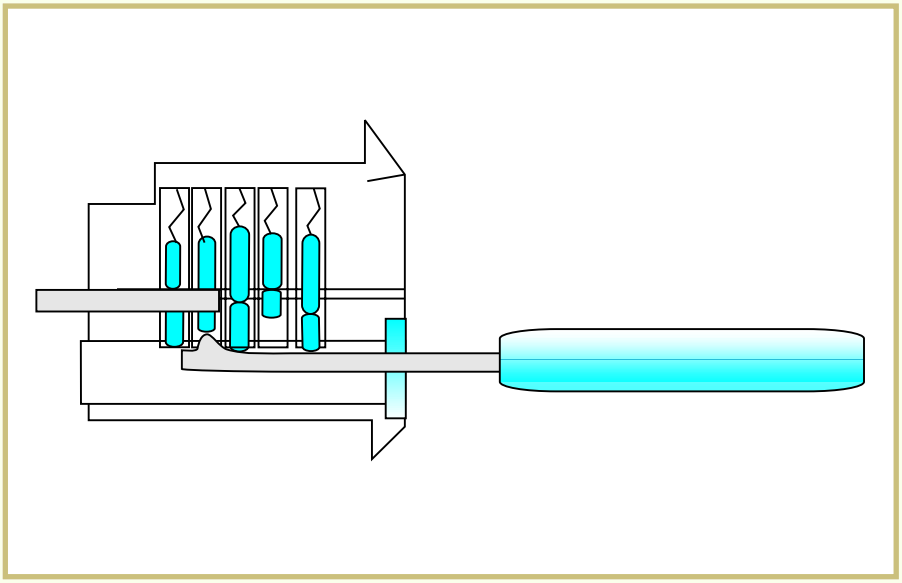


FIGURE 17—The shim will slip into place between the upper pin and the plug at the shearline.

This procedure for picking and advancing the shim continues from the rear to the front of the plug until all of the upper pins are separated from the lower pins and held above the shearline by the shim. The plug can now be easily turned using a tension wrench or a key. Once the plug is turned slightly, remove the shim and save it for your next shimming operation.

A second method of shimming a lock open is shown in Figure 18. Here a blank key is used instead of a feeler pick to lift the tips of the lower pins to the shearline of the plug.

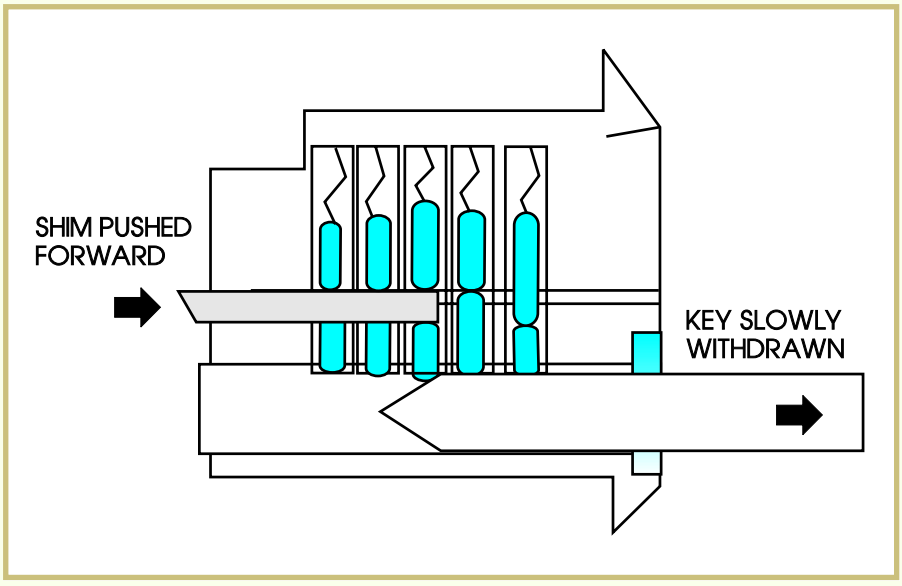


FIGURE 18—A blank key can be used to lift the tips of the lower pins to the shearline of the plug.

In practice, the shim is placed at the rear of the plug and the blank key is inserted into the front of the plug. This action will force most if not all of the lower pins into the shearline. As the key is slowly withdrawn, the lower pins will settle back into the plug. If the proper pressure is placed on the shim, it will separate the upper and lower pins as the lower pin rides down the angle of the front of the blank key's blade.

Combination Locks

Let's stray away from keyed locks for a short time and take a look at the lock that needs no key — the combination lock. Combination locks contain a numbered dial face and knob. The lock is opened by turning the knob both clockwise and counterclockwise until you reach certain numbers on the dial.

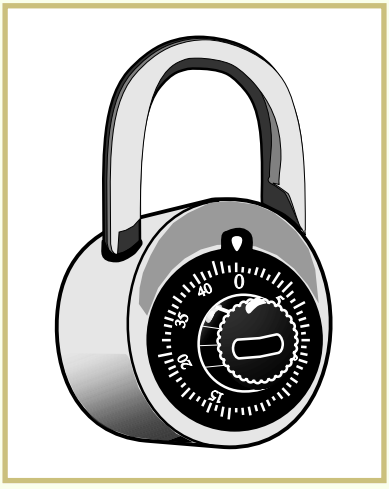


FIGURE 19—A typical combination-style padlock is shown here.

Once these numbers are "dialed," an internal locking dog is released, opening the lock's shackle. A typical combination padlock is shown in Figure 19.

A combination lock can take many forms. Many types of padlocks, door entry systems, and safes use a combination lock. The internal components of a typical combination padlock are shown in Figure 20. This particular lock contains three tumblers, two washers that serve as clutch plates, a tension spring, and a dial with its knob.

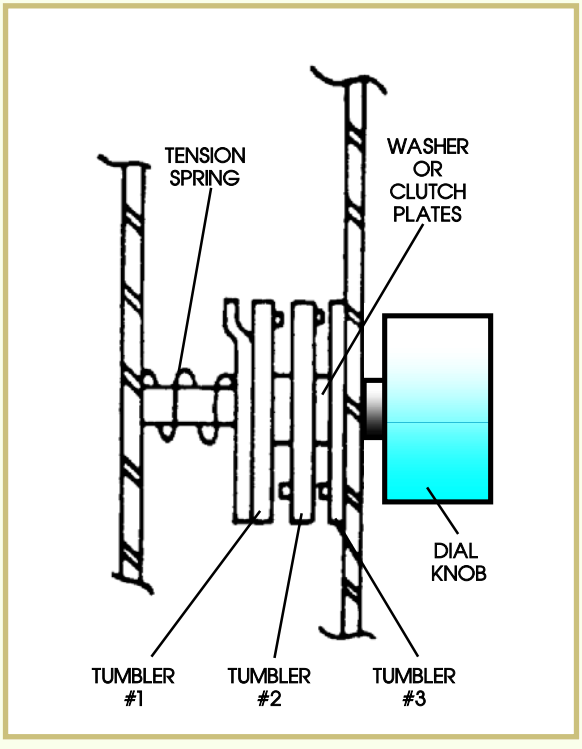


FIGURE 20—These are the internal components of a typical combination lock.

Note the tangs on the tumblers. When you turn the knob on the front of the lock, you turn only the first tumbler until its tang makes contact with the tang on the second tumbler. These two tumblers turn until the tang on the second tumbler makes contact with the tang on the third tumbler. All three tumblers turn as you rotate the dial knob. For this reason, you always begin picking this lock by turning the knob at least three revolutions in either the clockwise or counterclockwise direction. This action lines up the tumblers inside the lock.

If you look at a back view of the combination lock, you can see how the lock releases the locking dog and the shackle (Figure 21). Notice how the tumbler has a gate cut into it. When the proper numbers are dialed on the lock, the three tumblers line up with their gates open to the pawl on the locking dog. Since the locking pawl is free to pivot, it enters the gates on the three tumblers and opens the lock's shackle.

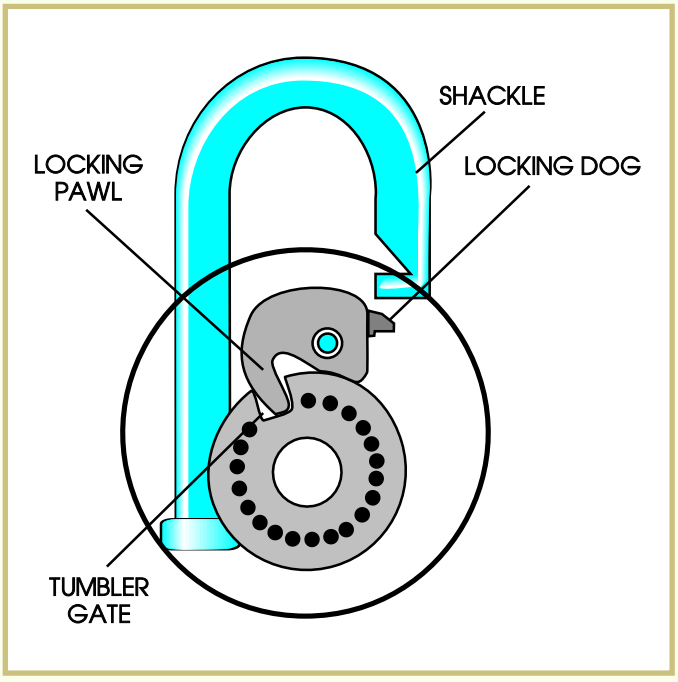


FIGURE 21—When the tumbler gates are aligned, the locking pawl will be released.

You can pick this kind of lock using many different methods. Just as with keyed locks, a number may be present on the combination lock. By looking up the number in a code book, which you can purchase from a locksmith supply house, you may be able to find the combination. Then you just dial in these numbers and open the lock. The numbers would appear in the code book as shown here:

28R 6L 18R

The letters R and L signify the direction to turn the knob. R means right or clockwise, while L means left or counterclockwise.

Many locksmiths open this type of lock simply by listening to it. As each tumbler passes the locking pawl during knob rotation, you will hear a very faint click. This click will be somewhat amplified if you pull upwards on the shackle. These clicking sounds can be further amplified if you use a stethoscope or other amplifying aid.

In order to get the combination numbers, turn the lock at least three times in one direction. Lift up on the shackle and turn the knob very slowly. At some point during this rotation, you'll hear a faint click as the locking pawl touches a gate in a tumbler. The locking pawl has actually hit the back of the gate. The number at the front dial will be one digit off from the actual combination. Therefore, depending upon the direction of the front knob's rotation, add or subtract one number from the front dial's number. For example, if you're turning the knob clockwise and the numbers are increasing as you turn, subtract one number from the number that's on the dial when you hear the click. If the number on the dial is 26, the actual combination number will be 25.

Next, turn the dial at least two full turns past this first number, and begin turning the knob slowly until you hear another click. Again, look at the dial face and add or subtract one digit from this number, depending upon the direction of dial rotation.

You can find the final number by reversing the direction of rotation once again until you hear the third click. Add or subtract one digit and you'll have all three numbers of the combination. However, these numbers may not be in the correct order to open the lock.

If, for example, you have the numbers 25, 8, and 31, the possible combinations are

25, 8, 31
25, 31, 8
8, 31, 25
8, 25, 31
31, 8, 25
31, 25, 8

One of these six will open the lock.

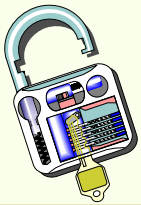
Some locksmiths open combination locks by drilling a hole into the lock's back. They then look inside and see exactly what numbers line up with the gates on the tumblers. This hole is then filled, sanded and polished.

Just as with keyed locks, "picking" combination padlocks takes practice and patience. It's often best for beginners to purchase a combination lock just for practice. Remove its back cover with a hacksaw or similar tool. Once the back is

removed, however, it can't be replaced, so remove the back cover from a lock you intend only to use for practice. With the mechanism in view, pick the lock open from the back side without looking at the dial. Reclose the lock and pick it using only the sounds of the pawl and the tumbler gates to guide you.

The information given in this section is applicable only to the more common low- and medium-security locks available today. The procedures and tools mentioned won't work on high-security locks. Obviously, manufacturers of high-security locks are very careful about who has information, spare parts, diagrams, and other such information about their locks. Normally, to get this information you must be a licensed, bonded locksmith invited to special training seminars. Even the keys for these locks are registered by the manufacturer and are often delivered to customers by courier or registered mail. High-security combination locks have internal cuts on the tumblers besides the gate cuts which give false clicks as you rotate them. You end up with a huge grouping of combination numbers (to make picking the lock an extremely difficult, time-consuming task).

Some high-security pin tumbler locks use keys with cuts at odd angles. These angular cuts rotate the lower pins into the proper position to lift the upper pins. One high-security pin tumbler lock even contains a side bar along with the lower and upper pins! Even more difficult high-security pin tumbler locks have as many as 30 pin sets spaced radially around the plug. The key for this lock is flat, with the proper holes drilled into the blade at the proper angle to open the lock. All of these "tricks" help keep the "wrong" lockpickers out.



Locking It Up! 1

At the end of each section in your *Professional Locksmith* texts, you'll be asked to pause and check your understanding of what you've just read by completing a *Locking It Up!* quiz. Writing the answers to these questions will help you review what you've studied so far. Please complete *Locking It Up! 1* now.

1. When making a key pick for a disk or pin tumbler lock, where should the shallowest cut on the key blade be?

   _____

   _____

2. Why is a warded lock easier to pick than a lever, disk, or pin tumbler lock?

   _____

   _____

3. What does the rear plate of a double-bitted cam lock look like?

   _____

   _____

Check your answers with those on page 65.

IMPRESSIONING

Making Keys with the Impression Method

In the last section, you learned how to pick various types of locks. Mastering this locksmithing activity takes many hours of practice and great patience. Trained locksmiths make the job look easy, though. The locksmith will study the lock a few moments, select the proper tools, and in a matter of seconds, the lock is open.

Key impressioning is also an art. Some locksmiths master lockpicking while others master key impressioning. Few locksmiths master both. Like lockpicking, key impressioning can open any keyed lock. And, when impressioning is complete, you'll have a working key for the lock you've just opened.

The process used for impressioning varies from lock to lock. The basic impressioning process is to place a key into a lock and twist it. The tumblers in the lock will leave faint marks or impressions on the key. You can then file these marks, thus creating a key for the lock.

Tools Needed

Key impressioning requires few new tools other than those already discussed. You'll need your vise, a selection of key blanks, a round file, a square file, a C-clamp, a candle or black magic marker, and a bright light.

Impressioning Keys for Warded Locks

Since warded locks are relatively simple, they provide a good introduction to key impressioning. The first step (in any impressioning procedure) is to select a blank of the proper size. The next step is to cut the blank so that it fits the keyhole.

Some warded locks have a ward in the lock's cover that prevents the blank from entering the lock. Such a lock is shown in Figure 22. To begin impressioning this kind of lock, smoke

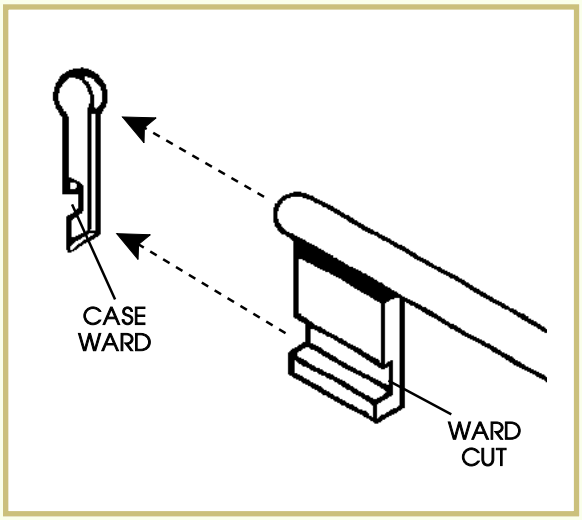


FIGURE 22—The first cut to make when impressioning a key for a warded lock is the cover ward cut as shown here.

the blank's end with a candle. With a good layer of soot on the blank's end, press it against the cover ward and wiggle it slightly. Use a needle or scribe to draw two lines on the blank, one line just above and one line just below the case ward.

What you've just done is define the cut's depth and location on the key blank. The lines you've drawn indicate the area that must be filed across the blade face. The end of the blade will also have the soot removed where it came in contact with the case ward. These marks define the depth of the cut to be made. Now, take the blank to your vise and use a square or warding file to remove this area on the blank.

Now the blank should enter the lock. There may be one or more case wards that prevent the key from turning. To locate these case wards, blacken the blade of the key once again with a candle. (Some locksmiths use a black marking pen instead.) Place the key into the warded lock. Turn it hard against the case wards. Remove the key. You should see bright spots on the key where it came into contact with the case wards. Using your square or warding file, file these areas.

Be patient and don't file too deep. If the key still won't turn in the lock, remove it, and soot or mark it once again. Reinsert the key and twist it against the case wards. Remove the key and check for the bright spots where the wards came into contact with it. File these areas and try again. Re-soot or remark the key and file as necessary until the key turns in the lock.

Once you've done this, all you have left to do is clear the cuts of burrs using your file or emery paper. Some locksmiths smoke the key once more to check its contact points. If a bright spot appears on the key, lightly file and deburr it once more.

Impressioning Keys for Lever Tumbler Locks

Lever tumbler locks come in a wide variety of styles and security levels. Some lever tumbler locks can contain as many as sixteen lever tumblers. These locks are, of course, high-security locks such as those used on bank safe deposit boxes. In this section, we'll deal with medium-security locks with two to five internal tumblers.

The first step in creating an impressioned key for this type of lock is to select the proper key blank. Lever tumbler locks normally use a flat key, so you should look for a flat key of the proper length, height, and width. If the key blank is too long or too high, you can file the key blank as necessary. If the blank is too short or too wide, you must choose another blank.

After you've chosen the proper blank, make the first cut — the ward or throat cut near the key's shoulder. This cut lets the key turn within the lock. To make this key cut, insert the key into the lock until the tip is seated in the lock's rear. Now, draw a line on each side of the key where the key meets the lock's outer cover. Next, remove the key and place it in a vise. Make a thin cut with your square or warding file, starting at the lines and working towards the tip, as shown in Figure 23.

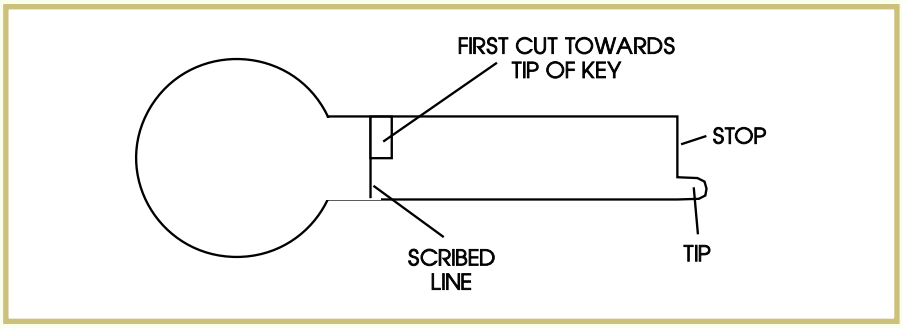


FIGURE 23—The first key cut to make on a flat key blank for a lever tumbler lock is the ward or throat cut.

Again, be patient. Make a short cut and try the key. If the cut is too small, you can always file away more material. If the cut is too deep, the blank is ruined, and you'll have to start over. Try the key and widen or deepen the ward or throat cut as necessary until the key turns within the lock.

Now the tricky part of key impressioning begins. First, smoke the key blank until it's completely covered with soot. Now, reinsert it into the lock and turn it clockwise. When the key is turned against the internal levers, the levers leave

shiny spots on the key where contact has been made. The idea here is to file ONLY the shiny areas of the key. Resmoke and reinsert the key as necessary.

You may find that it's often easier to pick lever tumbler locks. Once picked, you can remove the cover and positively identify the depths of the cuts to be made on the flat key blank.

Impressioning Keys for Pin Tumbler Locks

Though it's the most difficult method of opening a lock, many locksmiths open pin tumbler locks with key impressioning. This action not only opens the lock but provides a sample key for which a final key can be cut.

The first step in impressioning a pin tumbler lock is selecting the proper blank. The blank must be of the correct length and width, with the exact keyway cuts to match the lock's plug. Once you've selected the blank, remove all oil and dirt from it using a clean, lint-free rag or cloth. Next, insert its bow into a C-clamp or a vise grip; insert it into the plug. With the key fully inserted into the lock move the key up and down while twisting it clockwise and counterclockwise. Don't be gentle! The idea is to physically bind the lower pins and leave their marks in the key blade. This action is shown in Figure 24.

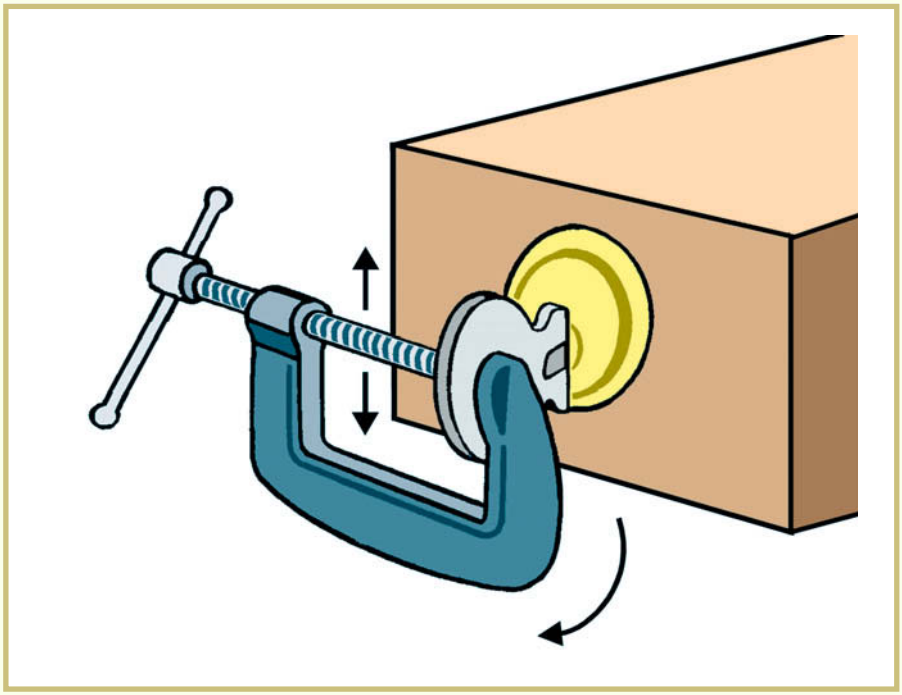


FIGURE 24—In order to create good impression marks in a blank, twist the key side-to-side while moving the key up and down in the plug.

The impressions on the key are very fine marks, which can best be seen by holding the key under a bright light and rotating it from side to side. Sample impression marks are shown in Figure 25. These marks appear as very fine scratches on the blank's blade.

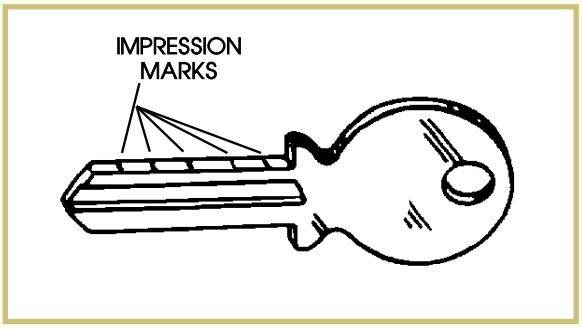


FIGURE 25—Impression marks will show up as small, shiny marks on the blank.

At this point, some locksmiths choose a small round file to file the impression marks. Others choose a small triangular-shaped file. However, your best choice is a number-four round-swiss file, as this produces the best cuts in the blank.

Place the blank in a vise and begin filing it at each impression mark. But don't file too deeply. After one or two cuts with the file, it's time to impression the blank again.

Reinsert the blank into the plug and again wiggle it up and down while twisting it. Remove the blank and look for new impression marks in the cuts you just made. One method of forcing new impression marks is to place backwards pressure on the blank while turning it from side to side. To apply backwards pressure, place a screwdriver between the shoulder of the blank and the plug; apply force while twisting the blank.

Now, remove the blank and examine it closely for new impression marks. File only those cuts where you see new marks; again, file only a few cuts at a time. Reinsert the blank after cutting. If it opens the lock, your task is complete, and you can deburr the key and create a duplicate. If the lock doesn't open, repeat the impressioning process once more.

Experienced locksmiths employ a few tricks when impressioning keys for pin tumbler locks, and you may find these helpful. One trick is to use impressioning matte, which leaves a dull finish on the top of the blank. When the blank is inserted into the lock and impressioned, the pins leave shiny marks that are easier to see.

Another trick is to file the blank key's blade to a knife edge. When this type of blade is inserted into the plug, the pins dull the knife edge at their locations. The blade is then cut at

the impression marks and a knife edge is again created at the cuts. Upon reinserting the key and forcing it, the lower pins again dull the knife's edge at each cut where they haven't reached the shearline.

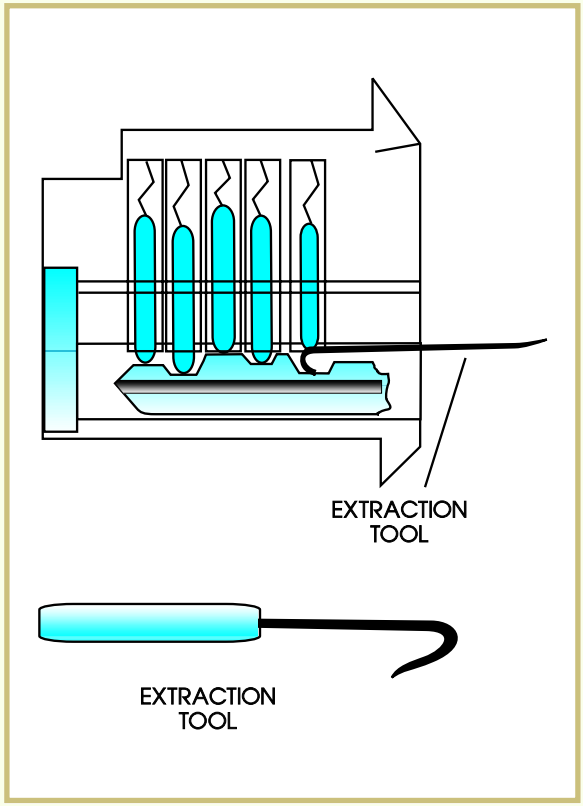


FIGURE 26—If you break a key during impressioning, you can remove the blade using an extraction tool as shown here.

One problem that often occurs during impressioning is key breakage. Normally, the key breaks at the blade's shoulder or just before it. When this happens, a simple extraction tool, such as the one shown in Figure 26, can be used to grab the blank and pull it from the plug.

One of the best methods for creating a key combines the impressioning technique with reading a lock. Reading a lock gives you a good idea of its cuts' depths. This topic is explored in detail in the next section.

Locking It Up! 2

1. List two methods of blackening a key for impressioning in a warded or lever tumbler lock.

   _____

   _____

2. When working with a lever tumbler lock, which cut is made on the key blank first?

   _____

   _____

3. How do the pins in a pin tumbler lock leave impression marks on the key blank during impressioning?

   _____

   _____

Check your answers with those on page 65.

"READING" LOCKS

Definition

Reading a lock is looking inside the keyway and determining the relative heights of the wafers, disks, or pins. Once you've determined these heights, you can cut a key on a code-cutting machine to open the lock.

Reading a lock accurately takes a lot of practice and patience. Don't be surprised if the first few keys you make this way don't open the locks. In fact, it's a good idea to practice reading locks and cutting keys for them. If the key doesn't open the lock, remove the plug and insert your key. You'll get an ideal visual display of the disks or pins you misjudged during the reading process.

Steps in Reading a Lock

The process of reading a lock involves four major steps, as follows:

1. Read the lock using a reading tool.
2. Create a wafer, disk, or pin chart based on this information.
3. Create a key using a code cutting machine.
4. Deburr and test the key.

You've already studied the last two steps of this process in Study Unit 6. For this reason, only the first two steps are detailed in this section.

Reading Tools

Many different types of reading tools are available to locksmiths. The tool you select depends upon your personal preference. You might find one tool easier to use than another. Two common types of reading tools are shown in Figure 27. Both are made of steel, and both are designed not to bend under the light pressure required during lock reading.

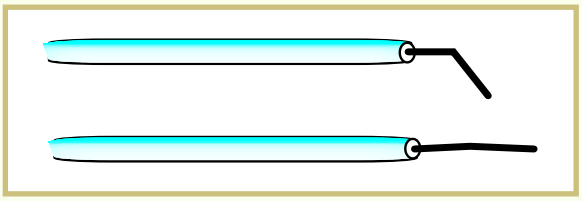


FIGURE 27—Two types of commonly used reading tools are shown here.

As you can see in Figure 27, one type of reading tool has a straight pick end that's bent shortly below the handle. The second has only a gentle bend to it.

Just as with a pick, the reading tool is held loosely in your hand like a pen. Support your hand's position by pressing your little finger against the lock. As a good first practice, insert the reading tool into the lock's keyway. Lift the reading tool so that all wafers, disks, and pins are raised to their maximum height. Now, slowly withdraw the reading tool, listening for the clicks as the tool is withdrawn from the plug. The number of clicks you hear should equal the number of wafers, disks, and pins that are in the plug of the lock.

In the actual reading of a lock, you'll be using the reading tool to lift the individual wafers, disks, and pins and judge their relationship to each other and to the typical depths of cuts used on the type of lock you're reading. The easiest method of performing these comparisons is to create a reading chart.

Creating a Reading Chart

Reading charts are great aids when you first begin reading lock codes. Two such charts are shown in Figure 28. The top chart should be used with wafer or disk locks (0.015 inch), while the lower diagram is used with 0.025-inch pins or disks.

In a reading chart, a line is drawn from the cut number to the cut depth you determine. Let's look at a sample chart for a pin tumbler lock. The key code for this lock will be 3, 2, 4, 2, 1. Figure 29 shows such a chart. Remember, these codes would be developed by using the reading tool.

To develop the codes for the pin tumbler lock, insert the reading tool into the plug and compress all but the last lower pin in the plug. This fifth lower pin has been judged to be a number 1 code, which will require a full width on the blank's blade to raise the upper pin to the shearline. Judging the lower pin's length comes from trial and error and practice, practice, practice.

FIGURE 28—These two charts can be used to decode the key code for locks during the reading process.

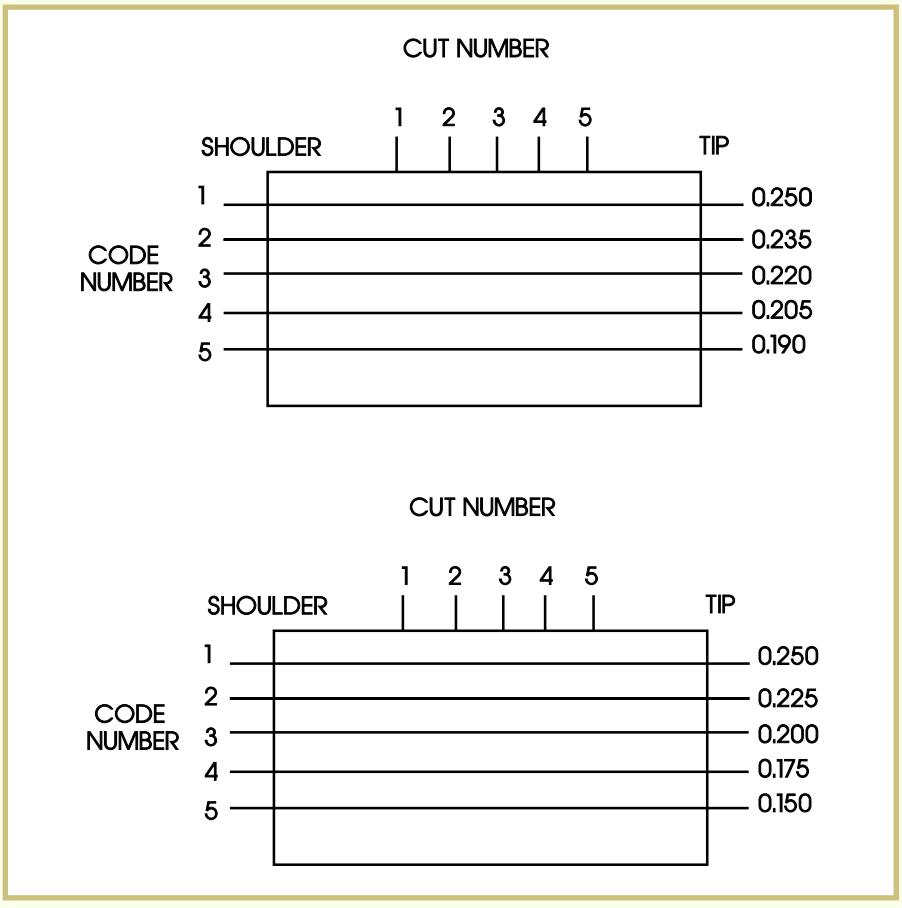
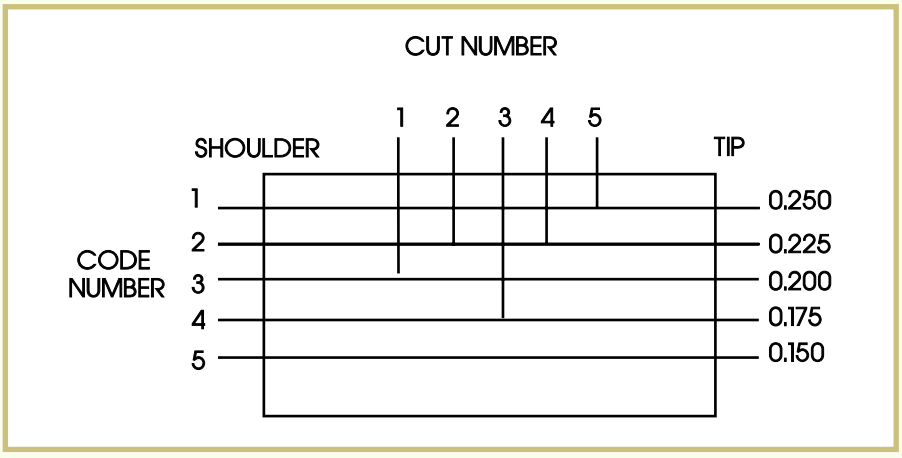


FIGURE 29—The reading chart shown here will display the cuts needed for a key for a lock coded 3, 2, 4, 2, 1.



When reading a lock, the length of the first pin or slot size in a wafer or disk is a critical judgment, because all of the other codes are compared to this first wafer, disk, or pin. If you're off even by one code number, the entire code sequence will be off, also. In our example key code of 3, 2, 4, 2, 1, if you're off by one number on the fifth cut, the code might advance by one number, resulting in a key code of 4, 3, 5, 3, 2. As you can

see, advancing the fifth pin by one number has a great influence on your final code.

Making Keys to Fit

After you've determined the lock's codes or cut depths, a key can be created in many different ways. You might impression the key in a pin tumbler lock to determine the spacing of the cuts. Then, you could use your codes to file and measure the cuts with a vernier caliper.

A second, more efficient method is to use a code key machine. However, you'll need the proper spacer or guide key to match the lock you're working on. Once you know the key codes, it's a simple matter to install the spacer or guide key in the machine and then dial in the proper cut depths.

This operation can be performed either at your shop or in the field. Most modern key machines use dual-voltage motors that can run on either 120-VAC or 12-VDC power. The 120-VAC power can be supplied by a normal shop outlet, while the 12-VDC power can be supplied by an adapter that plugs into the cigarette lighter outlet of your car or van.

Now, let's look at how to read two types of locks, the disk and pin tumbler locks.

Reading Disk and Pin Tumbler Locks

As you'll recall, disk tumbler locks may contain up to five types of disks in the plug. These five disks are shown in Figure 30. Note that the shape of each disk is identical. Because the key slots are positioned in different places on the disk, a different cut depth is required to lift each individual disk to the shearline, thus allowing the plug to rotate.

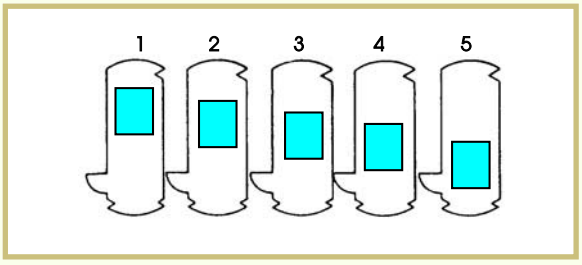


FIGURE 30—These are the five disk sizes used on typical disk tumbler locks.

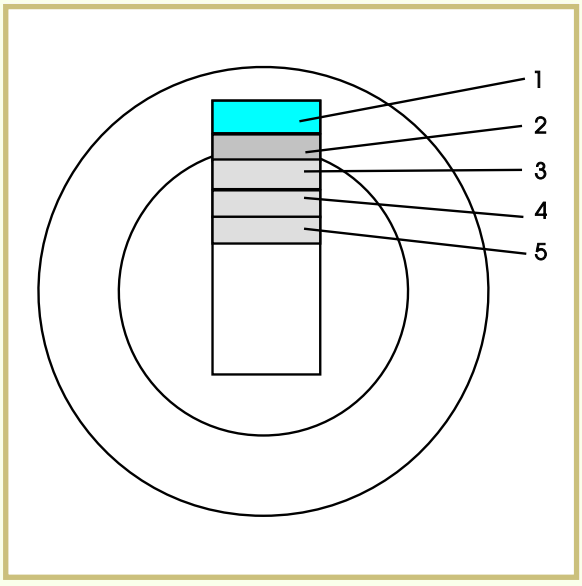


FIGURE 31—If you were to look into the plug of a lock with a disk arrangement of 1, 2, 3, 4, 5, this is what you would see.

If the disks are placed in the plug in numerical order, the slot heights would appear as shown in Figure 31. Since the dimension between the different code numbers is only 0.015 inch, only a slight amount of difference exists between the slot positions.

Let's look at the reading process for a typical disk tumbler lock. This type of lock is often used as a drawer or cabinet lock in homes and businesses.

The very first step in reading any form of lock is to illuminate the inside of the plug. As already mentioned, most locksmiths use an otoscope with a halogen bulb to provide a bright beam of light into the plug. An alternative to this is a small but very bright penlight.

Next, position yourself so that your body is stable. Floor cabinets and desks can best be read using a kneeling position, while file cabinets require a standing position. Often, it's best to place your elbow against the desk or cabinet for support.

Slide the reading tool through the disk slots until it reaches the back of the plug. Once the reading tool is seated in the back of the plug, begin pulling it slowly from the lock. As each disk is released by the reading tool, make a mental note of the various heights of the slots. Slot height can be determined by visual inspection or by watching the distance the disks fall when released by the reading tool.

You can perform a first scan to find out which disk slot is the highest, a number one or two disk, and which disk slot is the lowest, a number four or five cut. This first scan will show you the relationship of the slots in the lock most efficiently.

At this time, you may want to mark the reading chart as shown in Figure 32.

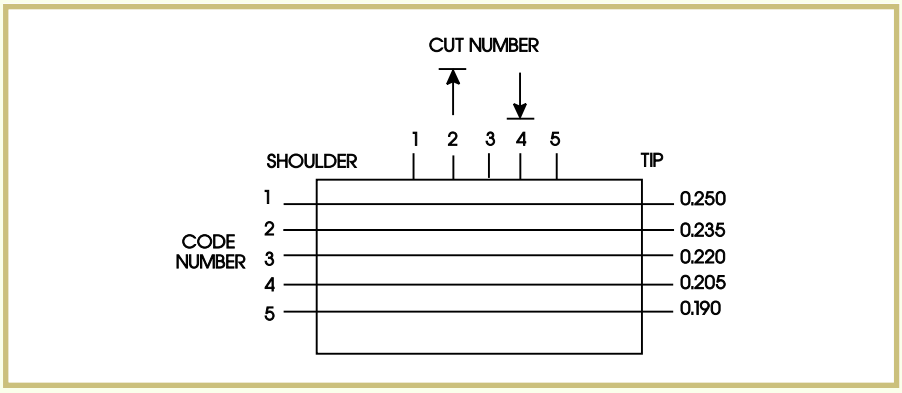


FIGURE 32—In this illustration, arrows have been added to display the highest and lowest disk slot.

Note the use of arrows on the reading chart. In the case of this disk tumbler lock, the second cut from the key's shoulder has the smallest code number (shallowest key cut), while the fourth cut from the shoulder has the largest code number (deepest key cut).

Reinsert the reading tool into the lock to judge the relationship of the other disk slots to the highest and lowest disk slots. Again, raise all of the disks with the reading tool. Now, release the fifth disk. Judge its depth compared to the fourth disk. Continue withdrawing the reading tool slowly until the third disk drops down in the plug. Finally, slowly remove the reading tool to view the slot relationship of the first disk in the lock.

In our sample lock, let's use a key code of 3, 1, 2, 4, 2. As we've seen in the first stage of reading, the second and fourth disks have the slots with the greatest difference in slot heights. We used large arrows on the top of the reading chart to identify these disks. Now, let's add smaller arrows to the chart to identify the relationship of the disks in positions one, three, and five.

While reading the lock, you should have determined that the third and fifth disk contained the same disk number, and therefore, the same slot height. This may have been difficult, since the number four disk separated these, blocking your vision. Often it takes more than one pass of the reading tool to judge slot height relationship when a larger-numbered disk separates two smaller-numbered disks.

The first disk in the lock can then be judged to be just slightly deeper than the third disk in the plug. This is a fairly easy judgment, since you can look through the slot in the disk in the second position.

Adding shorter arrows to the top of the reading chart results in a chart as shown in Figure 33. Note the relationship of the

arrows used on the chart. The deepest and shallowest slots contain the largest length arrows. The first cut nearest the shoulder has the second longest arrow (meaning the second deepest cut in the slot). The disks in positions three and five have equal length arrows which are slightly shorter than the arrows for the first disk.

Now, all we need to do is identify one of the disks to complete our chart.

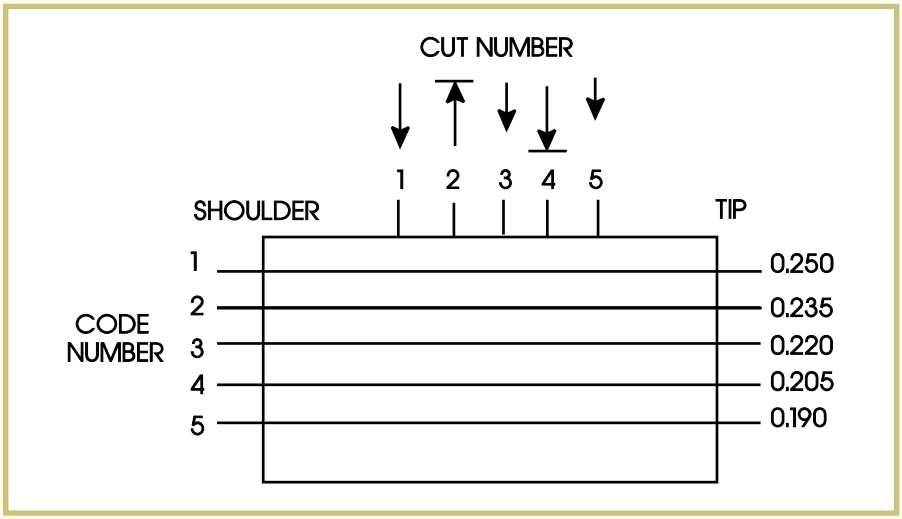


FIGURE 33—Adding the arrows for the rest of the pins would appear as shown here on the reading chart.

Remembering that a number one cut requires a full blade width of 0.250 or one-quarter inch, you can make a tool to read a number one disk. Simply bend a piece of wire at a right angle so that its small end is exactly one-quarter inch. Insert this wire into the plug of the lock. In our example, gage the height of the second disk. If the disk lifts, it will be a number two or three disk. In this case, the wire fits perfectly

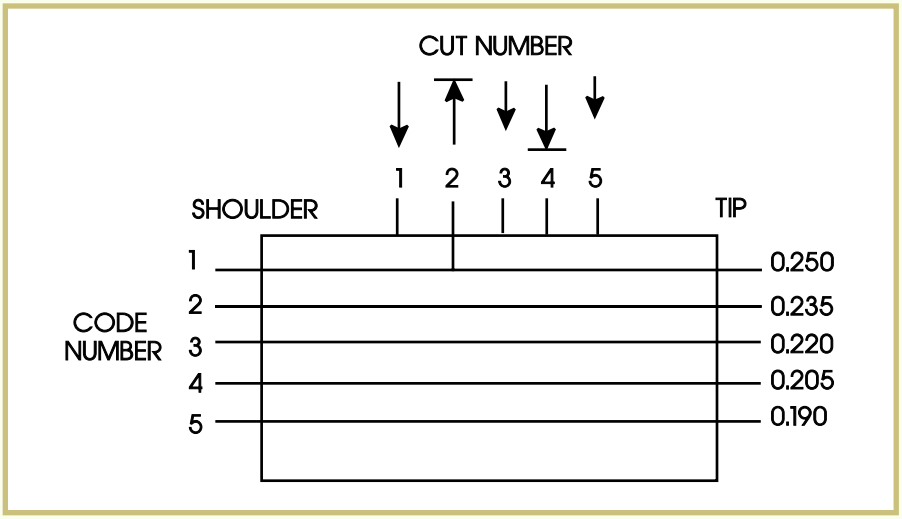


FIGURE 34—The reading chart can be added to by drawing a line for the number one disk as shown here.

in the slot, meaning that this slot is in a number one disk. Now, the relationship of the disks is known, and you have a starting point for completing your reading chart. This chart is shown in Figure 34 with a line drawn to the number one cut depth on the chart.

At this point, you should be able to complete the chart using lines for actual cut depths, as shown in Figure 35.

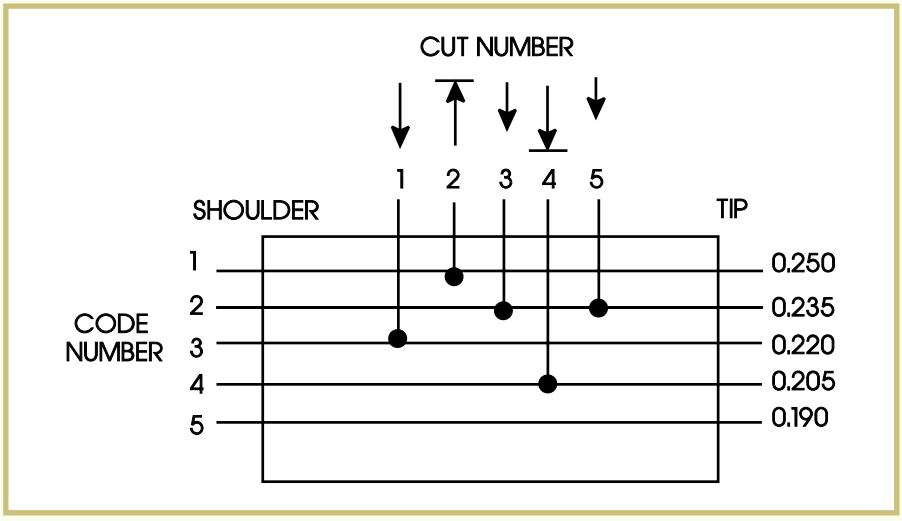


FIGURE 35—The completed reading chart would appear as shown here.

Figure 36(a) illustrates a profile view of the disks in our sample lock. The slots in each disk are highlighted as solid blank areas on each disk. Figure 36(b) shows how these disks align at the shearline when a properly code-cut key is inserted into the lock's plug.

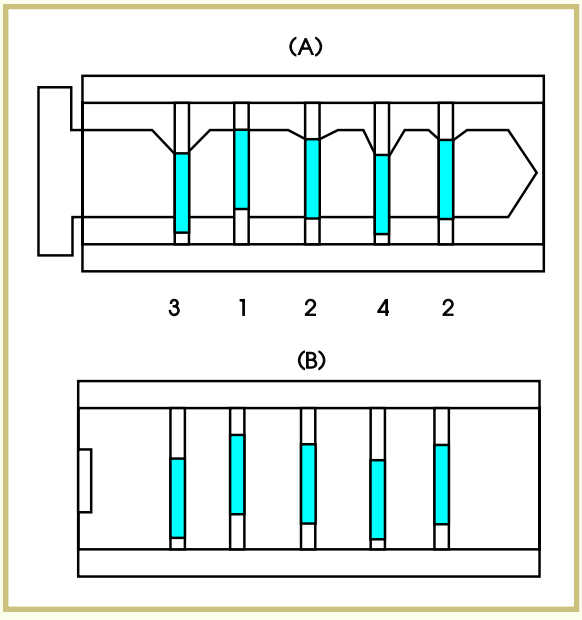


FIGURE 36—This diagram shows the profile views of our example lock with a key inserted as in (a), and with the key removed as in (b).

Would a locksmith perform this process in order to read a disk tumbler lock? No, because the locksmith would simply light the keyway and use a reading tool to scan-read the disks (he or she would have practiced, practiced, practiced!). One

final pass of the reading tool and the locksmith would be ready to cut the key. No chart would be created, as the locksmith would simply memorize the codes while withdrawing the reading tool the second time. The reading charts are simply an aid to use during your practice sessions. Once you can competently read a lock, stay on top of your skill by reading a lock several times each week.

Once you know the key codes, you can create a key for the lock. If you have a spacer or guide key and a code-cutting machine, this is a simple task. However, if you don't have this equipment, you can create a key using the impressioning method. Simply blacken the key with soot or a marker and insert the key into the plug. Twist and turn the darkened blank to pick up the disk locations. Cut the key using a file and a vernier caliper.

Pin tumbler locks can be read using the same methods shown for disk tumbler locks. Instead of reading slots, you lift all lower pins to their maximum upward travel using your reading tool. Now, as with a disk tumbler lock, determine the longest and shortest pins by the amount the pins drop when released. Finally, complete the reading chart by identifying the comparative heights of the remaining pins. Using a code chart for a pin tumbler lock, cut a key for the lock, deburr it, and open the lock.

Reading Lever Tumbler Locks

The reading of a lever tumbler lock requires great skill and again, practice. The difficulty in reading this type of lock lies in its narrow keyway which makes it very difficult to see inside the lock.

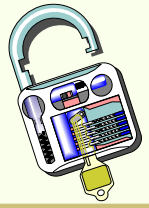
One advantage you may find is that some manufacturers use different width levers or saddles inside their locks. When using a reading tool, you can feel these different width saddles and identify them. In these locks, a thin saddle can be lifted by a key with a very shallow cut, while a thick saddle requires a deep cut to lift the trap and release the bolt.

Some lever tumbler locks contain saddles of the same width. These are the most difficult types of lever tumbler locks to read. To read these locks, lift each tumbler to its point of full

upward travel, which allows you to judge the minimum cut needed across the key.

From this point on, reading the lever tumbler lock is more like picking than reading. To begin, install a tension wrench to force the bolt of the lock inward. Use the reading pick tool to lift each lever. Begin reading the lever with the most tension on it. Judge how high you must lift it to release the tension as you "pick" this lever. Move on to the next-highest tension lever, and judge the height it must be raised to place the trap at the bolt's post. Continue this process with each lever by raising the lever's saddle with your reading tool. If need be, create a reading chart as you progress through the lock. Normal key-cut increments for lever tumbler locks are in the range of 0.015 to 0.025 inch.

Reading lever tumbler, disk or pin tumbler locks can be very frustrating at first. Often, it's best to disassemble these locks, place only a few levers, disks, or pins in the lock, and then read only these. As you become more experienced, you'll find it much simpler to perform a correct "read" of a lock on the first or second pass.



Locking It Up! 3

1. How is a reading tool different from a pick?

   _____

   _____

2. How can you tell if you've reached all five pins or disks in a five disk or pin tumbler lock?

   _____

   _____

3. What is the easiest method of cutting a key for a lock once the lock has been read?

   _____

   _____

Check your answers with those on page 65.

FORCING A LOCK AND FORCED ENTRY

The Last Resort

Locksmiths normally force a lock only in emergencies. Forcing a lock takes more skill than it seems at first glance. You must understand how the lock works, what its security level is, and where and how to force it. Brute force isn't always the proper method.

Picking, impressioning, or reading are usually the first attempts. In certain situations, however, it's quicker and easier to force a lock rather than to open it using one of the three previously mentioned methods. For example, a file cabinet can sometimes be forced in a matter of seconds. Forcing won't damage the lock, only drop the bolt behind the plug. In such a case, forcing is a quicker and more efficient way of opening the cabinet, especially if the owner has simply left the keys home and doesn't need to have a key cut for the lock.

Forcing a lock, like picking, impressioning, or reading, should only be used when you're sure that the true owner is present. Otherwise, forcing the lock is against the law.

Forcing Padlocks

Depending upon the type and security level of a padlock, you can force it open using many different methods. One commonly used method is called the rapping method. A tension wrench is inserted into the plug and a light force is placed in the plug's clockwise, or normal opening, direction. Then, a soft-faced hammer is used to strike the side of the padlock that contains the springs and upper pins. The striking force causes the upper pins to push back against their springs, raising them above the shearline. If the lower pins stay in the plug, the plug turns, and the lock opens. This method can also be used on wafer or disk tumbler locks. However, the rapping method isn't as successful with pin tumbler locks, because the disks or wafers move to the shearline only if the exact amount of tension wrench pressure is applied. Too little pressure lets the wafers or disks fall back into the lower slot, while too much pressure binds them in the lower slot.

Inexpensive padlocks and combination locks can also be opened by applying force to the locking mechanism. The force necessary depends upon the lock's security level.

The shackle locking mechanism of inexpensive padlocks is a simple spring-loaded locking dog that mates with a notch cut out of the shackle. If enough force is applied upward on the shackle or downward on the shell, the locking dog moves backwards enough to free the shackle. This force is normally provided by a brass bar and a hammer. The object is to place the brass bar against the lock near the shackle and strike the bar once, violently, with the hammer. The brass bar tends to spread the blow evenly over the shackle. Figure 37 shows the internal locking mechanism and the point on the lock where you should strike it.

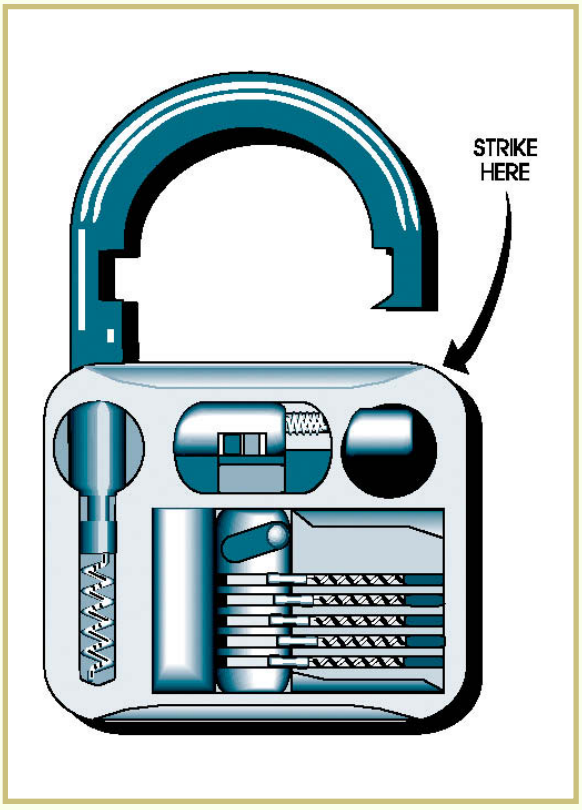


FIGURE 37—A padlock can often be opened by hitting the padlock in the location shown here.

One brute force method often used by the nonprofessional is to use a long pointed bar or crowbar to slam the lock. Although this method is often successful on inexpensive padlocks and combination locks, it can damage the lock's shell, shackle, or locking mechanism.

Most high-security padlocks have been internally designed to defeat rapping, hitting, or slamming. In these locks, both sides of the shackle are held by the locking mechanism, instead of just one side.

Two of the most common methods for providing double locking of the shackle are

1. Using two hardened steel bars on a pivot plate in the lock

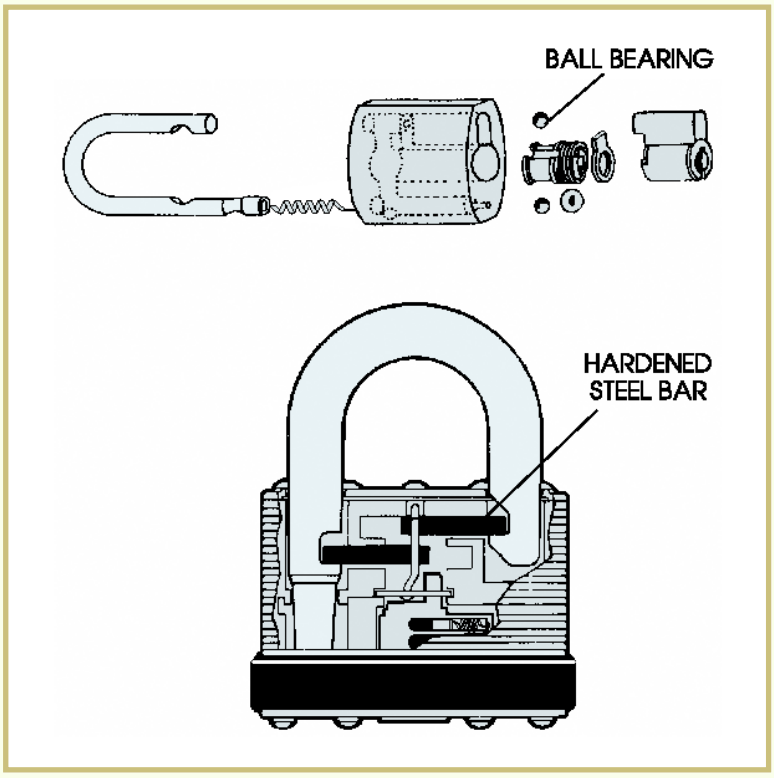


FIGURE 38—High-security padlocks can use either a set of hardened steel bars or ball bearings to hold the shackle.

2. Using hardened steel ball bearings

These methods are shown in Figure 38.

High-security locks can withstand force in excess of 5000 pounds (2 ½ tons) before opening. This amount is well beyond the capabilities of your brass bar and hammer or the nonprofessional's crowbar.

Although the shackles of high-security locks are hardened steel, you can often defeat them by using a tool called a bolt cutter. This tool has extremely hard steel cutting blades and long handles to let you amplify the cutting pressure. This tool isn't simply squeezed to cut the shackle. Instead, you position the cutting jaws on the shackle and violently pull the handles together to snap the shackle. Hardened steel shackles break after repeated attempts are made with a bolt cutter. Sawing these shackles with a common hacksaw blade can take upwards of one hour. If you must cut the shackle, it's best to use a small grinder and a steel cutting wheel.

Another option for opening a padlock is to drill out its plug. This is shown in Figure 39. Normally, the lock is drilled slightly above the shearline. This action damages the upper pins as the drill goes through them. After you've drilled into

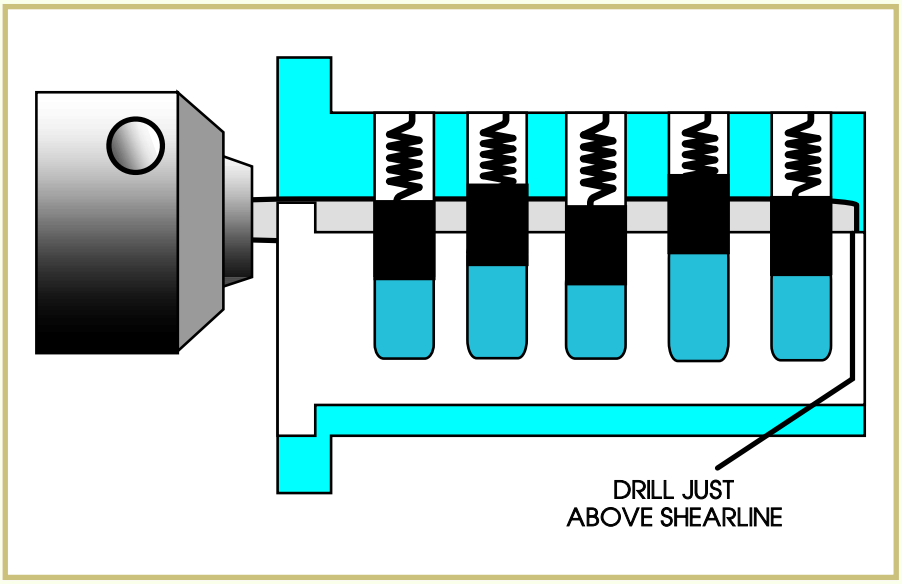


FIGURE 39—A lock can be drilled just above the plug to force it open.

the lock as far as the key would enter, turn the plug with a tension wrench or screwdriver.

Some locks contain hardened steel areas to protect the plug and locking mechanism. These areas can sometimes be drilled with tungsten-carbide drill bits. In some cases, hardened steel ball bearings are used inside the locks to protect against drilling.

The lock's plug can also be pulled from a lock to open it. On padlocks and even automobile locks, the center of the plug at the keyway can be drilled. Then, a device called a slide hammer with a screw tip can be inserted into the drilled hole in the plug. The slide hammer's weight is inserted slowly forward and then violently backward against a stop collar. The force exerted when the weight hits the collar can be great enough to pull the plug from its retainer, thus removing it from the cylinder or shell. The locking mechanism can then be tripped, opening the lock. The lock is destroyed in this process. Figure 40 displays such a slide hammer.

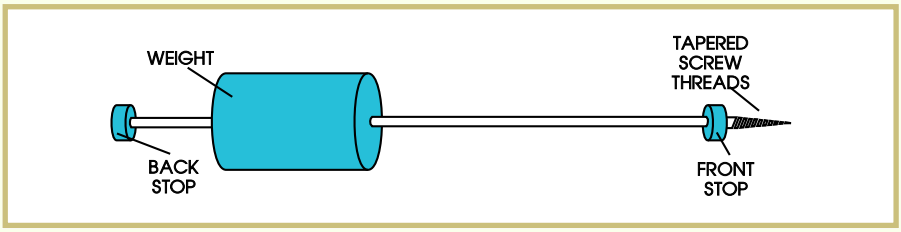


FIGURE 40—A slide hammer uses a weight striking a collar to apply backward force on the plug.

Opening Desks and File Cabinets

Desk and file cabinet locks generally feature a wafer, disk, or pin tumbler lock. The locking mechanism is normally a bolt that rises from the lock's rear when the plug is turned to the locked position.

You can use one of two basic methods to open desks and file cabinets without destroying their locks or using the picking, impressioning, or reading methods. These methods are

1. Lowering the bolt with a specially shaped pick
2. Drilling a small hole into the desk or file cabinet to release the bolt

Due to the construction of most desk or file cabinet locks, a specially shaped pick can often be inserted through the key-way to lower the bolt. This action can take place without turning the plug. Figure 41 shows this tool lowering the bolt.

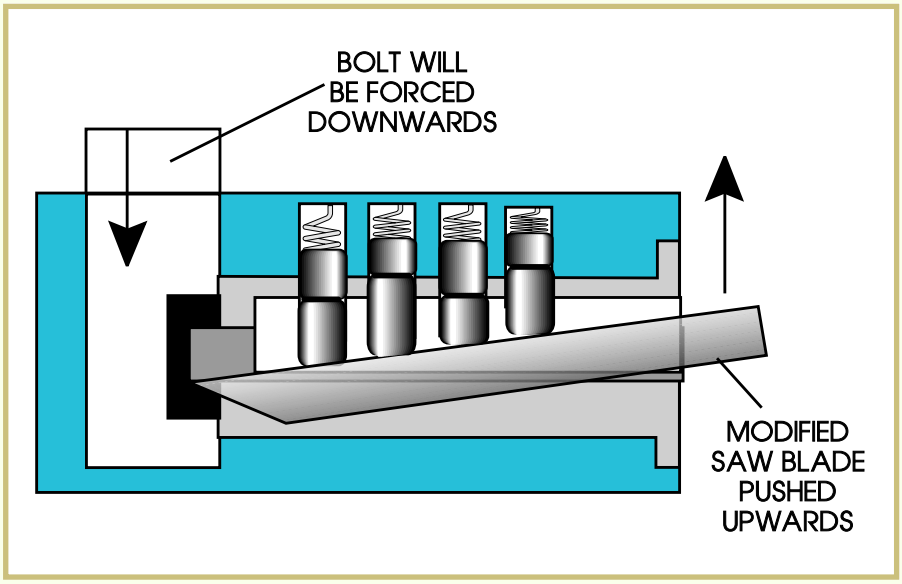


FIGURE 41—A desk lock can be forced open by lowering the bolt as shown here.

The picking tool can be made from a saber or jigsaw blade. Select a blade that's longer than a standard blade and one that is made for cutting thin metal. The blade can then be ground to the shape needed to drop the bolt.

The second method of opening a desk or file cabinet lock requires that you drill a hole just above the lock. The hole should be as small as possible, around one-eighth of an inch in diameter. Normally, a small battery-powered drill can

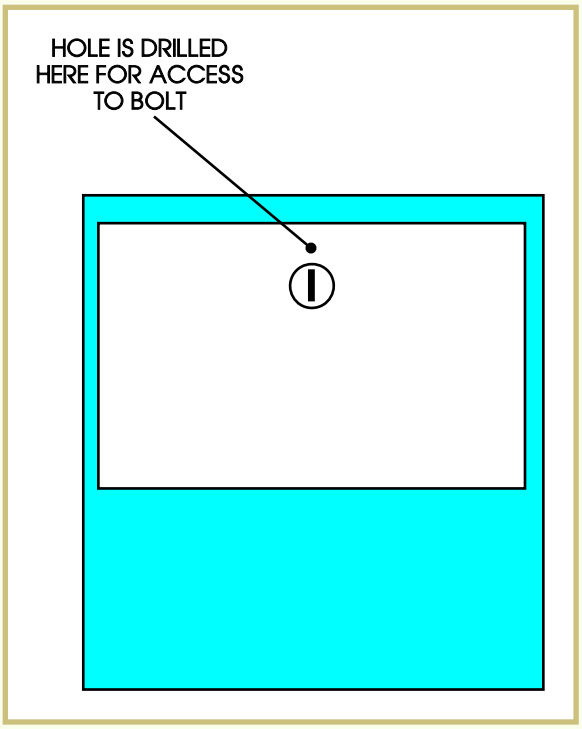


FIGURE 42—If the bolt can't be lifted through the plug, the bolt may be accessed through a hole drilled as shown here.

quickly and easily drill a hole of this diameter through wood or steel drawers without the need to run extension cords. Once the hole is drilled, you can insert a small, straight-pointed spring steel pick inside the hole. Push down on this pick while pulling gently outward on the drawer. The pick lowers the bolt, releasing the drawer. The hole can then be filled in with color-matching wood putty, epoxy, with a bolt and nut, or a decorative screw. The location to drill the hole is shown in Figure 42.

Forced Entry

The forced entry of an automobile, locker, home, or business is always a last resort. It's much better to pick, impression, read, or use "try" keys to open a lock rather than force your way into it. "Try" keys are produced by lock manufacturers; they feature the most common key cuts and open many locks. Lockpicking with "try" keys should also be attempted.

In many cases, forced entry results in some form of damage to the lock or its surroundings (e.g., the desk in which the lock resides). And remember, forced entry without the owner's approval is illegal. It's called breaking and entering by law enforcement personnel.

Forced Entry of Homes and Businesses

Any area of a home large enough for a person to enter is a potential location for forced entry. Cellar windows, doors,

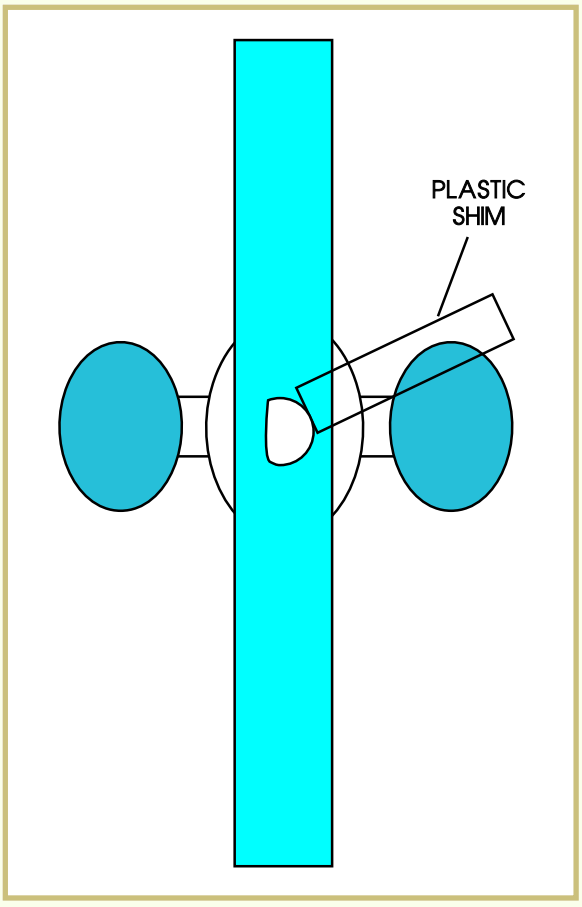


FIGURE 43—A plastic shim can be used to open simple key-in-knob locksets without a deadlocking pin.

house windows, attic vents, and so on, offer viable opportunities for forced entry. Most locksmiths prefer to use a door or first-floor window as a point of entry.

A wide range of tools is available to force doors open. One simple tool is a plastic shim shaped like a credit card. If you place this shim between the doorjamb and the latch of a key-in-knob lockset, you can usually spring the latch. This system is shown in Figure 43.

When using the plastic shim, place it between the door and the jamb at knob level. Insert the shim until it makes contact with the latch. Wiggle the shim up and down while pressing it forward against the latch. If the lockset doesn't contain a deadlocking pin, the latch is pushed backward into the lock, opening the door.

For locksets with deadlocking latches, you can purchase a tool to force the latch. This type of tool, made of spring steel, is approximately one-half inch wide and about ten inches long (Figure 44). The bar is placed between the door and the jamb until it contacts the deadlocking pin. The lower jaw on the bar fits around the deadlocking pin. By wiggling the bar properly, you can move the latch behind the deadlocking pin and free the strike on the jamb.

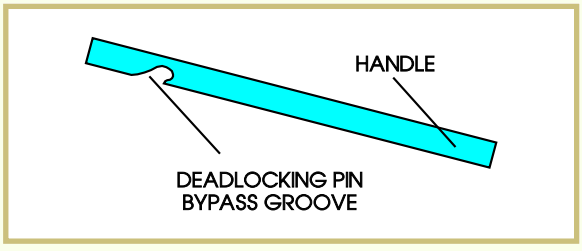


FIGURE 44—A jimmy bar can be used to open many types of lockset protected doors.

You can also use many brute force methods to open doors. The outside knob assembly can be dealt a severe blow, causing it to separate from the rest of the lock. Then, you can simply insert a screwdriver and turn the latch out of the strike. Of course, the lock is destroyed when you do this.

Another brute force method is to drill the plug's center and use a slide hammer to remove the locking cylinder. Then, with the cylinder removed, insert a pair of thin-nosed, or needle-nosed, pliers into the cylinder cavity to turn the connecting bar and open the latch.

In extreme emergencies, the door can be forced open with a crowbar. Push the crowbar in between the door and the jamb, and wedge the door open. Normally, the jamb moves and the door flexes enough to open it. The movement comes from the method of mounting most doors. Figure 45 shows a top view of a typical door-mounting system.

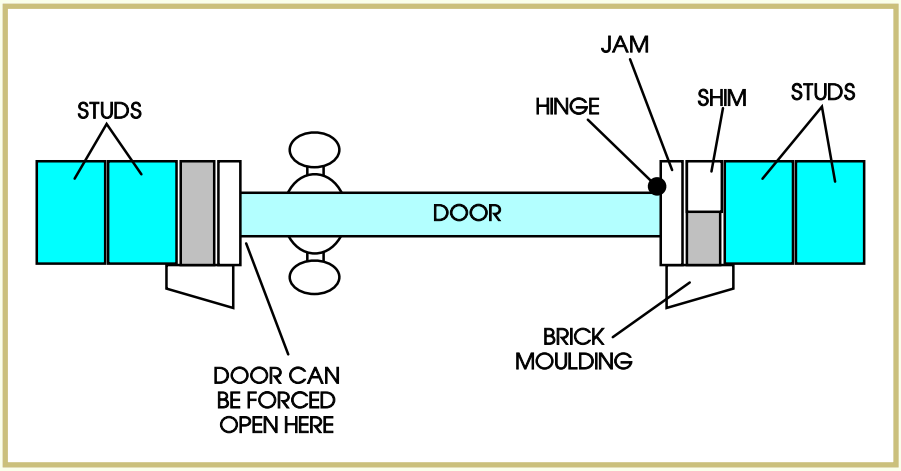


FIGURE 45—This is a top view of how a typical entry door is mounted between the studs of a house.

When a home is first studded for a door entry, a larger-than-necessary gap is left between the studs on each side of the door. This gap around the door allows the installer to insert the door into the opening and shim it until it's square and level. Normally, the door's strongest side is the hinge side, since long screws are used through the hinge and shims, finally seating in the studs. The strike side is simply shimmed and screwed into the opposite stud on the knob side of the opening. An external molding called a brick molding is often used to cover the external gap. On the inside, the gap is filled with loose insulation; an interior molding is then used to cover the gap. Since the knob side of the door and its jamb

are the weakest links, a crowbar should bend the jamb and the door enough to release it.

Again, you should use a crowbar to open a door only in extreme emergencies where damage is unimportant.

Forcing Dead Bolt Locks

Many modern doors contain a decorative latch and a dead bolt. The dead bolt is securely mounted above the latch and has a long bolt that passes into a strike box in the jamb. Forcing these doors with a crowbar won't usually allow entry, since the dead bolt protrudes well into the strike box on the jamb.

The center of the dead bolt mechanism is normally a pin tumbler cylinder. The first try on this lock should normally be to pick, impression, or read the lock. However, in an emergency, the entire cylinder can often be removed from the door, allowing you to open the bolt with a pliers or screwdriver.

A special tool is used by locksmiths to grab the cylinder. The cylinder itself is mounted through a plate on the outside door. This plate can sometimes be pried off with a screwdriver to allow better access to the cylinder. This arrangement is shown in Figure 46.

In use, the tool has two hardened steel jaws used to grab the outside of the lock. These jaws are sharpened and contoured to grab the lock's outer diameter. Once the jaws are tightened, the tool is pivoted against the door to remove the cylinder. A padded end in some tools protects the door from damage. Otherwise, use a piece of wood to protect the door from damage.

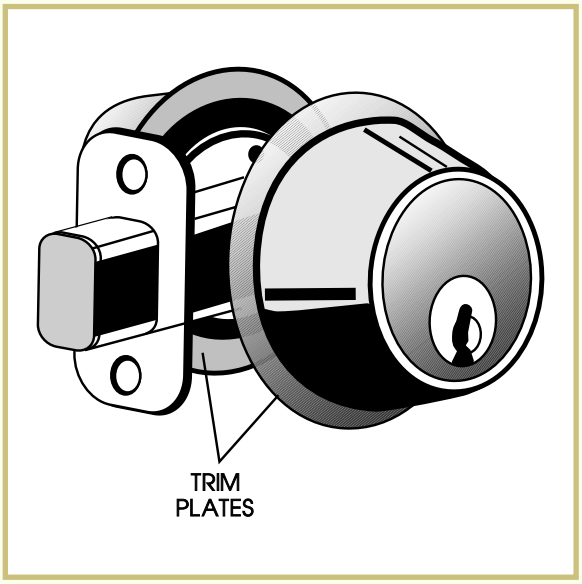


FIGURE 46—A dead bolt assembly is protected by trim plates as shown here.

Some dead bolt door locks use a hardened steel security plate behind

the cylinder on the outside of the door. Also, the cylinder is somewhat recessed behind the plate, rendering the tool useless. In this case, it's best to drill the lock with a tungsten-carbide drill bit and remove the plug with a slide hammer.

Forcing Rim Cylinder and Mortise Locks

Rim cylinder locks have a cylinder that's held from the inside of the door by two screws and a retaining plate. Because of this construction, a rim cylinder lock can be opened using the cylinder-gripping tool just mentioned. Simply grab the cylinder and pry it from the locking assembly.

If a cylinder-pulling tool isn't available, you can always use a pair of pliers, as shown in Figure 47. Use the pliers to grab the lock and twist it until the bolt pulls back or the retaining screws break.

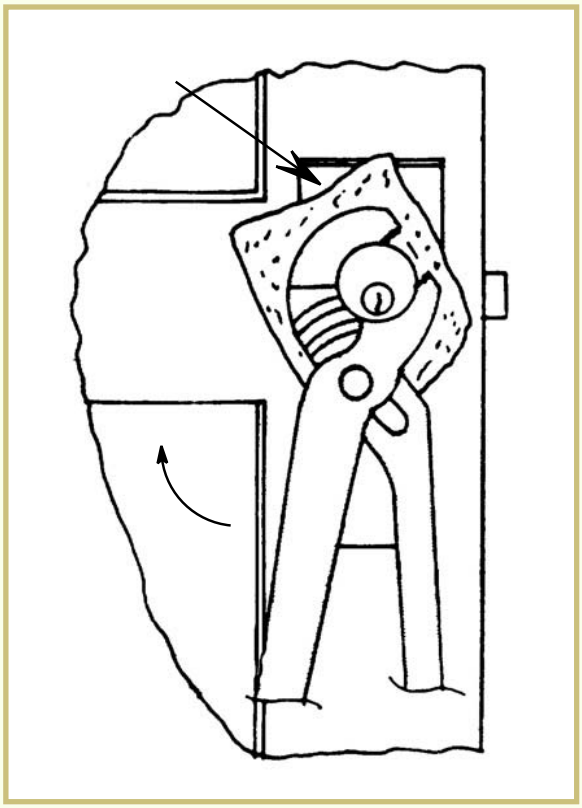


FIGURE 47—Pliers such as the long handled type shown here can be used to twist the lock from the door.

A soft cloth or a circle of plastic material can be cut to protect the door from damage.

This method can also be used to force mortise cylinder locks. Remember that a mortise cylinder lock is screwed into the locking mechanism and is held by a set screw. If sufficient pressure is applied, the set screw releases, allowing you to unscrew the cylinder from the lock. Of course, the cylinder is destroyed in the process. Once the cylinder is removed, the lock can be easily opened with a screwdriver or a pair of needle-nose pliers.

A professional locksmith carries various types of locks to replace those damaged during forcing. By replacing the damaged lock, you provide two services to your customers.

1. You force open the door, allowing access to the property.
2. You replace the broken lock, providing security to the customer against unlawful entry.

In providing this service, you help the customer and provide a greater income for your business.

Window Entry

Windows offer another opportunity for forced entry. The method of entry depends upon the style and age of the window. Older windows tend to shrink over time, which results in a loose-fitting window with a gap between its moving parts. This gap allows you to insert a stainless steel bar such as the one shown earlier (Figure 39) into the gap and trip the latch.

On newer windows, you might have to drill an access hole to reach the latch as shown in Figure 48.

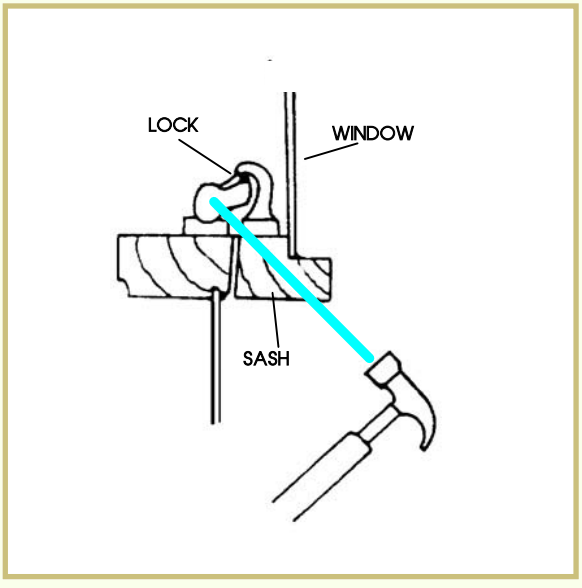


FIGURE 48—An access hole can be drilled through the sash of a window to operate the latch as shown here.

When drilling the hole, use a one-eighth inch drill bit. Place the hole in line with the latch handle. Once the hole is drilled, slip a piece of stiff wire or drill rod into the hole, until it contacts the latch handle. Then, tap the wire or rod with light blows of your hammer to open the latch.

One other method of opening a window or a door is to cut the glass pane. You can purchase a special cutter that cuts perfect circles in glass. Once this circle of glass is removed, you can stick your arm through to open the window or door.

A typical glass cutter is shown in Figure 49. Use a suction cup to secure the cutter to the glass pane. The radius of the cutter is adjusted by means of the two thumbscrews. Hold the top of the cutter between your fingers as you rotate the cutter around the suction cup, using a light force against the cutter. It's a good idea to lubricate the cutting wheel with a light oil or kerosene. Once you've completed one pass of the cutter, stop. A single complete pass is all that is needed.

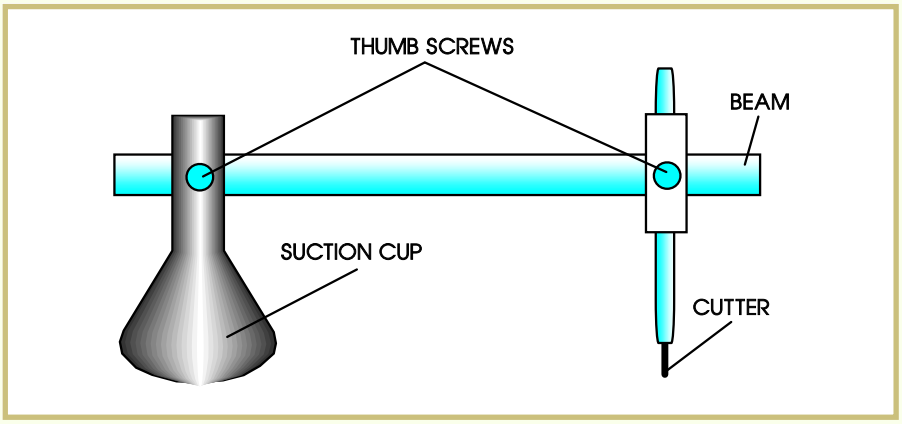


FIGURE 49—A glass cutter uses a suction cup and a cutter to remove a circle from glass panes.

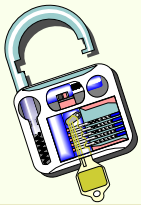
After this pass is complete, hold the suction cup on the glass and use a small pointed object to tap on the glass in a circular pattern where the glass has been scribed by the cutter. Normally, when you've tapped around the entire scribed circle, the glass circle can be lifted out with the suction cup.

Always be careful when you're cutting glass. Use leather gloves and safety glasses to avoid injuries.

When you're cutting glass for forced entry, look for the easiest windows to cut. Obviously a single pane window is easiest, since you have to cut only one glass pane. Double- and triple-pane windows are much more difficult. If you must cut through a double- or triple-pane window, start with a fairly large diameter hole in the pane, working toward smaller holes in the inner panes.

In this section, you've seen how to force locks and how to use certain forced-entry procedures to enter a home or business. There are also many specialized tools and equipment that can be purchased for forced entry on specific locks and systems. These are available through locksmith supply houses and are listed in their catalogs.

Please keep the information in this study unit confidential. Picking, reading, impressioning, and forcing are talents only a locksmith should know and use. This knowledge should never be abused for personal advantage or profit.



Locking It Up! 4

1. When should locksmiths force a lock instead of picking, impressioning, or reading the lock?

   _____

   _____

2. Why does hitting the side of a pin tumbler lock while applying tension to the plug open some types of locks?

   _____

   _____

3. What type of tool can be used to unscrew a mortise cylinder lock from its locking mechanism?

   _____

   _____

Check your answers with those on page 65.

NOTES

Practice Exercise: Picking a Lock

Introduction

In this exercise, you'll be picking open your Papaiz padlock, a pin tumbler lock. As you've seen in this study unit, picking a lock open requires that you raise the lower pins or disks to the shearline of the lock. This action can be performed by

1. Using a feeler pick to raise each individual pin or disk to the shearline while applying a slight turning force on the plug with a tension wrench
2. Using a rake pick to lift multiple pins or disks to the shearline while using the tension wrench to apply pressure
3. Using the "bounce" method of pulling a rake pick quickly from the plug
4. Using a pick gun

In this exercise, you'll open your Papaiz lock using a feeler pick and a tension wrench.

Picking Pin Tumbler Locks

The picking of a pin tumbler lock is somewhat more difficult than a disk tumbler lock. The keyway is rather small and after the tension wrench is placed into the keyway, it's often difficult to feed the pick into the lock. It's also rather difficult to find the feel of how far up to raise each lower pin.

In general, in the picking of a pin tumbler lock, apply a slight pressure with your tension wrench. Then lift each pin gently. Find the pin with the most tension against it and pick this pin first. Continue on to the next pin with the greatest tension and pick that pin next. After each pin is picked, you can feel a gentle nudge on the tension wrench. Also, the plug will shift ever so slightly in the clockwise direction.

Picking the Papaiz Padlock

The Papaiz lock that comes with your course is an ideal training guide for picking. It's difficult because of the spool-shaped pick-resistant upper pins. Yet it's simple since you can see the action of the pins through the cutaway.

Step 1: To begin picking the Papaiz lock, place the tension wrench in the lower side of the keyway as shown in Figure A. Make sure the tension wrench's end lies flat in the keyway so as not to obstruct your feeler pick.

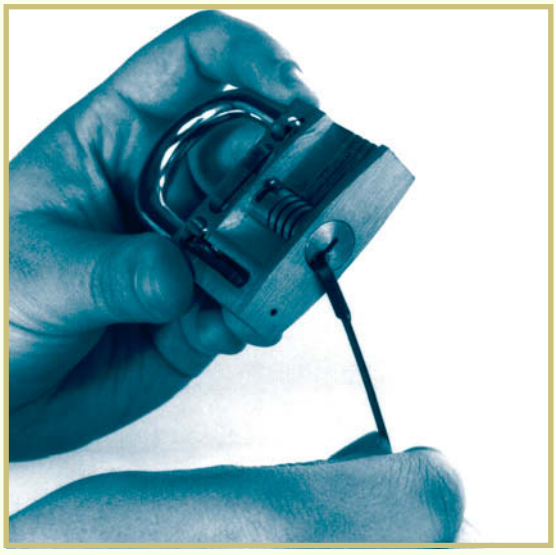


FIGURE A—Place the tension wrench into the keyway as shown here.

Step 2: Next, holding your feeler pick between your fingers like an ink pen, place it into the keyway. Feel the tension on each pin and begin picking the pin with the greatest tension on it. This procedure is shown in Figure B.

FIGURE B—To begin picking the pin tumbler lock, arrange the tools as shown here and lift the lower pins.

Step 3: Continue picking the cutaway lock until you get all of the tips of the lower pins at the shearline. Then, the tension wrench should open this lock.

Step 4: Repeat the exercise several times until you can open the lock in under one minute. Then, cover the cutaway with tape and again pick the lock without your eyes as a guide. The spool pins will make this difficult but not impossible. If you gained a good feel of the pins in the lock previously, this action should also take about one minute.

Practice Exercise Questions

Now, let's see how well you've learned the basics of picking a pin tumbler lock. Check your understanding of this exercise by answering the following questions. Writing the answers to these questions will help you review what you've studied so far. *DO NOT* send the answers to the school for grading.

1. What makes picking a lock with pick resistant pins so difficult?

   _____

2. When lifting the pins or disks within the plug of a lock with a feeler pick, which pin or disk should you select first?

   _____

3. Why should a feeler pick be held like an ink pen?

   _____

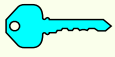
Check your answers with those on page 67.

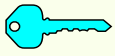
THE KEY TO SUCCESS

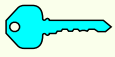
Well, you've come to the end of another information-packed study unit. Think about all you've learned so far! You now know how to open a variety of locks without using any key at all. And you've completed a valuable hands-on exercise with your Papaiz padlock. With a little more practice, you'll be ready to open locks without keys on all types of locks.

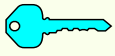
Now, when you're ready, read through the following section of the text, Key Points to Remember. This is a review section designed to highlight all the most important facts you learned in this study unit. When you've reviewed the material and feel you know it well, move on to the practical exercises and your examination. Good Luck!

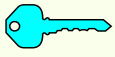
KEY POINTS TO REMEMBER

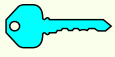

A wide selection of picks are available for your use.

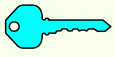

The half-round and round feeler picks are used to lift individual wafers, disks, or pins. Rake picks can be used to rake the internal components of plugs. Rake picks can also be used in "bounce" procedures for picking disk, pin tumbler, and double-bitted locks.

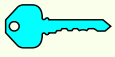

Tension wrenches are used to apply light turning pressure on plugs. Special tension wrenches can be purchased or made for double-bitted and lever tumbler locks.

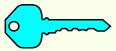

When picking a lock, hold the pick in your hand like a pen.


Combination locks can be opened by listening to the clicks created as the locking pawl hits the gates on the tumbler.

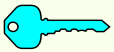

Impressioning is a practice of producing impression marks on a key blank where cuts should be made.


When impressioning a warded lock, you'll need to start with the cover ward cut and then impression the internal case ward cuts.

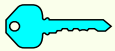

When impressioning lever tumbler locks, the first cut is the throat cut; then you continue with the saddle cuts.



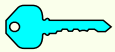
When impressioning a pin tumbler lock, look for the small impression marks left in the key after it's twisted and raised and lowered in the plug.



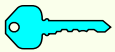
Reading a lock ultimately gives you the key codes that can be used to cut a key for that lock.



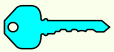
A reading tool is used to lift all wafers, disks, or pins to judge their required cuts on a key blank.



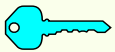
Reading charts are a great aid when you begin reading locks.



Forcing a lock, window, or door is normally a last resort for most locksmiths.



Some padlocks can be forced with a blow to the shell or shackle.



A home or business can be entered through a door, window, vent, or other open area.

Do You Know Now . . .

Below are the answers to the questions asked at the beginning of this study unit.

What is a *tension wrench?*

A tension wrench is a spring steel tool used to place light tension on the plug.

How is a rake pick used?

A rake pick is used by inserting it into the lock and lifting the wafers, disks, and pins. A rake pick can also be used to bounce the internal components of the plug.

What is a *pin impression?*

A pin impression is a fine line or mark left on a blank key by the lower pins of a pin tumbler lock.

Locking It Up! Answers

1

1. At the tip of the key
2. Because the internal locking mechanism is simple, and you can easily see into the keyway
3. It's shaped like the wafers, but has a key slot cut into the plate.

2

1. Smoke it over a candle or use a blank marking pen.
2. The case ward or throat cut
3. The pins leave impression marks, since you twist the key in the plug while lifting it up and down.

3

1. A reading tool doesn't have a shaped end for lifting disks, levers, or pins. Instead, its end is straight or slightly bent.
2. The reading tool is fully inserted into the lock. As it's withdrawn, you listen for the clicks of the disks or pins reseating in the plug.
3. To cut the key using key codes on a code-cutting machine

4

1. Most locksmiths force a lock only in an emergency.
2. Hitting the lock while pressure is applied to the plug can cause the upper pins to leave the plug, allowing the plug to turn.
3. A large pair of pliers

NOTES

Practice Exercise Answers

1. The pick resistant pins tend to bind at the shearline, making the tension provided by the tension wrench very critical.
2. You should always try picking the pin or disk with the most tension against it. This will deliver a greater feel and the most motion of the plug after the pin or disk has been picked.
3. By holding the feeler pick like an ink pen, you get the greatest feel and the most accuracy in lifting the pins or disks.

NOTES

Important Instructions for Practical Exercises 03180401 and 03180501

In addition to your regular examination for Study Unit 7, there are two Practical Exercises with this unit. The first exercise (03180401) is *Shimming Open and Rekeying the Mortise Cylinder.* The second practical exercise (03180501) is *Impressioning a Key for a Mortise Cylinder.*

As with your previous exercises, these will be sent to one of our locksmithing consultants for evaluation and grading. This expert evaluation may take several weeks. Please be patient. To expedite the grading and return of your exercises, *please follow the directions carefully.*

Specific instructions for each exercise begin on page 73 and continue through page 82. Read these instructions carefully before beginning the exercises. After completing both practical exercises, remove the practical exercise answer sheets on pages 71 and 72 from your binder and fill out the top portion. Answer the appropriate questions on the answer sheet and include it with your submission.

Be sure to include *all* of the following:

- **Mortise cylinder re-pinned to the proper key code**
- **Impressioned key to fit and operate the mortise cylinder**
- **Properly completed answer sheets for both exercises**

Do *not* include any other examinations with your exercises.

Submit *both* of your completed exercises together.

Failure to follow instructions may affect your grade for these projects. You must send these exercises in the special shipping box (PM0008) provided. Secure your key and lock in the shipping container. Once the carton is sealed, it cannot be opened without tearing it. Do not seal it until you have placed all items in it. We recommend that you put your *name and return address* on the carton. Our locksmithing consultants will evaluate your work and return your grades as soon as possible. Again, please be patient.

NOTES

Print

Professional Locksmith

Practical Exercise Answer Sheet 03180401

Name: Duwane Higginbotham

Grade 03180401: ____________

Please Print

Address: 17060 89th rd

City: McAlpin | FL | 32062

State Zip

Phone Number: 386-364-8001

Student Number: 20516951

❒ Check here if new address

- -

Exercise Number

03180401

Practical Exercise: Shimming Open and Rekeying the Mortise Cylinder

This exercise is based on shimming open and rekeying the Mortise cylinder. You'll be graded in the following areas:

Part I: Operation: The lock must operate smoothly.
Appearance: There must not be any damage to the lock surface or mechanism.
(Operation and appearance are worth a maximum of 75 points.)

Part II: Answer the following questions in the space provided on this answer sheet.
(These are worth up to five points each.)

1. Why must the plug be turned slightly before removing it from the cylinder?
2. What type of lock can be opened using the shimming method?
3. Which pin must be picked first when using the shimming method?
4. Which end of the plug follower should be used to push the plug out of the cylinder?
5. When properly shimmed, what does the shim separate in the lock?

1 so the top pins do not fall into bottom while removing.
2 a pin tumbler lock
4 the slotted end
3 the rearmost pin first
5 the top and bottom pins

Exercise Number

03180501

Practical Exercise: Impressioning a Key for a Mortise Cylinder

This exercise is based on the *impressioning* of a key for a mortise cylinder. Please note that this exercise consists of two parts—the impressioning of the key to fit the mortise cylinder and the questions asked below on this answer sheet.

Grade 03180501: _____

You will be graded in these areas:

Part I: Operation: Your mortise cylinder must operate smoothly and reliably with your impressioned key.
Appearance: Your key must be free of burrs and rough areas.
(Operation and appearance are worth a maximum of 80 points.)

Part II: Answer the following questions in the space provided on this answer sheet.
(These are worth up to five points each.)

1. How do you first prepare a key for impressioning? buff the blade and use a marker
2. What will happen if you do not bind the pins in place by twisting the key and plug while impressioning? you will not get marks to go by
3. What are two “tricks of the trade” that you can employ to better see the impressioning marks? buff the blade and use a magic marker
4. How deep should you file the key on each impressioning session? just a few strokes

Practical Exercise: Shimming Open and Rekeying the Mortise Cylinder

Introduction

As you've seen, there are many methods of opening a lock without a key. This exercise will cover the use of a piece of shim stock to open a lock.

The shimming method will work only for pin tumbler locks. In using the shimming method, a piece of shim stock is inserted between the plug and the cylinder or shell. A gentle forward force is placed on the shim stock toward the front of the plug. Then a pick is inserted into the keyway and the rear most lower pin is raised to the shearline. Once raised the proper amount, the shim stock will fit in between the lower and upper pins and separate them at the shearline. The shim stock will advance forward in the plug until it reaches the next upper pin.

Each pin is then lifted in sequential order from the rear of the plug to the front of the plug until the shim stock reaches the front of the plug. Once the shim stock has reached the front of the plug, you can use a tension wrench or a blank key to spin the plug.

Your Tools

The tools that you'll need to work on a mortise lock will fall into two categories. The first category will include a screwdriver, an Allen wrench, and a pair of pliers. These tools will be used to remove the mortise cylinder from the locking mechanism.

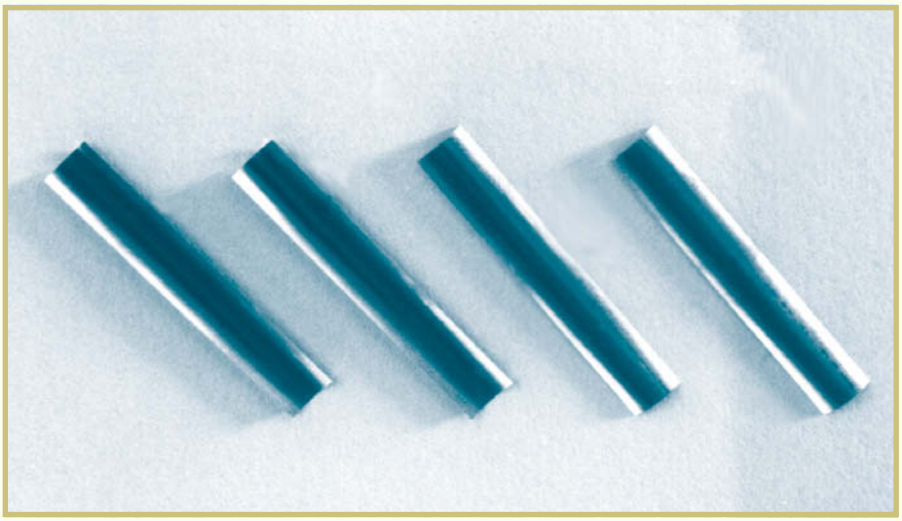
The second category of tools consists of shims, a pick, and a key blank or other key that won't operate the mortise lock. The final items you'll need are a pinning kit to repin the plug of the lock once the plug is shimmed and removed from the shell or cylinder.

The mortise cylinder that you will use for this exercise has a Schlage keyway. However, you will still use the pins from

your LAB brand pinning kit for Kwik-Set locks and you can also use your Kwik-Set key gauge to measure your progress.

For this exercise, you've received a typical mortise cylinder, a key, and a set of shims. These shims are 0.0015 inch in thickness and are preformed to match the shape of the plug. Figure F shows a few preformed shims.

FIGURE F—Preformed shims are shown here.



Instructions

Step 1: Begin this exercise by trying your key in the mortise cylinder. You'll notice that this key does not operate the lock. Two or more of the lower pin combinations must be the wrong combination for the key in your possession.

Step 2: Next, remove the retainer plate at the rear of the lock. This action is shown in Figure G.

FIGURE G—Remove the retainer plate as shown here.

Two small screws are used to hold the retainer plate to the plug. Select a proper fitting screwdriver, remove these screws, and place them and the retaining plate in a tray or other container.

Step 3: With the retainer plate removed, try to push forward on the plug. Notice that it won't move forward or turn since the upper pins are pushed down into the plug below the shearline. To open this lock, you must raise the upper pins above the shearline.

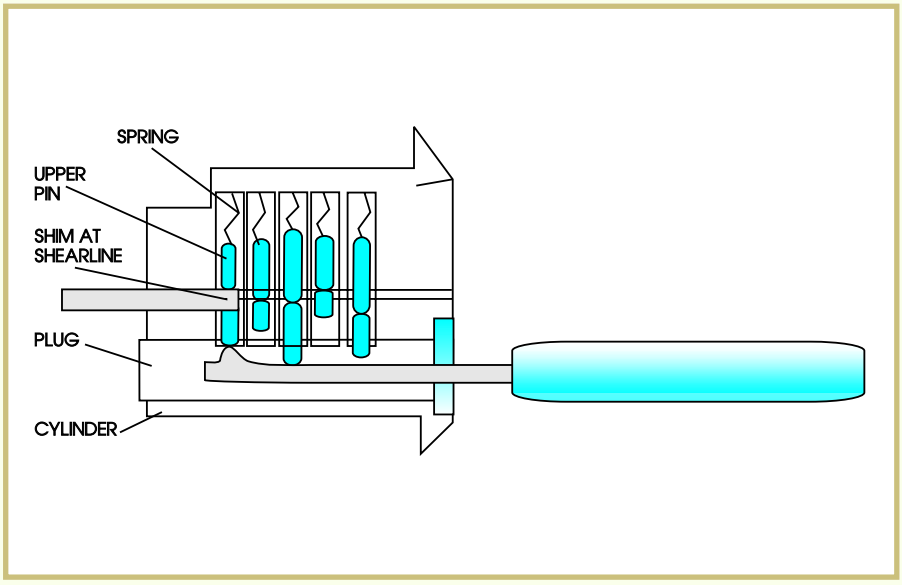
Step 4: To continue with the shimming procedure, select a single shim. Place the shim in the small gap between the top of the plug and the cylinder. Don't force it! Start with one edge of the shim as shown in Figure H. Work this edge into the gap between the plug and the cylinder, and then press gently forward to seat the shim against the rear upper pin.

FIGURE H—Begin shimming as shown here.

Step 5: With the shim in place, insert the feeler pick into the keyway of the mortise lock. Use the feeler pick just as if you were attempting to pick the lock with the feeler pick and tension wrench. However, go all the way back to the rear of the plug and lift the last lower pin.

Step 6: As you're lifting this lower pin, apply a gentle forward pressure against the shim stock. Once the lower pin is raised so that the top of the lower pin is at the shearline, you should feel the shim slide forward and strike the next upper pin on the plug. You'll have shimmed your first pin. This action is shown in Figure I.

FIGURE I—Shimming a pin



Step 7: With the shim seated against the second upper pin from the rear of the plug, pull back gently on the feeler pick until it strikes the lower pin. Now, carefully raise this pin with your pick until the shim slides gently forward. Don't apply too much force on the shim stock and bend it. Once bent, the shim stock will need to be removed from the lock and replaced.

Step 8: Once the second upper pin is separated with the shim stock, continue raising the lower pins and inserting the shim stock until all of the pins have been picked.

Step 9: At this time, the *plug should be turned* slightly with the tip of a key blank or a tension wrench. Remember to maintain pressure on the front of the plug to keep it from falling from the cylinder. After turning the plug, gently pull on the shim material and remove it from the lock.

Step 10: The next step is to remove the plug from the lock. Here you'll use the plug follower to push the plug out of the cylinder. This is shown in Figure J. The slotted end of the plug follower must be used against the plug. Remember the plug and follower must be turned slightly to prevent the top pins and springs from dropping down and becoming wedged in the gap between the rear of the plug and the follower.

FIGURE J—Use a plug follower to push the plug out of the cylinder.

Step 11: Empty the lower pins from the plug. You are now ready to re-pin your lock. The pin combination that you must use is *31512*. Select the proper pins from your *pinning kit* and place them in your plug in the proper order. You may want to measure the pins to be sure you are using the correct size. The proper length of each is marked in your kit. You can use a caliper, micrometer, or simply sort the six different sizes in your kit.

Step 12: When you're sure that you have the correct pins in the proper order, reinsert the plug into the cylinder. The plug must be properly aligned with the groove in the plug follower and the plug must be turned slightly or the pins and springs may jam the lock. If this occurs *you must completely disassemble the lock and rebuild it.*

Step 13: Now you can reattach the retainer plate to the back of the plug with the two small screws. Remember that the plug can still fall out until the retainer plate is securely reattached.

Remember, the shimming method of opening a lock will only work with pin tumbler locks. Disk, wafer, or lever tumbler locks can't be opened by shimming.

Now that your lock is reassembled, make sure that the answer sheet on page 71 is complete. Now you can continue to the next exercise: *Impressioning a Key for a Mortise Cylinder*.

NOTES

Practical Exercise: Impressioning a Key for a Mortise Cylinder

Introduction

This exercise will be the most difficult of all of the exercises you'll perform. Impressioning a key is no easy task. It takes great patience, vision, and a slow, steady file to make an impressioned key for a lock.

Impressioning can be performed using many methods. All of these methods deal with how the blank key is prepared. For example, some locksmiths that are experts at impressioning won't prepare the blank at all. Their great practice has resulted in a trained eye for impression marks and a skilled hand for cutting these marks.

Another method is to use a black marker to color the top edge of the blank's blade. When this blade is placed into the plug and twisted, the lower pins will leave clear marks in the blank. This is the method we'll use in this exercise. Using a black marker, however, has one major drawback. When impressioning with black marker, the marker will leave a deposit inside of the plug on the lower pins. This deposit can cause the lock to malfunction if it's not properly cleaned out of the lock after impressioning is complete.

Selecting the Blank

If a number appears on the lock, it's a simple matter to select a blank for a lock. Look in the code book or blank catalog for an exact blank for the lock you want to impression. If no number appears on the lock, you'll have to select a matching blank from your key board or inventory.

In this exercise, you will be using an SC1 blank to fit the Schlage style of keyway.

Instructions

Step 1: Once you have selected the correct blank, clean it to remove all dirt and oil. If the edge of the blade is very rough, you may want to polish it with *very fine* emery paper to better see the impressioned marks.

Step 2: Secure your lock in a vise. Attach a C-clamp or hold on to your key blank with vise grip type pliers. Insert your key blank into the lock. Twist the blank and plug to one side or the other. This is very important! This will *bind* the bottom pins between the plug and the cylinder. Now, move the blank in a vigorous up and down motion against the pins to make the indentations or impressions.

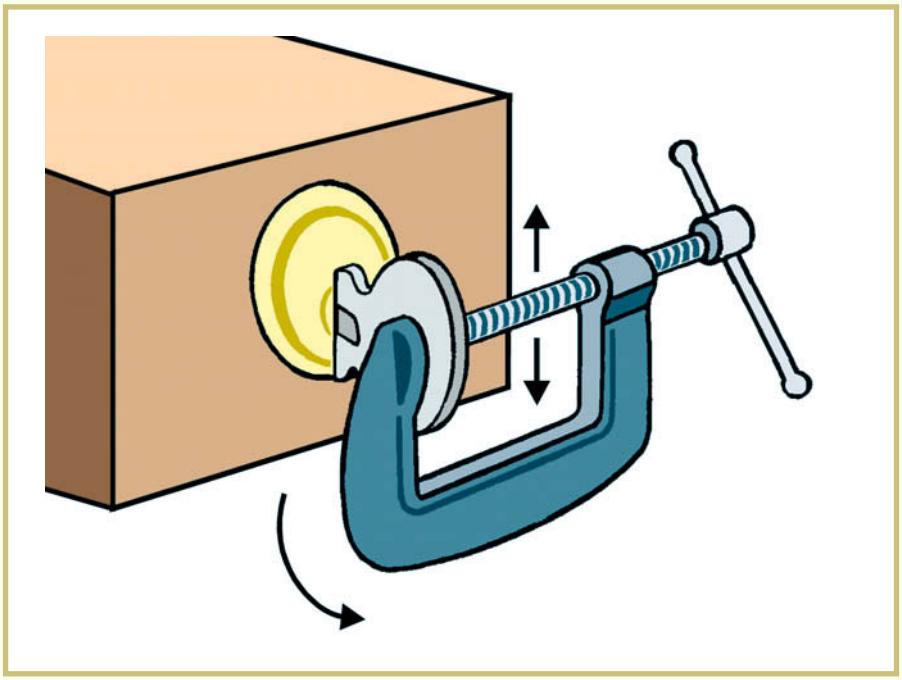


FIGURE C—With the lock in your vise, twist the key and move it up and down to create impression marks.

Step 3: Remove the key and examine the edge of the blade under a bright light. Rotate the key at an angle to help you see the impressions better. Seeing the impressions is often said to be the most difficult part of impressioning a key blank, so look very carefully. If you prepared the edge properly and moved the key correctly, you will see five slight impressions on the edge of the blade. If you didn't make impressions, re-read the instructions and try again.

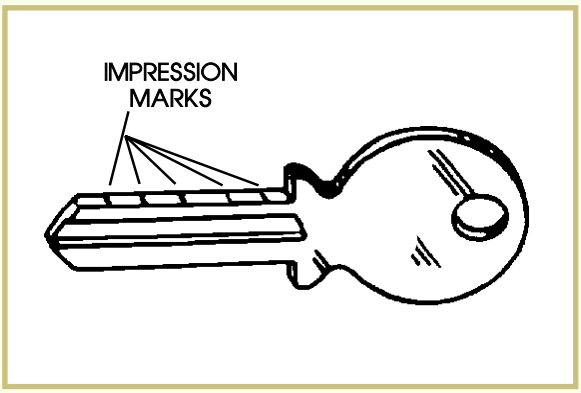


FIGURE D—The impression marks will appear as small scratch marks on the blank.

Step 4: Use your round file to make a shallow cut at each impression mark. Make sure that the bottom of your cut is very smooth or you may not be able to see your next impression marks. You may want to polish the cut with very fine emery paper.

FIGURE E—Using a small round file, begin cutting at the impression marks as shown here.

Step 5: Re-insert the blank in the lock and re-impression your key. Some locksmiths work on only one cut at a time. They repeat the impressioning process and deepening one cut until the pin no longer makes an impression at that location.

Step 6: Repeat this process with each of the pins until they no longer make impressions on the edge of the blade. Note that if you make your file cuts straight down into the blade, the pins will not be able to ride over the cut as you attempt to insert or withdraw the key. This will lock the key in place. So, be sure to file an angle at each cut so that the key will not become jammed in the lock. You have a selection of files to use.

Step 7: Inspect your blank for burrs and rough edges. Make the appropriate corrections, if necessary. Your key should now be capable of operating the lock smoothly and reliably.

Your impressioned key should now fit and smoothly operate your mortise cylinder that you have re-pinned to 31512. If your key does work smoothly and reliably—Congratulations! You're on your way to mastering one of the most difficult locksmithing skills. You can be justifiably proud of your accomplishment.

If your key doesn't work, don't be discouraged. This skill often takes a lot of practice and patience to develop. Review the study unit and the exercise instructions on impressioning. Figure out where you went wrong and use your other blank to complete this exercise.

After you've completed the Impressioning exercise and the appropriate answer sheet, refer to page 69 for instructions for submitting them for grading.

THOMSON
EDUCATION DIRECT™
925 Oak Street
Scranton, Pennsylvania 18515

Opening Locks Without Keys

EXAMINATION NUMBER:

03100700

Whichever method you use in submitting your exam answers to the school, you must use the number above.

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When you feel confident that you have mastered the material in this study unit, complete the following examination. Then *submit only your answers to the school* for grading, using one of the examination answer options described in your "Test Materials" envelope. Send your answers for this examination as soon as you complete it. *Do not wait until another examination is ready.*

Questions 1-20: Select the one best answer to each question.

1. Which one of the following picks or tools moves the pins of a pin tumbler lock most violently when picking?

A. Rake pick
B. Picking gun
C. Diamond pick
D. Circular pick

2. What type of file produces the best results with a blank key being impressioned for a pin tumbler lock?

A. Flat
B. Round
C. Square
D. Triangular

3. Which of the following locksmith activities usually requires the most practice to learn?

A. Picking a lever tumbler lock
B. Impressioning a pin tumbler lock
C. Knowing when to pick a lock
D. Forcing a door open without damage

4. How can you pull the plug from a lock after it has been drilled?

A. Use a tension wrench to spin the plug and then remove it.
B. Use a slide hammer to forcibly pull the plug from the shell.
C. Grab the plug with needle-nosed pliers.
D. Pry the plug from the lock with a screwdriver.

5. Before impressioning a pin tumbler lock, which one of the following actions should be performed?

A. Clean the blank with a lint-free cloth.
B. Form shim stock around a screwdriver.
C. Twist the key violently in the plug.
D. Prepare a reading chart.

6. What type of pick or tool would you most often use to raise an individual pin to the shearline of a plug?

A. Picking gun
B. Reading tool
C. Rake pick
D. Feeler pick

7. What type of pick should be used as a first-try pick on a disk tumbler lock?

A. Half-round feeler
B. Round feeler
C. Half-rake
D. Rake

8. What's the primary reason a brass bar is used while you're applying a blow to the shackle or shell when forcing open the shackle?

A. Brass tends to spread the blow evenly over the shackle.
B. Brass won't leave residue on the shell or shackle.
C. Brass prevents the shackle from being broken.
D. Brass causes the blow to be intensified at the point of contact.

9. What tool should be used to turn the plug after the disks or pins have been picked?

A. Tension wrench
B. Rake pick
C. Reading tool
D. Extraction tool

10. One method of opening desks and file cabinets without destroying their locks is

A. using pliers to twist the lock.
B. using a cylinder-pulling tool.
C. using a jimmy bar.
D. lowering the bolt with a specially shaped pick.

11. What holds the end plates and the wafers together inside the plug of a double-bitted cam lock?

A. Z-shaped spring steel clamps
B. Grooves in the plug
C. A special shell cavity
D. Spring steel pins

12. How can you increase the sound made by a combination lock as the locking pawl passes over the gates of the tumblers?

A. Use a locksmith's otoscope.
B. Tap on the lock's dial.
C. Apply upward pressure on the shackle.
D. Turn the dial quickly clockwise, then counterclockwise.

13. What feature of some lever tumbler lock's construction makes these types of locks easy to read?

A. The large keyway allows you to see all of the tumblers.
B. The levers are always color coded for easy reading.
C. The tumblers have saddles of different width.
D. The tumblers have tapered gates that allow the lever to be easily pushed into place.

14. Rapidly pulling a rake pick from a plug of a lock while applying light turning pressure with the tension wrench is termed as what kind of picking method?

A. Scrape
B. Bounce
C. Dance
D. Comb

15. What's the easiest method of opening a warded padlock?

A. Use a bent wire to offset the ward.
B. Use a pick key to open the lock.
C. Use a round feeler around the ward.
D. Use two tension wrenches to pressure the bolt and lift the lever.

16. The rapping method of opening a padlock involves

A. hitting the shackle of the lock with a hammer.
B. tapping on the bottom side of the plug to loosen the disks or pins.
C. using a soft-faced hammer to strike the side of the padlock that contains the springs and upper pins.
D. using a thick tension wrench and a hammer to force the plug, breaking the pins or disks.

17. What type of pins can be used in a pin tumbler lock to help defeat picking attempts?

A. Oval
B. Radial
C. Convex
D. Spool

18. A reading tool is used for a disk tumbler lock involving which one of the following methods?

A. A reading tool is inserted after the tension wrench to see how far the disks must rise to reach the shearline.
B. A reading tool raises the disks. You judge their size by the amount the disks drop when released.
C. A reading tool has a calibrated end width of 0.015 inches to be used in comparing disk slots.
D. The reading tool is used to even out the disks in the lock for comparative height judgement.

19. When picking a pin tumbler lock with a feeler pick, what pin or pins should you begin picking first?

A. The center pin
B. The last pin and work towards the front
C. The longest pins
D. The shortest pins

20. What type of file should be used to make cuts in a flat key for a lever tumbler lock?

A. Triangular
B. Square
C. Round
D. Half-round

COMING ATTRACTIONS

Well, you've completed your study of how to open locks without keys. You should now be familiar with the various methods of picking locks and forcing locks open. Remember, though, to discuss these procedures only with other trained locksmiths. Study Unit 8 covers home, business, and retail security and how they are related to the locksmithing profession. You'll learn about crimes against property and how you can help your customers prevent their property from being targeted by criminals. See you there!