Lesson 5

CODES AND EQUIPMENT

Contents

Another Way To Make a Key

In Lesson 4, you learned how to make a key from a pattern key. But that is not the only way to provide your customers with keys. This lesson introduces you to a service that most locksmiths perform on a daily basis: cutting keys by code. If you have a code, you don't need a pattern key.

To cut keys by code, you must know

1. how codes are used,
2. how to find the required information quickly, and
3. how to accurately produce a key by code.

Codes have been used for years on numerous types of locks. At one time, the code for most locks was imprinted on the lock. That is still true for some locks. However, due to the increase in theft, especially vehicular theft, the key code usually appears only on the key. For example, Master padlocks once had the code number stamped into the bottom of the body. Then it was printed on so the consumer could erase it. Today, the code for a Master padlock is found on the key only.

The global economy is another factor that has led to changes in the locksmith's ability to cut keys by code. Many well-known manufacturers of machinery and equipment are importing locks. Because of this, figuring out a code can be challenging. What's a locksmith to do?

As a locksmith, one of the best things you can do is read code books. Why? Reading code books lets you

- become familiar with the different lock manufacturer series and the brand names of equipment the locks are on, and
- understand why some lock makers key their locks a certain way.

Code—A designation assigned to a particular key combination for reference when additional keys or cylinders may be needed

Blind Code—A designation, unrelated to the bitting, assigned to a particular key combination for future reference when additional keys or cylinders may be needed

Direct Code—A designation assigned to a particular key which includes the actual combination of the key

The ALOA Professional Glossary of Terms defines **code** and also suggests we look up **blind code** and **direct code.**

To prepare you to provide keys to customers using codes, we'll look at codes and code books first. You'll learn why keys sometimes need to be cut by code. Then we'll show you how to find the information you need in a code book.

Next, we'll take a look at tools you'll use when you cut keys by code. And finally, you'll learn about code equipment.

Objectives

When you have completed this lesson, you should be able to

- ☞ List and define two types of codes.
- ☞ Explain why locksmiths use code books.
- ☞ List 3 ways calipers and micrometers are used when cutting keys by code.
- ☞ Describe the differences between calipers and key micrometers.
- ☞ List the steps for making a key on a non-motorized code machine.
- ☞ List and describe three types of motorized code machines.
- ☞ List the steps for making a key on a card system motorized code machine.

Main Ideas

1. Codes
2. Calipers and Key Micrometers
3. Code Equipment

Codes

The two most likely reasons that keys need to be cut by code are

1. All keys have been lost, misplaced, or are locked inside.
2. The only pattern keys available are too worn to duplicate.

If a good pattern key exists, cutting by code is not necessary. Cutting keys by code requires specialized equipment, code books or code software, and additional time. A key cut by code can cost four to five times more than a duplicate key because of the additional tools, equipment, and knowledge needed.

As a locksmith, you will work with two types of codes:

1. Blind Codes.
2. Direct Codes.

Blind Codes

Blind Code—A designation, unrelated to the bitting, assigned to a particular key combination for future reference when additional keys or cylinders may be needed

Code Series—Sequential blind codes a code manufacturer has assigned to a particular type or group of locks

Most codes today are **blind codes**. Lock manufacturers use blind codes to keep track of how their locks are keyed without revealing the cutting information. You'll find the blind code numbers stamped on the locks and/or the keys. For example, the blind codes for office furniture, file cabinet, and drawer locks are stamped on the face of the lock.

Blind **code series** are established by the lock manufacturers. One blind code series, for example, is AA427 through AA650. In this series, a manufacturer assigns a specific code, such as AA452, to the cuts used for a key to a specific product.

For example, the blind code A383 is for a **Master padlock**. This code does not directly tell you the cuts used for the key. However, you can use a code book to find out that the cuts for this blind code are 5642. The cuts are listed right next to the code in most code books you use.

Another example is Chicago Lock's blind code of 1X9. This is a code for file cabinet locks. Again, you can find out that the cuts 6363 are used for keys that fit locks with this code series.

However, it is not all that simple. One reference lists four brands and styles of locks for A383. None of these four relates in any way to Master padlocks. If you don't already know you are looking for a Master padlock, you have a problem. That's why it's important to spend some time inside the covers of many different types of code books.

Here is a blind code problem with a twist. The code, AA427, is for a cabinet lock that was manufactured by Chicago Lock. What do you do? Your familiarity with code books has taught you that this code must be decoded to get the real code. You look in the index of *Reed Code Books*. You find that the code AA427 falls in the series AA426 through AA650. This code series states the following conversion:

-425=LL.

This means that any code in the AA426 through AA650 series must have 425 deducted from its number to get the conversion in the LL series. So your code AA427 converts to LL02. (427-425=2)

Direct Codes

Direct Code—A designation assigned to a particular key which includes the actual combination of the key

You'll find **direct codes** imprinted right on factory original key blanks. Schlage and Weiser imprint direct codes on the head or bow of their original keys.

An example of a Schlage code is 35657. Schlage codes are direct digit listings of how the key is cut from bow to tip.

An example of a Weiser code is E64734. This is also a direct digital listing of how the key is cut from bow to tip. The difference is that you must ignore the "E" prefix when making the cuts.

Some lock manufacturers use a reversed-order, direct digit code. One example is National Lock, a maker of residential locksets. You may see the direct code of 46696 on a national lock original key. This code is direct, but the cuts are listed tip to bow.

Code Books

Spacing—The dimension from the stop to the center of the first cut and/or to the centers of successive cuts

Bitting Depth—The depth of a cut which is made into the blade of a key

Locksmiths use code books to find the information they need to cut a key by code. What information do they need? The correct key blank, the **spacing**, and the **bitting depth**. The spacing and the bitting depth are number systems that tell you how far apart and how deep to make the cuts.

However, to find the correct key blank and cutting code, other information can be very helpful depending on the type of key needed.

For a vehicle key,

- the make,
- model, and
- year of the vehicle

can be very helpful.

For a cabinet key,

- the brand name of the cabinet,
- a key from a similar cabinet, or
- the lock or drawer itself

can help you find the correct key blank and code.

Many different code books are available to locksmiths. Most locksmiths use more than one. However, Reed Code Books and HPC Code Books are two major publishers of general code books in our industry. Both these publishers offer the same information in software form. Treskat and Blackhawk are two others that also offer code software.

Some companies specialize in codes for certain locks, such as foreign automobiles or motorcycles. And most locksmith industry magazines contain references and advertisements for the tools and equipment needed to cut keys by code.

Lock manufacturers create new blind and direct codes every day. Major locksmith publications contain lists of new codes and partial lists that have been compiled. The publisher of one major locksmith magazine, *Locksmith Ledger*, prints both code updates and code books. Two other trade magazines that list codes are *National Locksmith* and *Keynotes*.

More codes means more code books are needed for reference. Because computers can contain so much data and provide it so quickly, code software is becoming very popular.

For example Locksmith Publishing Corporation codes and code information have been collected over a 70-year period. This reference system contains the most accurate, up-to-date information available in the security industry. It provides more domestic and foreign code series than any other system in existence. More than 4,000 code series and millions of individual key codes are included in the current code system.

Computext, a computer code retrieval system, was developed to quickly access specific key codes from this large inventory of information. With only a few key strokes, the computer program can display

- key cuts,
- special parts required for all popular code cutting equipment,
- key blank comparisons for most manufacturers,
- visual images of the finished key,
- key blade shape, and
- all necessary measurements for originating a new operating key.

Advanced features such as

- searches by OEM manufacturer,
- vehicle model names, and
- lock type

also speed code retrieval.

New features such as

- vehicle opening instructions,
- code progression charts, and
- the ability to send code information directly to electronic code cutting machines

have been recent additions.

Each year, Locksmith Publishing Corporation sources code information worldwide and offers updates to maintain Computext as the most important information tool a locksmith can own.

Soon most mobile locksmith vans likely will carry a calculator-sized computer with installed code software.

Typical Scenarios

Earlier we gave a few examples of codes and their respective cuts. Let's look at a few more.

Finding the Cuts for EP2032

If a customer called today for a car key to be cut using a code of EP2032, would you need any other information? Yes, you would need to know

- what make of car,
- the model, and
- the year

to choose the correct code series. The EP series has two or more references in the code listings today, each using different blanks and cut dimensions.

Knowing the make, model, and year of car lets you ensure that you use the correct key blank and code series. Sometimes you can look up the make, model, and year of the car in the code book. Sometimes you will need another reference to confirm the proper code series and blank. For example, you might use *ILCO Auto/Truck Key Blank Reference* or the *SILCA Automotive, Truck, And Motorcycle Key Blank And Cross Reference Guide*. So you can see that locksmiths use more than one type of reference to get the job done when cutting by code.

General Motors uses two code series in the 0A00-7A99 range. One is for 1971, 1979, and 1985 primary keys. The other series is for 1994 and later models. This series uses a different key blank and cutting dimensions.

Finding the Cuts for LL48

A popular code series used on cabinets is the LL series. If a customer came into your store requesting a key cut to LL48, where would you begin? The index in the *Reed Code Book* lists five possibilities. Here are three questions you need to answer.

1. What is the brand name of the cabinet?

   Brand names are sometimes referenced in the code books. If that is the case, you have a lead to the proper blank and series.

2. Does the customer have cabinets, like the one in question, with keys using the same code series? If so, check the style of blank used.

   If the customer has similar cabinets with the same code series, it can lead you to the proper blank even if the actual code is different.

3. Is the lock easily removed or on a drawer that may be brought in?

   If the code leads to many possible key blanks and the equipment does not have a brand name, bringing in the actual lock or drawer can be extremely helpful.

It Still Takes the Right Code

When the U.S. was 13 colonies, most locks were European made. But the revolution that gave birth to a country also saw the beginnings of the American Lock Industry. As was typical of early Americans, each locksmith had his own ideas about how to provide security. So more than 3,000 types of locks were patented between 1774 and 1920. One of those was the patent for a "domestic lock," by Linus Yale, Sr. This lock improved on an Egyptian pin-tumbler that used a revolving cylinder. Then, in the early 1920s, Walter Schlage improved on the domestic lock by putting a push-button locking device between the two knobs.

Time and technology have continued their advance, but it still takes the right code to gain access. Of course, today that code is sometimes the right sequence of pushed numbers, the right voice, or the right thumb or palm print rather than the number sequence that reveals the cut depths of a cylinder key.

FR452

Finding the Cuts for FR490

Let's try one more. Chicago Lock Company uses a FR451-800 code series. These locks are popular on office furniture. What makes this code series somewhat unique is that four different blanks are used for the locks. The original blank numbers are K101, K102, K103, and K104. Each blank is milled differently and will not enter the other keyways.

To determine which blank to use, divide the code number by 4. If the remainder is 1, use the K101 blank; remainder of 2, use K102; remainder of three, use K103; and for no remainder, use K104.

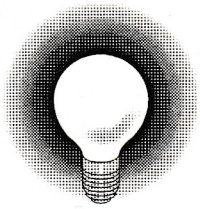
Let's use FR571 as an example. The number 571 divided by 4 equals 142 with a remainder of 3, so we would use the K103 blank.

How do you know which cuts to use? That's right. The cuts are listed next to the respective code in the code books.

What are the cuts for FR571? Go to Appendix A at the end of this lesson. Find the column that is headed "571." The numbers next to "71" are the cuts for FR571: 313533.

As you can see from these scenarios, it is important to know what information needs to be gathered to get the job done. The time you spend looking over code books and locks with visible codes will be time well spent. You will be gaining knowledge for the future.

Organize the Main Ideas



This outline will help you organize the information in this section of the lesson. Read through the outline and jot down what you remember about each of the topics listed. If you can't remember details related to one or more of the topics, you may wish to reread the text before you go on.

1. Codes

   a. Blind Codes

   b. Direct Codes

   c. Code Books

   d. Typical Scenarios

Check Your Knowledge 1

This quiz will help you check what you've learned in this section of the lesson. Read through the questions and jot down your answers. Then check those against the suggested answers at the end of this lesson. If your answers differ greatly from the suggested answers, you may wish to reread the text before you go on.

1. What is a blind code?

2. What is a direct code?

3. A direct digit code can be listed either tip to bow or bow to tip. (True or False?)

4. Locksmiths use code books to find the correct _____ _____, the _____, and the _____ _____. (Fill in the blanks.)

Calipers and Key Micrometers

Two of the most useful and necessary tools used today in a locksmith company are the caliper and the key micrometer. You'll use these tools in numerous ways when cutting keys by code. Three examples are listed below.

1. If a key is too worn to duplicate, you can measure the depths of the cuts and often determine the original depths. Then you can cut a key to these depths.

2. If a key cut by code doesn't work, you can check the cut depths to determine if one or more of the cuts is off.

3. When you adjust your code machines, you'll need a micrometer or a caliper to check for proper depth.

Whether you use a caliper or a key micrometer is usually a personal choice. Let's examine both.

Calipers

Root Depth—The measurement from the bottom of the blank to bottom of the cut

The caliper for locksmith use is a tool that measures the **root depths** in a key. As you can see by looking at Appendix A, the Chicago FR series has three different depths.

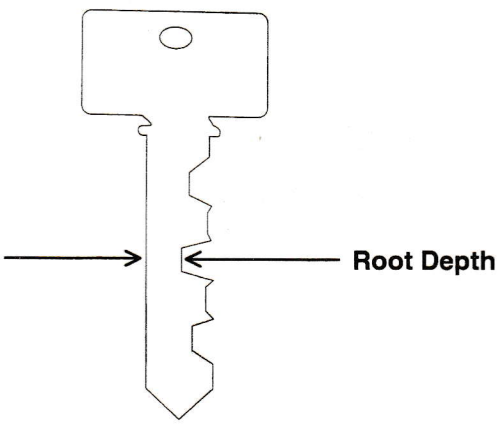
1 = 0.250"

3 = 0.220"

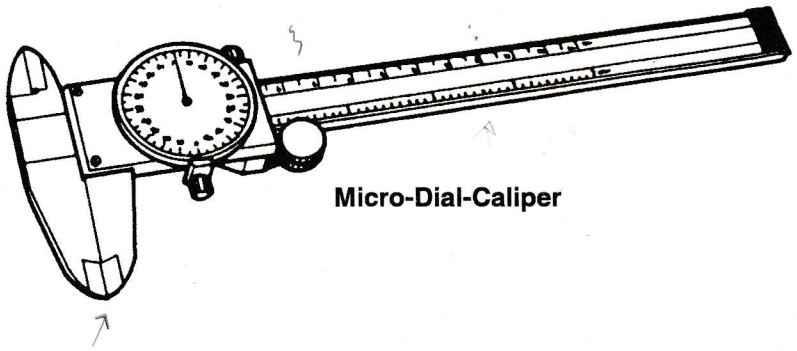
5 = 0.190"

Each depth is listed in thousandths of an inch or 0.000". Our job with the calipers is to accurately measure this distance.

Each cut into a key blank has a root depth.



Most popular calipers use a dial that is divided into one hundred small marks. Each mark represents 0.001" or one thousandth of an inch. Every ten marks, you'll find a larger mark with a number representing how far the dial has moved. The numbers start at 10 and increase by 10 (10, 20, 30, 40, and so on). This makes the job easier. You count the small marks after the last large mark and add them together for the measurement.



Micro-Dial-Caliper

(courtesy of Ilco Unican)

Moving the thumb roller separates the calipers and causes the dial to spin. The marks on the body of the caliper are labeled starting at 1 and increasing by 1 (1, 2, 3, 4, and so on).

When you pass the number 9 the first time, you'll see a large number 1. Here's what's taking place. Each complete revolution of the dial is 100 thousandths of an inch, or 0.100". The marks on the body of the caliper represent 0.100" of movement.

If you move the thumb roller to a point past the number 3 mark on the body, and the dial reads 2 marks past the 40 mark, what would our reading be? The reading would be three-hundred forty-two thousandths or 0.342".

To measure the root depth of a cut, follow the steps listed below.

1. Move the thumb roller to separate the calipers.
2. Reverse the thumb roller to bring the calipers to rest in a perpendicular fashion on the cut.
3. Read the measurement.

Do not use force when measuring the root depth with calipers. If you do, the reading will be inaccurate.

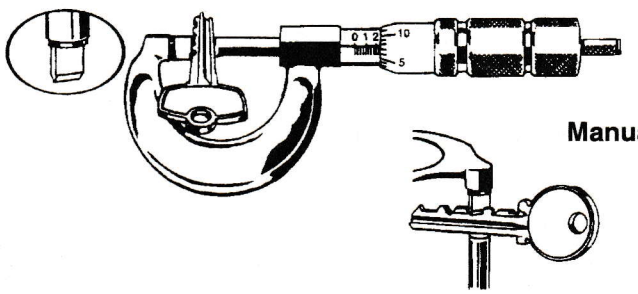
Key Micrometers

Micrometers work in much the same fashion as calipers. The main differences between a dial caliper and a micrometer are

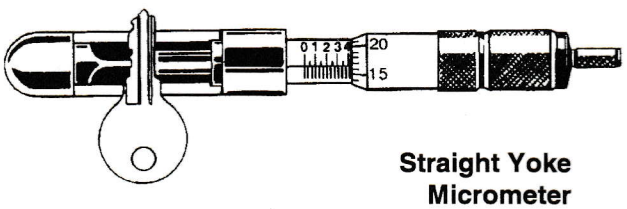
- the micrometer uses marks on the body only to give readings;
- rather than sliding back and forth, the micrometer spins in a circular fashion; and
- calipers have thinner jaws.

Locksmiths use micrometers with thinner than normal jaws to measure key cuts.

Two micrometers frequently used by locksmiths are shown below.



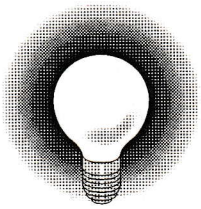
Manual Micrometer



Straight Yoke Micrometer

(courtesy of Ilco Unican)

Organize the Main Ideas



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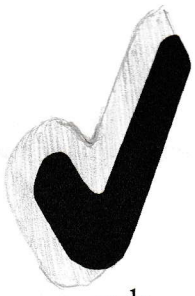
1. Calipers and Key Micrometers

   a. Calipers

   b. Key Micrometers

Check Your Knowledge 2



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1. List three ways you might use a micrometer or caliper when cutting keys by code.

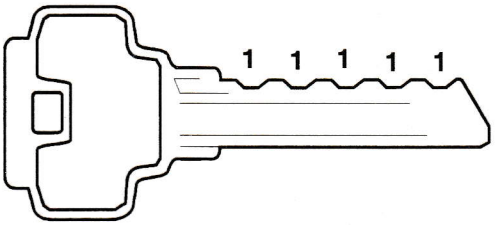
2. The caliper for locksmith use is a tool that measures the _____ _____ in a key. (Fill in the blanks.)

3. Calipers have thicker jaws than key micrometers. (True or False?)

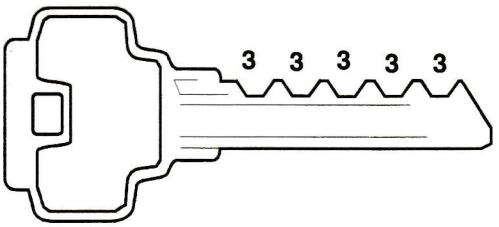
Code Equipment

Depth Key Set—A set of keys used to make a key by code on a key duplicating machine to a lock manufacturer's given set of key specifications; each key is cut to one depth only in all bitting positions, with one key for each depth

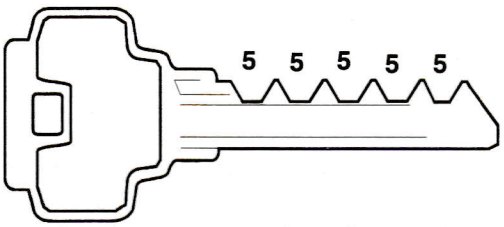
In the past, many locksmiths used a **depth key set** for code cutting. Space and depth key sets consist of one key each for every depth with the same depth in every space. For instance, a Schlage depth and space key has ten keys with one key cut to zeros in every space, one key cut to ones in every space, one key cut to twos in every space, and so on.



Depth key cut to all ones



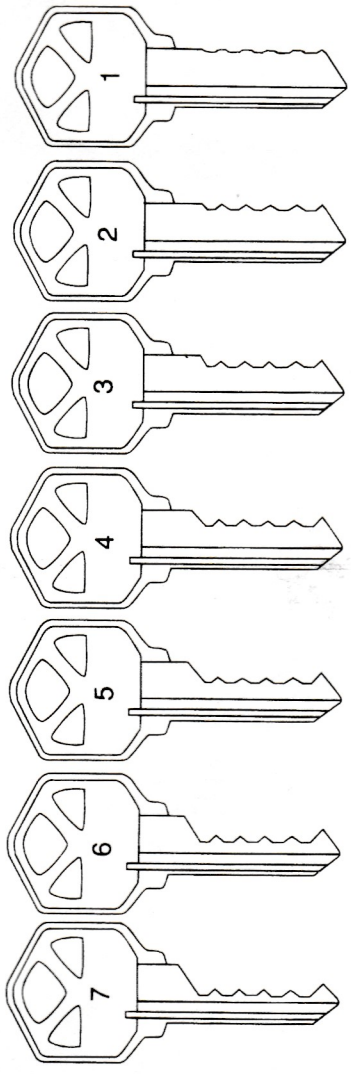
Depth key cut to all threes



Depth key cut to all fives

A locksmith cutting a number 2 depth in a code key would insert the proper depth key in the pattern vise and duplicate it in the respective space on the blank. The locksmith would continue this procedure until the new key was complete.

Using space and depth keys is not the most accurate way to ensure a correct depth, but it was a beginning. Even today, depth key sets are an inexpensive way to start up into code work.



Product Number	Description	Spaces	Keys Per Set
	A/LARGE PIN CYLINDER		
DKA100	Arrow (New Standard & Sectional)	6	10
DKA101	Best and Falcon	7	10
DKA103	Corbin - 60 Series	6	6
DKA104	Dexter Large Pin ('69 up)	6	10
DKA105	Dominion Standard Large Pin	5	8
DKA107	ILCO Standard Large Pin	6	10
DKA108	Ilco 560-561 and 600 Series	5	7
DKA109	Kwikset (New) also used on Corbin Russwin pop out cylinder	5	7
DKA110	Lockwood Standard Large Pin	7	10
DKA112	National Rockford Standard Pin	5	10
DKA113	Russwin Standard Large Pin	6	10
DKA114	Russwin Sectional Russwin 70 Series (Use Corbin 60 Series)	6	10
DKA115	Sargent Standard Large Pin	6	10
DKA116	Sargent Sectional	6	10
DKA117	Schlage Standard Large Pin	6	10
DKA119	Segal-Earle Standard Large Pin	5	7
DKA120	Taylor Standard Large Pin	5	7
DKA121	Weiser Standard Large Pin	7	10
DKA123	Weslock Standard Large Pin	5	8
DKA124	Yale Standard & Sectional	6	10
	B/DISC TUMBLER		
DKB200	Chicago 6 Disc	6	5
DKB201	Corbin All (Most) Dexter (Use B & S)	6	5
DKB202	Eagle Disc	5	5
DKB203	Ilco Disc	5	5
DKB204	Ilco DF & U Series	5	5
DKB205	Illinois Single Sided	5	4
DKB206	National (Rockford) (Most)	5	4
DKB207	Yale (Most)	5	5
	C/SMALL PIN (INCLUDING LETTERBOX) Bargman Trailer (Use Ford Pre-'52)		
DKC300	Chicago, Pin	5	7
DKC301	Corbin (B4R, 4T)	6	10
DKC302	Eagle (Long Space)	4	10
DKC303	Hudson Auth, Bommer & Others	5	6
DKC304	Ilco Pin	5	7
DKC305	American, Junkunc Pin Tumbler Padlock	6	8
DKC306	Ilco Lockwood 3/4" diam. Cylinder	5	7
DKC307	Master Padlock Large 4 Pin	4	8
DKC308	Master Padlock Small 4 Pin Tumbler 1092B	4	6
DKC309	National (Rockford) Not for letterbox application	5	10
DKC310	National (Rockford) letter Amek device, Auth, Bommer, etc.	5	10
	D/AUTOMOTIVE American Motors Pre'70 (Use B & S)		
DKD401	American Motors '70 up	5	5
DKD402	Briggs & Stratton	5	5
DKD403	Chrysler '56 -'67 Pin Tumbler Chrysler "CV" Side Bar Trunk Lock (Use GM)	5	5
DKD405	Chrysler '68 DP & DS Series	5	5
DKD406	Chrysler '68 up EP & ES Series	5	6
DKD407	Ford Pre'52	5	5
DKD408	Ford '52 - '64 (65 and 66 Mustang)		5
DKD409	Ford '65 up Double Sided Ignition	5	5
DKD410	Ford '65 up Double Sided Trunk	5	5
DKD411	General Motors All	6	5
DKD412	84 1/2 Ford	10	5

(courtesy of Ilco Unican)

Note: The listed key blank numbers should be used for reference. These depth key sets may apply to other equivalent key blank numbers.

Depth key sets are an inexpensive way to start up into code work.

As you know from your lesson on key duplication, a code key cut from depth and space keys would really be a second generation key. And duplicates made from this "original" would really be third generation. Locksmiths thought there had to be a better way. And of course there is — code equipment.

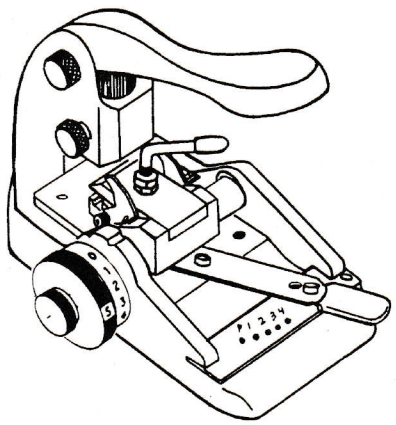
Code equipment on the market today fits into one of two categories:

1. Non-motorized Code Equipment.
2. Motorized Code Equipment.

Let's take a closer look at these two types.

Non-Motorized Code Equipment

One example of non-motorized equipment is the ILCO MK2, shown below. This is a hand-operated machine specifically designed to originate keys by code. This machine does not use electrical power. It is compact, versatile, and can go to any job with you.



(courtesy of Ilco Unican)

To make a key using the MK2, you do not need a pattern key. Follow the steps listed below.

1. Insert the key blank.
2. Move the spacing lever to the first space.
3. Set the depth knob to the required depth.
4. Push down on the main lever to make your first cut.
5. Repeat steps 1-4 until your key is complete.

One of the limitations of the MK2 is that you must have a different plate for each manufacturer's depth and spacing requirements.

You, or your employer, may own other brands of non-motorized code equipment. Some of these are A-1, Pro-Lok, and Curtis. They all have some of the same characteristics. With the right attachments, they all can get the job done.

Motorized Code Equipment

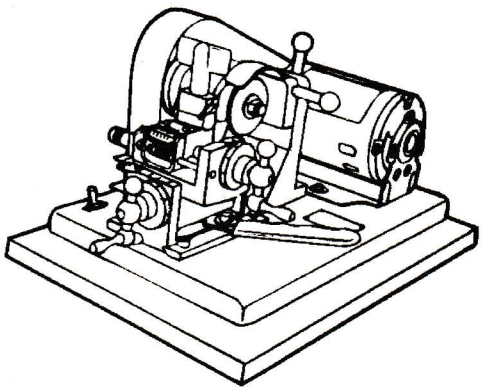
In this section, we'll look at three types of motorized code machines.

1. Built-In Micrometer Machines
2. Card System Machines
3. Electronic Code Machines

However, we will focus on the card system machine. You'll learn the procedure for using that machine. If you use a built-in micrometer machine or a computer chip memory machine, refer to the manual that comes with the machine for operating procedures.

Built-In Micrometer Machines

For our example of this type of machine, we'll use the Framon, shown below.



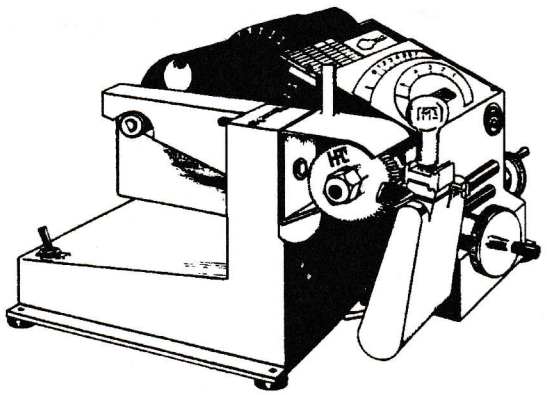
(courtesy of Framon)

The Framon is an accurate, versatile, and well-built code machine. The space and depth dimensions, the correct blank, and the cutter are all you need to make an accurate key.

As you can see, the Framon machine uses a built-in micrometer for attaining accurate spacings and depths. A manual of space and depth increments comes with each machine. Refer to the manual that comes with the machine for operating procedures.

Card System Machines

For our example of this type of machine, let's look at the HPC 1200, pictured below.



(courtesy of HPC)

The HPC 1200 code machine uses a card system to perform code cutting. These cards are printed with the manufacturer's name, keyway, depths, spaces, correct cutter, and sometimes other helpful information.

Once the correct card has been selected, you need to know only the depths by number. For instance, look at Appendix A and find the code FR481. The cuts listed bow to tip are 335313.

Follow these steps to make a key using the HPC 1200.

1. Choose the correct card and insert it into the machine.
2. Check for the proper cutter and jaw.
3. Insert the blank in the vise and flip up the shoulder gauge. Once the key is properly seated in the vise, return the shoulder gauge to the at-rest position.
4. Turn the space crank until the space needle is at the mark designated number 1.
5. Turn the depth crank, cutting the key to the mark for the proper depth (number 3 if you are cutting 335313).
6. Reverse the depth crank until the cutter has cleared the blank.
7. Turn the space crank to the next number (number 2 and so forth).
8. Repeat steps 1-7 until you have all cuts for the key (six cuts if you are cutting 335313).

Micrometer Card—A card used with motorized code equipment that lets the locksmith cut a key to chosen dimensions

In addition to manufacturers' cards, **micrometer cards** are available so you can cut to dimensions of your choice. Let's say, for instance, that Chevrolet introduces a new keying system. You have not purchased the card or it is not available yet. If you have the blank, and the space and depth dimensions, you can cut this key with a micrometer card.

Electronic Code Machines

Most mechanical code machines require special accessories to provide the proper spacing and depth dimensions. These machines usually let the user cut reasonably accurate keys. However, mechanical code machines can become more and more costly as you purchase additional accessories whenever new lock products appear in the marketplace.

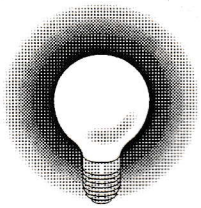
Electronic code machines can cut keys by code for hundreds of lock products without additional accessories. One example of this type of machine is Ilco Unican's ECM100.

This machine stores the multitude of spacing and depth dimensions used by various lock manufacturers. All you have to do is select the manufacturer's product for which you need the key, and the machine configures itself to cut that key!

Like electronic code machines, the ECM100 can also interface with a personal computer. This lets you use code database and master keying programs.

Electronic code machines are very accurate and efficient. For many users, this high level of performance and capability proves to be very cost effective.

Organize the Main Ideas



This outline will help you organize the information in this section of the lesson. Read through the outline and jot down what you remember about each of the topics listed. If you can't remember details related to one or more of the topics, you may wish to reread the text before you go on.

1. Code Equipment

   a. Non-Motorized Code Equipment

   b. Motorized Code Equipment

      1) Built-In Micrometer Machines

      2) Card System Machines

      3) Electronic Code Machines

Check Your Knowledge 3

This quiz will help you check what you've learned in this section of the lesson. Read through the questions and jot down your answers. Then check those against the suggested answers at the end of this lesson. If your answers differ greatly from the suggested answers, you may wish to reread the text before you go on.

1. Steps for making a key using a non-motorized code machine (the MK2) are listed below. However, the steps are not in the correct order. Put these steps in the correct order by placing number 1 in front of the first step, number 2 in front of the second step, and so forth.

   ____ Move the spacing lever to the first space.

   ____ Set the depth knob to the required depth.

   ____ Insert the key blank.

   ____ Push down on the main lever to make your first cut.

   ____ Repeat steps 1-4 until your key is complete.

2. Match the following descriptions (a, b, and c) with the correct type of machine by placing the correct letter on the blank space next to the type of machine.

   a. The space and depth dimensions, the correct blank, and the cutter are all you need to make an accurate key. A manual of space and depth increments comes with each machine.

   b. The machine stores hundreds of manufacturers' space and depth dimensions. You load the codes into your machine, look up the code, send the data, and press cut.

   c. All you need to know is the manufacturer and the depths by number.

   _____ Built-In Micrometer type

   _____ Card System type

   _____ Electronic Code Machine type

3. Steps for making a key using a motorized card system code machine like the HPC 1200 are listed below. However, the steps are not in the correct order. Put these steps in the correct order by placing number 1 in front of the first step, number 2 in front of the second step, and so forth.

   ____ Insert the blank in the vise and flip up the shoulder gauge. Once the key is properly seated in the vise, return the shoulder gauge to the at-rest position.

   ____ Check for the proper cutter and jaw.

   ____ Choose the correct card and insert it into the machine.

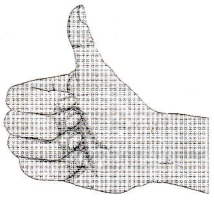
   ____ Turn the depth crank, cutting the key to the mark for the proper depth (number 3 if you are cutting 335313).

   ____ Reverse the depth crank until the cutter has cleared the blank.

   ____ Turn the space crank until the space needle is at the mark designated number 1.

   ____ Turn the space crank to the next number (number 2 and so forth).

   ____ Repeat steps 1-7 until you have all cuts for the key (six cuts if you are cutting 335313).



Now You Can Do It!

You've reached the end of the lesson, but what have you learned? Let's find out. First complete the exercise below using only your memory. Next go back to the text to complete and/or check your answers.

1. List and define two types of codes.

2. Explain why locksmiths use code books.

3. List 3 ways calipers and micrometers are used when cutting keys by code..

4. Describe the differences between calipers and key micrometers.

5. List the steps for making a key on a non-motorized code machine.

6. List and describe three types of motorized code machines.

7. List the steps for making a key on a card system motorized code machine.

Stop for Review

To answer the following questions, circle the letter next to the correct response. Only one correct response is provided for each question.

1. A designation, unrelated to the bitting, assigned to a particular key combination for future reference when additional keys or cylinders are needed is called a _____.
   a. direct code
   b. code series
   c. blind code
   d. code combination

2. A designation assigned to a particular key which includes the actual combination of the key is called a _____.
   a. direct code
   b. code series
   c. blind code
   d. code combination

3. Locksmiths use code books to find _____.
   a. code combinations
   b. references and advertisements for tools and equipment needed to cut keys by code
   c. listings of ALOA magazines that include key codes
   d. the correct key blank and the correct combination for a key

4. When cutting keys by code, calipers and key micrometers are NOT used to _____.
   a. determine the original cut depths of a worn key
   b. check the cut depths
   c. determine the blind code
   d. check for proper depth when adjusting a code machine

5. When compared to calipers, key micrometers do NOT _____.
   a. have thicker jaws
   b. have thinner jaws
   c. use marks on the body to give readings
   d. spin in a circular fashion

6. Insert the key blank; move the spacing lever to the first space; set the depth knob to the required depth; and push down on the main lever to make the cut are the steps for making a key on a _____.
   a. non-motorized code machine
   b. built-in micrometer code machine
   c. card code machine
   d. electronic code machine

7. A built-in micrometer type code machine _____.
   a. comes with cards printed with the manufacturer's name, keyway, depths, spaces, and correct cutter
   b. requires you to know only the depths by number to be able to cut a key accurately
   c. requires you to know the space and depth dimensions, the correct blank, and the correct cutter to be able to cut a key accurately
   d. stores hundreds of manufacturers' space and depth dimensions

8. A card system type code machine _____.
   a. comes with a manual of space and depth increments
   b. requires you to know only the depths by number to be able to cut a key accurately
   c. requires you to know the space and depth dimensions, the correct blank, and the correct cutter to be able to cut a key accurately
   d. stores hundreds of manufacturers' space and depth dimensions

9. Choose the correct card and put it in the machine; check for proper cutter and jaw; place the blank in the vise and gauge it; turn the space and depth cranks to the proper numbers; and reverse the depth crank until the cutter has cleared the blank are the steps for making a key on a _____.
   a. non-motorized code machine
   b. built-in micrometer code machine
   c. card code machine
   d. computer chip memory code machine

10. An electronic type code machine _____.
    a. comes with a manual of space and depth increments
    b. requires you to know only the depths by number to be able to cut a key accurately
    c. requires you to know the space and depth dimensions, the correct blank, and the correct cutter to be able to cut a key accurately
    d. stores hundreds of manufacturers' space and depth dimensions

Appendix A

CHICAGO "FR" 451-800

Blanks: Chicago K101, K102, K103, K104 (to determine correct blank, divide code number by 4 - if remainder is 1, use blank K101, 2 use blank K102, 3 use blank K103, or if no remainder, use blank K104). For example: FR571 divided by 4 equals 142 with a remainder of 3, so you would use blank K103. (For further explanation, see "Notes" on page 09-04-001.)

Spacings: Shoulder to center of 1st cut 0.139, cut to cut 0.093

Depths: 1 = 0.250, 3 = 0.220, 5 = 0.190

Cut BOW to TIP.

Notes: Cut BOW to TIP.

Notes: An asterisk (*) indicates a variation that can be found at the end of the series.

Continental Micro--Card 5

451		**481**		511		541		**571**	
51	553113	**81**	**335313**	11	131355	41	513153	**71**	**313533**
52	553113	82	335313	12	131355	42	513153	72	313533
53	115551	**83**	**335313**	13	135315	43	513153	73	331551
54	115551	84	335313	14	135315	44	513153	74	331551
55	115551	85*	351513	15	135315	45	531135	75	331551
56	115551	86*	351513	16	135315	46	531135	76	331551
57	133551	87*	351513	17	153153	47	531135	77	351315
58	133551	88*	351513	18	153153	48	531135	78	351315
59	133551	89	355311	19	153153	49	533331	79	351315
60	133551	90	355311	20	153153	50	533331	80	351315
61	151353	91	355311	21*	551331	51	533331	81	355131
62	151353	92	355311	22*	551331	52	533331	82	355131
63	151353	93	513513	23*	551331	53	553131	83	355131
64	151353	94	513513	24*	551331	54	553131	84	355131
65	153513	95	513513	25	315153	55	553131	85	515133
66	153513	96	513513	26	315153	56	553131	86	515133
67	153513	97	531153	27	315153	57	131535	87	515133
68	153513	98	531153	28	315153	58	131535	88	515133
69	311553	99	531153	29	333315	59	131535	89	533133
70	311553	500	531153	30	333315	60	131535	90	533133
71	311553	1	533313	31	333315	61	135531	91	533133
72	311553	2	533313	32	333315	62	135531	92	533133
73	315333	3	533313	33	335511	63	135531	93	551511
74	315333	4	533313	34	335511	64	135531	94	551511
75	315333	5	551331	35	335511	65*	153531	95	551511
76	315333	6	551331	36	335511	66*	153531	96	551511
77	333153	7	551331	37*	353331	67*	153531	97	133155
78	333153	8	551331	38*	353331	68*	153531	98	133155
79	333153	9	131355	39*	353331	69	313533	99	133155
80	333153	10	131355	40*	353331	70	313533	600	133155

601		651		701		751		Variations	
1	151513	51	513315	1	133353	51	515151	485*	351531
2	151513	52	513315	2	133353	52	515151	486*	351531
3	151513	53	533151	3	133353	53	151533	487*	351531
4	151513	54	533151	4	133353	54	151533	488*	351531
5	133311	55	533151	5	313353	55	151533		
6	133311	56	533151	6	313353	56	151533	521*	515331
7	133311	57	113553	7	313353	57	515113	522*	515331
8	133311	58	113553	8	313353	58	515113	523*	515331
9	331353	59	113553	9	351351	59	515113	524*	515331
10	331353	60	113553	10	351351	60	515113		
11	331353	61	151335	11	351351	61	155151	537*	353311
12	331353	62	151335	12	351351	62	155151	538*	353311
13	335331	63	151335	13	531315	63	155151	539*	353311
14	335331	64	151335	14	531315	64	155151	540*	353311
15	335331	65	315135	15	531315	65	551133		
16	335331	66	315135	16	531315	66	551133	565*	135351
17	511515	67	315135	17	115335	67	551133	566*	135351
18	511515	68	315135	18	115335	68	551133	567*	135351
19	511515	69	335151	19	115335	69	335133	568*	135351
20	511515	70	335151	20	115335	70	335133		
21	515313	71	335151	21	313515	71	335133		
22	515313	72	335151	22	313515	72	335133		
23	515313	73	513135	23	313515	73	315531		
24	515313	74	513135	24	313515	74	315531		
25	535311	75	513135	25	353313	75	315531		
26	535311	76	513135	26	353313	76	315531		
27	535311	77	515113	27	353313	77	135153		
28	535311	78	515113	28	353313	78	135153		
29	115133	79	515113	29	551151	79	135153		
30	115133	80	515113	30	551151	80	135153		
31	115133	81	115515	31	551151	81	333513		
32	115133	82	115515	32	551151	82	333513		
33	135351	83	115515	33	153315	83	333513		
34	135351	84	115515	34	153315	84	333513		
35	135351	85	153351	35	153315	85	531351		
36	135351	86	153351	36	153315	86	531351		
37	155313	87	153351	37	353133	87	531351		
38	155313	88	153351	38	353133	88	531351		
39	155313	89	333351	39	353133	89	511533		
40	155313	90	333351	40	353133	90	511533		
41	331515	91	333351	41	553311	91	511533		
42	331515	92	333351	42	553311	92	511533		
43	331515	93	353511	43	553311	93	133533		
44	331515	94	353511	44	553311	94	133533		
45	351513	95	353511	45	315351	95	133533		
46	351513	96	353511	46	315351	96	133533		
47	351513	97	531513	47	315351	97	113535		
48	351513	98	531513	48	315351	98	113535		
49	513315	99	531513	49	515151	99	113535		
50	513315	00	531513	50	515151	00	113535		

REED CODE BOOKS

09-04-05