

[The Locksmith Guide™ to: Common Master Keying](#)

Here are a few pages from the Book. These should give you a sample of the text.

Table of Contents

The Table of Contents shows the Chapter Titles for the information contained in this book.

Methods of master Keying

Shoe-Box, RCM (Rotating Constant Method), **TPP** (Total Position Progression Method) and **Maison** Keying are fully covered and explained.

Chapters cover Cylinder Design, Master Key System Design and Development, and Specific Service instructions and techniques.

Scan & Print Extras are full page "Blank Forms," which compliment the text and allow the reader to apply the methods and techniques found in each Chapter.

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Figure 1.10 Universal Locksmith Pin Kit

cylinders. The biggest advantage to an OEM or OEM style pin kit is the actual pin configuration. Most will duplicate the manufacturers pin style and pin lengths faithfully.

Figure 1.11 shows a few of the most popular pin styles. Universal pins are cone pointed, as are the Corbin Russwin and Schlage. Weiser and Sargent pins are blunt "round nose" pins. Yale and Kwikset pins are flat tipped pins. The Kwikset pin is reversible. Both ends



Figure 1.11 OEM Pin Configurations

of the Kwikset pin have the same chamfered point. The Universal pin configuration is a suitable substitute for 90% of the manufacturers you will encounter in the field. If you are combining a large number of a single manufacturers original cylinders, an OEM kit may be a good investment.

A Shim Holder can make shim-picking cylinders safer

Tools & Equipment

The book begins with Universal Key and pinning practice. Tools are introduced and explained. Universal combining pins are explained, along with some common OEM pin styles. The pin tumbler cylinder design and common pinning practice are introduced and explained.

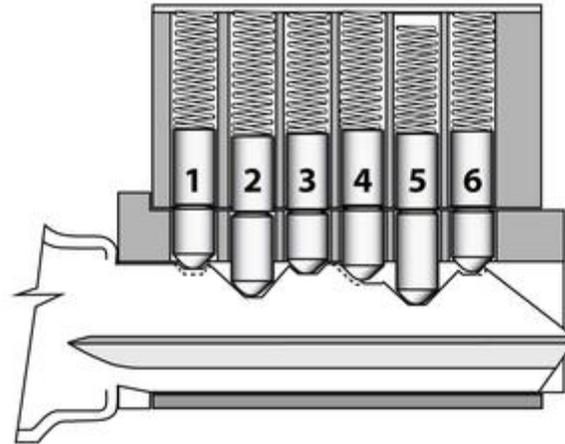
For those new to the trade, this section will contain many critical insights and reasons for specific methods of service. This section forms the foundation for all pinning practice, and is essential to your success in master keying.

Insights & Pointers

Insights into the causes of common key and cylinder malfunction are covered, to give answers to the question; "Why doesn't the key work properly?"

Causes and cures for these common problems are illustrated and discussed.

Insights are found in every chapter, that illustrate the reasoning behind why a certain method was used or choice made, concerning how the system was designed and written. Insights are the voice of experience.



- | | |
|--|---|
| 1. Cut too shallow | 4. Cut displaced toward the tip of the key |
| 2. Cut too deep | 5. Spring is collapsed |
| 3. Cut properly positioned, and the correct depth | 6. Cut displaced toward the bow of the key |

Why doesn't the key work properly?

Figure 1.20 Illustrated key problems

easily, but will "bind" and become harder to turn as it is rotated further. The chamfered top edge of the combining pin allows the plug to be rotated a short distance, to the point where the binding begins. To correct this problem, you can re-cut the position using a code machine or the proper depth key. Check and calibrate your code machine regularly. Measure your "cut-keys" to check the calibration. Be more careful positioning the "pattern key" in your key duplicator, if you are using depth and space keys. Check and calibrate your key duplicator regularly. In some cases, a stroke or two with a Pipin file, in the offending cut, will

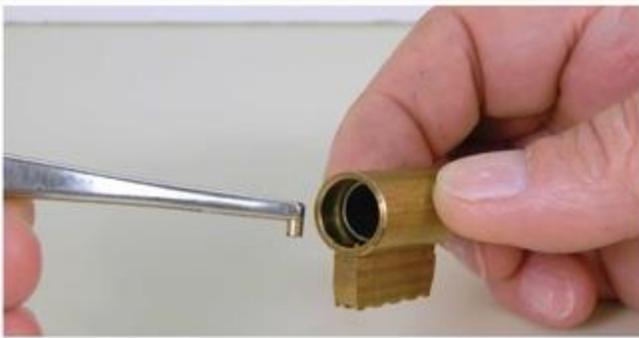


Figure 1.35 Proper positioning and holding of a cylinder & follower. The thumb and index fingers pull the cylinder over the follower. The follower is at the base of the little finger. This will allow you to put tension on the follower as the pins are loaded. Grasp the pin, as you see in the photo, using the locksmith pin tweezers. Note that a larger portion of the pin extends below the point of the tweezers. Load the driver pin into the third position from the end of the cylinder, over the cylinder spring. Only a portion of the pin can be placed into the cylinder hole. Pull the cylinder "back," over the follower, to jam the pin and prevent it from shooting out.

Figure 1.36 shows the top pin, jammed by the follower,



Figure 1.36 Top pin jammed, holding its cylinder spring compressed

Pinning Methods

Loading top pins can be a challenge. With a little instruction, it becomes as easy as loading the plug. Clear photos and easy to understand text lead the reader to a complete understanding and mastery of this task.

Convenience vs. Security

Master Keying creates a system of Convenience. This page illustrates the number of keys that will operate a common master keyed cylinder.

Carefully designed systems should afford the highest level of security, while providing the desired convenience.

Insights will allow you to create systems that meet your customers needs, while preserving the best level of security.

Common Master Keying

of keyed access. Most Master Key systems will have two or more levels of access, granting; total access by a Grand Master Key (GMK), limited access by a Master Key, and restricted access by a Change Key. A Great Grand Master (four level system) will grant total access to the Great Grand Master Key holder. The system can be as large or as small as is necessary to satisfy the needs of the facility.

The key word in this crude definition is "convenience." A Master System is a system of convenience. With each added "shear line" in a pin stack, the security of the system is diminished. *Figure 2.01* shows a simple master keyed cylinder. In this example we have chosen a Master Key bitting of 252361.

The Change Key bitting is 074725.

The bottom pins and master pins are labeled, to make this exercise easier to see.

Most will say that this cylinder will operate with two keys, the MK and the CK. They

would be wrong. This cylinder will, in truth, operate equally well with 64 different key bittings, including the MK and CK. Let's trace all of the working combinations. They are:

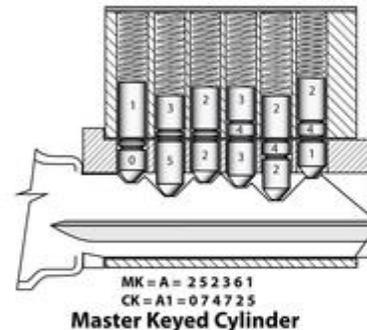


Figure 2.01 A Master Keyed Cylinder

052361	052761	052321	052721	052365	052765	052325	052725
252361	252761	252321	252721	252365	252765	252325	252725
072361	072761	072321	072721	072365	072765	072325	072725
272361	272761	272321	272721	272365	272765	272325	272725
054361	054761	054321	054721	054365	054765	054325	054725
254361	254761	254321	254721	254365	254765	254325	254725
074361	074761	074321	074721	074365	074765	074325	074725
274361	274761	274321	274721	274365	274765	274325	274725

A "3 in 5" System

Figure 3.04 shows a "3 in 5" RCM progression system. This progression will allow us ten (10) patterns. The positions being progressed are represented by an "X." The Constant positions are represented by the bitting shared with the TMK (Top Master Key).

Each pattern will produce sixteen (16) theoretical combinations. If we progress two positions, and each position has four possible bittings (depths), the result is 16 combinations. (4 x 4 = 16)

There are ten patterns, so this progression will produce one hundred sixty theoretical change keys (10 x 16 = 160).

These must necessarily be reduced by the MACS violations, but that is a fair number of cylinders. There will only be two (2) master wafers in any cylinder found in this system. The physical security is enhanced by the fact that the entire system was accomplished by adding only two (2) shear lines to the cylinder.

A "2 in 5" System

By changing the pattern of the progression to "2 in 5," we can increase the number of combinations. Figure 3.05 shows the patterns for a "2 in 5" system. There are three positions progressed in each pattern, with two Constant positions.

Each pattern will produce sixty-four (64) theoretical combinations. If we progress three positions, and each position has four possible bittings (depths), the result is 64 combinations. (4 x 4 x 4 = 64) There are ten patterns

TMK: 5 2 3 6 1

	5	2	3	6	1
1	5	2	3	X	X
2	5	2	X	6	X
3	5	2	X	X	1
4	5	X	3	6	X
5	5	X	3	X	1
6	5	X	X	6	1
7	X	2	3	6	X
8	X	2	3	X	1
9	X	2	X	6	1
10	X	X	3	6	1
	1	2	3	4	5

Figure 3.04 3 in 5 RCM patterns

RCM Patterns

A number of RCM (Rotating Constant Method) systems are illustrated, to show the advantages of this method. Here, a 3-in-5 progression is being explained.

Bitting Progression Method

The progression method is illustrated, in the most basic manner. This explanation shows a method of progressing a five position system.

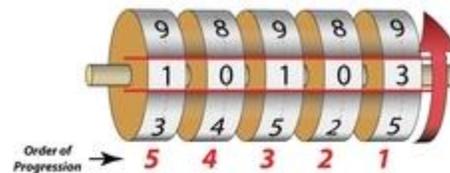
Each wheel carries the change key bittings for its position in the KBA. No TMK or Master bittings will be found on any wheel.

The right wheel moves up, one number at a time,

to reveal numbers: 5, 7 & 9. As the number three comes up, it "indexes" the next wheel "one position" to reveal the number 2. The right wheel again rotates to show numbers 5, 7 & 9, in sequence. As the number three comes up, again, it indexes the left wheel one more position, to reveal number 4. The combinations of the available bittings are read at the front of the wheels, between the red lines. They will be: 0-3, 0-5, 0-7, 0-9, 2-3, 2-5, 2-7, 2-9, 4-3, 4-5, 4-7, 4-9, 8-3, 8-5, 8-7, 8-9. The "order of progression" is 5 - 4 - 3 - 2 - 1. We are progressing position number five, first. We are progressing position four, next. There should be 16 bitting possibilities displayed for positions five and six.

As the #2 comes up a second time in position four, the wheel in position three will be indexed upward, to reveal the number five (5). Wheels four and five will continue, to reveal the same 16 combinations as before. When all sixteen have been used, the mechanism will push wheel three upward again, to reveal the number seven (7). Just like an automotive odometer, the wheels will index through all of the available combinations, to find 64 unique combinations from wheels three, four and five. These are shown on the next page. Note that there are four columns of sixteen combinations. Each column repeats the same combinations in the right two positions. Each column of combinations has a unique first number. No combination has been repeated.

The Progression Method



Progress the Change Key Bittings

Figure 3.11 The Odometer Visualization

System	Barnes Steel & Mfg.	Mfg.	Schlage	Keyway	C	# Pins	5	Date	6-6-15																																			
Notes	Bob Barnes 815-874-2300 (ext. 15)																																											
MACS	7																																											
1200CM Card	45																																											
Cutter	CW/AMC																																											
B-T or T-B	B-T																																											
Conf.	<table border="1"> <tr> <td></td> <td colspan="4">KBA</td> </tr> <tr> <td>TMK</td> <td>5</td> <td>2</td> <td>3</td> <td>6</td> <td>1</td> </tr> <tr> <td></td> <td>1</td> <td>0</td> <td>1</td> <td>0</td> <td>3</td> </tr> <tr> <td></td> <td>3</td> <td>4</td> <td>5</td> <td>2</td> <td>5</td> </tr> <tr> <td></td> <td>7</td> <td>6</td> <td>7</td> <td>4</td> <td>7</td> </tr> <tr> <td>CS Key Bitting</td> <td>9</td> <td>8</td> <td>9</td> <td>8</td> <td>9</td> </tr> </table>										KBA				TMK	5	2	3	6	1		1	0	1	0	3		3	4	5	2	5		7	6	7	4	7	CS Key Bitting	9	8	9	8	9
	KBA																																											
TMK	5	2	3	6	1																																							
	1	0	1	0	3																																							
	3	4	5	2	5																																							
	7	6	7	4	7																																							
CS Key Bitting	9	8	9	8	9																																							
Sub-Master	10	11	12	13	14	15	16	17	18																																			
Application	Office	Office	Engineering	Receiving	col. Room	Shipping	Heat Treat	Lab Offices	Restricted																																			
Inst.	6/15	6/15	6/15	6/15	6/15	6/15	6/15	6/15	6/15																																			

Figure 3.17 Completed "System" Card, Side A

- Keys are cut using a 1200CM Card #45.
- Bitting is listed Bow to Tip.
- The TMK (Top Master Key) is bitted: 52361.
- The KBA shows all of the available "change key" bitting depths.
- There are 15 Sub-Master keys
- Seven (7) Sub-Master assignments are shown.
- The AN master bitting is not used. (MACS violation).
- A restricted section is set aside, for "off the master" keying.
- There are Six (6) available Sub-Master key sections.
- Sub-Masters assigned were installed 6/15. (Date)

Note that this card will also service a five, six or seven pin systems. There is also space to record a Control Key bitting, for interchangeable core cylinders.

The front side of the System Card defines the System. The rear of the card lists Sixty-Four Change Key bittings, by their numeric position in the bitting list. Figure 3.18 shows a blank Bitting List. The list is numbered; 01 to 64, to accommodate sixty four bitting combinations from

The "System Card"

A "3 x 5" file card is used to record most master keyed systems, eliminating much paperwork, and simplifying the recording process. A complete explanation of this method is found with each system illustrated.

The "Pinning Matrix Card"

The "Pinning Matrix Card" is introduced and explained. This card simplifies and defines the pin stacks found in any system. It is a "short-cut," that will make pinning the cylinders a breeze.

Common Master Keying

be completed for "this system," to be useful. This is a companion card for the System Card.

The title block of the Matrix Card, shown in *Figure 3.20*, identifies this card for the system built for the Barnes Steel & Mfg. Company. The system is built for 5-pin Schlage, C keyway cylinders. It was built in June of 2015. The contact person, at the plant, is Bob Barnes, and his contact phone

System	Mfg.	Keyway	# Pins	Date			
Barnes Steel & Mfg.	Schlage	C	5	6-6-15			
Notes: Bob Barnes 815-874-2300 (ext. 15)							
Count	5	2	3	6	1		
Max	1	0	1	0	1		

Figure 3.20 Pinning Matrix Card, Side A

5	4	5	4	5		
7	6	7	6	7		
9	8	9	8	9		

Figure 3.21 Pinning Matrix Card, Side B

Common Master Keying

must show the arrangement and doors that are to be keyed into the Master System. A second section of this facility is anticipated in the near future.

In the drawing, there are three offices in the front section and two in the manufacturing section.

Number the Doors

The first step is to number the doors and begin a door schedule, keying schedule and keying plan. From this we can plan the mastering that will become our system. Knowing the number of doors, and the arrangement of the facility, the system will be designed to

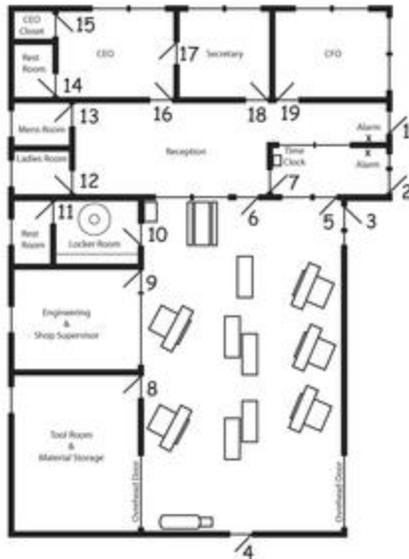


Figure 4.01 Nelson Tool Co. Doors #

guide each "key-holder" through the building, limiting and allowing access to specific areas. This is the point of any master system. Some key-holders will have total access to all areas. Others will have access limited to specific sections of the facility. Still others will have more limited access, allowing them into only specific areas. We will try to design a system that meets the specific needs of the client.

There are nineteen doors in the facility. Five are either non-locking or privacy (no lock cylinder) locksets. The remainder of the locksets contain cylinders that will be serviced to install the system.

Figure 4.02 is the list of door numbers. It defines the

System Design

The first master system begins with a diagram of the facility to be master keyed. The doors are numbered, and the system is designed to guide each "key-holder" through the building, limiting and allowing access to specific spaces, according to the desires of the management.

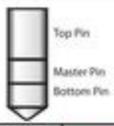
The Un-Combining work sheet

Special attention is given to "Backing into an existing system." The Un-Combining work sheet simplifies this process, with a little practice.

This work sheet is available in the "Scan & Print" section of the book, as are all of the forms and charts found in the text.

Chapter 7

Back into an Existing System



Mfg. : _____ Job# : _____ Date : _____
 Keyway: _____
1

5	Cont.	Use "Control"	Key Blade				
	TMK						
	MK						
2	Th K						

4							
	1	2	3	4	5	6	7

Length	#												

Bow	Tip		
Uncombining Chart, Schlage I/C (LFIC) Cylinders			
Bottom Pins	Master Pins	Top Pins (Drivers)	Cut Depths
0 - .165	2 - .030	1 = .235 (Stack total is: 0, 1, 2)	0 - .335
1 - .180	3 - .045	2 = .200 (Stack total is: 3, 4, 5, 6)	1 - .320
2 - .195	4 - .060	3 = .165 (Stack total is: 7, 8, 9)	2 - .305
3 - .210	5 - .075	The Top Pin Size is the determined by the "Stack-Total"	3 - .290
4 - .225	6 - .090		4 - .275
5 - .240	7 - .105		5 - .260
6 - .255	8 - .120		6 - .245
7 - .270	9 - .135		7 - .230
8 - .285			8 - .215
9 - .300			9 - .200

1200CM Code Card: 45
 Increment (depth): .015
 First cut: .231, cut-cut spacing: .156
 Plug Diameter: .507

Positions are read and written Left to Right, "Bow to Tip."
 Progression: two-step
 MACS: 7
 All Dimensions are in inches

Schlage I/C LFC Uncombining Chart, Copyright 2014 Robert L. Gooding, Ltd. 813-819-8000

Figure 7.03 Blank Un-combining Chart
 3. Pin length measurements are entered into the table below the representative pin stacks. Schlage pin length information is shown, on the form, to convert the measured pin lengths to numeric biting values (depths).

Scan & Print

The following pages contain many of the forms and illustrations you have seen in this book. They are included here as an aid to the locksmith that will be using the methods outlined in this text. These forms are ©copyright protected. Please do not publish or distribute them. They are included for your personal use only. Scan, Copy and Print them as much as you need, but do not produce them in another work or distribute them freely to others.

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Scan & Print

The "Scan & Print" section allows the reader to use the information from the text, and apply it to common practice. All of the forms and charts are illustrated, as blank forms, for easy reproduction. Scan and print your own forms, or take them to a printer, to have them printed and padded for your own use.

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