SPECIAL

IMPORTANT FILE COPY

Key Cutter - Basic Repairs

Pawl Spring

Pawl Spring (Part #: , A01079

The pawl spring is a thin, curved piece of heat-treated metal (giving it a slightly blue color) which is mounted into the ratchet lever and pushes against the pawl laminated assembly. The assembly then pushes against the notches in the key carriage, moving the key carriage forward after each cut is made. A properly installed pawl spring can last from months to years.

Symptom: The key carriage will no longer advance. Check to be sure the pawl spring is centered in the "track" of the ratchet lever. If the pawl spring has broken you can see that it no longer reaches the notches in the key carriage to push the carriage forward.

Replacing the Pawl Spring

Remove the key carriage and outer half.

1. Remove the key carriage by removing the small screw on underside of the key cutter. Once the screw has been removed the carriage stop pin will drop out of the unit and you can slide the key carriage out.

2. Unscrew the rubber "feet" from the underside of the key cutter.

3. Remove the 2 nuts on the body of the unit (the side with the name plate) using a 9/16" socket.

4. Locate the 3 bolts on the underside of the key cutter that are lined up below the name plate side of the outer half. Remove these 3 bolts from the underside of the key cutter using a 9/16" socket. Once these are removed you can remove the outer half of the cutter.

Replace the pawl spring.

5. With the outer half of the cutter removed, remove the pawl spring. The pawl spring is held in place with a single screw above the ratchet lever (see Illustration 1).

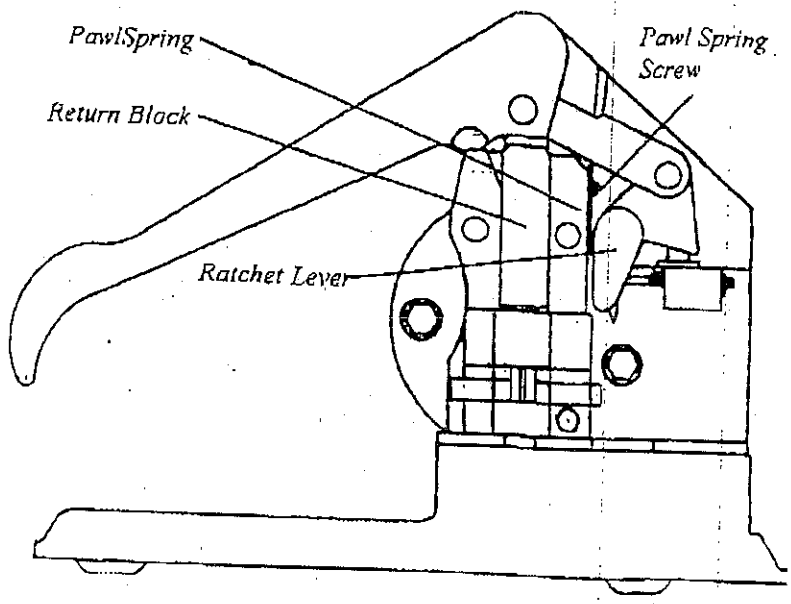
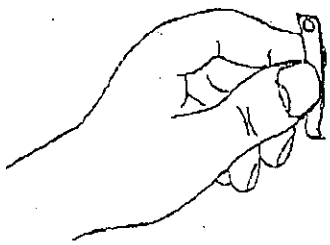


Illustration 1

6. Hold the new pawl spring so the end of the spring curves toward you and the angle at the bottom of the spring faces away from you (see Illustration 2).

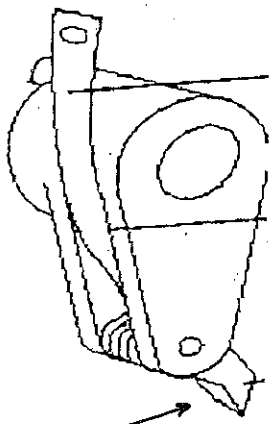


The pawl spring curves toward you and the angled end of the spring points away from you.

Illustration 2

7. Position the key cutter with the handle facing away from you. Insert the new pawl spring by placing the screw in the spring and positioning the spring between the main and the ratchet lever. Tighten the screw.

8. Turn the cutter back on its side and look to see if the spring is centered in the track of the ratchet lever. The spring should not touch either edge of the ratchet lever, but be suspended in the center (see Illustration 3). Recheck the position of the spring, adjust and retighted the screw. *If the spring is installed backwards it will work a few times, but will quickly break.*



1190804 (A01007)

Illustration 3

Replace the outer half.

7. Replace the outer half and loosely replace the 2 outside nuts and the 3 bolts on the underside. Alternate tightening between the nuts and the bolts until all are snug. Be sure the handle moves freely

8. Replace the rubber feet.

9. Replace the key carriage. A friction pin which protrudes into the carriage pathway may offer resistance as the carriage is inserted. With some cutters it is necessary to reach into the carriage pathway from the back of the opening and manually depress the pin in order to insert the carriage.

10. Replace the carriage stop pin on the underside of the cutter and secure it by replacing the holding screw. Press the handle 8 times to test that the key carriage advances properly.

Key Cutter - Basic Repairs

Cutting Blade

Cutting Blade (Part # A1021)

The cutting blade in the key cutter is a square punch positioned in the die block to punch shallow or deep cuts out of the key blank inserted in the cutter.

Symptoms: Key cuts are ragged.

Rotating the Cutting Blade

Remove the key carriage, outer half and handle assembly.

1. Remove the key carriage by removing the small screw on underside of the key cutter. Once the screw has been removed the carriage stop pin will drop out of the unit and you can slide the key carriage out.

2. Unscrew the rubber "feet" from the underside of the key cutter.

3. Remove the 2 nuts on the body of the unit (the side with the name plate) using a 9/16" socket.

4. Locate the 3 bolts on the underside of the key cutter that are lined up below the name plate side of the outer half. Remove these 3 bolts from the underside of the key cutter using a 9/16" socket. Once these are removed you can remove the outer half of the cutter.

5. Remove the handle assembly (carriage handle and operating block) by sliding it off the level handle pin.

   Helpful tip: It's easier to remove the handle assembly if you push the handle forward and insert a standard screw driver between the main body and handle spring follower. This releases the tension of the spring and makes the handle assembly easier

to remove. Leave the screw driver in place until you've completed your repair and replaced the handle assembly.

Rotate the cutting blade.

6. Remove the cutting blade/punch from the die block. (See Illustration 1.) If the punch is difficult to remove, look on the underside of the cutter, through the small rectangular opening for the diamond shaped punch. Use a screw driver to push the punch out of the die block.

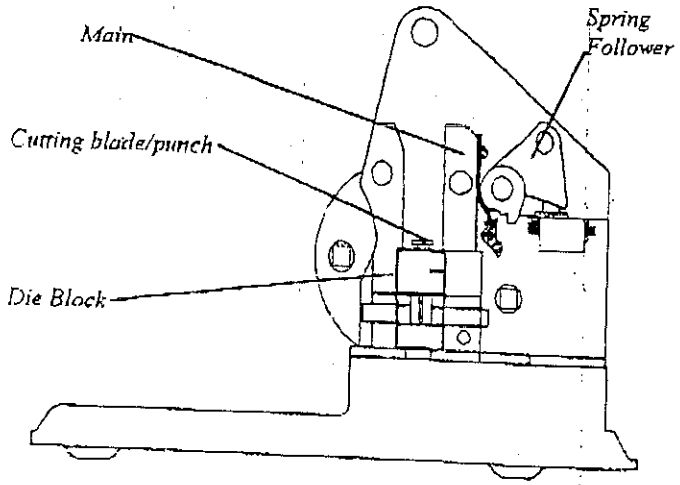


Illustration 1

7. Go to the top of the blade and place a mark on the pin to show the used edge of the blade. This will show you which way to rotate the blade next time you do this repair.

8. Rotate the blade/punch one quarter turn and replace it in the die block. The punch should insert with minimal resistance. Do not force the rotated punch into the die block. It is not unusual that all 4 sides of the punch can not be utilized. If only the worn side of the punch will fit properly in the die block, the punch should be sharpened and replaced as it was originally.

Replace the handle assembly, outer half and key carriage.

9. Slide the handle assembly on to the level handle pin. Remove the screw driver holding the handle spring follower.

10. Replace the outer half and loosely replace the two outside nuts and then the three bolts on the underside. Alternate tightening the two nuts and three bolts until all are snug. Be sure the handle moves freely.

11. Replace the rubber feet.

12. Replace the key carriage. A friction pin which protrudes into the carriage pathway may offer resistance as the carriage is inserted. With some cutters it is necessary to reach into the carriage pathway from the back of the opening and manually depress the pin in order to insert the carriage.

13. Replace the carriage stop pin on the underside of the cutter and secure it by replacing the holding screw. Press the handle 8 times to test that the key carriage advances properly.

Sharpening the cutting blade

The cutting blade/punch can be sharpened by using a V block and surface grinder. Take .001 inch off the bottom of the punch on the first pass and .001 inch on the second pass of the grinder.

A2 SYSTEM SERVICE MANUAL

CONFIDENTIAL MATERIALS

To be kept with key cutting codes in a secure place.
DO NOT JEOPARDIZE YOUR ACCESS SECURITY CONTROL.

BEST LOCK CORPORATION
INDIANAPOLIS, INDIANA 46250
(317) 849-2250
TELEX: 272365 BEST LOCK IND

A2 S-228
REV.681

"THE ORIGINAL INTERCHANGEABLE CORE — SINCE 1925"

INTRODUCTION

When any organization adopts the Best Locking Security Systems, the local Best Representative will provide initial instruction on systems concept and service equipment. One or no more than two individuals may receive training at the factory. The purpose is to train them to thoroughly understand the system and various BEST locks, and be able to control, maintain and, if necessary, extend the system within their own organization.

The value of this training is evident from the fact that many of these "students" have become experts with the system and need only contact the factory for service parts.

The individual responsible for your organization's security should keep this manual for ready reference. If that individual plans to leave the security department, arrangements should be made to train another, so there will be no period when the system is not thoroughly understood by a specified person.

However, we wish to emphasize that the service and advice of B E S T L O C K C O R P O R A T I O N are always at your disposal. Should situations or problems arise which are not covered in this manual, please contact the local Representative or the factory immediately. We are eager to assist you in any way.

SYSTEMS PLANNING
for
Security - Economy - Convenience

HOW MANY KEYS SHALL I PLAN FOR?

This is the first question to ask when adding more locks to your BEST system, or when recombinating the cores currently in use. This is very important. Since the number of combinations is limited by the type of pin segments in the lock core, it can happen that a plan is not broad enough to cover future lock changes or new building additions to the system (i.e., you may one day need 65 different keys for a certain area master series, but only 64 different keys are possible within your plan). Look ahead!

The chart (Table A) quickly shows the most common masterkeying arrangements. The numbers in each column indicate the number of different keys available. For example, Plan "C" allows one Control Key, one Grandmaster, from 2 to 4 Masters, with 256 different Operating keys available under each of the Masterkeys in a 5-pin system, 1024 different operating keys available under each of the Masterkeys in a 6-pin system, or 4096 different Operating keys available under each of the Masterkeys in a 7-pin system.

Before adding more locks to your BEST system, and before recombinating present cores, consult Table A for the number of possible keys. For situations not covered by the chart, contact BEST LOCK CORPORATION.

(NOTE: Consult your corporate system schematic for combinations available.)

TABLE A

PLAN	CONTROL	GRAND-MASTER	MASTER	SUB-MASTER	SUB-SUB-MASTER	OPERATING COMBINATIONS PER MASTER OR SUB-MASTER 5-PIN SYSTEM	6-PIN SYSTEM	7-PIN SYSTEM
A	1	1						
B	1	1	1			1023	4095	16383
C	1	1	2 to 4			767	3071	12287
D	1	1	5 to 16			256	1024	4096
E	1	1	17 to 64			64	256	1024
F	1	1	65 to 256			16	64	256
G	1	1	1 to 4	1 to 4		4	16	64
H	1	1	5 to 16	1 to 4		64	256	1024
I	1	1	17 to 64	1 to 4		16	64	256
J	1	1	65 to 256	1 to 4		4	16	64
K	1	1	1 to 4	5 to 16		0	4	16
L	1	1	5 to 16	5 to 16		16	64	256
M	1	1	17 to 64	5 to 16		4	16	64
N	1	1	1 to 4	17 to 64		0	4	16
O	1	1	5 to 16	17 to 64		4	16	64
P	1	1	1 to 4	65 to 256		0	4	16
Q	1	1	1 to 4	1 to 4		0	4	16
R	1	1	1 to 4	1 to 4	1 to 4	16	64	256
S	1	1	1 to 4	1 to 4	5 to 16	4	16	64
T	1	1	5 to 16	1 to 4	17 to 64	0	4	16
U	1	1	5 to 16	1 to 4	1 to 4	4	16	64
V	1	1	1 to 4	5 to 16	5 to 16	0	4	16
W	1	1	1 to 4	5 to 16	1 to 4	4	16	64
					5 to 16	0	4	16

COMBINATING PROCEDURES

This section explains how to combinate cores of BEST locks, from the simplest to the most complicated. An organization which installs the BEST lock system may purchase a Hand Combinating Kit which permits them to re-combinate any core if security is lost. It is suggested that this Kit be the responsibility of the person in charge of security. Only designated individuals should have access to the Kit, so pin segments will not become intermixed, parts lost, etc.

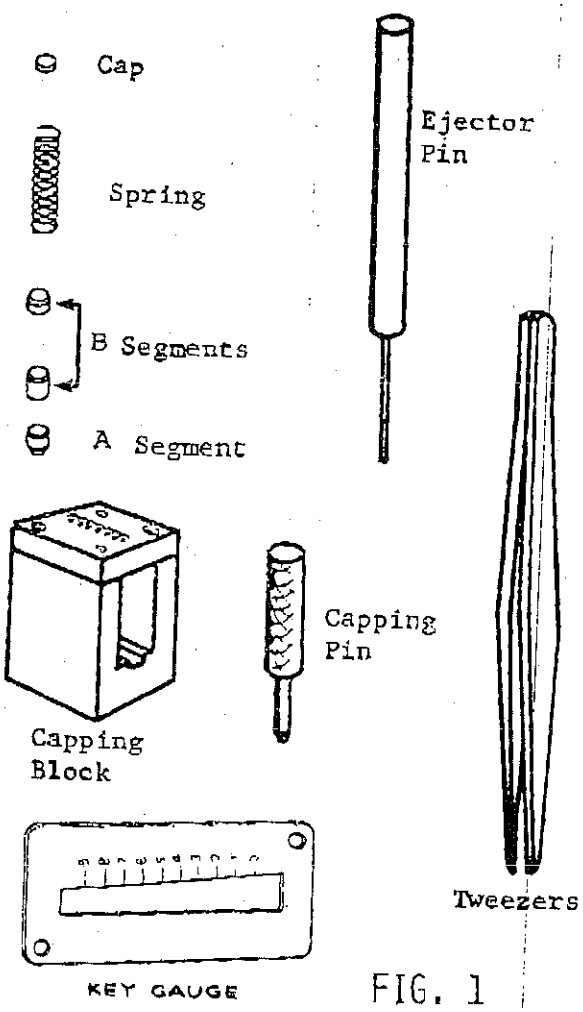


FIG. 1

The Hand Combinating Kit (Fig. 1) consists of a complete selection of pin segments, springs, caps, capping block, two capping pins, ejector pin, tweezers, two standard keys with notch depth from No. 0 to 9, and a key gauge. Number and letter dies with which to stamp keys are also available from the company. Check the equipment carefully to see if any part is missing: if so, contact BEST LOCK CORPORATION.

STANDARD COMBINATING PROCEDURES

Before actually combinating, let's get an understanding of the concepts involved. First of all a Best core has 2 shear lines: an upper control shear line and lower operating shear line. (See figure 2, notice that each shear line extends across all barrels.)

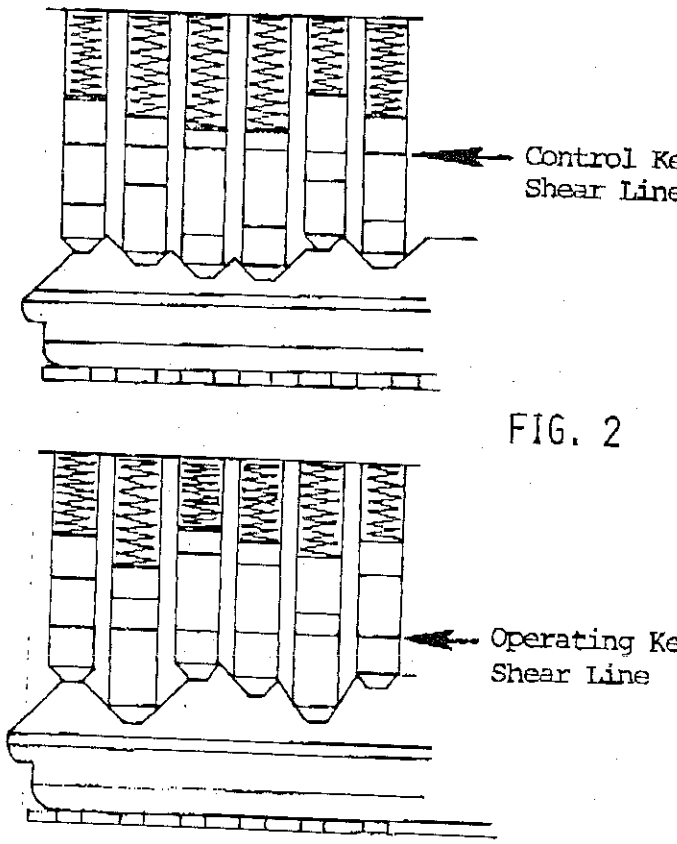


FIG. 2

The normal combinating procedure utilizes the Control, Grand Master, Master series, and Operating Keys. Assume these are our combinations:

Control Key	4189250
Grand Master Key	8301836
Master or Sub Master Key	6701836
Operating Key	6783058

To combinate, proceed as follows:

I. ALIGN BARRELS TO RECEIVE SEGMENTS

1. Align keyway slot in face of core, in vertical position. (Be sure keyway is not inverted.)

2. Be sure control lug is extended out. (See angled portion on control lug at rear of core.)

3. Insert ejector pin in barrel #1 at rear end of core. (See figure 3.) Now all barrels of core should be alligned to receive pin segments.

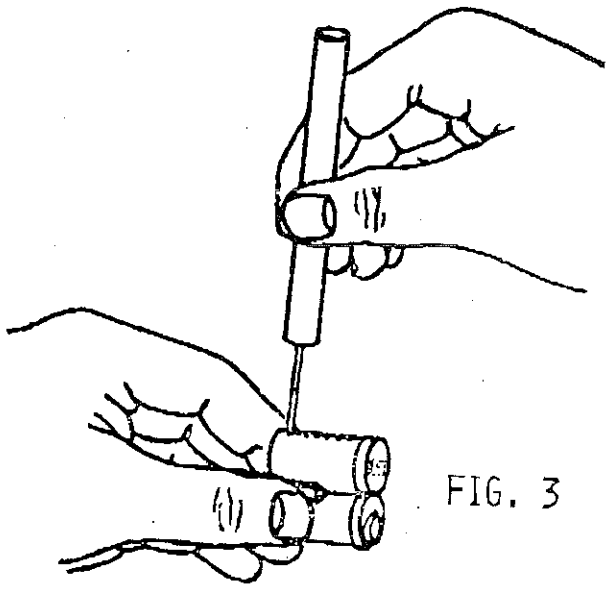


FIG. 3

NOTE: When combinating, start with barrel one at rear of core. Insert all segments, proceed to next barrel. Be sure control lug remains extended.

II. COMBINATING THE CORE

1. Always add 10 to the Control Key number in each column (this allows proper increments to develop upper shear line for Control Key operation of locking lug) (For example: in first barrel the number would become 10 + 4 = 14). The objective is to work to a total stack of 23 increments in each barrel.

2. From the left column of the codes (which corresponds with the rear barrel of core), choose the lowest operating number (that is, the lowest number other than control). In our example then the lowest number 6 becomes a 6A segment and is placed in the rear barrel, pointed end of segment down.

This 6A segment creates the Operating and Master shear lines. Make sure segment is all of the way down. All segments from this point on in this barrel will be "B" segments.

3. To determine the next segment in this same barrel subtract the lowest Operating number from the next higher Operating number, the difference represents the next segment to use. Thus, 6 from 8 equals 2. Our next segment to be stacked is a "2B" segment. Place this "2B" segment into barrel 1.

4. Remember to add 10 to the Control number (See Step 1) and subtract the last highest operating number. So 14 minus 8 equals 6. Add a "6B" segment in barrel #1. This creates the Control shear line. (Be sure segment is firmly set in barrel by tamping it with the ejector pin.)

5. The last step is to subtract your Control number from a total stack of 23. Therefore, 14 from 23 equals 9. The last segment in barrel #1 is a "9B". We now have a total stack of 23 increments in the first barrel.

NOTE: If you think an error has been made, use the ejector pin (figure 4) to punch out the segments by inserting it into the hole at the core bottom; it is easier to recombinate the barrel at this point than after the barrel has been capped.

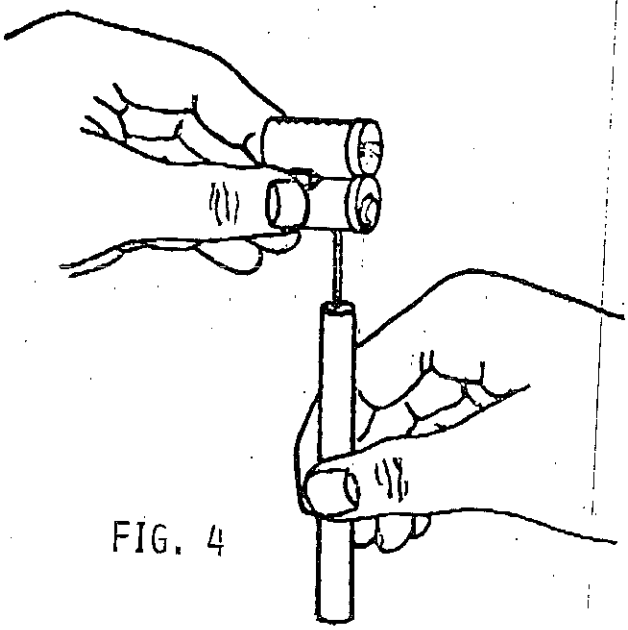


FIG. 4

6. To cap, first place spring in each barrel. Next, put a brass cap on capping block opening above spring. (fig. 5). Using a small hammer, and a capping pin, drive the cap down firmly into place until the capping pin shoulder contacts the capping block. Remove the core from the block.

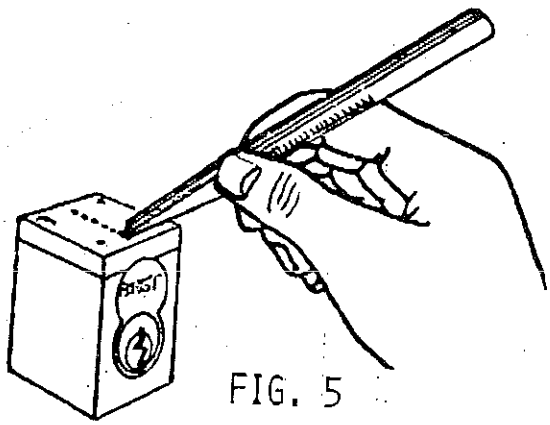


FIG. 5

7. At this point, you may desire to test the loaded barrel with both the operating and control keys to see if the proper segments were used. (To cut a key, see section Keys and the Key Combinator).

8. Load, cap and test the other barrels in the same manner.

9. When the core is fully capped, rub the back of the ejector pin over the tops of the barrels. This will turn the burrs in and help to hold the caps.

10. Place a small quantity of dry powdered graphite, (or other appropriate lubricant), into the core, through the key opening. Turn the core upside down, and run a key in and out of the core several times. (Rotate each time.) This lets the graphite sift into the barrels, assuring smooth operation.

11. Due to the possibility of burrs in the core, keys may not work smoothly until they are "seated". If this occurs, do this:

a. Use appropriate lubricant (DO NOT USE LUBRICATING OIL OR GREASE) through the core.

b. Insert a key, hold the key firmly, and gently tap the core counterclockwise to the key, (fig. 6, page 6) until the burrs are smooth and the key works perfectly. (A wooden, leather, plastic or composition mallet is recommended for this work to avoid damage to the newly combinated core.)

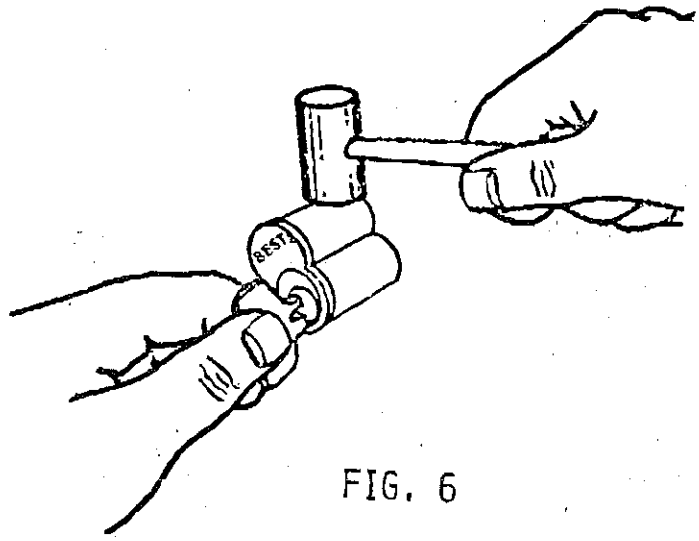


FIG. 6

12. Repeat above steps for all barrels.

13. Operate and test core with keys required.

COMBINATING THE SINGLE SHEARLINE

The Best 5E Series and 5P Locks may be combinated into an existing Best System. These are single shearline locks utilizing the operating and/ or various master series.

Combinating procedures are basically the same as the "Figure 8" core with the exception of (1) total stack of pin segments, and (2) the elimination of the control number.

Steps to combinate a 5E Series cylinder, which is to be grand masterkeyed and/or sub-mastered will include:

Assume these are our systems combinations . . .

Grandmaster Key	8301836
Master or/Sub-Master Key	6701836
Operating Key	6783058

Proceed as follows:

1. To combinate, first turn the key plug to align all barrels and then insert the ejector pin in the rear barrel. (See Combinating Procedures). Combinate the rear barrel first which corresponds to the left hand column of the combination.

2. In the left hand column choose the lowest number. In the example it is "6", place a 6A segment in the barrel. Use the ejector pin to be sure the segment is all the way down.

3. Deduct the size of the first segment used from the next lowest number, the difference represents the next segment to use. In the example, 8 minus 6 equals 2. Put a 2B segment in the barrel.

4. The object is to have 12 "units" in each barrel. You have now inserted a 6A plus 2B, which is 8. Subtract this 8 from 12 leaving 4.

Insert a 4B segment. The combination is now completed for the first barrel. Continue the same procedure as above for the remaining barrels.

The procedure for combinating each barrel of a 5, 6, or 7 pin core is the same.

A special 5E spring and 5E capping block are needed to cap the 5E cylinder.

Place cylinder in capping block, place a spring in each barrel, then place cap on top of each barrel and drive cap into place. Refer to Service Manual Procedures.

SPECIAL SECURITY CORE CONTROL

Note: Make special Key Control Record of following variations. Lockout cores may be combinated for security or safety backup.

*Direct To Control Core may be combinated with combinations direct to Control, preventing Grandmaster, Master, Sub-master and other keys in system from operating.

*Direct To Grandmaster Core may be combinated with combinations direct to the Grandmaster, preventing Masters, Sub-masters and other operating keys in the system from operating (control key will insert or retract core).

*Control Only Lockout Core Provides total Operating key blockout by using an extra long bottom "Lockout Pin Segment". (Note: May be used only when deepest key cut appears in existing control.)

*Special Control Lockout Core Same as above "Existing Control Only", except deepest cut must be added to barrel(s) using extra long bottom lockout pin segment.

*Control Operating Core May be combinated using any one designated Operating or Master series key in the system as Control key. Applies basically to 2M Series Anchor Lock and 4P Series Equipment Locks. The specific combination (non-control) is set up as a control. Use existing system control cuts as filler for operating shearline (non-functional) and follow normal combinating procedures. A specific operating combination may be used (non-functional) as filler or a series of 5's may be used as operating shearline filler in each barrel. (Use normal combinating procedures.)

*Combinating Double Control Two Controls may be used when necessary. Set up two required combinations same as procedures as above.

*Simple Selective Keying Use standard combinating procedures with 2 or more combinations (key cuts) for a particular barrel as designated by Best Representative or the factory. (Caution: Do not select numbers at will--cross keying will result from breaking the system.)

*Keyway Security-Safety Blockout Complete blockout of core keyway is quickly realized by insertion of Keyway Blockout Blade. Prevents any and all keys from being inserted. Available in kit form in same keyway as existing system.

*Specially Combinated Security Cores Various pick resistant tamper resistant and drill resistant cores are available on special order.

*Key Trap Core A special order core is combinated to match any specific key in your system you desire to trap.

*Contact your Best Representative or the Factory for availability specifics for your Best System.

SPECIAL COMBINATING NOTES

1. The pointed pin is always the bottom or "A" pin.
2. Discard all used caps and springs.
3. If a point of the spring shows above the cap after capping, it should be filed off.
4. The spring should be entirely down in the block before the cap is put on.
5. When using the key gauge, place key in the large opening at the rear of the long slot. With notches in contact with the graduated edge and the key blade parallel to the lines, slide key along slot until it is wedge tight. The nearest line indicates the correct number.
6. Like key cuts in the same column relate to the same shear line and should not be subtracted from each other.
7. If 3 or more different operating key cuts (other than control) appear in a barrel, repeat combinating step 3 for each.

KEYS and the KEY COMBINATOR

This section explains:

1. How to cut keys.
2. How to adjust the Key Combinator.

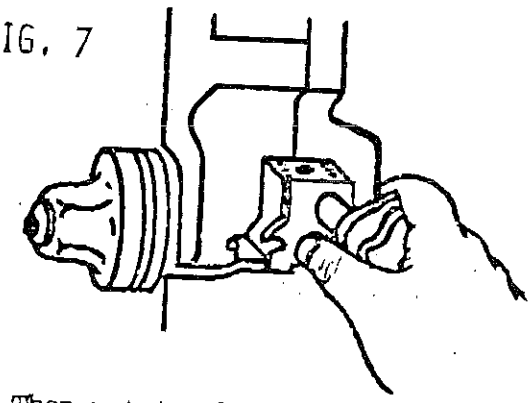
CUTTING THE KEY

With the BEST Key Combinator, keys may be cut to any combination up to 7 digits long. If your organization does not own a Key Combinator, but needs one, contact the factory.

To cut a key, follow these steps:

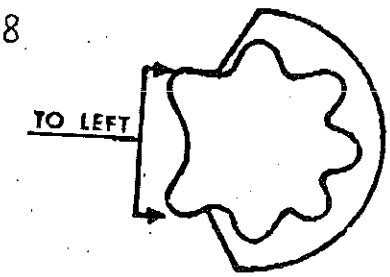
1. Using the small knob on the front of the key carriage, pull the carriage all the way forward (Fig. 7).

FIG. 7



Then rotate the knob so that the knob's deep notch is to the left (Fig. 8).

FIG. 8



2. While holding the carriage in forward position, insert a key blank into the carriage (fig. 9). NOTE:

   a. Thick edge back of blade is to the right.

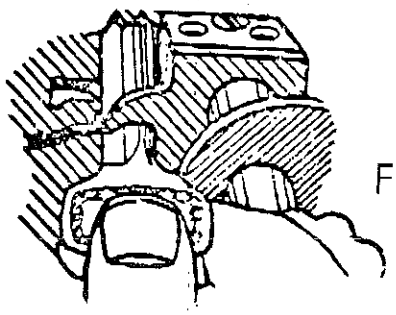


FIG. 9

   b. When inserting the key, have the key firmly against the right of the carriage - not at an angle.

   c. Push the key forward until it rests against the stop. The key should now be held firmly by a "gripper" keyway at its right edge. You will not be able to move it to the right, left or up and down, when properly seated.

3. Now turn the knob clockwise. This brings the key clamp in contact with the key bow, and holds the key in position (fig. 10). Do not attempt to cut keys without engaging clamp.

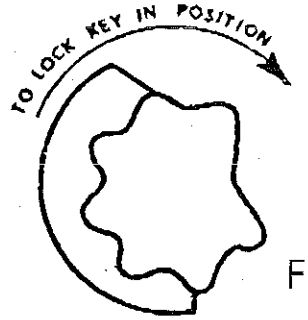


FIG. 10

4. Turn the dial on the left side of the machine until it lines up with number nine. NOTE: As the dial nears each number, it clicks into a slot indicating that you have reached the correct cutting depth.

5. With the dial in number nine notch, bring the handle down with a single stroke, quick and firm. Raise the handle quickly. This positions the key for cutting.

6. Any combination up to seven digits may now be cut in the key. For example, combination 6783058. Turn the dial to click at number 6. Operate the handle - quickly all the way down, quickly up. (A hacking motion will not give a clean cut). This cuts the first notch next to the point of the key, and puts the key in position for the next cut. Position dial on number 7 and make the next cut, proceeding until all the numbers in the combination have been entered in the key in consecutive order reading from left to right.

7. Pull the carriage forward and turn knob to release the key.

8. When using the key gauge, place key in the large opening at the rear of the long slot. With notches in contact with the graduated edge and the key blade parellel to the lines, slide key along slot until it is wedged tight. The nearest line indicates the correct number.

ADJUSTING THE KEY COMBINATOR

It is possible that your key combinator may sometime be slightly out of adjustment and would cause you to cut a key which would not operate a lock (i.e., the key notches are either too shallow or too deep).
If this happens, you can send the combinator to the factory for adjustment or do it yourself by carefully following these simple steps:

1. Turn the dial to any slot and remember the number.
2. Unscrew the square nut on the dial, (fig. 11) and pull the dial away from the machine.

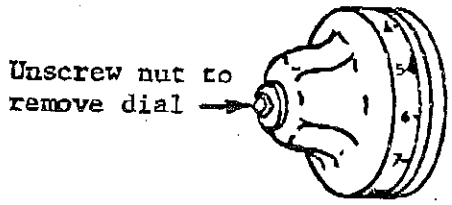


FIG. 11

3. Now, make a straight pencil mark from the steel to the brass case (fig. 12). This must be done so you will

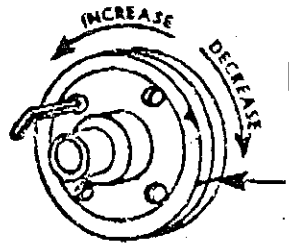


FIG. 12

know how far in either direction you must make the adjustment.
4. Loosen the four small clamp screws, which will let the steel pointer ring rotate in either direction.
5. Have the machine in front of you, as though you were going to operate it. In this position, if you turn the pointer ring away from you, you will increase the depth of notch in a key. Turning the pointer ring toward yourself will decrease the depth of notch. NOTE: A sixteenth-inch movement of the pointer ring is equal to about .001 inch in depth of key notch. This is why the pencil mark is necessary to show how far to go in either direction.
6. After making correct adjustment, be sure to tighten the four clamp screws. Also, replace the dial and dial spring in their original positions and tighten the square nut.

RECOMMENDED INSPECTION

It is highly recommended that frequent checks of keys be made with the key gauge. Doing this will enable you to know exactly when the combinator starts to go out-of-adjustment. (Without routine checks, it might happen that you could cut a large number of keys at one time, then learn that they won't work in the locks). When numerous keys are being cut at the same time, many persons prefer to cut a key, gauge it, then proceed, checking perhaps one out of every one hundred keys cut.

BEST also maintains an inspection service to help customers maintain accurate combinators. Occasionally, you should cut two test keys (No. 4321000 and

3456789) and send them to the factory. We will promptly notify you whether your combinator is accurate or should be adjusted. Some customers prefer to send their combinators to the factory for free adjustment. Repairs are made on a "time and material" basis. Shipping charges are paid by the customer.

The Key Combinator punch will cut approximately 100,000 keys without losing its edge. It should then be rotated so the three unused punch edges do the cutting. Ultimately, the punch should be sharpened or replaced. Although some customers have successfully rotated or sharpened punches, experience shows that this delicate work should be performed at the factory.

MAINTENANCE OF THE KEY COMBINATOR

Periodic oiling and cleaning of the Key Combinator will help assure accurate keys and longevity of the Combinator itself.

Using a good grade of light machine oil, occasionally lubricate the Combinator at various oil holes. At these times, you should also apply small amounts of oil to the four sliding surfaces of the key carriage.

Dust, metal chips, and other particles should be removed regularly from the carriage housing. To accomplish this (fig. 13):

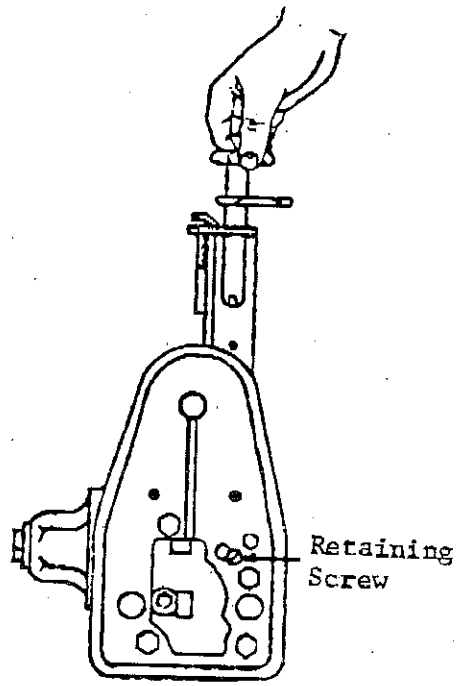


FIG. 13

1. Loosen the small stop plug retaining screw located on the underside of the Combinator, unscrewing it about 1/4 inch.

2. Loosen the stop plug and pull the carriage out of the machine.

3. Using appropriate solvent, remove all particles from both the carriage and its housing. Pay special attention to various holes, the key stop and other "chip traps".

4. Apply clean oil to the carriage and replace it. Push in the stop plug and tighten its retaining screw.