ABLOY® PROTEC

Technical Manual Industrial Products

ABLOY PROTEC Operating Principle and Cylinder Operation

The ABLOY PROTEC mechanism operates on a variation of the original rotating disk principle. This unique design was developed by ABLOY over 90 years ago, and serves as the foundation for every ABLOY lock. ABLOY cylinder designs are patented in many countries around the world.

The rotating disc cylinder provides many benefits. These benefits include:

- Virtually pick proof design
- Environmental durability
- Smooth & reliable operation
- Extensive master keying capabilities

These features are combined with physical security and strict key control to create a locking system for every application.

Operating Principle

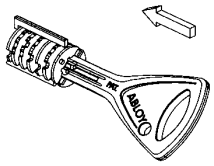


Fig. 1. The key meets little resistance when inserted into the keyway. There are no spring loaded parts to wear out.

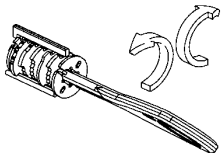


Fig. 2. Only the correct key, rotated ¼ turn (90º) clockwise or counterclockwise, will align the locking bar gates on all the discs.

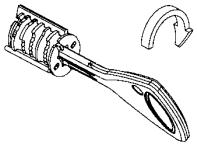


Fig. 3. Once the discs are aligned in the correct combination the locking bar will fall into the groove and disengage the drum from the cylinder housing. The key and cylinder can now be turned further to open the lock.

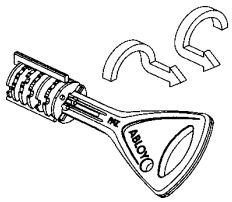
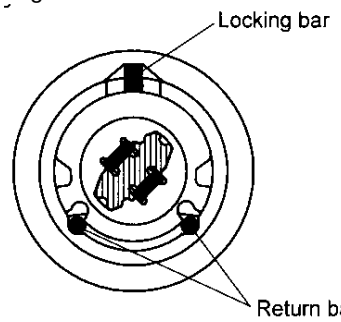


Fig. 4. The key can be turned back to the starting position and removed from the keyway. The combination is automatically scrambled by the two return bars. Unless this scrambling occurs, the key cannot be removed.

Cylinder Operation

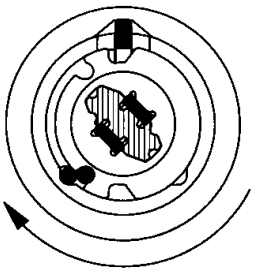
Fig. 5



In the locked position, the 0-discs hold the locking bar and the returns bars in place.

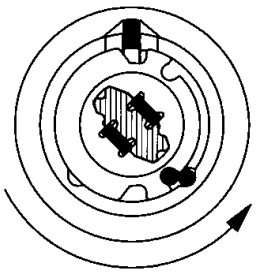
As the key is turned 90 degrees clockwise Fig. 6, the 0-disc also rotates 90 degrees and moves one of the return bars. Once the return bars connect, the discs will no longer rotate inside the drum. The locking bar gate is properly aligned for the lock to open. If the key is turned counterclockwise, the other return bar is moved, and the other locking bar gate on disc is aligned. Fig. 7.

Fig. 6



Clockwise operation
(90º = ¼ revolution)

Fig. 7

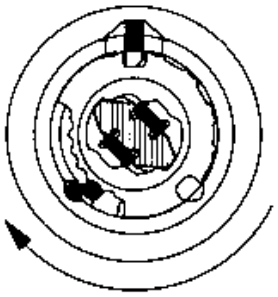


Counterclockwise operation
(90º ¼ revolution)

As the key is turned 90 degrees, the number 1 through number 5 disc will rotate from 15 to 75 degrees depending on the disc number and the direction of the turn. For the clockwise operation Fig. 8, the key will turn 30 degrees before contacting the number 2 disc. The key will then rotate the disc 60 degrees aligning the locking bar gate.

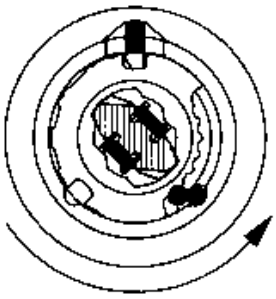
For the clockwise operation Fig. 9, the key turns 15 degrees before contacting the disc. The key then rotates the disc 75 degrees aligning the gate.

Fig. 8



Position of the number 2 disc after a clockwise operation

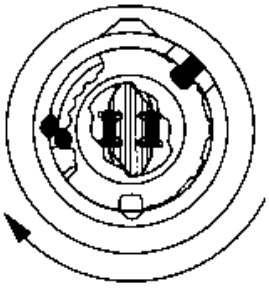
Fig. 9



Position of the number 2 disc after a counterclockwise operation

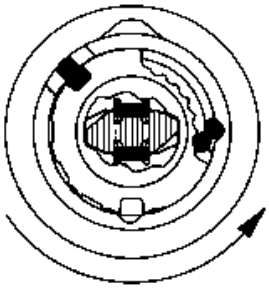
Once the key is turned 90 degrees and all the discs are properly aligned, the locking bar will drop inside the cylinder drum. This allows the drum to turn Fig. 10, Fig. 11

Fig. 10



Clockwise

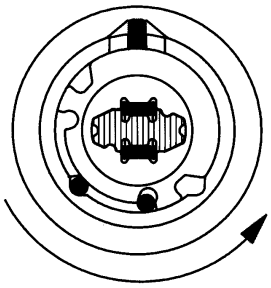
Fig. 11



Counterclockwise

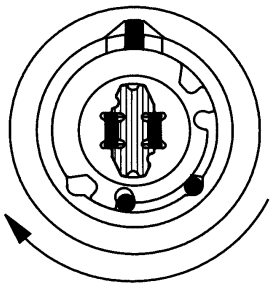
As the key turns, the 0-discs lift the locking bar, and move the return bars to the locked position. As the return bars move, they rotate the combination discs to the scrambled position, aligning the keyway. Fig. 12, Fig. 13, Fig. 14

Fig. 12



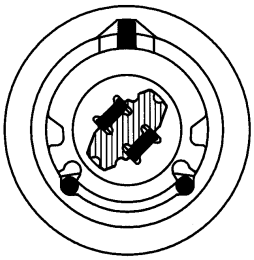
Counterclockwise scrambling turn clockwise operation.

Fig. 13



Clockwise scrambling after Counterclockwise operation.

Fig. 14



The starting position of the cylinder has been reached. The cylinder drum and housing are once more engaged. The combination is scrambled and the key may now be removed without resistance.

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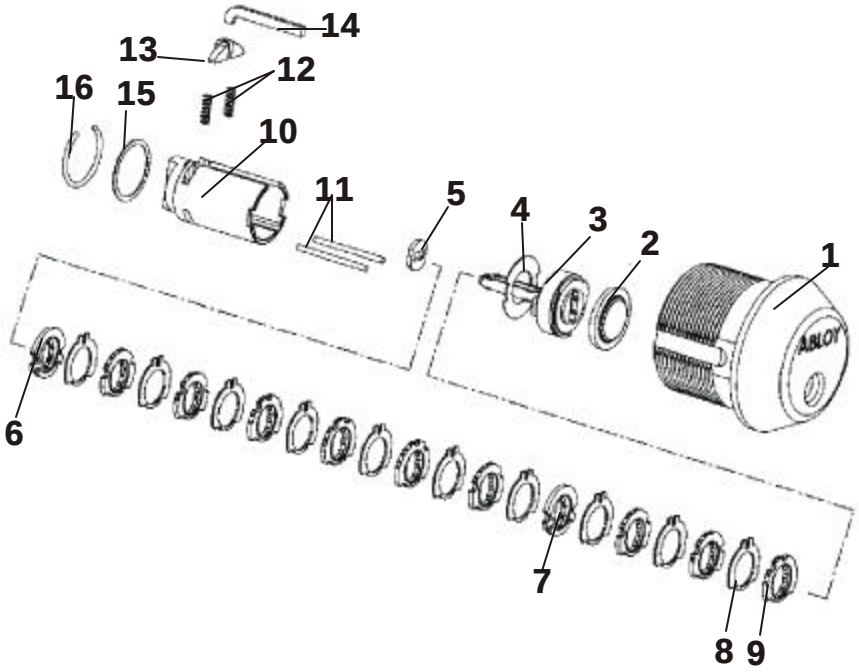


1	Cylinder housing
2	Profile plate
3	Controller
4	Washer
5	Drill protection plate
6	Bottom 0-disc. Corresponding to key profile
7	Upper 0-disc. Corresponding to key profile
8	Washer 10 pcs, 2 different thicknesses
9	Combination disc, 9 pcs
10	Cylinder drum
11	Scrambler bars
12	Spring 2 pcs
13	Stopper
14	Locking bar
15	Shim
16	Retaining ring

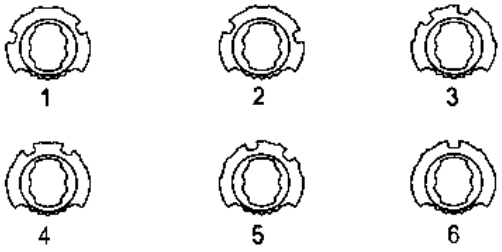
ABLOY® PROTEC

ZERO DISCS

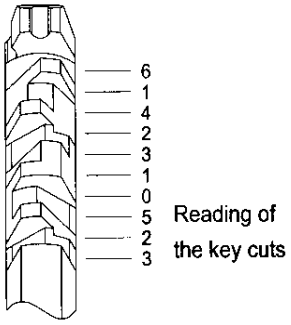
BOTTOM ZERO

UPPER ZERO

CODE DISCS



WASHER

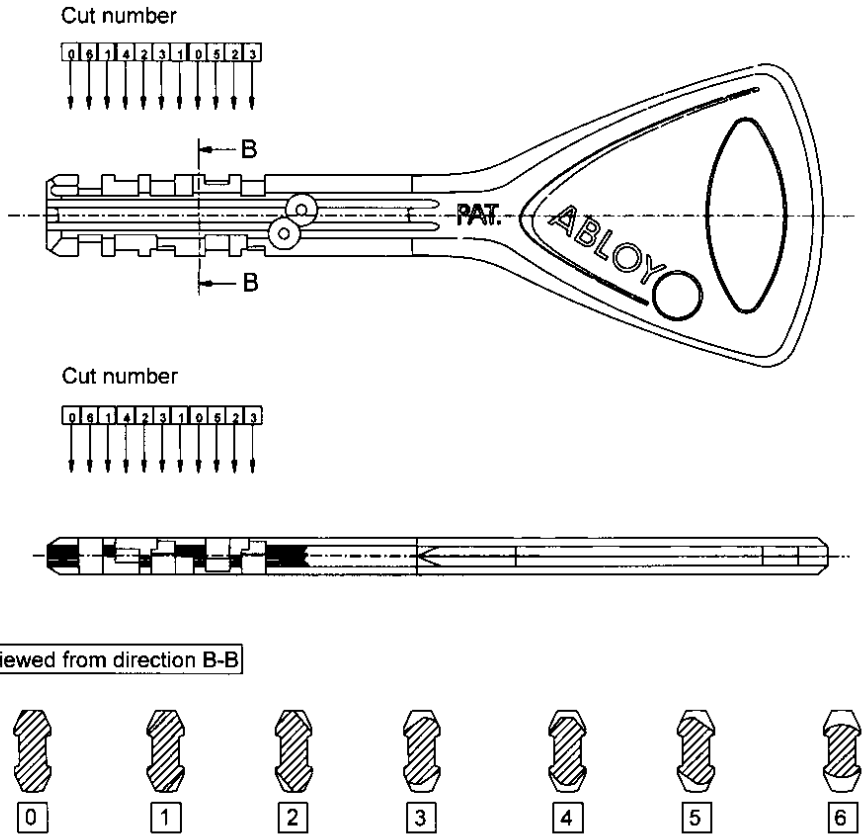


Key Cuts / Key Reading

Key cuts are at various angles and depths. There are seven different cut angles, which are numbered from 0 t0 6. Each cut angle corresponds to a disc, which is identified with the same number.

There are 10 spaces on the key for cut angles. Starting from the tip of the key there is an uncut portion of 2.57 mm (o-cut), followed by number of 2 mm wide cuts, depending on the coding of the key, with a division of 1.5 mm. Therefore the cuts are partially overlapping. Fig. 15.

Fig. 15



An o-cut is an uncut portion on the key, whilst a 6 is cut all the way around. All other cuts are formed using precise angles and depths.

ABLOY® PROTEC

Key Code Decoding Chart

All ABLOY PROTEC keys are supplied with a code registration card (or similar system) giving a ten-digit code number.

The code number can be decoded into the actual key cuts by using the chart (table 2) below

Table 2

ABLOY® PROTEC decoding chart											
	code number										
cut number or disc	0	3	2	9	8	1	5	6	2	2	8
	1	1	4	7	2	7	2	9	1	9	0
	2	5	3	6	1	5	7	1	0	8	1
	3	9	5	1	7	9	4	2	8	0	7
	4	2	0	5	5	3	3	4	3	5	9
	5	4	8	2	6	6	1	3	4	3	3
	6	7	1	3	4	2	6	8	5	1	2

Example										
Code	7	4	6	4	6	3	6	1	0	7
disc/cut	6	1	2	6	5	4	0	1	3	3

The decoding chart consists of ten columns used for converting the ten-digit code into the actual cut number. A separate column is used for each of the ten digits in the code number. The cut numbers are listed in the column at the far left and separated by the heavy line.

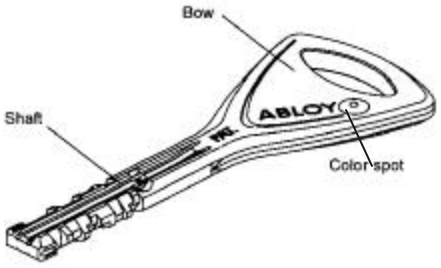
To determine the cut number.

__ Locate the first number of the key code in the first column of the decoding chart.

__ Go directly to the left to identify the cut number.

__ Repeat for each number in the key code using all ten columns.

To determine the code number when only the cuts are known, the reverse procedure is used.



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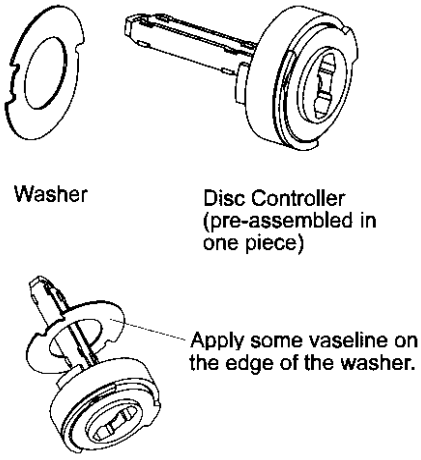
Disc Controller

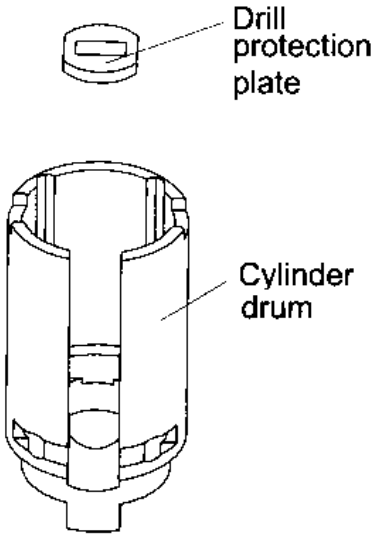
Fig. 1



Cylinder Assembly

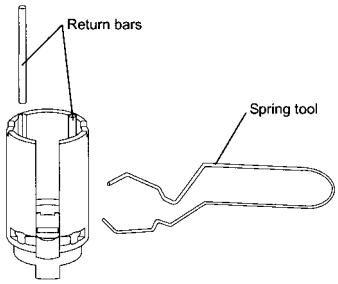
Place the drill protection plate on the bottom of the cylinder drum in the position shown in Fig. 2.

Fig. 2



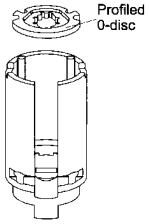
Install return bars into the grooves in the cylinder drum as shown in Fig. 3. In order to keep the return bars in place, use a separate spring tool or lubricate with vasaline.

Fig. 3



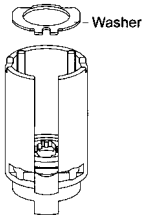
With embossed side downwards, place the profiled 0-disc into the cylinder drum into the position shown in Fig. 4.

Fig.4



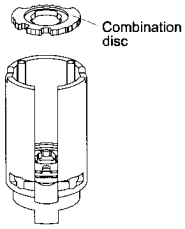
Place the first washer (which is always thinner and darker in color that the others) on top of the profiled 0-disc.

Fig. 5



Next, install the first combination disc. The combination disc is installed with the embossed side facing down.

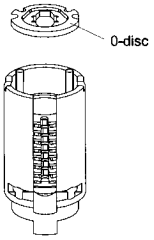
Fig. 6



Place the second washer on top of the first combination disc in the same way as the first washer. The second washer is always copper colored (thicker). Continue the installation alternating with combination discs and copper-colored washers until the eight disc.

The eight disc is always a 0-disc. It is installed like all the other discs, as shown in Fig. 7. a darker (thinner) washer is placed on top of this disc.. A darker (thinner) washer is also used on top of the ninth combination disc.

Fig. 7



After this, place the remaining combination discs. The top disc should be flush with the edge of the cylinder drum. If this is not the case the height should be adjusted as follows:

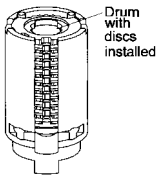
-If the top disc does not reach the edge of the cylinder drum, then place the dark colored (thin) washer above the intermediate 0-disc (the eight disc), with copper-colored (thick) washer and as many as required.

Or:

-If the top disc is above the edge of the cylinder drum, replace the copper-colored washers above the intermediate 0-disc, with dark colored (thin) washers and as many as required.

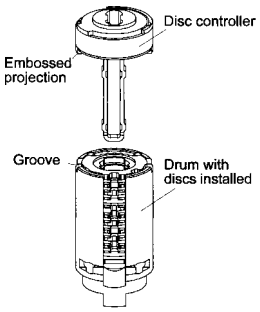
When adjusting the filling height try to level the top disc as accurate as possible with the cylinder edge. If this is not possible, the top surface can be slightly under the cylinder drum edge level, but never above. This will allow each disc to move independently and ensure smooth operation of the lock.

Fig. 8



The disc controller is installed into the drum so that its round embossed projections fir into the corresponding grooves in the discs.

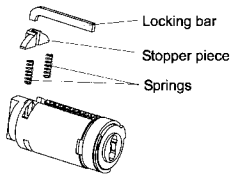
Fig. 9



The assembly is now checked with the correct key for the lock. When the key is turned 90º, either clockwise or counter-clockwise, the locking bar gates in the combination discs should be aligned. The drum is now oiled through the opening in the drum for the locking bar.

Finally, install the springs, the stopper piece and the locking bar into its groove, as shown in Fig. 10

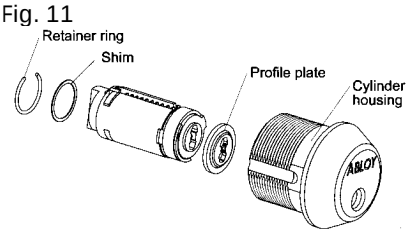
Fig. 10



Insert the drum assembly and the profile plate inside the cylinder and secure with the retaining ring.

Adjust the play of the drum assembly by placing a shim (1 or 2) under the retaining ring, as shown in Fig. 11.

Fig. 11



When the cylinder housing has been assembled ensure that the locking bar stay in place by lifting the key out about 5 mm while turning it in the opening direction. The cylinder drum must not move inside the cylinder housing.

Finish the installation by checking the function of the lock with all appropriate keys.

Special Notes on Assembly

When testing the operation of the lock, push the key in with considerate force whilst turning it. The operation of the lock should not become noticeably stiffer. The cylinder should move smoothly, not jerkily.