Schlage Wafer Locks

Author's Note: Schlage Wafer is presented here to illustrate positional master keying techniques. It is no longer manufactured for new construction in the U.S., and it is NOT covered in any of the current ALOA PRP testing.

Perhaps the most well-known use of positional masker keying in the U.S. is the Schlage wafer lock, both key-in-knob design and padlocks. This lock-type was researched for years and marketed for the first time by Schlage Lock Company of San Francisco in 1927. It was widespread globally and extremely popular through the 1970s. Oddly enough, today, it is an extremely popular lock for new construction in South America.

A total of six key blanks were manufactured for the Schlage wafer locks, though four of them have been discontinued *(Figure 18)*. The Type 1 (both handings) can be identified by the orientation of the "V" groove. If the cutout at the tip of the key is above the groove, it is a Type 1 key. If the cut out at the tip of the key is below the groove, it is a Type 2 key. If the tip of the key is uncut, it is a Type 0 key, usually used as a master or top master.

Plug models that use these blanks are known as No. 10 model [right-hand] and No. 20 model [left-hand]. The plugs are arranged to illustrate the handing wafer at the rear of the plug (note: the round part of the tumblers facing the viewer) *(Figure 19)*.

The handing wafer allows or disallows the proper blank from completely entering the plug. This wafer, called a master wafer, has no relationship to the combination key cuts. It only guards the plug for correct key blank use based on the "V" cut at the tip of the key. The key with the correct "V" cut will pass through the last master wafer. The term may be confusing because the master wafer has absolutely no relationship to the positional master keying of the cylinder.

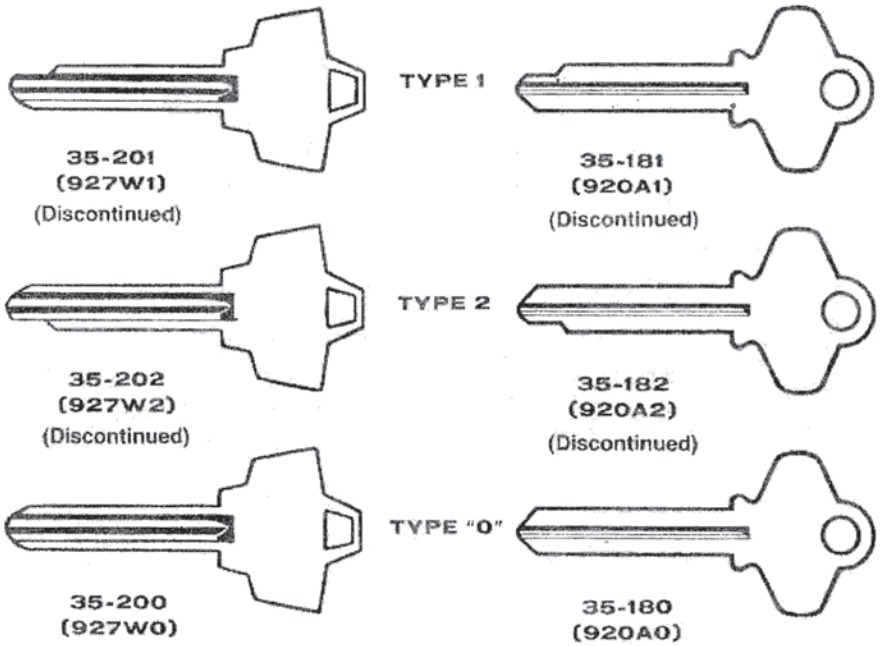


Figure 18. A total of six key blanks were manufactured for the Schlage wafer locks, though four of them have been discontinued.

SERIES AND COMBINATION WAFERS

After viewing a plug with wafers inserted (with no key inserted), you can see that some of the wafers have a protrusion out of the plug, while some of the wafers are withdrawn into the plug. Those wafers that extend out of the plug are called series wafers *(Figures 20-23)*.

If we insert a key blank into the same plug, a reversal of fortune happens. The series wafers, which were previously extended outside of the plug are now withdrawn into the plug, and the combination wafers, which were previously withdrawn into the plug without a key blank inserted, are now extending outward.

Because this is a binary system, either a cut will be present on the key (.060") or it will not be present. There are no variations of cut depths. In this scenario, it is the positions of the wafers/key cuts that determine plug operation.

Optimally, each Schlage wafer plug will have only four combination wafers in various locations. The remaining wafers are series wafers. Obviously, the correct key cut locations will withdraw the combination wafers into the plug, to allow rotation.

The combination wafers also have the attribute of being able to be placed into the

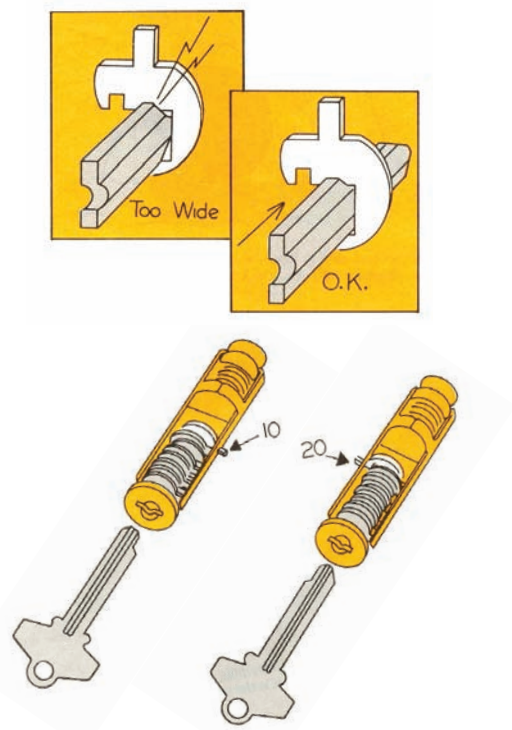


Figure 19. Plugs are arranged to illustrate the handing wafer at the rear of the plug (note: the round part of the tumblers facing the viewer).

plug up or down (a 180-degree difference), permitting twice as many possible positions for combinations. That translates into cuts on either side of the key bank. Again, all of the key cuts for this type of lock are at .060" in depth. Unlike split pin cylinders or other types of wafer tumbler locks, the Schlage wafer lock depends on positions for the combinations rather than multiple key depths. In just a moment we will investigate how positional master keying is applied to this lock type.

Figure 20

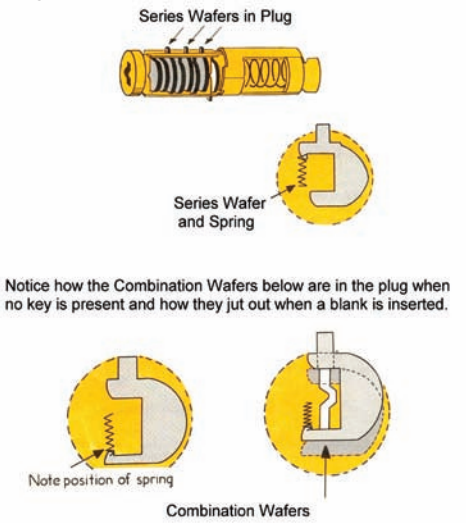
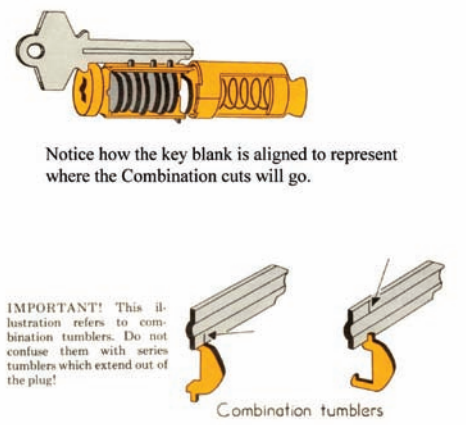


Figure 21



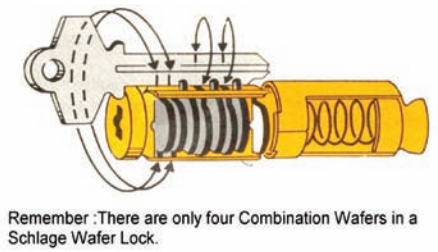
KEYS BY CODE

The key cut combination for a Schlage Wafer lock is stamped directly onto the key bow and will consist of six numbers. The first two numerals on the key bow indicate either a 10 model or 20 model plug. The remaining numerals signify the direct key cuts.

A key stamped "1 0 4 7 0 3" would indicate a No. 10 blank and 4703 are the cuts from tip to bow. The plug has 14 numbered slots *(Figure 24)* for a visual orientation of this arrangement.

Again, the numbering system begins at the rear of the plug and moves toward the plug face. Notice that odd numbers are designated for the bottom and even numbers are at the top of the plug.

Figure 22



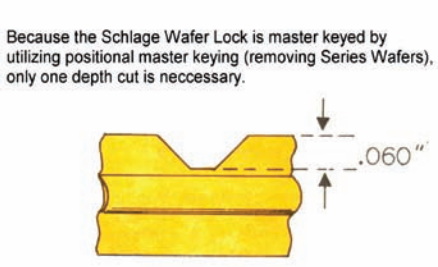
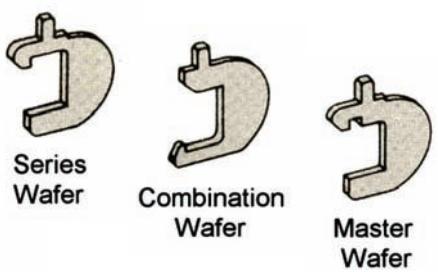


Figure 23



Figures 20-23. After viewing a plug with wafers inserted (with no key inserted), you can see that some of the wafers have a protrusion out of the plug, while some of the wafers are withdrawn into the plug. Those wafers that extend out of the plug are called series wafers.

POSITIONAL MASTER KEYING

To understand the mechanics of master keying the Schlage wafer lock, it is imperative that you recognize the fact that the series wafer extends into the shell when at rest or when a key cut is encountered. To withdraw the wafer for plug rotation, it must rest upon the uncut portion of the key blank.

Imagine, if you will, the plug with no series wafers inserted. There would only be one master wafer and four combination wafers. When a key cut with all 14 cuts was inserted, the plug would turn — no problem. But if only one series wafer was inserted, the plug would not turn with all 14 cuts since that position would need to be a "0" cut (no cut) for the series wafer to retract — thus, the concept of positional master keying *(Figures 25 and 26).*

The series wafer (only one) would be located in one slot consistently in all cylinders within the master key system. Consequently, all change keys would require the four combination cuts in the correct positions, along with a "no cut" wherever the series wafer was placed. The master key would have cuts in all 13 positions, except for the position of the series wafer. This is one of the most clear-cut examples of positional master keying.

CHANGE KEY BITTINGS

Notice that any "occupied" position excludes its opposing position for active use. That is, if the combination wafer is in the first position pointing down, its upper counterpart is unable to be used and is considered inactive. One position (top and bottom) is reserved for the series wafer, though only one of those positions will be active. This leaves four other possible positions for active use.

In other words, there are six slots offering 12 possible active positions. (Remember that one slot is reserved for the series wafer). When the first combination wafer

is installed, 10 positions remain. When the second combination wafer is installed, eight positions remain. The third wafer leaves us with six positions, and the last wafer ends the available slots.

The formula for determining the possible number of change keys is:

Number of Active Positions / Number of Wafers Used: 12 x 10 x 8 x 6 / 4 x 3 x 2 x 1 = 5,760 / 24 = 240

Since the keyway frames are handed, a total of 480 changes are possible with one series wafer in the same location. Since the series wafer can be relocated to form different systems, there is a possibility of 14 different systems that can be created using one series wafer. It would also be possible to add a second series wafer, but the number of possible changes would diminish proportionally, even though the security level would be greater.

The Schlage wafer lock is unique in its approach to cylinder keying through accomplishing key combinations by relocating wafers to various positions rather than by varying the depths of cuts. Furthermore, master keying this type of lock is accomplished by eliminating wafers instead of adding to them. By systematically moving combination wafers throughout 12 locations with a no-cut series wafer to delimit an all-cut key from operating, the master key positionally uses all 13 cuts, minus the series wafer cut position to have authority to operate all locks in the system.

WHAT'S YOUR POSITION?

Positional master keying uses a truly unique technique to generate change keys and master keys without adding master pins in a cylinder. This is certainly the case with the Kaba Gemini cylinders. What's more, the empty chambers are directly related to the higher authority of the master keys.

The Schlage wafer locks employ a similar concept of "empty chambers" or empty slots to assist in generating a master key system. Master wafers are not involved in developing a master key system. Again, it is the position of the series wafer that determines how this binary master key system functions.

Understanding and working with positional master keying can be a refreshing break from split-pin master keying for many. What's your position?

Figure 24. The plug has 14 numbered slots for a visual orientation of this arrangement.

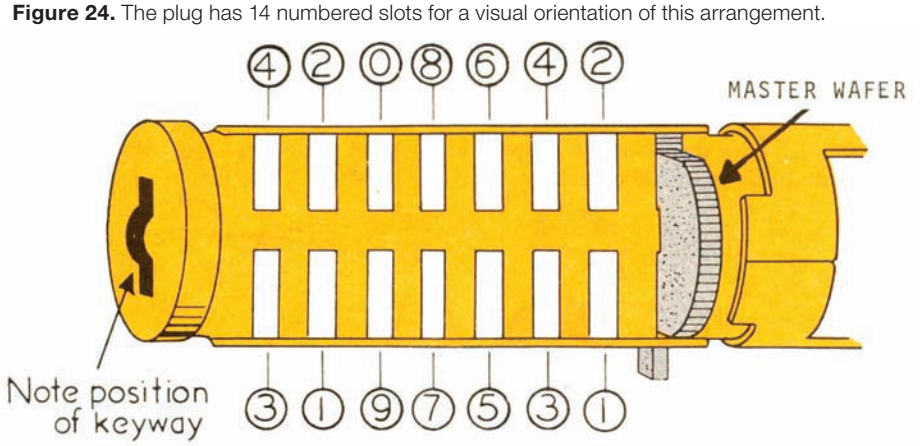


Figure 25

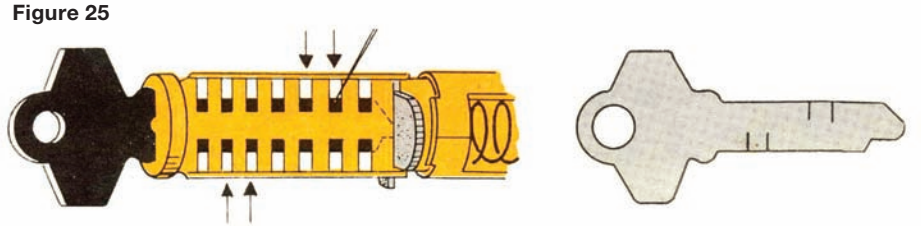
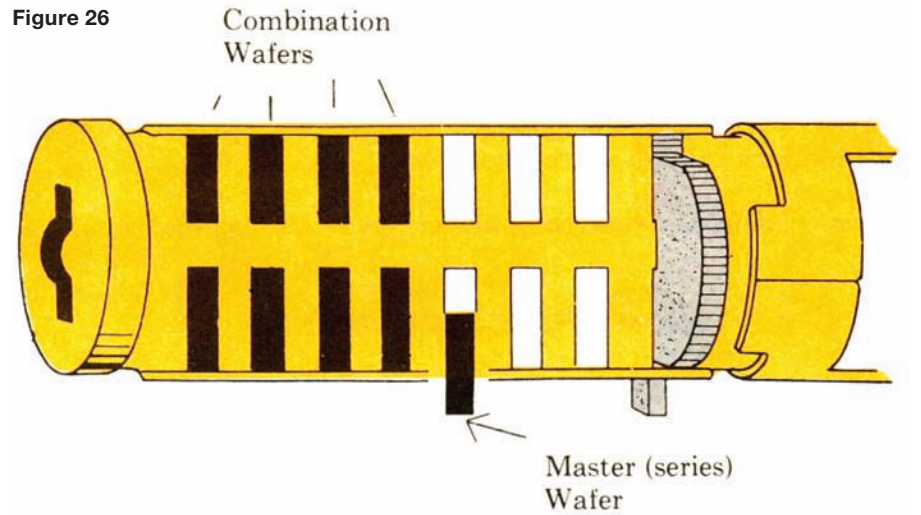


Figure 26



Figures 25-26. If only one series wafer was inserted, the plug would not turn with all 14 cuts since that position would need to be a "0" cut (no cut) for the series wafer to retract — thus, the concept of positional master keying.

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