

The New ASSA Maximum+ SFIC:

"It's Not Your Grandpa's SFIC"

-By William M. Lynk, CML, CPS, ICML, CMIL, CAI, M.Ed.

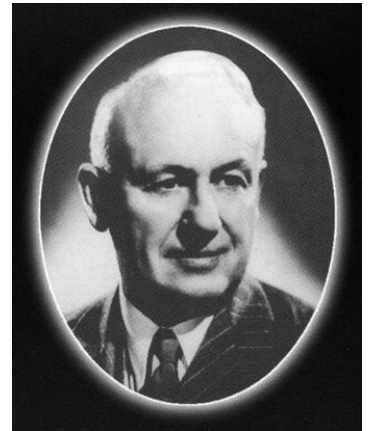
SFICs (Small Format Interchangeable Cores) were created over 100 years ago. But, the new **ASSA Maximum+ SFIC** is big, and it's here! Unusual in its specs, it can offer over 117,000 bittings in a single 6-pin system, far more than any 7-pin SFIC A2 or A4 system out there. Even though the 3-Step Pin Stack Calculations are completely different from traditional SFIC systems, with the correct insight, it can still be easy-peasy. So, let's look at the unusual twists of this revolutionary A5 System and the ways it can be used effectively, not to mention and how simple it all is...IF you know how.



F1. ASSA SFIC

Historical Perspective: BEST and ASSA

BEST: The BEST system was developed/created over 100 years ago. Frank E. Best first conceived the concept of a self-contained locking cylinder that was key removable and easily integrated into specialized locking hardware. Thus, in 1912 the concept of an interchangeable core locking mechanism was born. This was an exciting time when radio and automobiles were first appearing, and Frank Best made his mark, as would be clearly seen decades later, and continuing into the next century.



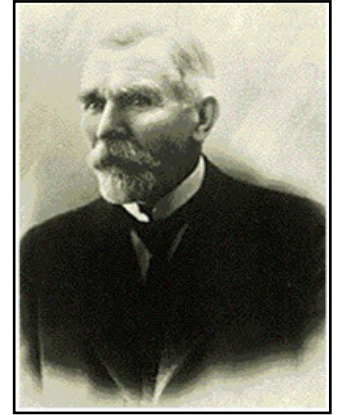
F2. Frank Best

The notion that hardware such as mortise locks, deadbolt locks, key-in-knob locksets, cabinet locks, mailbox locks, padlocks, etc., that were previously a connected feature of the complete locking hardware package could now remain in place as the 'core' could be removed by a special key, was certainly a revolutionary idea. This type of lock could employ change keys and/or master keys to operate the locking unit, similar to other traditional lock cylinders on the market. However, this small, self-contained figure-eight shaped cylinder could be easily removed with the use of the appropriate "control key" (often called "core key") so that another similar locking cylinder could replace the original, as desired. Frank Best finally applied for a United States patent for his unique lock in August of 1919 and two years later received the very first patent for the "interchangeable lock core."

In October of 2002 the Best family sold BEST Access Systems to the Stanley Works Corporation. Headquartered in New Britain, Connecticut, Stanley purchased all of the outstanding stock in BEST Access Systems through a cash deal for \$310 million in November of 2002. BEST later moved to a dedicated distribution model instead of selling direct to end users, as it had done for its entire history. Finally, in 2017, dormakaba acquired STANLEY Security's mechanical division to form BEST Access Solutions, Inc. and added it into their portfolio of companies.

ASSA: ASSA was established in 1881 by the blacksmith August Stenman after buying a small hinge manufacturer in the town of Eskilstuna, Sweden. One day his wife embroidered a pillowslip with his name forwards and backwards – "August Stenman, Stenman August", and so **ASSA** became the name of the new company. By 1939, ASSA had produced its first cylinder lock and delivered its first 5-pin cylinder master key system seven years later. In 1959, ASSA introduced its first registered key systems with key control. In 1981, ASSA celebrated its 100th anniversary as a company with the release of the ASSA Twin 6000 system, a new cylinder concept utilizing the dual locking mechanisms of today's ASSA cylinders.

Starting in 1992, ASSA, Inc. shifted their sales direction from independent dealer sales to institutional, industrial, and government sales. Some of the customers who made this possible were The World Bank, The United States Supreme Court, Boeing, AT&T, Baltimore Ravens Stadium, the all too famous Twin Towers in New York City, The University of New Hampshire, Prince George's County School District, Alexandria City Public Schools, Tucson Unified Schools, and numerous other schools and federal government facilities.



F3. August Stenman

Today ASSA ABLOY is a well-known global leader in door opening solutions for end-users requiring security, safety and convenience. ASSA ABLOY operates in markets worldwide, with leading positions in much of Europe, North America and the Asia Pacific region. The Americas division manufactures and sells mechanical and electro-mechanical locks, cylinders, security doors and door frames. Some of Americas' industry leading brands include ASSA, Corbin Russwin, Medeco, Sargent and Yale. Finally, ASSA has introduced their own ASSA Maximum+ SFIC, allowing for over 117,000 bitting in a single system, and offered to locksmiths through ASSA Technical Services, Inc.

"The Facts Ma'am...only just the Facts"



F4. ASSA SFIC & Key

Those of us who watched the series *"Dragnet"* in the 1960's are aware of this phrase. So, to be true to the series, the ASSA Maximum+ SFIC is quite a unique system that touts retrofitting into any standard SFIC housing, though it is unlike its 'clones' in the fact that it uses strikingly different methods of pin stack calculations that defies anyone accustomed to their grandpa's old SFIC pin stack methods.

But, one of the comforting specifics is that we're still thinking 'tip to bow' as we would in any older SFIC system. However, there is no tip stop. Keys are gauged from the shoulder, but read from tip to bow. Also, the pin lengths are new to SFIC. A large number of bittings are available with the ASSA Maximum+ 6-pin SFIC, more than in any A2, A3 or A4 system.

We will look at this in more detail later. Additionally, those who would like to integrate this new SFIC system into their existing ASSA system can do so, with some caveats. The possibilities are huge. So, fellow detectives, let's investigate core construction...just the facts.

Core Construction

As expected, the cores are manufactured with solid brass for durability. Bottom pins, unique and not compatible with other aftermarket SFIC pins, are solid nickel-silver in composition. Each pin chamber can be individually changed as needed for serviceability. This new system is compatible with existing ASSA Maximum+ cylinders and is patented until 2030. One other benefit is that this new ASSA SFIC system can be combined using existing standard tools for SFIC, with the small exception of the Ejector Tool. It will accommodate any application where a 6-pin SFIC is present and can be used where both key control and security are a concern.

Pins

Those who are familiar with the ASSA standard pin depth system are in for a delight. The engineers have taken this same basic ASSA increment system, utilized it in the new SFIC system and added a few special treats.

The single-step, .024" (actually .0235") increment, is also used in the ASSA Maximum+ SFIC. They have reduced the pin diameter down to standard SFIC-size at .108". Furthermore, the system has eight bottom pins and 12 wafer pins which include master pins, build-up pins and top pins. If you are used to working single-step A4, then you get the basic idea. There is no key cut parity to be concerned with within any given chamber.

The pins are seated on the flat (root) of the key cut, which has the cut specifications of a 90-degree angle. The key flat is .032" and the total pin stack dimension is approximately .4385". And, there are no side pins to worry about within the ASSA SFIC. Spacing remains at a standard .150", a happy tribute to many SFIC systems.

Keys, by the way, can be originated with standard rotary cutters (sorry, no punches at this time), such as a Framon, ITL, HPC Blue Shark/Tiger Shark, etc. Since the ASSA SFIC key is slightly shallower in blade height, it will retrofit into the same existing ASSA keyways, but the ASSA standard keys of the same keyway will not enter the ASSA SFIC.

Dedicated Pin Kit

The pin kit (#PK-SFIC) contains all nickel-silver pins, bottom pins and all wafer pins. Figure 5 and Figure 6 show the kit:



F5. ASSA SFIC Pin Kit #PK-SFIC

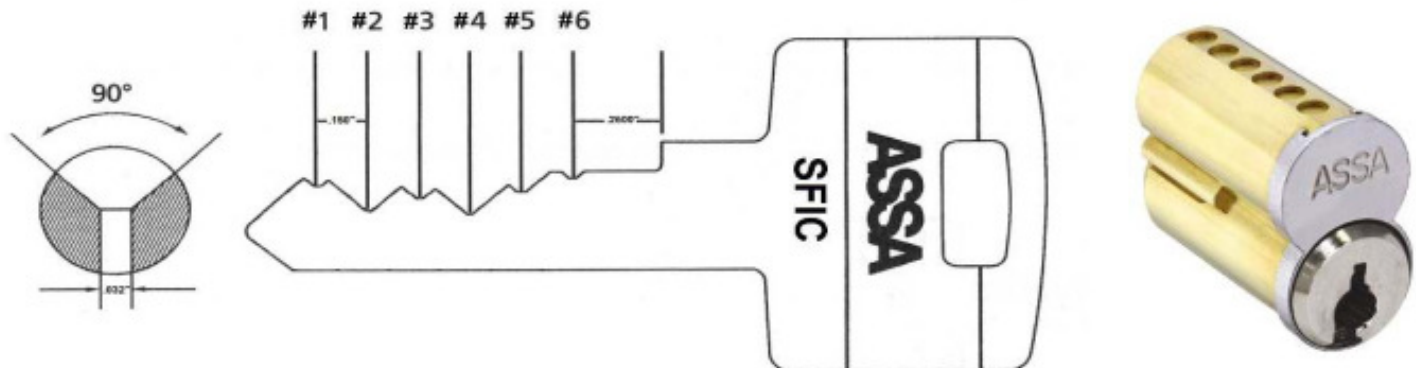


F6. Pin Kit Contents

One note is that the Ejector Pin used to eject pins from the core is smaller than a standard SFIC ejector tool, so you will need this dedicated tool. It's part number is: 900800, though it does come as part of the Pin Kit #PK-SFIC.

Figure 7 (to follow) shows the technical data one would need to know for this new system:

ASSA Maximum+ SFIC Technical Data



Pin & Key Specifications

Part Number:	SFIC Bottom Pin Number:	Pin Length:	Key Cut Depth:
909001	SFIC Bottom Pin #1	0.2740"	0.1645"
909002	SFIC Bottom Pin #2	0.2505"	0.1880"
909003	SFIC Bottom Pin #3	0.2270"	0.2115"
909004	SFIC Bottom Pin #4	0.2035"	0.2350"
909005	SFIC Bottom Pin #5	0.1800"	0.2585"
909006	SFIC Bottom Pin #6	0.1565"	0.2820"
909007	SFIC Bottom Pin #7	0.1330"	0.3055"
909008	SFIC Bottom Pin #8	0.1095"	0.3290"
SFIC Wafer Pin [BP, MP, BUP, TP] Number:		Blank	0.3290"
911001	SFIC Wafer Pin #1	0.0235"	
911002	SFIC Wafer Pin #2	0.0470"	
911003	SFIC Wafer Pin #3	0.0705"	
911004	SFIC Wafer Pin #4	0.0940"	
911005	SFIC Wafer Pin #5	0.1175"	
911006	SFIC Wafer Pin #6	0.1410"	
911007	SFIC Wafer Pin #7	0.1645"	
911008	SFIC Wafer Pin #8	0.1880"	
911009	SFIC Wafer Pin #9	0.2115"	
911010	SFIC Wafer Pin #10	0.2350"	
911011	SFIC Wafer Pin #11	0.2585"	
911012	SFIC Wafer Pin #12	0.2820"	
09340	Chamber Springs		
910013	Caps		
762951	Key Blank		

System Features & Data

System Feature:	System Data:
Manufacturer:	ASSA, Inc.
Distributor:	ASSA Technical Services
Distributor Contact:	Tom Demont, CML, CMST
Increment [A5 - New]	.0235"
Progression Type:	Single Step
Pin Diameter:	.108"
Pin Configuration:	6-pin core
Plug Diameter:	Face: .5095" Barrel: .4350"
Key Cut Angle:	90°
Key Cut Measurements:	Bottom of Blade to Cut
Key Cut Method:	Rotary Cutter
Key Cut Direction:	Tip to Bow
Deepest Key Cut:	1 (8 increments)
Width of Key Flat Base	0.032"
Key Cut Tolerance	+0.0008" / -0.0012"
Spacing / A2, A4 Compatible?	.150" / Yes
Spacing Calculation:	.2600" from Shoulder
Pin Stack Total:	6 (15 increments)
Pin Stack Dimension:	Total = .4385"
MACS:	5
Side Pins:	None
Integrate into ASSA:	Yes, possible
UL437 Listed / Restricted:	No / Yes
Patent Expiration:	2030
Number of Theoretical Bitings Possible:	117,649 (Minus MACS losses)

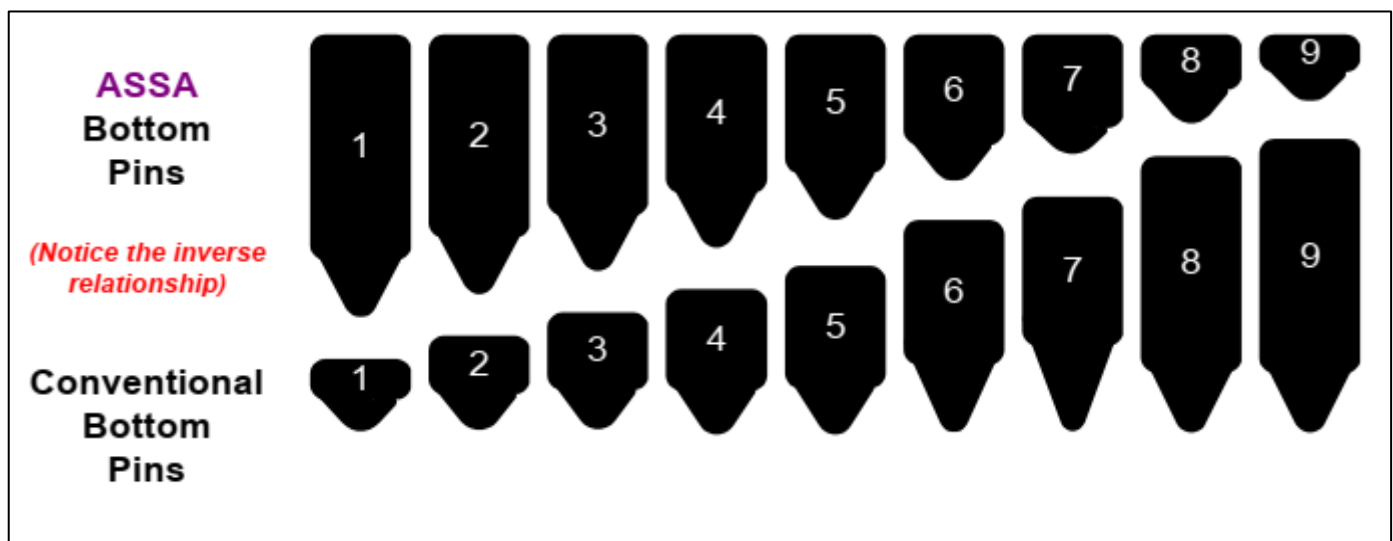
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Finally, those of you who are not familiar with the bottom pins found in a standard ASSA pin kit and used with their fixed cylinders and LFICs, are in for a special treat. It's time to wrap your head around a new way of looking at an innocent set of bottom pins. Please be forgiving.

"Trouble in River City"

If you have ever seen the musical: "*The Music Man*", then you know things in River City were allegedly not perfect. So, what does that have to do with ASSA bottom pins? We will let you be the judge.

Figure 8 shows the ASSA bottom pins compared to what most of us would term 'conventional' bottom pins:



8. Illustrating the inverse relationship between the ASSA bottom pins and conventional bottom pins

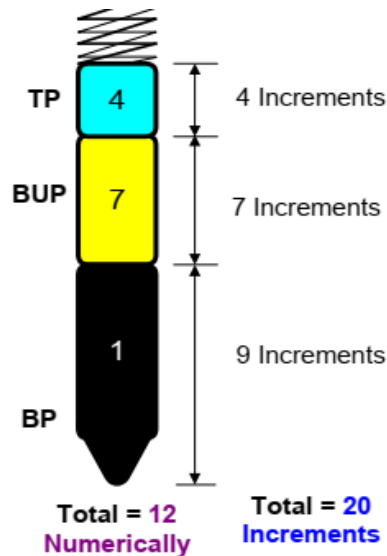
A picture can speak 1,000 words. As you can see, the smaller number of an ASSA bottom pin is equivalent incrementally to the longest bottom pin in a conventional system. The ASSA #1 BP is the same actual length (incremental length) as a #9 conventional BP. This chart shows the inverse relationship.

NOTE: This chart shows standard ASSA bottom pins for fixed cylinders and LFICs. The SFIC version does NOT have a #9 BP. They run #1 - #8 only in ASSA Maximum+ SFIC.

Numeric Dimension vs. Incremental Dimension

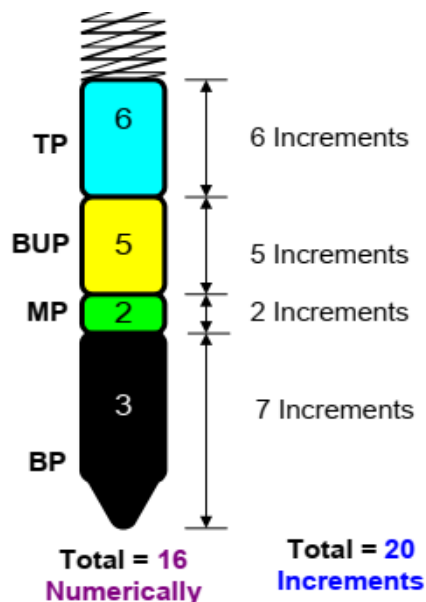
Since ASSA has given us the pleasure of dealing with **Inverse Increments** regarding their Bottom Pin designations opposite traditional Bottom Pin designations, we will just have to roll with it. However, there exists a serious issue involving calculating pin stacks because of this juxtapositioning that we must carefully consider.

Take a look at this graphic in Figure 9 that illustrates the issue at hand. It involves the ASSA LFIC [not SFIC] in one of the four control chambers. In each control chamber, the pin stack must total 20 increments:



F9. An example showing the numerical vs. the incremental values in an ASSA LFIC control chamber pin stack

In this example, you can see that the 'numerical' total of this LFIC pin stack equals 12 (not 20). That is because we must calculate the inverse of the bottom pin into what the actual incremental distance is. In this case it is 9 ($10-1=9$). The number 10 becomes the converter from numeric dimension to incremental dimension. Then we can see the pin stack actually totals 20, as it should. Here is another example, shown in Figure 10:



F10. A second example showing the numerical vs. the incremental values in an ASSA LFIC control chamber pin stack

Again, it is the value of the bottom pin that is the 'ringer', as they say. Within the ASSA Maximum+ SFIC, the converter number is 9 to achieve the real pin stack total, as you will see in more detail when we discuss pin stack calculations.

A2, A3, A4...A5?

A2, A3 and A4 systems are all based on the varying increments of the respective systems. The pin diameter remains constant, as does the spacing. Why have them? Very simple: Single-step systems can yield many more bittings than 2-step systems. If a system's increment is small, usually under .023" [excluding SFIC A4] , then a 2-step system is needed. We can see this with Schlage Conventional (.015"), Sargent (.020"), BEST A2 (.0125"). But, if we increase the increment to over the threshold of about .023", we have increased bitting capability in a single-step system such as with ASSA (.0235"), Kwikset (.023), Russwin System 70 (.028"), etc.

ASSA has become ground breaking in this instance, as it is the only manufacturer, aside from BEST, to create a fourth SFIC increment system: **A5**, if you will.

Figure 11 shows the bittings available in the four systems comparing 6-pin and 7-pin cores:

<i>Theoretical Key Bittings /Change Keys</i>				
SFIC System:	A2	A3	A4	A5
Status:	In Use	Discontinued	In Use	In Use
Originator:	BEST	BEST	BEST	ASSA
Progression Type:	2-Step	1-Step	1-Step	1-Step
Increment:	.0125"	.0180"	.0210"	.0235"
Pin Diameter:	.108"	.108"	.108"	.108"
MACS:	9	6	5	5
6-pin Cores:	4,096	46,656	15,625	117,649
7-pin Cores:	16,384	279, 936	78,125	n/a

F11. This chart shows the potential theoretical key bittings possible in A2, A3, A4 and A5 systems, with additional data

Can I Use My A2 Pin Kit...Pretty Please?

Well, since you asked nicely, yes. The core was constructed to conventional SFIC standards, with exception of the plug. The control shear line remains 10 increments as in A2. However, the ASSA key blank will mitigate the larger space needed in the plug because of the seating of the key blank itself for both ASSA A5 and standard SFIC A2. In other words, no problemo. Just make sure your code machine is set for a custom DSD that incorporates the center of the cut nearest to the shoulder at .2600".

So, if you are not wanting to take advantage of the massive 117,000 bittings available within the ASSA SFIC .0235" single-step A5 increment system, you can compromise those totals to a maximum of 4,096 bittings by using the existing A2 system (or even an A4 system for 15,625 bittings), excellent for small to medium size applications.

Tools - Use Your Own!

I am an advocate of using the proper tools for the job at hand. But, if I can use tools I already own to successfully accomplish a job, so be it. The point here is that you can utilize your existing SFIC combining tools for the ASSA SFIC. Your favorite SFIC Pin Kit (LAB, BEST, Arrow, etc.), the Annex (LAB), capping press (A-1, Framon, BEST), Quic-Test Tool (ICLS Global), Quic-Load Block (ICLS Global) and your pinning block (A-1, ProLok, BEST, Schlage) will all work beautifully.

The only other tool that will be necessary is the ASSA SFIC Ejector Tool, used when you need to recombine these cores. The standard aftermarket SFIC ejector tool, and even the thinner Medeco KeyMark ejector tool, will not work. The reason is that there is a keyway ward on both sides of the bottom of the plug that will only allow the thinner, specially made ASSA SFIC Ejector Tool to bypass that warding. Again, its part number is #900800 and comes included in the ASSA SFIC Pin Kit.

Calculating ASSA SFIC Pin Stacks

Those of you who have been calculating SFIC pin stacks for years might as well forget everything you know about it. That is because the new ASSA SFIC (Figure 12) pin stacks are determined in different ways: calculating bottom and master pins, determining the build-up pins and calculating the top pins each use alternate methods of calculations.



F12. Core Side View

Calculating the Bottom Pins and Master Pins

In order to accomplish this correctly, one must do the REVERSE of what you would normally do with a conventional fixed cylinder or SFIC pin stack. Traditionally, you would look at the key cuts for the change key and top master key. Whichever is the smaller bitting, that would become the bottom pin. The difference between the two would be the master pin value.

Since ASSA uses the inverse of the bottom pin dimensions, we do the opposite. The larger value of change key cut compared to master key cut will be the bottom pin. The difference of the 2 cuts becomes the master pin.

Let's use an example that ASSA uses in their Pin Calculator (discussed later) so that we can illustrate this point. Figure 13 shows the change key and master key bittings:

Change Key:	346858
Master Key:	135633

F13. Example change key & master key bitting

Looking now at the first chamber in Figure 14 (farthest left) of the two bittings, we see:

Change Key, Chamber #1:	3
Master Key, Chamber #1:	1

F14. Change key & master key bitting for only Chamber #1

Now, Figure 15 provides the formula for Determining BP and MP Values:

Formula for Determining BP and MP Values: <i>(from TMK & Change Key Cuts for ASSA SFIC Pin Segments)</i>	
1) Larger value:	_____ <i>(Will be BP)</i>
2) Subtract	– _____ <i>(other cut)</i>
smaller value	
3) Result:	_____ <i>(Will be MP)</i>
<i>If both cuts same, no MP used</i>	

F15. The formula for Determining BP and MP Values

3 Change Key Cut [larger value = **BP**]

-1 Master Key Cut [smaller value]

2 Master pin value = **MP**

One issue many students have is that they tend to confuse the key cut number with the pin number. Remember: they are different types of numbers! A key cut may not necessarily be a pin number and a pin value may not necessarily be a key cut number.

That being said, if we apply this 'altered' BP and MP formula, Figure 16 shows the core's partial pin stacks so far:

Master Pins:	2	1	1	2	2	5
Bottom Pins:	3	4	6	8	5	8

F16. The core's partial pin stacks for BPs & MPs

Calculating the Build-Up Pins

Conventional, or fixed cylinders do not have build-up pins (BUPs). Many interchangeable cores, especially those which have a separate shear lines such as SFICs, do. Some will call them 'control pins', which is the same thing as build-up pins.

Its purpose is to allow the control key to bring the pin stacks to the control shear line to allow the removal of the core from its housing or to insert the core into its housing.

Again, the formula to determine the BUP is different from that of a conventional SFIC (Figure 17). The ASSA SFIC Factory Build-Up Formula is:

Factory BUP Formula
(Bottom Pin) - (Master Pins) - (CTRL Key Cut) + 5 = BUP
<i>NOTE: A "0" result indicates no BUP</i>

F17. Factory BUP Formula

There is also an alternate BUP formula (Figure 18), as there are usually a number of ways to achieve the same end. Try both out and you will see that you will get the exact same result. Whichever formula makes more sense to you or is easier to calculate is what you might use. To use the Alternate BUP Formula, it is necessary to calculate the top pins before the BUPs:

Alternate BUP Formula
15 - (9 - BP) - MP - TP = BUP
<i>NOTE: A "0" result indicates no BUP</i>

F18. Alternate BUP Formula

Let's start with the Factory BUP Formula for Chamber #1(Figure 19). Figures 20 and 21 show the math and result:

Build-Up Pins:	?
Master Pins:	2
Bottom Pins:	3

F19. The Factory BUP Formula for Chamber #1

3 - 2 = 1 (Bottom Pin minus Master Pins)
1 - 5 = -4 (minus CTRL Key Cut)
-4 +5 = 1 (plus 5)
1 (BUP)

F20. Calculations for the Factory BUP Formula for Chamber #1

Build-Up Pins:	1
Master Pins:	2
Bottom Pins:	3

F21. BPs, MPs and BUPs for Chamber #1

To complete the core for BPs, MPs and now BUPs (Figure 22):

Build-Up Pins:	1	5	6	6	1	2
Master Pins:	2	1	1	2	2	5
Bottom Pins:	3	4	6	8	5	8

F22. Chart showing the complete core for BPs, MPs and BUPs

Calculating the Top Pins

Once again, this formula is easy, but still different from conventional SFICs. Simply add a value of "1" to the control key cuts (Figure 23):

Top Pin Formula
Control Key Cut +1 = TP

F23. The "Simple" TP Formula

Control Cut for Chamber #1: 5

5 + 1 = 6 (Top Pin)

To top off the core's pin stack for the Top Pins would be (Figure 24):

Top Pins	6	4	5	6	8	7
Build-Up Pins:	1	5	6	6	1	2
Master Pins:	2	1	1	2	2	5
Bottom Pins:	3	4	6	8	5	8

F24. The core's pin stacks with all TPs and ancillary pins

Let's take a look at and use that alternate BUP Formula) since we know the TP values (Figure 26. The chart is repeated without BUPs in Figure 25:

Top Pins	6	4	5	6	8	7
Build-Up Pins:						
Master Pins:	2	1	1	2	2	5
Bottom Pins:	3	4	6	8	5	8

F25. The core's pin stacks with all TPs and ancillary pins, bit omitting the BUPs

Alternate BUP Formula
15 - (9 - BP) - MP - TP = BUP
<i>NOTE: A "0" result indicates no BUP</i>

F26. Here is the Alternate BUP Formula

For chamber #1 without the BUP is in Figure 27, and with the BUP is shown in Figure 28:

Top Pins	6
Build-Up Pins:	?
Master Pins:	2
Bottom Pins:	3

F27. Pin stack for Chamber #1, without the BUP

$15 - (9 - 3)$
 $(3 - 9) = -6$
 $15 - 6 = 9$
 $9 - 2 = 7$
 $7 - 6 = 1$

Top Pins	6
Build-Up Pins:	1
Master Pins:	2
Bottom Pins:	3

F28. Pin stack for Chamber #1, with the BUP

For chamber #2 (Figure 29):

$15 - (9 - 4)$
 $(9 - 4) = 5$
 $15 - 5 = 10$
 $10 - 1 = 9$
 $9 - 4 = 5$

Top Pins	6	4
Build-Up Pins:	1	5
Master Pins:	2	1
Bottom Pins:	3	4

F29. Pin stacks for the first 2 chambers, all inclusive

Once again, two different roads can still take us to the same destination.

Checking Pin Stack Height

ASSA recommends the following formula (Figure 30) to check pin stack height:

Pin Stack Height Formula $(TP + MP + BUP) - BP = 6$

F30. ASSA's Factory Pin Stack Height Formula

Top Pins	6	4	5	6	8	7
Build-Up Pins:	1	5	6	6	1	2
Master Pins:	2	1	1	2	2	5
Bottom Pins:	3	4	6	8	5	8
TOTALS	6	6	6	6	6	6

F31. All pin stacks shown totaling "6" as per ASSA

As you can see in Figure 31, there will be uniform pin stack height of 6 in each chamber. For those who are purists and need to see 'why' this is so, we must remember that the bottom pins are only the inverse of their actual incremental value. So, one can use this formula instead (Figure 32):

Alternate Pin Stack Height Formula (must know TPs first) $(9 - BP) + MP + BUP + TP = 15$

F32. Here is the Alternate Pin Stack Height Formula

Top Pins	6	4	5	6	8	7
Build-Up Pins:	1	5	6	6	1	2
Master Pins:	2	1	1	2	2	5
Bottom Pins:	6	5	3	1	4	1
TOTALS	15	15	15	15	15	15

F33. A chart showing all pin stacks equaling 15 from the Alternate Pin Stack Height Formula

This alternate pin stack height formula, though adding one more step, shows the pin stack's true incremental height of 15 (Figure 33). But, for simplicity, I would recommend using the factory's formula totaling 6 for each chamber. A list of all of these formulas in a matrix can be found in Figure 34, which follows.

ASSA MAXIMUM+ SFIC Formulas

Formula for Determining BP and MP Values:

(from TMK & Change Key Cuts for ASSA SFIC Pin Segments)

1) Larger value: _____ (Will be BP)

2) Subtract _____ (other cut)
smaller value

3) Result: _____ (Will be MP)
If both cuts same, no MP used

Factory BUP Formula

(Bottom Pin) - (Master Pins) - (CTRL Key Cut) + 5 = BUP

NOTE: A "0" result indicates no BUP

Alternate BUP Formula

15 - (9 - BP) - MP - TP = BUP

NOTE: A "0" result indicates no BUP

Pin Stack Height Formula

(TP + MP + BUP) - BP = 6

Alternate Pin Stack Height Formula

(must know TPs first)

(9 - BP) + MP + BUP + TP = 15

F34. A comprehensive chart illustrating all of the ASSA MAXIMUM+ SFIC Formulas

ASSA Pin Stack Calculator

Now that you see the hows & whys of calculating the pin stacks for the ASSA SFIC, it is not difficult at all. But, to further assist you, ASSA had created an EXCEL calculator that can take the CK, MK and CTRL key bittings and quickly whip them up into six useable pin stacks in a jiffy. Notice the two green boxes (Figure 35). This alerts you to the fact that your predetermined control key bitting may not be useable within this system if it appears red in color. If so, alter it so that the cut is deeper. Furthermore, ASSA requires at least one cut on the control key to be deeper than any operating key cut. Note that the MACS of 5 is shown as a reference. Figure 35 illustrates this. You can access it via the LSA Michigan web site at:

NOTE: Since this is an EXCEL file and not an .EXE file, you will need to download it, save it to your device (desktop, computer, phone, etc), and open the file. You will need an EXCEL program on your device to work it. You cannot OPEN it online and expect it to work ☹!

ASSA MAXIMUM+ SFIC						
Cylinder Pinning						
	1	2	3	4	5	6
Top Pin	6	4	5	6	8	7
Build-Up Pin	1	5	6	6	1	2
Master Pin	2	1	1	2	2	5
Bottom Pin	3	4	6	8	5	8

At least one box must be green. If red, control key cut is too high [shallow]

0=no pin

In at least one pin chamber, the control key must be lower [deeper] than any user key
The control key can be max 5 increments higher [shallower] than the user key in any pin chamber

Figure 35. A graphic from the ASSA MAXIMUM+ SFIC Cylinder Pinning via an Excel File

Conclusions

ASSA has created a revolutionary new SFIC system, A5, that can accommodate many more bittings than in any other existing SFIC system, without the use of side pins, side cuts or any other mechanical add-on device. They were able to successfully utilize their existing .0235" increment system and .150" spacing to effectively offer an SFIC with a standard pin diameter of .108" that can retrofit existing SFIC hardware. If you are interested in acquiring this system, feel free to contact Thomas R. Demont, AHC, CFDI, CFL, CMIL, CML, CMST, IFDI, ICML, LSFDI, ARL, CAI through ASSA Technical Services, Inc. at (724) 969-2595 for product fulfillment or further system questions. **'Additional Considerations'** for TMKs, CTRLs and using ASSA SFICs with A2, A3 & A4 systems are on the following pages of this Technical Manual.

Happily, ASSA has stepped up to the plate, at a time when SFIC is as common to locksmiths as bread-n-butter, and options are extensive as we have seen over the last century. But, when a manufacturer can think outside of the box, the ramifications for the industry are striking and is a further indication that SFIC isn't going anywhere, anytime soon...other than becoming even more expansive than it already is.

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Special thanks are extended to: **ASSA, Inc. USA, Bo Widen**, Widen Innovation, Inventor of the ASSA SFIC, **Daniel Andersson**, ASSA Sweden, Engineer, **Lance Berger**, Lberger Sales, LLC, Manufacturer's Rep, **John Hubel**, CML, ICML, M.Ed. and **Tom Demont**, AHC, CFDI, CFL, CMIL, CML, CMST, IFDI, ICML, LSFDI, ARL, CAI, ASSA Technical Services, Inc. for assistance in preparing for this Technical Manual.

ADDITIONAL CONSIDERATIONS

Creating an ASSA SFIC A5 System Top Master Key

When setting up your ASSA SFIC system, establishing the TMK is accomplished the same way as is done in any conventional system. Here are a few specific considerations:

- 1) Make sure the numbers match the possible bottom pins in the system (1-8: no 0 and no 9)
- 2) Observe MACS. No adjacent cut may be greater than 5 (i.e., 2 next to a 5 is OK; 1 next to a 7 is forbidden)
- 3) Follow industry guidelines for creating an appropriate TMK

12 Rules for Selecting a TMK

- 1) One of the TMK cuts should be the **deepest** possible (avoid the bow)
-security (picking); key integrity (key bow breakage)
- 2) Never make **all cuts deep**
-security (all change keys can be filed down to a TMK)
- 3) One of the TMK cuts should be the **shallowest** possible (avoid the tip)
-security (altering); key/lock wear
- 4) Never make **all cuts shallow**
-security (picking); key/lock wear
- 5) Never make a TMK become a **declining or ascending** step key
-security (picking; turned plug - key out = unlocked); key/lock wear
- 6) Never make a TMK have a **straight line** combination
-security (toothpick opens); wear (eventual key pull out in open position)
- 7) Avoid **shallow/deep extremes** [ex.: 9180908]
-mechanical (premature wear on keys and locks)
- 8) Use **moderate shallow/deep** cut-to-cut variation
-system (may provide more useable bittings, less MACS loses)
- 9) Do not use **pre-written systems** found in books, internet, classes, etc.
-liability (keep excellent records; store in a safe; make all systems different)
- 10) Observe specific **manufacturer rules**
-key system peculiarities (manufacturers have reasons)
- 11) Alternate **parity**
-key system security (keeping systems distinct)
- 12) Maintain **TMK Register**
-key system security (avoids unknowing duplication of systems)

Creating an ASSA SFIC A5 System Control Key

The procedure is similar as with standard SFIC systems. Once the TMK has been created, diagram a simple KBA. Our example TMK bitting will be 574346:

5	7	4	3	4	6
6	8	5	4	5	7
7	1	6	5	6	8
8	2	7	6	7	1
1	3	8	7	8	2
2	4	1	8	1	3
3	5	2	1	2	4
4	6	3	2	3	5

Create the control key by selecting a bitting number in each column below the TMK. Be careful to watch for any MACS violations. Use similar factors as shown in the previous section on Creating a TMK. Be aware that some systems may use a bitting from the TMK within the control bitting. Our example control bitting will be:

2 4 7 8 5 1

Do not worry about parity (odd/even) in each column. ASSA SFIC A5 is a single-step system where parity is not applicable.

Once you have selected your new control key, be sure to strike it from the progression list. It should NOT be used in the system as a change key.

ASSA has also listed several other considerations related to the control key:

- 1) In at least one pin chamber, the control key MUST be lower (deeper) than any user key. [1=deepest cut; 8=shallowest cut]
- 2) The control key can be a maximum of 5 increments higher (shallower) than the user key in any pin chamber [1=deepest cut; 8=shallowest cut]

Decoding for the Control Key

Since the control key is usually a random change key bitting extracted from the system, there will be no method to determine its value by key comparisons or extrapolation. To decode for the control, one will need to have access to a combined core, remove the top pin in each chamber, measure each with a caliper and use the formula shown next:

Determining the Control Key
Top Pin – 1 = Control Key Cut

Using A2, A3 and A4 Systems with the ASSA SFIC Maximum+

If you choose to combine the ASSA SFIC Maximum+ using standard SFIC pins (not the dedicated ASSA SFIC Pin Kit), you must allow for the shallower plug which accommodates the ASSA key. The pin stack totals for A2, A3 or A4 systems are calculated the same as usual.

The only extra consideration while combining will be the value of the top pin. This is where we make up the difference of a shallower plug in the ASSA SFIC as related to the ASSA SFIC pin stack total of .4385". Thus, the pin stack will be a bit larger in non-A5 systems to allow for proper spring pressure on the stack. In A2 we will add 3 extra increments so the pin stack will total a coded 26. Two other adjusted values for A3 and A4 are also shown in the chart below:

Use of Standard SFIC Pins in an ASSA Maximum+ SFIC				
Standard SFIC System	Pin Stack Measurement	Increment Measurement	Coded Pin Stack Height in Standard SFIC	Coded Pin Stack Height in ASSA SFIC
A2	.397"	.0125"	23	26
A3	.398"	.018"	16	18
A4	.404"	.021"	14	15

All keys will operate as usual with no adverse effects on the system. If the plug tends to turn a bit harder, you might lessen the top pin by one increment.

The other factor will be originating the ASSA SFIC key when using standard SFIC pins. You will need to set up a new DSD, or adjust a current one. Depths are the same, as based on each of the respective A2, A3 or A4 systems.

Spacing is the biggest factor. Again, since there is no tip stop on the ASSA SFIC key, it will be gauged from the shoulder on the bow. The key will still be cut tip to bow. The first cut will be measured from the bow to the center of the first tip cut, and so on. Spacing from cut to cut will remain .150". The distance from the shoulder stop to the center of the 6th cut is .2600". Below is an image to illustrate this:

