

A Completely

NEW DESIGN

for an

Electronic Deadbolt

from

Sunnect Inc.

by
Richard Dickey



The Sunnect AP501 electronic deadbolt lock is designed to provide the highest level of security for your home. Your first impression when you see the AP501 is that it has a beautiful style and looks as tough as a tank, (see photo 1) As I take you through the details of its construction, operation, and testing, you will agree that the AP501 is one tough residential deadbolt.

When a new electronic deadbolt hits the streets, you have to wonder about the quality of its design as well as the quality of the manufacturing facility that made it. The AP501 deadbolt was designed by engineers that have almost a decade of world wide experience in the digital door lock field. Millions of their digital door locks have been in use throughout the world including Japan,

England, U.S.A., Kazakhstan, Turkey and Denmark, as well as South Korea, where the locks are manufactured.

The manufacturing facility has a monthly production capacity of 100,000 units and is certified for ISO 9001 (Quality Management) and ISO 14001 (Environmental Management Systems). They also run a series of tests on their



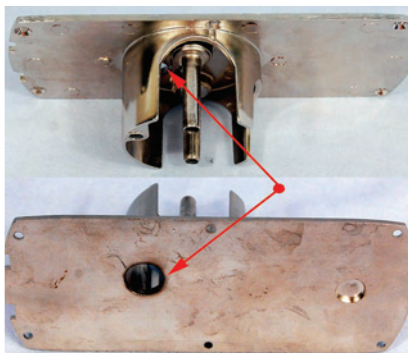
1. This is an exterior view of the new AP501 electronic deadbolt from Sunnect. This is truly a new lock design.



2. The lock is shipped ready to install. You only need a Phillips screwdriver.

products before, during, and after assembly to ensure high quality. You can see the series of tests used for the AP501 at the end of the article, which includes the, "shooting it with a big gun test." You have to see it!

The AP501 is constructed mostly of metal. That includes both the interior and exterior housings, keypad cover, battery compartment cover and the Open/Close button. No wonder it weighs 6 pounds.



3. Here you can see both sides of the exterior mounting plate. The only hole is for wires to pass.

The AP501 ships complete and ready to install, (see photo 2). Since it is made for the North American market, it is guaranteed to fit all standard prepared doors with a 2-1/8" crossbore. That means you only need a Phillips screwdriver to install the lock. There are no extra holes to drill.

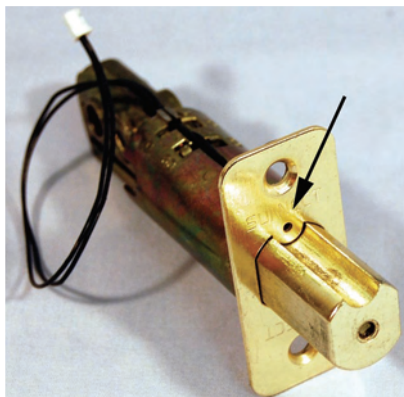
The main components of the exterior unit are designed to withstand hammering. The Tag Key sensor, temporary power terminal, and the keypad are supported by metal, or hard-rubber parts, so that any impact on them is transferred to a 100 thousandths thick metal mounting plate as well as the door surface. Smashing any of these components will not automatically yield access to an intruder. Why?

The exterior mounting plate blocks access to the throwbolt even if the exterior unit is broken off, (see photo 3). The arrows are pointing to the hole used for

wiring. This hole is well below the center of the throwbolt and only 1/2" in diameter. Most conventional deadbolt locks would immediately expose the deadbolt latch if the exterior unit is broken off. This would allow the intruder to manually retract the deadbolt latch and gain access.

The opening between the exterior unit and the interior unit (through which the connection cable passes) is small and covered in rubber, so that hot or cold air from the outside is not allowed to enter the interior unit. This will minimize condensation.

The 1-inch throwbolt is fortified with a 200 thousandths thick carbon rod in its center that resists sawing. It also has a patented magnetic sensor built into the bolt, (see photo 4). This



4. The throwbolt has a patented magnetic sensor that is used with the auto lock function to automatically extend the bolt. It is also used as an alarm monitor.

has two purposes. The first is to indicate when the door is shut so the auto lock function can do its job, if turned on. The second is to sound an intruder alarm if the door is kicked in. The backset of the bolt is set by pushing a pin and sliding the inside portion of the bolt in or out, depending on the required 2-3/8" or 2-3/4" backset, (see photo 5).

The strike plate is designed to work with the throwbolt. It has a magnet built into the liner



5. The throwbolt is adjustable for 2-3/8" and 2-3/4".



6. The strike liner has a magnet built in that works in conjunction with the sensor in the throwbolt.

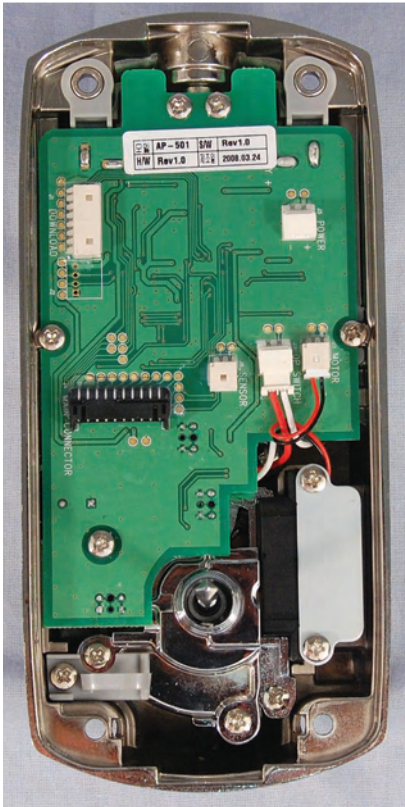


7. The AP501 can be set to automatically lock when the door is closed.

that works in conjunction with the sensor in the throwbolt, (see photo 6). When the "auto lock" function is turned on, the sensor in the throwbolt will know the door is shut when it senses the magnet, (see photo 7). This will initiate the internal computer to extent the bolt.



8. Although waterproof, the AP501 is designed with weep holes to allow condensation to escape.



9. Here is a view of the interior unit.

Although water-proof, any moisture that is able to enter the exterior unit from condensation is allowed to flow down through the weep holes, (see photo 8). The weep holes are partially blocked by the mounting plate to prevent abuse.

The vital parts of the lock, such as the central processing unit (CPU), printer circuit board (PCB), batteries, motor, throw-

bolt drive mechanism, etc., are all located in the interior unit on the secure side of the door, (see photo 9). They are further protected by a heavy-duty interior mounting plate that will not allow any access to the vital parts, (see photo 10).



10. This is the interior mounting plate.



11. There is a manual override knob that can be used in the event of a battery failure.

The AP501 has a bypass circuitry that protects the PCB in case of a high-voltage attack so that the lock remains locked. The battery compartment cover is fastened with a screw. It also has rubber pads to secure the batteries in place.

The manual override knob directly operates the deadbolt

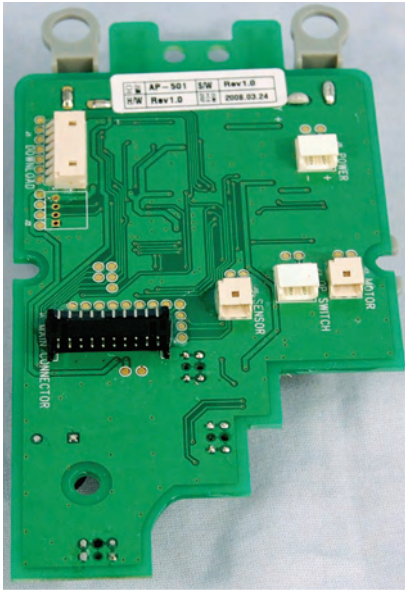
latch, (see photo 11). This knob surrounds the open/close button that is normally used. It has no intervening parts other than a directly connected rotary bar made of metal. This ensures egress is always allowed. Now I am going to take you a little deeper into the AP501 and show you why this lock is so special.

Most new locks you see on the market today are basically like all the others with the exception of a facelift. They have a handle, knob or lock cylinder on the outside of the door that is used to extend or retract the bolt. There is an engagement mechanism that separates the spindle from the outside assembly. A solenoid or motor drive will engage the outside assembly with the spindle, allowing the bolt to be retracted. There is nothing wrong with this, but it lacks creativity. Some may say, "If it's not broke, don't fix it," which is why most have stuck with a tried and proven standard design.

Sunnect took a completely different approach. It is as if their engineers never saw an electronic lock before they created their own. Their approach to the electronic as well as the mechanical solution is completely different from anything you have seen before in the U.S.A..

The inside unit houses all the important stuff. The PCB has several connectors on one side, (see photo 12). These are for the outside unit, throwbolt sensor, motor etc.. The other side is what's interesting.

When the PCB is removed and turned over, you will see the battery holder above three black "U" shaped things indicated by the arrows, (see photo 13). These are optical sensors. They do exactly the same thing as micro switches that are used in most locks. The big difference is that they have no moving parts.



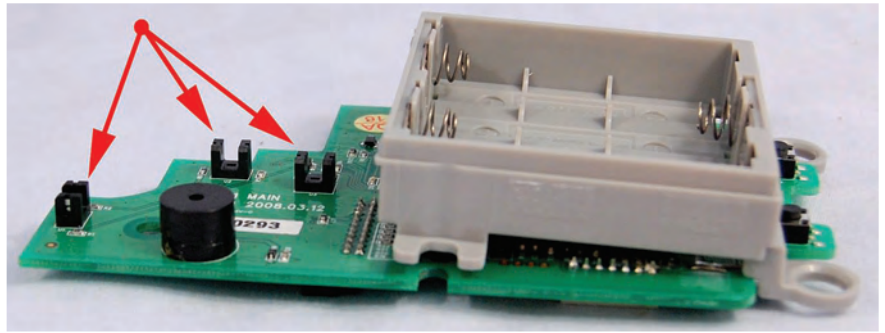
12. All connections are made on this side of the board.

The way they work is one side of the sensor emits an invisible light and the other side of the sensor receives the light. While this is happening it means that there is nothing blocking the path of the light. The onboard computer or CPU monitors this. If something moves between the two sides of the sensor, the light will be blocked and CPU will know that something is there.

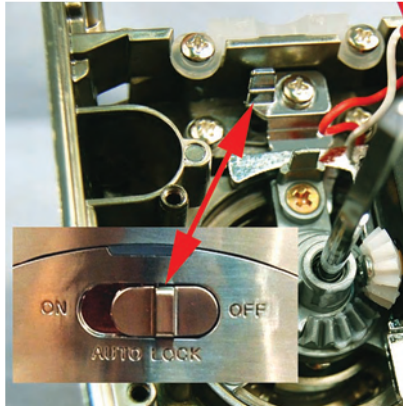
One of the optical sensors is used with the on/off for the auto lock feature. When the metal slide on the outside of the lock is moved, its finger on the inside will either block or not block the light traveling from one side of the optical sensor to the other, (see photo 14).

Two optical sensors are used with the finger that is directly below the auto lock finger. They identify the throwbolt position. The finger will be rotated by the motor at the same time that the throwbolt is being extended or retracted, (see photo 15). When the finger blocks the light from either of the optical sensors, the motor stops. Obviously one optical sensor indicates extended while the other indicates retracted.

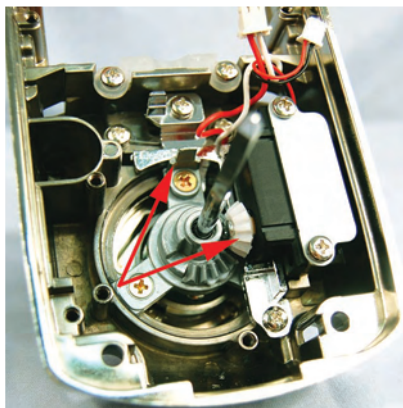
You may wonder how much power is used by the optical sen-



13. The reverse side of the board has the CPU, battery holder and 3 optical sensors.



14. One optical sensor is used to turn the auto lock function on or off.



15. The motor drive rotates a finger while extending or retracting the throwbolt. Two optical sensors are used to identify the position of the throwbolt.

sors. After all, they are electronic and project a light. That is a good question and I have a good answer. If they were on all the time there would be a drain on the batteries. However, the only time the optical sensors are supplied power is when the motor is running. That is only for a few seconds every time the lock is used.



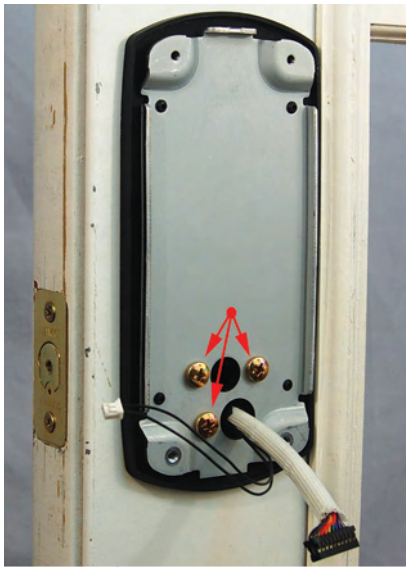
16. With the throwbolt installed, the exterior unit can be slid into place.

Lock Installation

The installation process of the Sunnect lock is very simple. If you are simply replacing an existing deadbolt, start by removing the old hardware. Install the new throwbolt assembly so the wires from the magnetic sensor are on the bottom side. Now slide the exterior unit into place, (see photo 16). The wire bundle and connector will pass through the cross bore, under the throwbolt assembly.

The inside mounting plate is installed next, (see photo 17). All wires pass through one hole in the bottom of the plate. It is attached to the outside unit with 3 screws.

The wires that pass through the door are connected to the inside unit, (see photo 18). Next slide the unit into place, (see photo 19). It attaches to the mounting plate with 4 screws, one in each corner. The 2 mounting screws at the bottom of the interior unit are hidden



17. The interior mounting plate is held in place with 3 screws.



18. Two wire connections are made before installing the interior unit.

with plastic screw covers. The 2 upper mounting screws are hidden when the battery cover is in place.

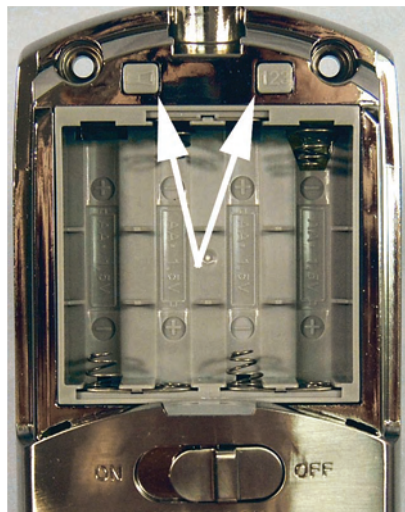
You do not have to worry about right or left handing at this point because the handing is changed with the press of a couple of buttons on the keypad. This is another new feature from Sunnect that saves installation time and also eliminates internal parts.

Lock Programming

With the interior unit screwed into place, it is time to place the four batteries in the battery holder and start programming the lock. As soon as the batteries are installed, the lock will self



19. The interior unit is held in place with 4 screws.



20. Two buttons are used in the programming process. One for a passcode and the other for tag keys.

test and then play a musical tune to indicate everything is OK.

There are 2 buttons above the battery holder, (see photo 20). They are used to register the tag keys and a passcode. To register a passcode, press the button on the right. You will hear 2 beeps. Now you can enter from 3 to 20 digits for your passcode. Press the right button again and you will hear 3 beeps indication success. The default passcode is "1234."

A beautiful feature of the AP501 is its ability to allow you to



21. Raising the keypad cover activates the keypad and illuminates the keys.

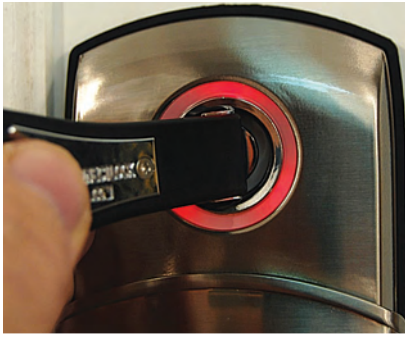


22. The tag keys work on the same principal as an iButton.

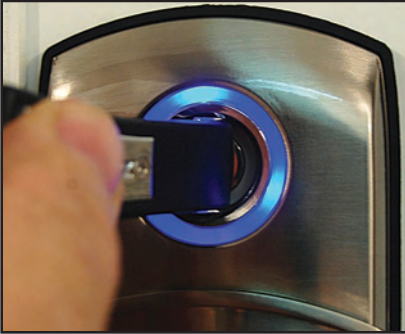
disguise your passcode if someone is standing over your shoulder. Some people feel uncomfortable, blocking the view of a guest while entering a passcode. It has to be done. At least it use to.

Raising the keypad cover activates the keypad, (see photo 21). The AP501 will allow you to press any sequence of buttons as long as the numbers of your passcode are the last numbers you press. If your passcode was the "1234" you could enter "5564784523121234." The person watching will never be able to remember the entire sequence. They also don't know if all the numbers you pressed were used or just the last 3 to 20 numbers, depending on your actual passcode length.

The tag keys are basically the same thing as an iButton®, (see photo 22). They do not look the same but they work the same way. The tag key is touched to the tag key reader on the exterior unit. The information inside the tag key is



23. An invalid tag key will illuminate red.



24. A valid tag key will illuminate blue.



25. Pressing the open/close button will extend or retract the throwbolt.

read and either denied, (see photo 23) or accepted, (see photo 24).

The tag keys are registered by pressing the left button above the battery holder. When pressed, 2 beeps are heard. Touch the tag key to the reader and you will hear 2 more beeps. Keep touching tag keys to the reader until all are registered, up to 20 tag keys. Press

the left button again and 3 beeps are heard indicating success.

From the inside, it is recommended that to extend or retract the throwbolt, you press the open/close button, (see photo 25). The manual override knob is always available if necessary.

Here are a few specifications for the AP501:

- Throwbolt: 1" for maximum security.
- Passcode: 3 to 20 digits.
- Maximum number of Tag Keys supported: 20.
- Operating temperature range:
 - Interior unit -5° – 130° F
 - Exterior unit -35° – 130° F.
- Power: 6 Volt and the 4 AA batteries are included.
- Estimated battery life: 1 year.
- Temporary power: 9V battery.
- Door thickness range: 1 3/8" – 2".
- Backset distance supported: 2 3/8", 2 3/4".
- Interior unit (H x W x D): 6 1/4" x 4" x 1 1/2".
- Exterior unit (H x W x D): 5 3/4" x 3" x 1 1/8".
- Warranty period: 2 years including the express option.

Now I want to expose you to a condensed example of the testing conducted on the AP501. This was a very exciting lock to work with and I hope all of you have an opportunity to at least see one in action.

Lock Testing

To ensure that each unit of the AP501 digital door lock is made to the highest standards of quality, they start with the materials and components used in the lock. All incoming parts are sampled frequently and some critical parts such as the connector cables are 100% tested before they are entered into the manufacturing process. The suppliers of parts

and materials must adhere to strict standards of quality and their performances are measured against an ever improving benchmark. Once inspected, the parts are stored in a climate controlled storage room.

The PCBs are manufactured by state of the art, lead free, soldering machines that solder computer chips onto the board. Every PCB is inspected by an automated PCB tester to ensure that each computer chip is mounted and soldered correctly.

Every electrical connection is tested and then inspected with an x-ray microscope. The x-ray microscope enables the human inspector to see below the surface of the PCB.

An electro static discharge (ESD) tester is used to make sure the PCB can withstand ESD. A vibration tester and an impact tester are used to make sure the AP501 is built rock solid.

Temperature and humidity testing is conducted using a Thermo Hygrostat. The AP501 has been tested after being exposed to a temperature of -35° F for 6 hours, although the stated temperature range for the AP501 is -5° F to 135° F. The hygrostat also simulates humidity in which the AP501 is tested.

Now for the cycle testing. Using robotic arms and fingers, cycle tests are conducted to ensure the lock's durability. There are 2 types of cycle tests.

The first test uses a set of robotic arms and fingers to simulate typical human use of the lock. They raise the keypad cover, enter the passcode, and lower the keypad cover to retract the throwbolt. They then press the Open/Close button to extend the throwbolt. This cycle test is repeated every 4 seconds. The AP501 has been tested to more than 100,000 cycles, which takes about a week to perform.

The second cycle test involves just the deadbolt latch and the motor where they are repeatedly cycled, extending and retracting the throwbolt every 4 seconds. The AP501 has been tested to more than 200,000 cycles. If you open the door 10 times a day, it would take more than 50 years to reach 200,000 cycles.

Now that you know what type of factory testing is done to verify the quality of the AP501, lets look at a real world test. You are going to love this!

Shooting Test

Sunnect, Inc. has conducted a bullet test on its new AP501 Advanced Protection digital door lock. Working with firearms professionals from the Blue Ridge Arsenal and the Tontine Group, both in Chantilly, Virginia, Sunnect conducted a series of shooting tests on the AP501 digital door lock.

The lock was mounted on a wooden stand. Two calibers were used during the testing. The first was a .22 caliber

weapon followed by a .40 caliber Smith & Wesson handgun.

The video from "www.Sunnect-Lock.com/photo.html" shows live results of the firearm test and should be viewed just for the "WOW" factor if for no other reason.

The shooting test revealed three extraordinary strengths of the AP501 construction:

1. The AP501 digital door lock would have continued to secure the door despite multiple gunshots. It never released the throwbolt.

2. The lock does not expose the throwbolt control mechanism to the potential intruder, despite the gunshots. This is in part due to its 2.5-mm thick exterior mounting plate which is secured from inside the door.

3. The lock's monitor and control mechanism (key sensor, CPU, motor, etc.) continues to operate despite the gunshots. The lock successfully retracted the throwbolt when a valid Tag Key was presented.

Conclusion

The Sunnect electronic door lock is a very impressive product. It's the first stand alone door lock I have seen in a long time that really took a completely different approach in its lock design. It is built like a tank, is a dream to install and operate, and for what you get, has a price point that will make anyone smile. If you do any kind of stand alone lock installations, you owe it to yourself and your potential customers to take a look at the Sunnect product. I think if you do, you will be as impressed with this product as I am, and I can assure you that this one I'm keeping.

For more information about the AP501 electronic deadbolt from Sunnect, you can contact them at: Sunnect Inc.
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Lorton, Virginia 22199-1501
You can call them at 1-877-DOORLOK (366-7565), or e-mail them at Sales@SunnectLock.com.



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