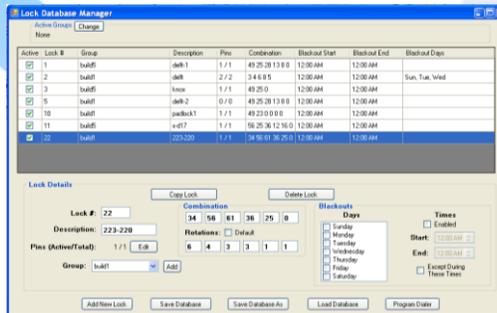


# USER'S GUIDE FOR THE ROBOTIC KEY SYSTEM

Stanton Concepts

September 2009



## USER'S GUIDE FOR THE ROBOTIC KEY SYSTEM

### The RKS Cylinder

The RKS cylinder is a purely mechanical device that uses a combination type of lock mechanism, however, with a vast increase in the number of combinations (keyspace) from conventional high security manually operated combination locks. There is no keyway and it cannot be finger manipulated. The mechanical design yields several billion possible combinations. The Plug only consists of 12 unique parts with a total of about 36 parts. The embodiment of the RKS shown in FIG. 1 is a drop in replacement for current high security keyed cylinders.

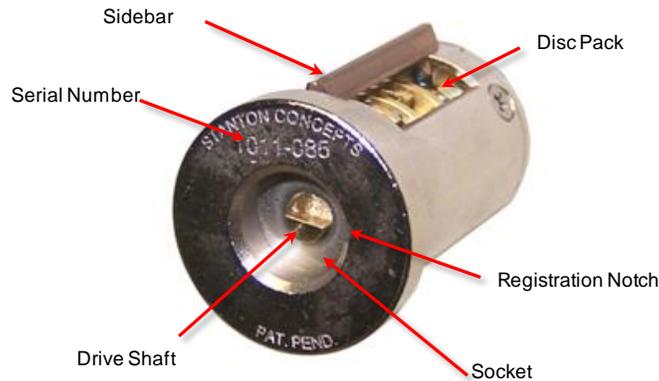


FIGURE 1

The primary external features of the cylinder include a socket with a registration notch, a drive shaft with a “D” interface and an engraved serial number.

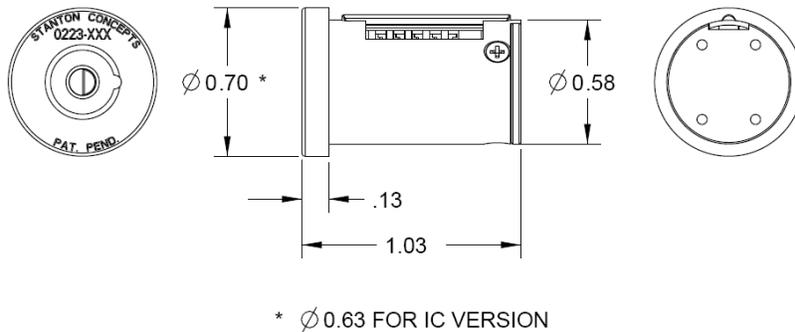


FIGURE 2

Over all cylinder dimensions are shown FIG. 2. Note that the tail piece is not shown for clarity. The tail piece is removable and can be customized for specific applications. Also note that there is a version of the cylinder (plus adaptor kit) that is compatible with large format changeable core cylinder hardware.

### The Cylinder Assembly

The Plug assembly is a simple mechanism that can be easily disassembled and re-assembled.

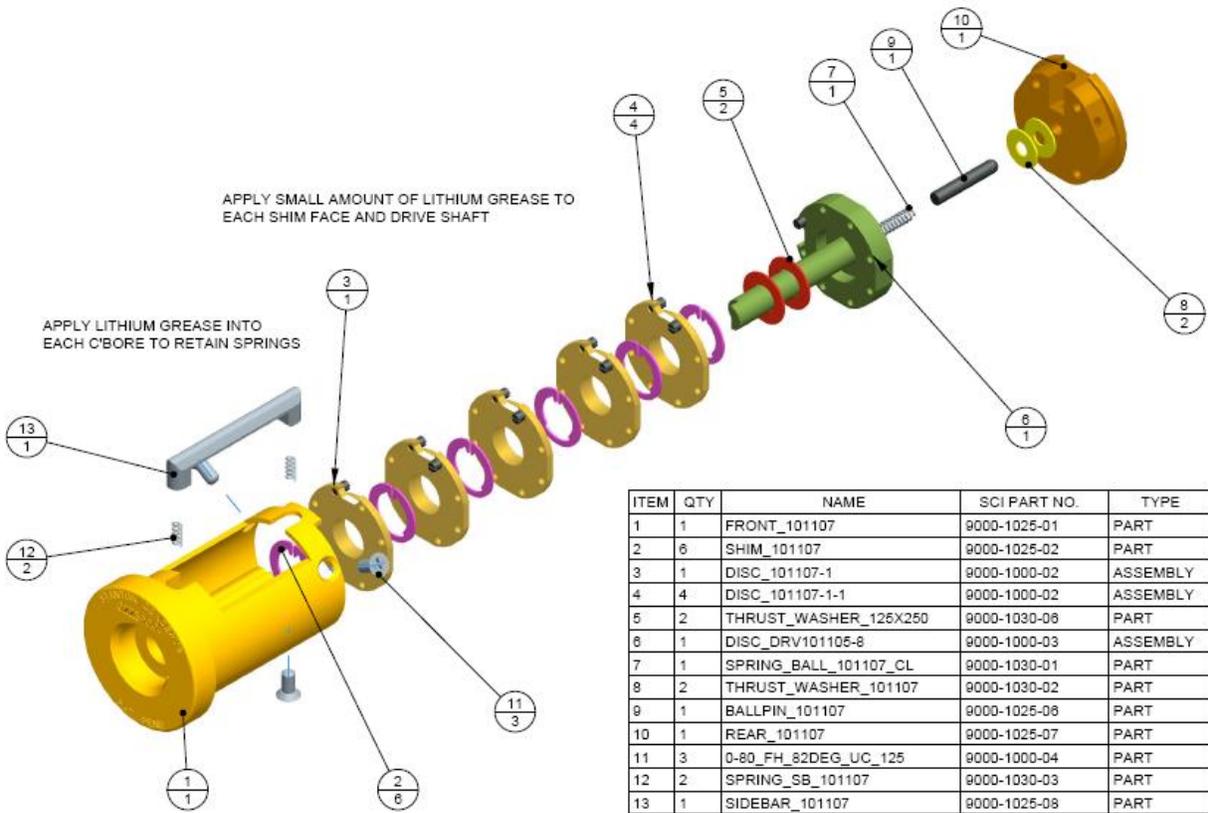


FIGURE 3

### The Discs and Disc Pack

RKS cylinder plug assemblies are assembled with a default configuration. The default configuration is depicted in the FIG. 4.



FIGURE 4

### The Discs

Each disc has a Side A, the driven side and a Side B, the driving side. There are 8 possible cam locations on each disc. The cams have a .009” screw driver slot and a 0-90 thread that facilitates assembly and re-configuration. Disc 1, the last disc to be positioned during alignment, is only driven and thus only has a Cam on Side A. The Drive Disc only has a Cam on its Side B, the driving side, because it is not driven by another disc.

FIG. 5 below shows a Disc assembly (disc and cams) with the Cams in their factory default locations; Side A position 1 and Side B position 8.

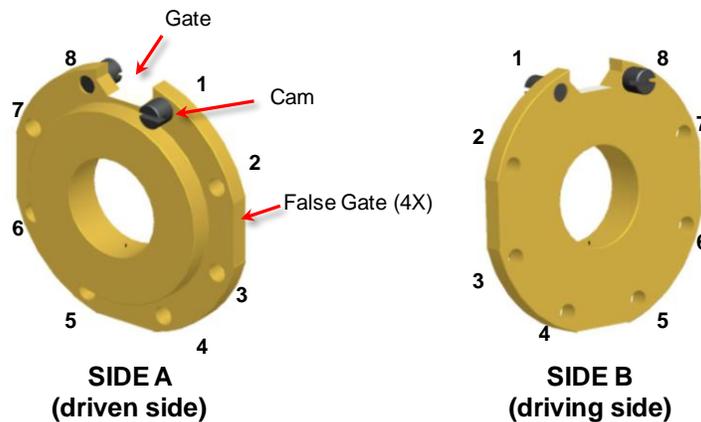


FIGURE 5

It is useful to have a way to designate a discs configuration. One system for designating the discs that describe the default disc assembly is [1-0]:{8-0}. '['..' ] designate Side A and '{..}' designate Side B. [1-0] designates that there is a Cam at position 1 on Side A, the second digit, '0' indicates that there is not a second cam on Side A. {8-0} indicates that Side B has only cam and it is located at position 8 (second Cams described later).

Using this designation system the default disc pack shown in FIG. 4 would be described as: [1-0]:{NA}, [1-0]:{8-0}, [1-0]:{8-0}, [1-0]:{8-0}, [1-0]:{8-0}, [NA]:{8-0}.

### Manual Dialing

The Manual Dialer for the Robotic Key System (RKS) provides three valuable functions:

1. When the combination is known it provides a way to manually dial the combination of a RKS cylinder.
2. When the RKS cylinder is re-combinated it provides a way to observe the new combination sequence which can then be used to program the Robotic Dialer.
3. The Manual Dialer provides a tactile interface to the RKS cylinder to facilitate observation and understanding of the RKS Cylinder mechanism.

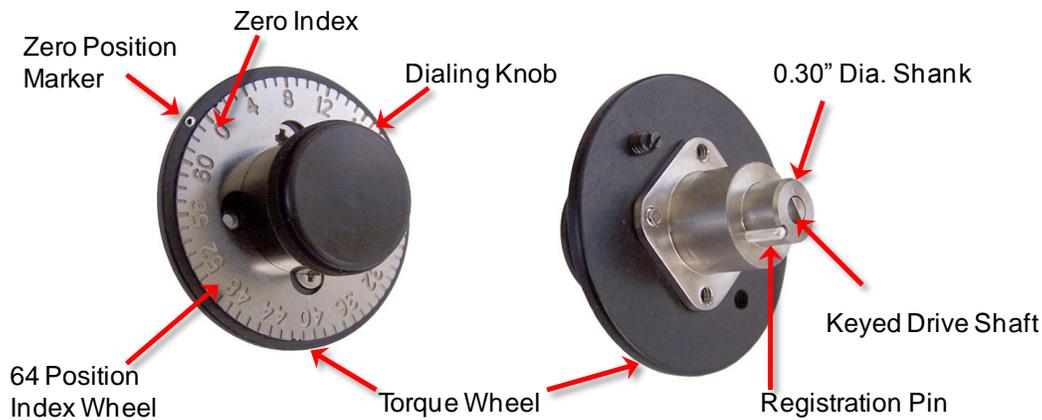


FIGURE 6

The combination for the default configuration is >>>>49,<<<<<25,>>>28,<<<13,>8,<0

*Note that small variations in the combination numbers between different default cylinder assemblies and Manual Dialers may occur due to manufacturing tolerances.*

To dial the combination of the default cylinder use the following procedure:

- 1) Align dialer registration pin with notch in front cavity of cylinder and fully insert shank into cavity.

- 2) Rotate dial until drive shaft on dialer and cylinder are engaged. Rotate dial to assure that the drive shafts are coupled. Dial should spin freely.
- 3) While observing the index wheel and zero marker, rotate the dial so that the zero index passes the zero marker **6** times (>>>>>>), continue turning knob **clockwise** and stop at **49**
- 4) Rotate dial **counterclockwise** so that the zero index passes the zero marker **5** times (<<<<<<), continue turning the dial counter clockwise and stop at **25**.
- 5) Rotate dial **clockwise** so that the zero index passes the zero marker **3** times (>>>), continue turning the dial clockwise and stop at **28**.
- 6) Rotate dial **counterclockwise** so that the zero index passes the zero marker **3** times (<<<), continue turning the dial counter clockwise and stop at **13**.
- 7) Rotate dial **clockwise** so that the zero index passes the zero marker **1** time (>), continue turning the dial clockwise and stop at **8**.
- 8) Rotate dial counter **clockwise** stop at **0**.
- 9) Gates on all discs should be aligned with sidebar.
- 10) Grip fingers on outside edge of torque wheel and turn counter clockwise to unlatch (dial and torque wheel move in unison)

## Re-Configuring The Cylinder

The RKS cylinder is a simple mechanism with a relatively low part count. No special tools or skills are required for assembly or disassembly. However, care should be taken to keep the cylinder mechanism and components free of debris. The tools required are:

- #0 Phillips Tip Screw Driver to remove the Rear
- Slotted Tip Miniature Screw Driver, Tip Width ~.055" , Tip Thickness ~.006" for the Cams
- Self-Closing Tweezers, good for handling the shims

To re-configure the cylinder; refer to assembly drawing, FIG. 2 and carefully disassemble the cylinder. Disassemble the cylinder on a clean surface. To operate properly the cylinder components must be free of any debris or foreign objects.

1 or more discs can have their cams re-arranged, however the following rules apply:

- Cams cannot occupy the same the same position on both sides of a disc
- Cams cannot occupy the same position on facing sides of adjacent discs

The cam screws are very small components so special care should be taken during handling. The thread pitch is 00-90 and they are made from 300 series stainless steel and therefore have little to no magnetic properties. Be careful not to over tighten during assembly. Over tightening may damage the head and or the threads.

Example:

Re-configuring the discs as shown in FIG. 7 yields a designation of:

[2-0], [1-0]:{7-0}, [2-0]:{8-0}, [1-0]:{7-0}, [3-0]:{7-0}, {1-0}

and a combination of:

>>>>>34<<<<56>>>61<<<36>25<0

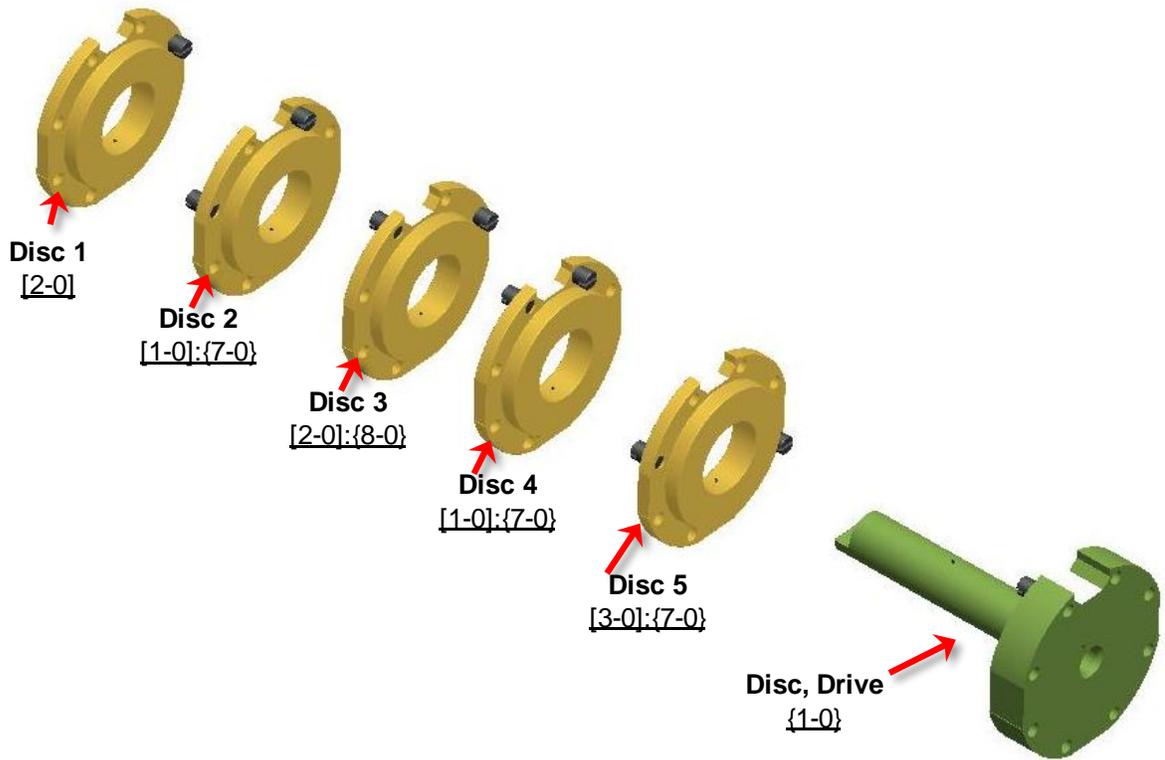


FIGURE 7

FIG. 8 is an exploded view of the re-configured cylinder with all parts except sidebar shown.

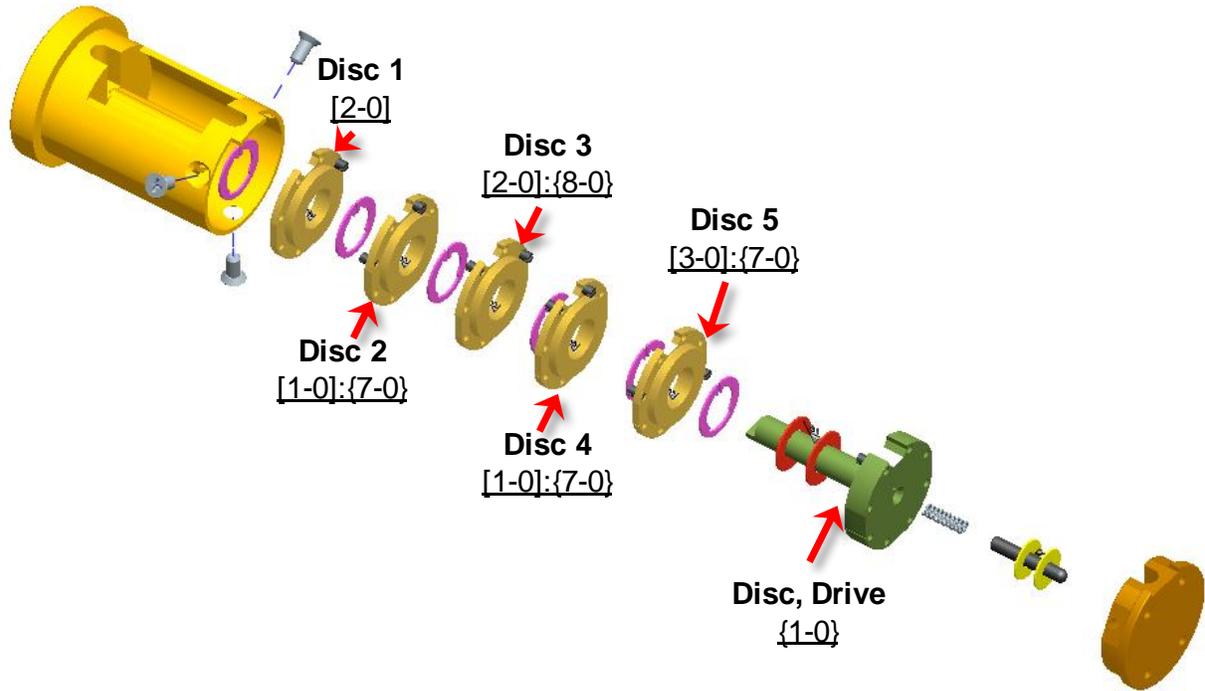


FIGURE 8

### Double Cams

To greatly increase the number of possible combinations, not only can the cams be moved to different locations but a second cam can be added to Side A and/or Side B. Adding a second Cam adds another variable, cam width. FIG. 9 illustrates the number of variations for a disc with 8 Cam mounting holes.

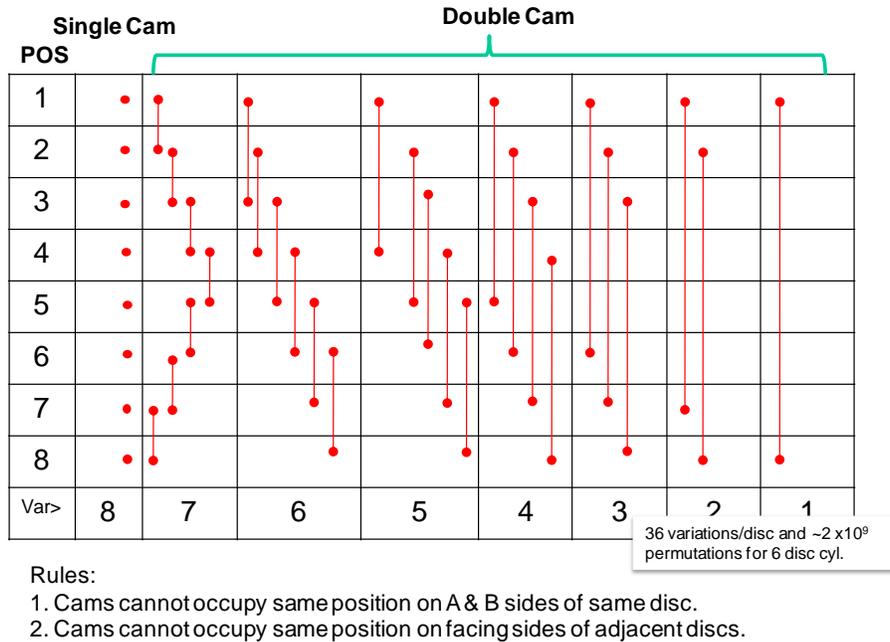


FIGURE 9

FIG. shows an example of a Disc with 2 Cams on each side, it would have the designation [2-4]:{5-6}.

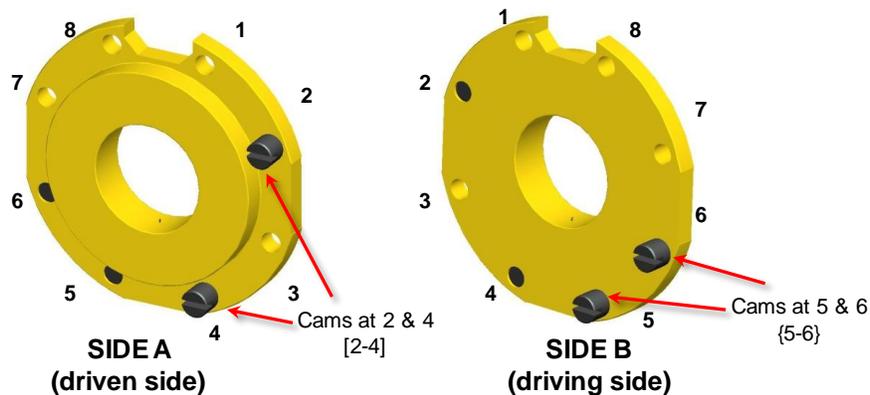


FIGURE 10

## **RKS Dialer**

### **Introduction**

The only user controls on the RKS Dialer are the power ON/OFF switch and the keypad for entering information.

The RKS Dialer is a portable electro-mechanical device that engages the RKS cylinder, once authorized (optional) the Dialer retrieves the opening combination from an onboard or database and opens the lock by driving the cylinder's discs in the proper clockwise and counter-clockwise sequence.

Because the possible features and functions for the dialer are virtually limitless (GPS, biometrics, encryption, RFID, cellular and wireless etc.), the strategy of Stanton Concepts is to provide a basic platform that includes an inexpensive and widely used PIC microcontroller (Microchip PIC16F917), motor controller, clock and EPROM and a DC servomotor. The basic dialer shown in FIG. 11 can store a multitude of lock combinations, uses PIN based access control, has programmable time out periods for specific locks and operators, and keeps a record of all activity. The dialer also has an USB interface to facilitate communication with a PC or Mac. This basic platform may be used for real world physical security applications or as a development platform.

The Dialer shown in FIG. 11 is comprised entirely of off the shelf electronic components and the PCB assembly is a low track and part density 2 sided board.

The Dialer package size can be much reduced by eliminating the keyboard and LCD and further engineering of the mechanical design.

The Robotic Dialer is a natural for Open Source development. While the lock cylinders may be part of an installed base perhaps located in uncontrolled environments the dialer is portable and free to evolve independently and in real time. There is really no limit to the technology the Robotic Dialer could employ. The dialer could also be well suited for an iPhone or similar application.

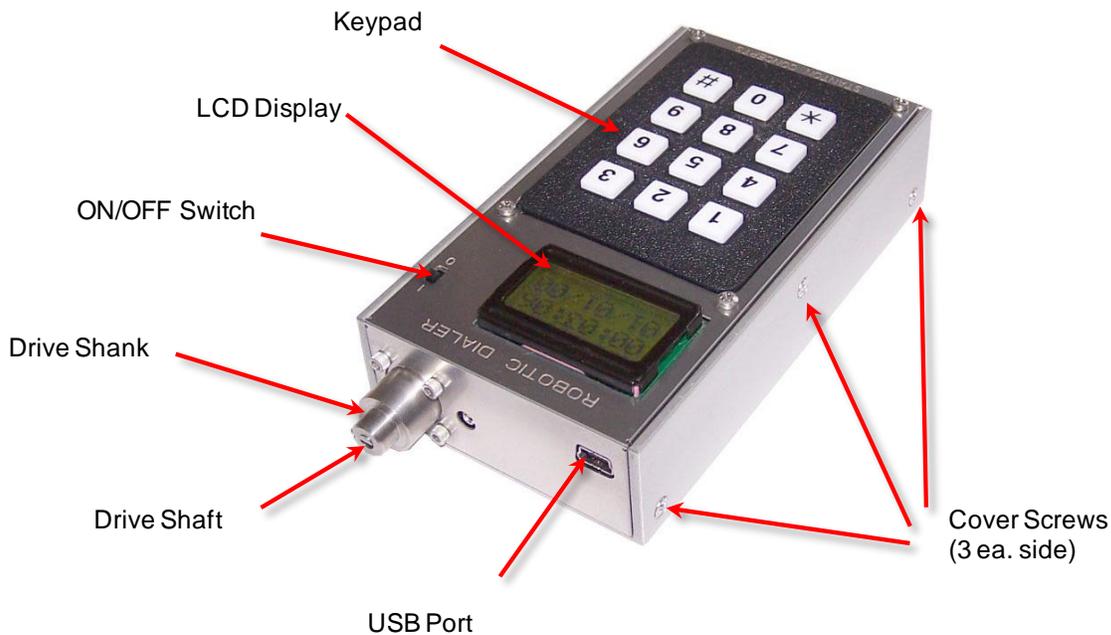


FIGURE 11

### Quick Start (To Open Cylinder With Default Configuration)

The RKS dialer is pre-programmed to open a RKS cylinder with a default number designation of “1” and a default combination; >>>>>>49,<<<<<<25,>>>28,<<<13,>8,<0 (Disc Pack = [1-0], [1-0]:{8-0}, [1-0]:{8-0}, [1-0]:{8-0}, [1-0]:{8-0}, {8-0}).

*Note: Each ‘>’ indicates ‘0’ passing the ZERO reference (12 O’clock) position in the clockwise direction one time. ‘>>>’ indicates ‘0’ passing the ZERO reference (12 O’clock) position in the clockwise direction three times. ‘<’ indicates the same thing in the counter clockwise direction. See the Manual Dialing Section for more information.*

- Turn the power switch to “ON”. The liquid crystal display (LCD) then shows “STANTON CONCEPTS” on 2 lines for 3 seconds, “RKS 1.2” and “DIALER” on 2 lines for 2 seconds, and “\*=CANCEL” on the top line for 2 seconds.
- After 5 seconds, the LCD continuously alternates between 7 seconds of the current (military) time of day in the format Hour:Minute:Second on top line with Month/Date/Year-2000 on bottom line, followed by 5 seconds of “LOCK #?” and “(#....#)” on two lines.

*Note: The time set at the factory is Eastern Standard Time and will remain so until the dialer is programmed at which time the dialer will retrieve time and date information from the programming computer.*

- To open the default lock, press the '#' key, followed by '1' key, and then the '#' key. The '\*' key at any point restarts the lock number entry process.
- Insert Align dialer registration pin with notch in front cavity of cylinder and fully insert shank into cavity.
- Press any key except '\*' key.
- The display shows "DIALING!", the countdown time is approximately 3 seconds (with accelerating beeps during the countdown), then there is 2 seconds of spinning the dialer to initialize the lock and line up the D-connectors. Next, there is a 0.5 second delay before dialing the combination. The lock is now unlocked.
- Next, the LCD displays "SCRAMBLE" and "ANY KEY" on 2 lines. Any key press causes a lock scramble after a 3 second countdown and 0.5 second delay. This is necessary to relock the lock and randomize the lock disks. The '\*' key exits the Scramble.
- Power off the RKS Dialer

## Using the Dialer

Turn the power switch to "ON". The liquid crystal display (LCD) then shows "STANTON CONCEPTS" on 2 lines for 3 seconds, "RKS 1.2" and "DIALER" on 2 lines for 2 seconds, and "\*=CANCEL" on the top line for 2 seconds.

If the Dialer has previously had 6 or more wrong Dialer passwords entered, the Dialer is frozen and cannot be used for unlocking any locks until the Control Program is used to download a new Lock Database. The LCD will then display "DIALER" and "FROZEN" on 2 lines. (Note: If the RKS Dialer password is set to 0000 by the Control Program, then no RKS Dialer password is required or requested—and there is no possibility of the Dialer being frozen by too many bad passwords.)

If a Dialer password is required (and the Dialer isn't frozen), the LCD will display "DIALER" and "PWD? #.#" on two lines. The user then uses the keypad to enter the '#' key, followed by 1-4 digits and the '#' key again. The Dialer beeps when each key is depressed. Any key other than '#' is ignored for the first digit. If you make a mistake entering the passwords digits, hit the '\*' key to restart. If keys have been depressed, but the Dialer password is not complete after 15 seconds, the LCD will start over by again asking for the Dialer password.

If the entered Dialer password is wrong but there have been less than 6 bad passwords (since the last Lock Database download), the LCD displays "DIALER" and "BAD PWD!" on 2 lines for 5 seconds, then starts over.

After the Dialer password is accepted (or if one is not required because the Dialer password = 0000), the Dialer asks which lock you want to unlock by having the LCD display “LOCK #?” and “(#...#)” on two lines.

After 5 seconds, the LCD continuously alternates between 7 seconds of the current (military) time of day in the format Hour:Minute:Second on top line with Month/Date/Year-2000 on bottom line, followed by 5 seconds of “LOCK #?” and “(#...#)” on two lines.

To specify the lock you want unlocked, press the ‘#’ key, followed by 1-4 digits, and then the ‘#’ key. The ‘\*’ key at any point restarts the lock number entry process.

If you enter an invalid lock number (one not in the Dialer’s memory), the LCD display “NO SUCH” and the lock number on 2 lines, holds for 6 seconds, and restarts the request for the lock number.

If the user entered a lock number that has been frozen out due to too many bad PINs, the LCD displays that lock number on the top line, and “FROZEN” on the bottom line for 6 seconds. The Dialer then restarts the request for the lock number. Note that all information on the relevant lock will be erased from the RKS Dialer memory after too many bad PINs.

*(Note: If the lock number is 0=00=000=0000, this means you are asking for a lock Scramble, i.e., put the lock disks in a random order. The LCD then displays “SCRAMBLE”. When you are ready to scramble the lock, hit any key except “\*” to begin the scramble countdown. Be sure to position the Dialer on the lock before the countdown is completed. The “\*” key cancels the Scramble. )*

Assuming the lock number that was entered is valid, the LCD displays the 8-character lock descriptor and “READY” on 2 lines, or else the descriptor and BLACKOUT if the day or time calls for the lock to be currently unavailable for unlocking. If blacked out, pressing any key returns to a request for a new lock number.

When ready to begin unlocking (if not blacked out), the user hits any key except “\*” (which restarts, as usual). The user then puts the dialer up against the lock prior to hitting a key. The display shows “DIALING!”, the countdown time is 3 seconds (with accelerating beeps during the countdown), then there is 2 seconds of spinning the dialer to initialize the lock and line up the D-connectors. Next, there is a 0.5 second delay before dialing the combination. The lock is now unlocked.

Next, the LCD displays “SCRAMBLE” and “ANY KEY” on 2 lines. Any key press causes a lock scramble after a 3 second countdown and 0.5 second delay. This is necessary to relock the lock and randomize the lock disks. The ‘\*’ key exits the Scramble prompt.

Powering off the RKS Dialer means that the Dialer password will be required when the Dialer is next powered up (unless the Dialer password is 0000, which is set in the Control Program discussed later).

## Inside The Dialer

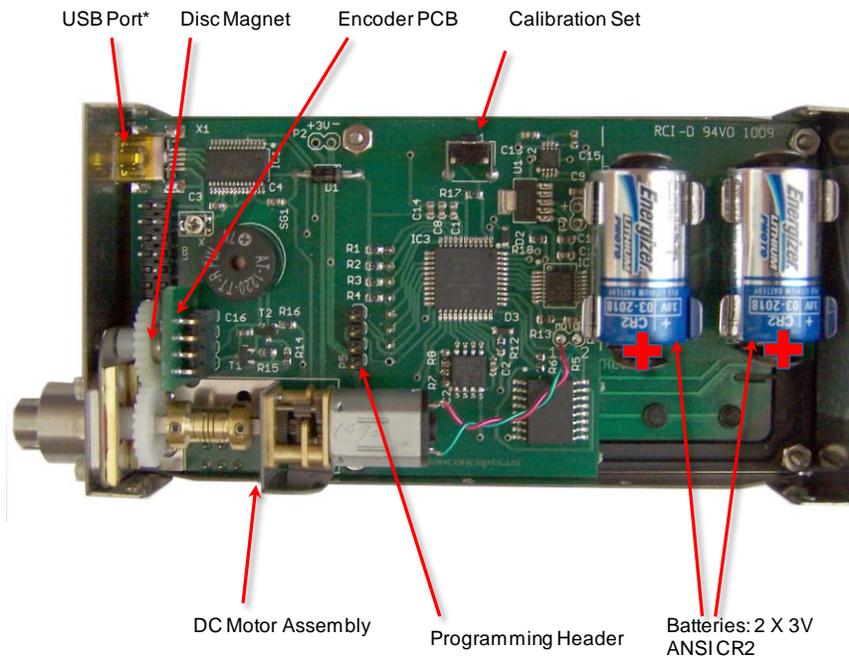


FIGURE 12

### Batteries

The Dialer uses 2 3 Volt CR2 Lithium batteries. To replace the batteries, power off the dialer, remove the cover, remove both batteries and replace. Be sure to properly orient the batteries during insertion.

### Calibration

The dialer has been calibrated (zero position set) at the factory. However, if the dialer needs to be re-zeroed use the following procedure:

- Power off dialer
- Couple dialer to a RKS cylinder where the drive disc's gate is observable. Be sure the dialer shank is registered and fully inserted into the cylinder's socket. Also make sure the dialer's drive shaft is positively coupled to the cylinder drive shaft (may need to manually turn the drive disc to achieve a positive coupling)
- With the dialer off depress the calibration set button, see FIG ##.
- With the calibration set button depressed turn on the dialer.
- Keep the calibration set button depressed until "<- #2 ->" appears on the LCD screen.
- Press the '1' key to increment the dialer 1 step clockwise

- Press the '3' key to increment the dialer 1 step counter clockwise
- The zero position is where the gate of the Drive Disc is at top center (12 O'Clock).
- Always bring the gate to the zero position from the counter clock wise direction, '3' key.
- When the gate is at it's zero position press the '2' key to set in the dialers memory.
- "DONE" appears briefly and then the dialer returns to it's normal mode and is ready to use.

## RKS Dialer Control Program Demonstration Version

### Introduction

The Control Program for the RKS Dialer is an Open Source demonstration program designed to program and extract logs from the RKS dialer. The program will work out of box on Windows 2003/XP/Vista/Win 7 as long as .net 3.0 or higher is installed (any updated computer will have these things). It will also work on mac or linux with Mono (<http://mono-project.com>).

The emphasis has been on creating a program that demonstrates various key features of the RKS lock in a simple manner, rather than being a final, fully engineered version with all possible options and features. The demo version is written in C # (C Sharp).

*(C# (pronounced "C Sharp") is a multi-paradigm programming language encompassing imperative, functional, generic, object-oriented (class-based), and component-oriented programming disciplines. It was developed by Microsoft within the .NET initiative and later approved as a standard by Ecma (ECMA-334) and ISO (ISO/IEC 23270). C# is one of the programming languages designed for the Common Language Infrastructure For more information: [http://en.wikipedia.org/wiki/C\\_Sharp\\_\(programming\\_language\)](http://en.wikipedia.org/wiki/C_Sharp_(programming_language)).)*

The Lock Database (with lock numbers, PINs, combinations, etc.) is kept in a file called 'rks.xml' and is located at ...'user'/local settings/application data/stanton concepts/rks/1.0.0.0/ . (on machines running Windows)

The user can save different versions of the database using the 'save as' command. The default database is rks.xml, other saved databases can be loaded using the 'load database' command.

Note that the Lock Database can contain information on far more locks than the maximum (25) that can currently be downloaded to the RKS Dialer. Only locks marked as "Active" prior to downloading actually have information about them sent to the RKS Dialer. Thus, one Lock Database file can be used to differently program many separate Dialers.)

### The Program

The name of the executable is rks.exe and should be located in an appropriate directory i.e. C:\programs\Stanton Concepts\RKS.

### Launching the program without the dialer connected

The program may be launched to view and edit a database with out the dialer connected.

When the program starts the following window appears:

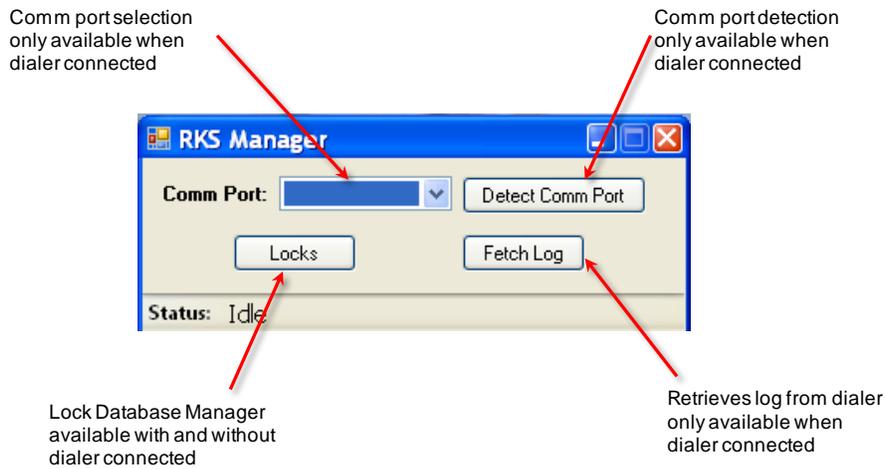


FIGURE 13

'Fetch Log' and the Comm Port functions are only available when the dialer is connected and will be discussed later.

### The Lock Database Manager Window

Clicking on the 'Locks' button will open the 'Lock Data Base Management' window:

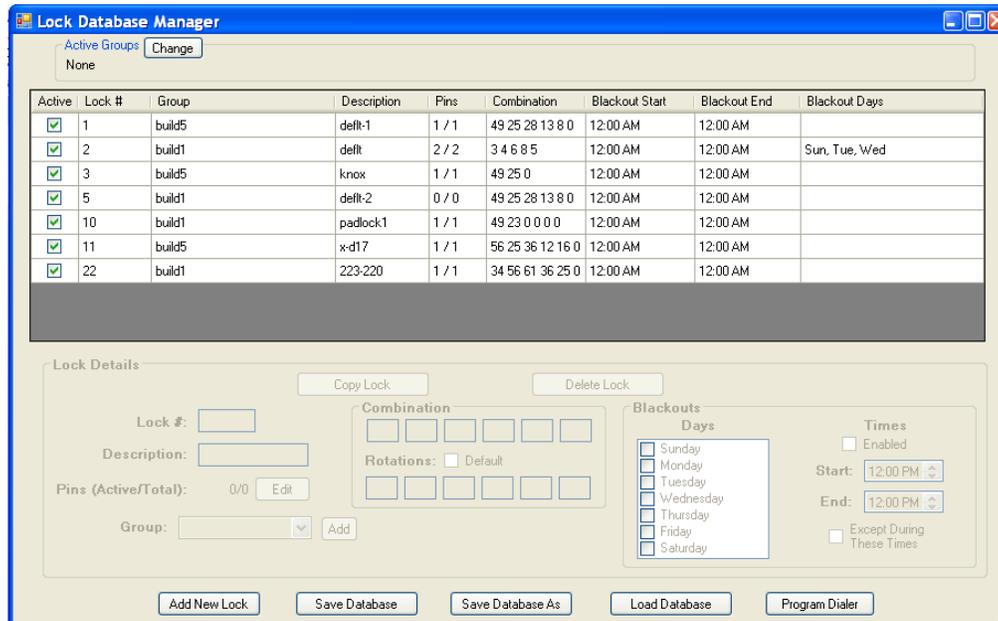


FIGURE 14

The Lock Database Manager shows the version number and database name.

The Lock Database Window is used to create, edit, and download information about various locks to the Dialer. This information includes an optional (4-digit) password for locking the Dialer, an 8-byte alphanumeric descriptor for each lock, the (4-digit) Personal Identification Numbers (PINs) that allow only authorized personnel to unlock a given lock, the lock combination for each lock, and blackout times and days when the given lock cannot be unlocked. (Note that a dialer password of 0000 or a lock PIN of 0000 means that the user of the Dialer will not be asked for a password or lock PIN, respectively.)

*Password protection and encryption were not included in this demo Control Program because they would complicate use of the program for demonstration purposes, plus there are numerous issues involved in deciding how to proceed with the encryption.*

## **Functions**

### **Lock #**

Locks are assigned a number 1-9999. The numbers do not need to be assigned sequentially. It is useful to think of the lock number as the lock's serial number.

Clicking on the header of a given column will sort that the data based on that parameter. Click on the same header again, and the data will be sorted in reverse order (ascending or descending)

### **Active**

Only locks that have an active status are programmed into the dialer when the dialer is connected and the 'Program Dialer' button is clicked (discussed later).

### **Group**

Groups basically are a quick way of toggling the active status of a lock or pin, if one or more groups are selected then all locks and pins other than those that are in the selected groups are deactivated and the groups mentioned are activated.

Allows presets for different user groups. For example a group named admin may have a non-active black out status, allowing an administrator 24/7 access to a lock.

### **Description**

The lock descriptor is limited to 8 characters because of the small size of the liquid crystal display used on the current RKS dialer. The description must include at least 1 character. Examples: "default", "Frntdoor", "GATE 1", "LKR #5" etc.

### **PINs**

Locks with a given description can have multiple PIN numbers. It is useful to think of the PIN (Personal Identification Number) as an identifier of 1 person. This is useful when you want the RKS dialer to track which person opened which lock at what time. The PIN's can be a number between 1 and 9999. A pin number of 0, 00, 000, and 0000 are the equivalent of no PIN.

The information in the PIN column shows the active PIN's and the total number of PINs for a given descriptor. Example: 1/3 indicates 1 PIN active and 3 PINs total.

PINs for a given descriptor can be added, deleted and edited by clicking the PIN edit button in the 'Lock Detail' section of the Database Manager window. Only active PINs will be downloaded to the dialer.

### **Blackouts**

Blackouts can be applied to both locks and users (PIN's). Blackouts can be for an entire day (or multiple days) as well as for a specific time range.

To assign a blackout for a given lock descriptor; click on the lock in the database window and then click on the desired blackout day(s). A different blackout time range may be assigned for each blacked out day. To assign a time range check the 'enabled' box in the time section. Hours are set by highlighting the hours and clicking the up/down buttons. Minutes and AM/PM are done the same way. "Except During These Times" is possible by checking the "Except During These Times" box.

### **Adding Locks**

New locks may be added by clicking on the "Add New Lock" button on the bottom left of the Lock Manager window. When this button is clicked a window appears and prompts the user for a new lock description. Enter a descriptor (8 characters max.) and click "OK". The Lock #, Description, PIN, Group, Combination and Blackout fields are available for editing (note: Combination fields discussed later). Click on another lock in the database field to register the entries. Click on "Save Database" (or "Save Database As") to save database.

A new lock can also be created by highlighting a lock in the database window and clicking "Copy Lock". A window appears and prompts the user for a new lock description. Enter a descriptor (8 characters max.) and click "OK". After "OK" is clicked the Lock #, Description, PIN, Group, Combination and Blackout fields are filled with the copied lock's data and are available for editing (note: Combination fields discussed later). Click on another lock in the database field to register the entries. Click on "Save Database" (or "Save Database As") to save database.

### **Combinations**

In the cylinder section of this document we discussed how the RKS cylinder can be re-configured and how the combination of the re-configured cylinder can be determined by

using the Manual Dialer and observing the alignment of the gates and recording the combination including the zero passes. Using the Lock Database Manager the re-configured lock can be created and assigned a number, a description and a PIN (optional).

The combination including the 'zero pass' information for the re-configured lock is entered using the Lock Database Manager.

*Note: there are some known bugs in the Dialer's firmware at the time of this writing. There are some combinations that do not properly execute. These are being addressed and will be fixed in subsequent versions.*

## Databases

The default database is named rks.xml and is located in a directory named /1.0.0.0/. Changes made to the database can be saved by clicking the 'Save Database' button.

Additional databases can be saved by selecting the 'Save Database As' button. When this function is selected a dialog window opens and allows the user to enter a file name and select a directory.

The 'Load Database' function allows the user to select a database to load.

## Programming the Dialer

**To program the dialer use the following procedure:**

1. Connect the dialer before launching the program using USB MINI to USB A. Connect the USB MINI to the USB port on the dialer and connect the USB A to the computer.

*Note that most microprocessors currently use RS232 serial communication including the Microchip PIC16F9117TQFP used in the dialer. Few computers nowadays, however, have serial ports To deal with this problem, the dialer uses a FTDI USB-To-Serial converter chip. See [www.ftdichip.com/FTProducts.htm](http://www.ftdichip.com/FTProducts.htm) for more information.*

*The use of this converter chip allows you to plug into the USB port of a desktop or notebook computer (Mac or PC) so that the Control Program can talk to the RKS Dialer. (In the future, microprocessors will probably automatically include USB communications capabilities.)*

*The desktop or notebook computer, however, needs to have the correct FTDI driver installed so that the Control Program can communicate with the microprocessor in the RKS dialer. You can get this driver at [www.ftdichip.com/FTDrivers.htm](http://www.ftdichip.com/FTDrivers.htm) .*

2. Launch the program and the following window appears. Select the desired COM port (note that you will most likely need to choose the highest available number).
3. Click on the “Locks” button and the Database Management window appears.
4. Locks can be edited, created, and deleted in this window. The database rks.html is loaded by default but other databases can be loaded.
5. If changes are made; save (or ‘save as’) the database.
6. Click on ‘Program Dialer’ to program the dialer. (Note that the dialer’s audit log is overwritten each time the dialer is re-programmed). Only active locks will be downloaded.
7. After a few seconds the following window will appear.
8. Disconnect the dialer
9. The dialer is now programmed and ready to use.

## Dialer Log

### To retrieve the Dialer’s Log

*(note that the dialer’s audit log is over written each time the dialer is programmed)*

1. Connect dialer to computer with USB cable.
2. Launch program
3. Select COM Port (not that you will most likely need to choose the highest number)
4. Click on “Fetch Log” after a few seconds the Dialer Log window appears. This window this window shows the history of the dialer currently connected. For a detailed view of Unlock Times for a specific lock click on the “View” button.
5. Close the Dialer Log window to return to the Database Manager Window/

The screenshot shows a window titled "Dialer Log" with a blue header bar. Below the header, it says "Bad Dailer Pins: 0". The main content is a table with the following columns: Lock Number, Description, Pin, Bad Pins, Times Unlocked, Earliest Unlock Time, Latest Unlock Time, and Unlock Times. There are three rows of data, each with a "View" button in the "Unlock Times" column.

Lock Number	Description	Pin	Bad Pins	Times Unlocked	Earliest Unlock Time	Latest Unlock Time	Unlock Times
1	delt-1	0	0	2	Fri, Aug 21 at 1:02 PM	Fri, Aug 21 at 1:02 PM	View
11	x-d17	0	0	1	Fri, Aug 21 at 1:02 PM	Fri, Aug 21 at 1:02 PM	View
22	223-220	0	0	2	Fri, Aug 21 at 9:18 AM	Fri, Aug 21 at 9:20 AM	View

FIGURE 15