

MIL-HDBK-1013/8
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MILITARY HANDBOOK

COMBINATION LOCKS



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ABSTRACT

This military handbook provides current information and guidance on correct procedures to follow for the installation, operation, and maintenance of mounted combination locks and combination padlocks. This handbook addresses both key-change and hand-change locks.

MIL-HDBK-1013/8

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MIL-HDBK-1013/8

FOREWORD

This handbook has been developed from an evaluation of facilities in the shore establishment, from surveys of the availability of new materials and construction methods, and from selection of the best design practices of the Naval Facilities Engineering Command (NAVFACENGCOC), other Government agencies, and the private sector. This handbook was prepared using, to the maximum extent feasible, national professional society, association, and institute standards. Deviations from these criteria in the planning, engineering, design, and construction of Naval shore facilities cannot be made without prior approval of NAVFACENGCOC HQ Code 04.

Design cannot remain static any more than can the functions it serves or the technologies it uses. Accordingly, recommendations for improvement are encouraged and should be furnished to Commanding Officer, Naval Civil Engineering Laboratory, Code L30, Port Hueneme, CA 93043; telephone (805) 982-1693.

THIS HANDBOOK SHALL NOT BE USED AS A REFERENCE DOCUMENT FOR PROCUREMENT OF FACILITIES CONSTRUCTION. IT IS TO BE USED IN THE PURCHASE OF FACILITIES ENGINEERING STUDIES AND DESIGN (FINAL PLANS, SPECIFICATIONS, AND COST ESTIMATES). DO NOT REFERENCE IT IN MILITARY OR FEDERAL SPECIFICATIONS OR OTHER PROCUREMENT DOCUMENTS.

MIL-HDBK-1013/8

PHYSICAL SECURITY CRITERIA MANUALS

<u>Criteria Manual</u>	<u>Title</u>	<u>PA</u>
MIL-HDBK-1013/1	Physical Security of Fixed Land-Based Facilities	NCEL
DM-13.02 LANTDIV	Commercial Intrusion Detection Systems (IDS)	
MIL-HDBK-1013/3	Bolt-On Installation and Checkout Procedures For The High-Security Hasp With Or Without Anti-Intrusion Bar Cover	NCEL
MIL-HDBK-1013/4	Instruction for Design, Fabrication, and Construction/Installation of Secure Enclosures	NCEL
MIL-HDBK-1013/5	Steel-Ply Wall Hardening Selection and Installation Guide	NCEL

MIL-HDBK-1013/8

COMBINATION LOCKS

CONTENTS

		<u>Page</u>
Section 1	INTRODUCTION.....	1
1.1	Scope.....	1
1.2	Purpose.....	1
Section 2	GENERAL.....	3
2.1	Combination Locks.....	3
2.1.1	Group 1 and 1R Locks.....	3
2.1.2	Mounted Combination Locks.....	3
2.1.3	General Operating Guidelines.....	3
2.2	Classification.....	4
2.2.1	Mounted Combination Locks.....	4
2.2.2	Combination Padlocks.....	4
Section 3	KEY-CHANGE LOCKS.....	5
3.1	General.....	5
3.2	Sargent & Greenleaf Mounted Combination Locks.....	5
3.2.1	Combination Change Keys for the R6700, 8400, and 8500 Series, as well as the 8470MP.....	5
3.2.2	8400 Series.....	7
3.2.2.1	Opening Procedure.....	9
3.2.2.2	Securing Procedure.....	9
3.2.2.3	Combination Changing Procedure.....	9
3.2.2.4	Installation Procedure.....	10
3.2.2.5	Torque Adjustment.....	12
3.2.2.6	Maintenance Recommendations.....	13
3.2.3	8500 Series.....	13
3.2.3.1	Opening Procedure.....	13
3.2.3.2	Securing Procedure.....	14
3.2.3.3	Combination Changing Procedure.....	14
3.2.3.4	Installation Procedure.....	16
3.2.3.5	Torque Adjustment.....	21
3.2.3.6	Maintenance Recommendations.....	21
3.2.4	R6700 Series.....	21
3.2.4.1	Opening Procedure.....	22
3.2.4.2	Securing Procedure.....	22
3.2.4.3	Combination Changing Procedure.....	24
3.2.4.4	Installation Procedure.....	25
3.2.4.5	Torque Adjustment.....	26
3.2.4.6	Maintenance Recommendations.....	26
3.2.5	8470MP Deadbolt With Combination Lock.....	27
3.2.5.1	Opening Procedure (8400 and 8500 Series).....	28
3.2.5.2	Securing Procedure.....	28
3.2.5.3	Combination Changing Procedure.....	31

MIL-HDBK-1013/8

	<u>Page</u>	
3.2.5.4	Strike Installation.....	32
3.2.5.5	Lock Installation Procedure (8400 Series).....	32
3.2.5.6	Lock Installation Procedure (8500 Series).....	33
3.2.5.7	Torque Adjustment.....	36
3.2.5.8	Maintenance Recommendations.....	36
3.3	Sargent & Greenleaf Combination Padlocks.....	36
3.3.1	8077AB.....	36
3.3.1.1	Opening Procedure.....	38
3.3.1.2	Securing Procedure.....	38
3.3.1.3	Combination Changing Procedure.....	38
3.3.1.4	Maintenance Recommendations.....	40
3.4	La Gard Mounted Combination Locks.....	40
3.4.1	1980-A RL.....	40
3.4.1.1	Opening Procedure - Factory-Set Combination.....	40
3.4.1.2	Opening Procedure - Previously Set Combination.....	42
3.4.1.3	Securing Procedure.....	42
3.4.1.4	Combination Changing Procedure.....	42
3.4.1.5	Installation Procedure.....	44
3.4.1.6	Maintenance Recommendations.....	45
3.5	Mosler Mounted Combination Locks.....	45
3.5.1	MRK 120.....	45
3.5.1.1	Opening Procedure.....	45
3.5.1.2	Securing Procedure.....	46
3.5.1.3	Combination Changing Procedure.....	46
3.5.1.4	Installation Procedure.....	49
3.5.1.5	Maintenance Recommendations.....	50
3.5.2	MRK 302-402.....	50
3.5.2.1	Opening Procedure.....	51
3.5.2.2	Securing Procedure.....	53
3.5.2.3	Combination Changing Procedure.....	53
3.5.2.4	Installation Procedure.....	54
3.5.2.5	Maintenance Recommendations.....	55
Section 4	HAND-CHANGE LOCKS.....	56
4.1	General.....	56
4.2	Mosler Mounted Combination Locks.....	56
4.2.1	MR 302-402.....	56
4.2.1.1	Opening Procedure.....	58
4.2.1.2	Securing Procedure.....	58
4.2.1.3	Combination Changing Procedure.....	58
4.2.1.4	Installation Procedure.....	59
4.2.1.5	Maintenance Recommendations.....	61

MIL-HDBK-1013/8

Page

FIGURES

Figure 1	Comparison Between the 6720 and 8400 Change Keys.....	5
2	Backplate With Flat Surface.....	6
3	Backplate With Raised Circular Area.....	6
4	Backplate With Raised Circular Area and Recessed Keyhole.....	6
5	Backplate With Slightly Recessed Circular Area.....	6
6	Front View, Sargent and Greenleaf 8400 Series Mounted Combination Lock.....	7
7	Exploded View, Sargent & Greenleaf 8400 Series Lock....	8
8	Sargent & Greenleaf 8400 Series With Back Cover Removed.....	12
9	Front View, Sargent and Greenleaf 8500 Series Mounted Combination Lock.....	14
10	Exploded View, Sargent and Greenleaf 8500 Series Lock..	15
11	Sargent & Greenleaf 8500 Series With Back Cover Removed.....	17
12	Sargent & Greenleaf 8500 Series, Dial, Dial Ring, and Spindle.....	19
13	Sargent & Greenleaf 8500 Series, Drive Cam with Spline Key Inserted.....	20
14	Front View, Sargent and Greenleaf R700 Series Mounted Combination Lock.....	22
15	Exploded View, Sargent & Greenleaf R6700 Series Lock...	23
16	Sargent & Greenleaf R6700 Series With Back Cover Removed.....	27
17	Front View, Sargent & Greenleaf Model 8470MP Deadbolt with Combination Lock.....	29
18	Rear View, Sargent & Greenleaf Model 8470MP Deadbolt with Combination Lock.....	29
19	Sargent & Greenleaf 8470MP, Strike No. 1.....	30
20	Sargent & Greenleaf 8470MP, Strike No. 2.....	30
21	Sargent & Greenleaf 8470MP, Strike No. 3.....	30
22	Sargent & Greenleaf 8470MP, Strike No. 9.....	30
23	Sargent and Greenleaf Model 8077AB Combination Padlock.....	37
24	Front View, La Gard Model 1980-A RL Mounted Combination Lock.....	40
25	Exploded View La Gard Model 1980-A RL.....	41
26	Change Key for the La Gard Model 1980-A RL.....	43
27	La Gard 1980-A R48 Back Plate With Change Key Inserted.....	43
28	Front View, Mosler Model MRK 120 Mounted Combination Lock.....	46
29	Exploded View, Mosler Model MRK 120.....	47

MIL-HDBK-1013/8

	<u>Page</u>
30	Change Key for the Mosler Model MRK 120..... 49
31	Mosler Model MRK 120 Backplate With Change Key in Inserted Position..... 49
32	Front View, Mosler Model MRK 302-402 Mounted Combination Lock..... 51
33	Exploded View, Mosler Model MRK 302-402..... 52
34	Change Key for the Mosler Model MRK 302-402..... 55
35	Mosler MRK 302-402 Backplate With Change Key in Inserted Position..... 55
36	Front View, Mosler Model MR 302-402 Mounted Combination Lock..... 56
37	Exploded View, Mosler Model MR 302-402..... 57
38	Mosler MR 302, Wheels..... 60
 TABLE	
Table 1	Types of Combination Locks..... 2
REFERENCES.....	63

MIL-HDBK-1013/8

Section 1: INTRODUCTION

1.1 Scope. This handbook provides basic instructions for the installation, operation, and maintenance of various mounted combination locks and combination padlocks. Also included are detailed instructions for changing and setting combinations for hand-change and key-change combination locks and combination padlocks. A list of locks included in this handbook is found in Table 1, along with other pertinent information.

As noted in Table 1, not all of the locks are currently available from the Defense Industrial Supply Center (DISC). However, those no longer stocked were at one time procured in large quantities, and are included in this military handbook. While the Sargent & Greenleaf 8500 Series and the Mosler Models MRK 302-402 and MRK 120 were not distributed by DISC, they were procured in large numbers direct from the manufacturers.

1.2 Purpose. This military handbook is for use by all personnel responsible for the installation, operation, and maintenance of mounted combination locks and combination padlocks.

MIL-HDBK-1013/8

Table 1
Types of Combination Locks

Lock	National Stock Number (NSN)	Combination Change Type	Description
Sargent & Greenleaf R6700 Series	Available from local S&G distributors	Key-change	Mounted lock, Group 2
Sargent & Greenleaf 8400 Series	5340-00-264-7592	Key-change	Mounted lock, Group 1R
Sargent & Greenleaf 8500 Series (Note 2)	Available from local S&G distributors	Key-change	Mounted lock, Group 1R
Sargent & Greenleaf 8470MP	5340-00-671-6607 5340-01-183-5952	Key-change	Mounted lock, Group 1R, Deadbolt with Combination Lock
Mosler MR(K) 302-402	Available from manufacturer (Note 1)	Key-change and hand-change	Mounted lock, Group 1R
Mosler MRK 120	Available from manufacturer (Note 1)	Key-change	Mounted lock, Group 1
La Gard Model 1980A RL	5340-00-905-4953	Key-change	Mounted lock, Group 1R
Sargent & Greenleaf 8077AB Steel Shackle 8077AB Brass Shackle	5340-00-285-6523 5340-00-285-6524	Key-change	Padlock Provides low level of Security

Notes:

- Locks, dials, and dial rings must be ordered separately.
- The 8500 Series locks are available from Sargent & Greenleaf with Group 1 wheels, but these locks are not to be used on security containers due to possibility of radiological attack.

MIL-HDBK-1013/8

Section 2: GENERAL

2.1 Combination Locks. A combination lock is any lock that requires the use of one or more movable lettered or numbered dials to align the lock components to open the lock. Mounted combination locks are those attached with screws or bolts to the container, door, or equipment that the locks secure. Combination padlocks are removable from the container or equipment that the locks secure.

Combination locks have many components that interrelate with each other. The wheels are the components inside the lock that must be aligned correctly to open the lock. On mounted combination locks and many combination padlocks, the dial is the movable metal or plastic part on the front of the lock used to turn the wheels. The wheels, spacers, and washers constitute the *wheel pack*. The *internal components of the lock* are housed in the lock case. On a mounted lock, a dial ring and dial are on the front of the door or drawer head between the dial and the lock case. The bolt projects from the case and prevents the door or drawer from opening.

2.1.1 Group 1 and 1R Locks. The Group 1 and 1R locks addressed in this handbook meet the requirements of MIL-L-15596 Series, Locks, Combination (Safe and Safe Locker). Group 1 locks have brass wheels, whereas Group 1R locks have X-ray proof (Delrin) wheels. Each lock has a thermal relock device for protection against forced entry using thermal devices. These locks, along with the Sargent & Greenleaf R6700 Series (Group 2), have a special relocking trigger for protection against punching of the spindle. If an attempt at penetration is made through either of the above-mentioned means, the trigger will automatically deadlock the unit.

2.1.2 Mounted Combination Locks. Each mounted combination lock is available with either a front-reading dial or top-reading ("spy proof") dial. The top-reading dial permits only the person dialing the combination to see the numbers involved. Each lock is furnished with a spindle that can be cut to suit varying thicknesses of doors or drawers. The spindles and drive cams are designed to allow the locks to be mounted in the right-hand, left-hand, vertical-up, or vertical-down positions.

2.1.3 General Operating Guidelines. When operating combination locks or setting combinations, always observe the following rules:

a) Never spin or jerk the dial. Always turn the dial slowly and evenly, stopping exactly on each number of the combination.

b) Passing a combination number requires restarting the entire combination sequence from the beginning.

c) Never use force. If a lock fails to operate or operates with difficulty, request assistance from a qualified locksmith.

MIL-HDBK-1013/8

d) Never close a door or drawer after setting a new combination until the new combination is worked at least three times and is recorded in accordance with security directives.

e) On a mounted three-wheel lock, there are 1,000,000 possible combinations. Some combination padlocks have as many as 125,000 possible settings. However, because of mechanical and psychological factors, not all of these combinations are valid. Specifically, follow these guidelines:

(1) No two numbers should be closer than exactly five digits apart, or multiples of ten.

(2) The third number should not range from 0 to 20 or from 85 to 100.

(3) Do not use straight ascending or descending combinations. Examples: 41-56-71, 81-58-30. It is better to use a sequence that is HIGH-LOW-HIGH or LOW-HIGH-LOW. Examples: 72-23-81, 33-67-38.

(4) All three numbers should not be even.

(5) All three numbers should not be odd.

(6) Never set a 50-25-50 combination (the standard factory combination sequence) on the lock of a container that holds classified material. When removing a container from service, set combination to 50-25-50.

(7) Do not use significant dates (birthdays, anniversaries, etc.), street addresses, telephone numbers, etc., as the basis for combinations.

(8) When locking a safe, door, or cabinet, turn the dial at least four full revolutions in one direction.

2.2 Classification

2.2.1 Mounted Combination Locks. Underwriters Laboratories' Standard UL 768, Standard for Combination Locks, classifies mounted combination locks as either Group 1, Group 1R, or Group 2. To qualify for a Group 1R rating, a lock must be manipulation, radiographic, and thermal resistant. Group 2 combination locks must be reasonably resistant to unauthorized opening.

2.2.2 Combination Padlocks. Combination padlocks are classified according to Federal Specification FF-P-110 (Series), Padlock, Changeable Combination (Resistant to Opening By Manipulation and Surreptitious Attack).

MIL-HDBK-1013/8

Section 3: KEY-CHANGE LOCKS

3.1 General. Key-change locks require no disassembly to set new combinations. To change the combination, the change key provided with the lock is inserted into a keyhole in the back coverplate. Some key-change locks have two reference marks on the dial ring. At the top of the dial ring is the opening index. A changing index may be either slightly to the left or to the right of the opening index, depending on the model. When a key-change lock has only one reference mark, the single mark is used as both the changing and opening indexes. Before the combination of any lock is changed, read the entire change procedure carefully. Read installation instructions thoroughly before beginning an installation procedure.

3.2 Sargent & Greenleaf Mounted Combination Locks

3.2.1 Combination Change Keys for the R6700, 8400, and 8500 Series, as well as the 8470MP. To change the combination, these locks require one of two different change keys (see Figure 1). For the four different backplate (back cover) styles, see Figures 2 through 5. The installed backplate style on a particular lock will determine the required change key. The first style, as shown in Figure 2, has a flat backplate. The second, shown in Figure 3, has a raised circular area. As depicted in Figure 4, the third has a raised circular area with a recessed keyhole. The fourth, shown in Figure 5, has a slightly recessed circular area.

The backplates shown in Figures 2, 4, and 5 use the 6720 change key. The 6720 key measures approximately 1-3/16 inches (30 mm) from the tip of the key to the shoulder. The backplate shown in Figure 3 uses the 8400 change key. The 8400 change key measures approximately 1-7/16 inches (36 mm) from the tip to the shoulder. Figure 1 illustrates the difference in length between the 6720 and 8400 change keys. Using the incorrect key will cause the lock to malfunction, requiring the repair services of a locksmith.

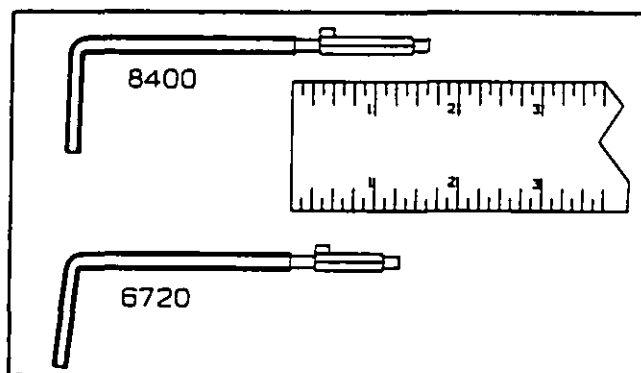


Figure 1
Comparison Between the 6720 and 8400 Change Keys

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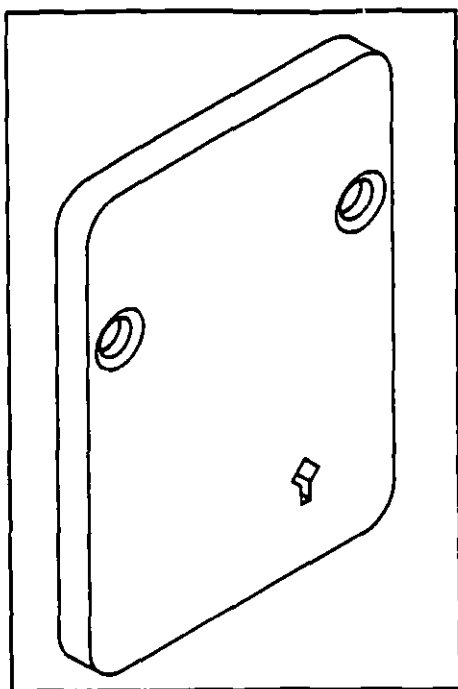


Figure 2
Backplate With Flat Surface

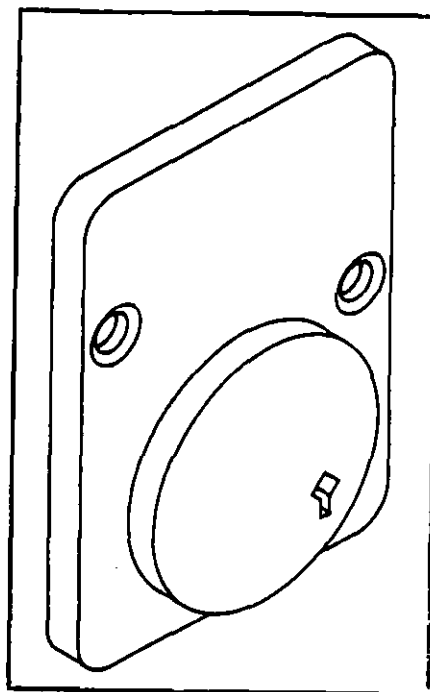


Figure 3
Backplate With Raised Circular Area

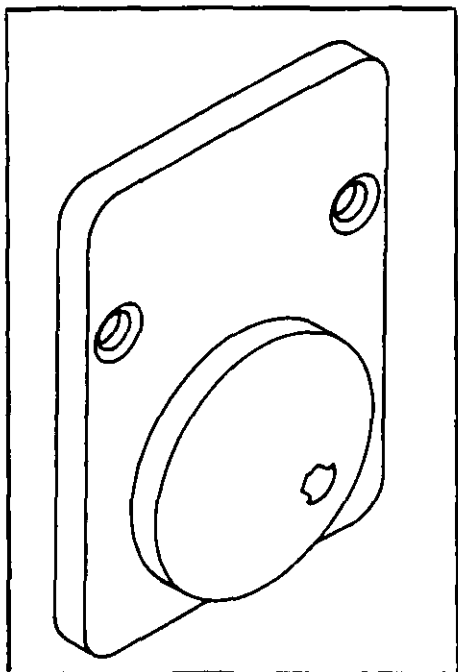


Figure 4
Backplate With Raised Circular
Area and Recessed Keyhole

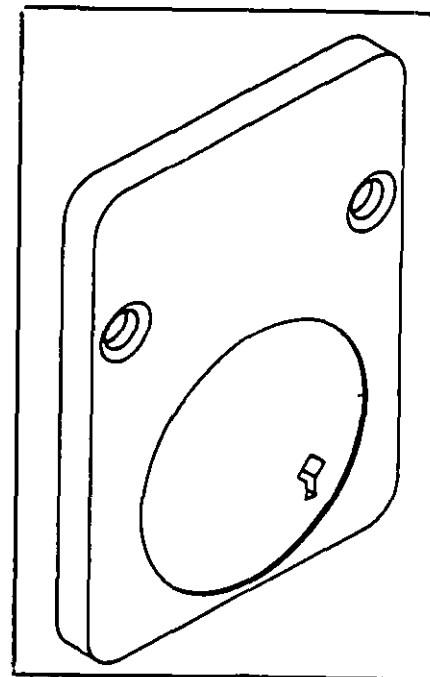


Figure 5
Backplate With Slightly
Recessed Circular Area

MIL-HDBK-1013/8

3.2.2 8400 Series. These combination locks are Group 1 or 1R locks designed to provide resistance against surreptitious opening by manipulation through the sense of touch, sound, "reading," electronic listening, and on Group 1R models, radiological attack. These locks are equipped with the universal "centi-spline" dial. This dial has a removable spindle that can be positioned to any one of 100 settings that correspond with the dial graduations. This permits the spline to be positioned to any hand condition. Each model is available with or without a metal tube that is secured to the lock case and simplifies installation by accurately aligning the dial ring index with the lock. It also protects the spindle from door insulation.

Some 8400 Series locks have a torque adjustment feature that applies precise pressure to the wheel pack to guard against vibrating or "walking" the wheels into alignment. The torque adjustment allows the dial torque to be adjusted to individual touch. An 8400 Series lock is illustrated in Figures 6 and 7.

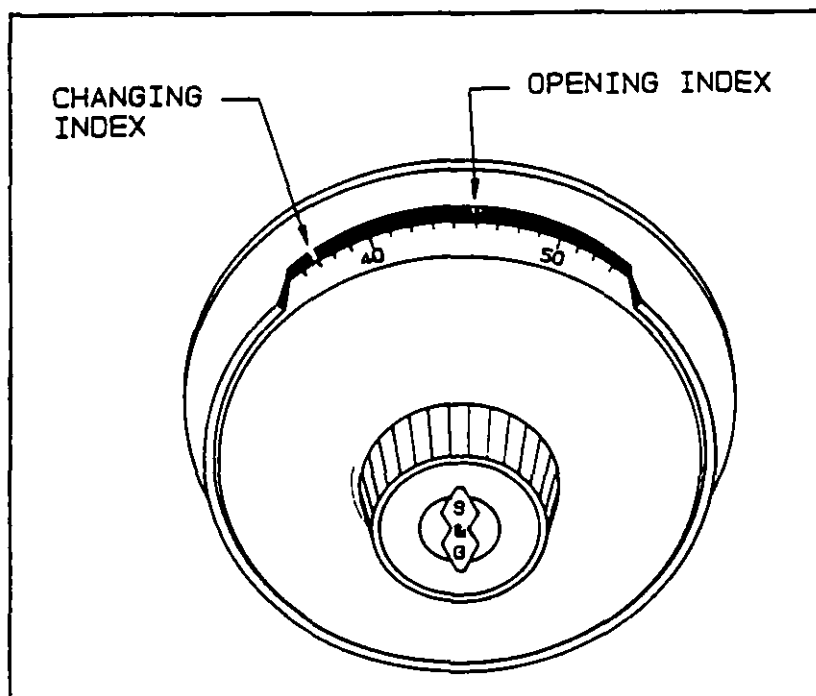


Figure 6
Front View, Sargent & Greenleaf 8400 Series Mounted
Combination Lock

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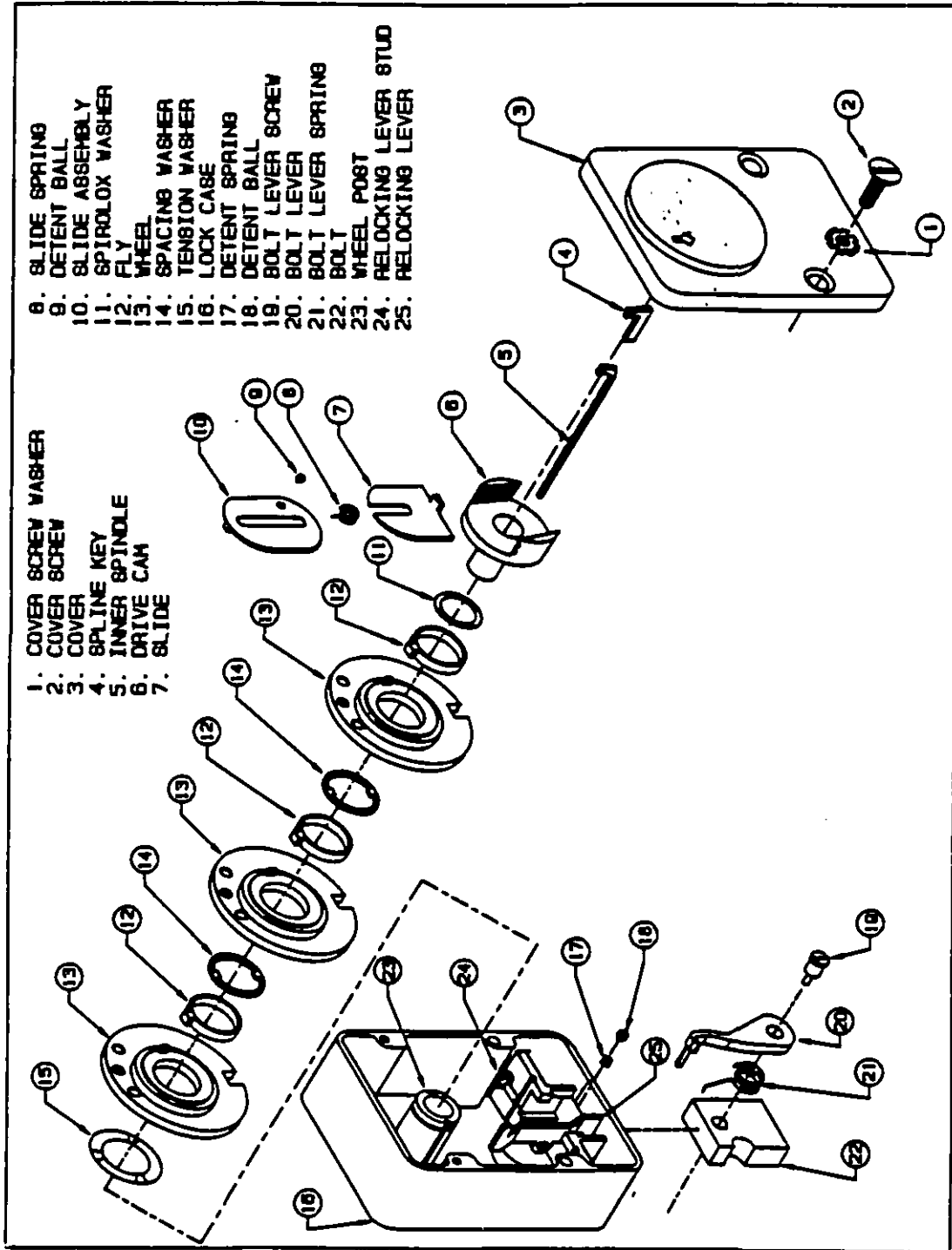


Figure 7
Exploded View, Sargent & Greenleaf 8400 Series Mounted Combination Lock

MIL-HDBK-1013/8

3.2.2.1 Opening Procedure. To open a Sargent & Greenleaf 8400 Series Combination Lock, proceed as follows:

- a) Turn the dial LEFT, stopping when the first number of the combination is aligned with the OPENING index the fourth time.
- b) Turn the dial RIGHT, stopping when the second number is aligned the third time.
- c) Turn the dial LEFT, stopping when the third number is aligned the second time.
- d) Turn the dial RIGHT to 0. Hold the dial in this position.
- e) Turn the arrow knob (butterfly) in the center of the dial RIGHT as far as it will go.

CAUTION

Ensure that the dial is held at 0 when turning the arrow knob during opening and closing. Internal spring damage can occur, requiring lock to be replaced.

f) Turn the dial to the RIGHT until it stops. The bolt is now fully retracted.

3.2.2.2 Securing Procedure. To secure the 8400 Series lock, release the arrow knob by turning it to the LEFT, then turn the dial to the LEFT at least four complete revolutions.

3.2.2.3 Combination Changing Procedure. To change a combination setting, begin by selecting a new three-number sequence based on the rules presented in paragraph 2.1.3e. Record the new combination in accordance with security directives and proceed as follows:

- a) Open the lock as described in paragraph 3.2.2.1.
- b) With the door or container open, throw the door/drawer bolt to the locked position. If the container has a bolt interlock, it will be necessary to depress the interlock plunger before the bolt can be thrown while the unit is open. Use the procedure recommended by the unit's manufacturer.
- c) Throw the locking bolt by using the procedure in paragraph 3.2.2.2.
- d) Using the CHANGING index and the old combination, turn the dial LEFT, stopping when the first number is aligned the fourth time.

MIL-HDBK-1013/8

- e) Turn the dial RIGHT, stopping when the second number is aligned the third time.
- f) Turn the dial LEFT, stopping when the third number is aligned the second time. Hold the dial in this position.
- g) Fully insert the appropriate change key in the keyhole in the back of the lock (reference paragraph 3.2.1). Rotate the key one quarter turn LEFT. This will unlock the wheels. Do not force the key.

NOTE

On some containers, it may be necessary to remove a cover or door panel to expose the back of the lock.

- h) With the key in this position, turn the dial at least four complete revolutions to erase the old combination.
- i) To set the new combination, turn the dial LEFT, stopping when the first number of the new combination is aligned with the CHANGING index the fourth time.
- j) Turn the dial RIGHT, stopping when the second number is aligned with the CHANGING index the third time.
- k) Turn the dial LEFT, stopping when the third number is aligned with the CHANGING index the second time. Hold the dial in this position.
- l) Turn the change key RIGHT and remove it from the lock. The new combination is now set.
- m) Work the new combination at least three times with the door or container open. If the lock cannot be opened using the new combination, it can be assumed that the new numbers were not set correctly. If this is the case, call a qualified locksmith.

3.2.2.4 Installation Procedure. To install a Sargent & Greenleaf 8400 Series Combination Lock, proceed as follows:

- a) Using the template (provided with lock), position lock in desired location.
- b) Using the template, drill and tap four holes in mounting plate for the lock-attaching screws (1/4-20). Drill hole in mounting plate for the spindle shaft (0.813-inch (21-mm) diameter if lock has a tube, 0.625-inch (16-mm) diameter if it does not).

MIL-HDBK-1013/8

c) Make sure the bolt is in the locked or engaged position. To accomplish this, rotate the dial left to 0. Turn the arrow knob in the center dial to 0, and rotate the dial left four revolutions, stop at a random position.

d) Remove the back cover of the lock.

If your lock is equipped with a tube, proceed with step e) below. If not, proceed to step i).

e) Insert tube and hold lock against mounting plate. Place dial ring on tube and lightly tighten tube nut.

f) Measure tube excess leaving 1/16 inch (2 mm) above tube nut.

g) Remove lock and cut off excess tube.

h) File end of tube smooth.

i) Securely fasten lock to mounting plate by installing the four lock-attaching screws and tightening.

j) While aligning hole through door, fasten dial ring to door using screws and tighten tube nut (if present on lock).

k) Insert dial into dial ring and hold snug.

l) Measure and cut off excess spindle from the wheel post, leaving 1/16 inch (2 mm) above the wheel post. Remove burrs.

m) Screw the drive cam on spindle until snug, then back off until keyway lines up. Insert the spline key with the key handle pointing away from the center of the cam (see Figure 8). Drive the spline key in carefully. If the spline key becomes loose, the lock will not function properly. Make certain that the spline key is tight.

NOTE

Before screwing dial/spindle into the drive cam for the final time, lubricate the dial, dial ring, and drive cam bearing surfaces. Sargent & Greenleaf recommends G-322L lubricant manufactured by General Electric. NEVER use oil- or petroleum-based lubricants.

n) Cut off amount from inner spindle equal to the amount removed from the spindle. Spindle excess can be inserted over inner spindle for ease of measurement.

MIL-HDBK-1013/8

- o) Rotate dial to 0 and the arrow knob to 0.
- p) Insert the inner spindle. Make sure the tip of the inner spindle seats properly into the hole in the cam slide (see Figures 7 and 8).
- q) Attach the back cover using the cover mounting screws. The lock is now ready to have the new combination set.

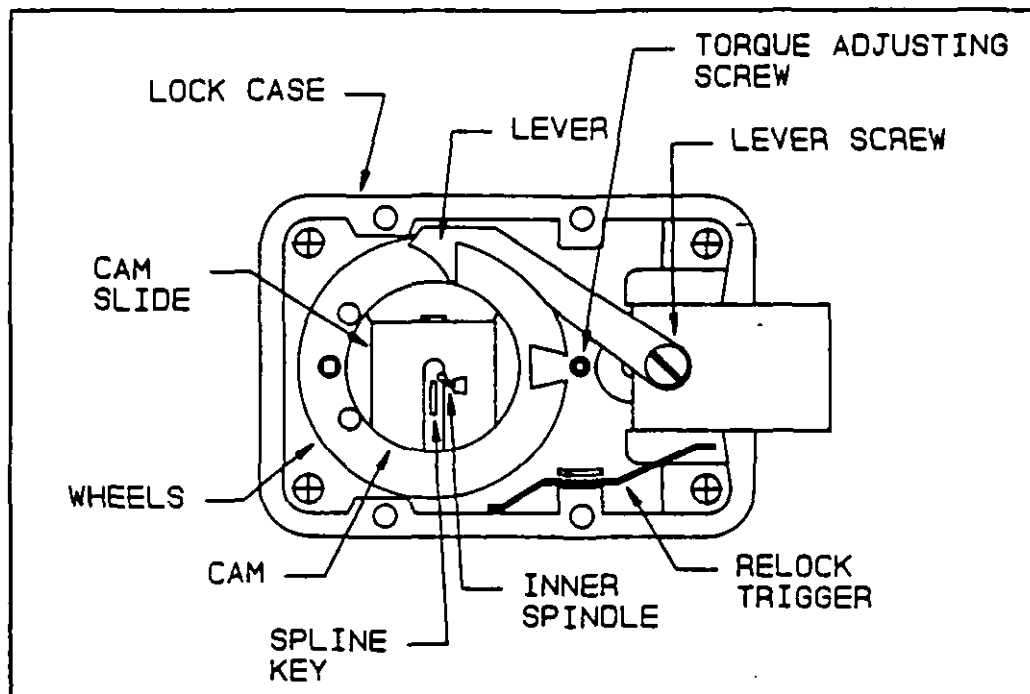


Figure 8
Sargent & Greenleaf 8400 Series With Back Cover Removed

3.2.2.5 Torque Adjustment. To adjust torque on locks equipped with an adjusting screw, remove the back cover and insert a 3/32-inch allen wrench into the adjusting screw (reference Figure 8). Turn clockwise to tighten or counterclockwise to loosen.

NOTE

Adjustment should not be less than 18 inch-ounces (0.13 N·m) nor more than 24 inch-ounces (0.17 N·m) of dialing torque (a slight drag on the dial). Whenever lock torque is changed, the combination must be reset.

MIL-HDBK-1013/8

3.2.2.6 Maintenance Recommendations. Periodic servicing will extend the life of the lock and is essential for maintaining proper security. Each time the combination is changed, inspect the lock for wear, metal filings, drilled holes, cracks, or any other visual signs of attempts to defeat the lock by forced entry techniques. The inspection process should entail removal of the back cover of the lock, and visual examination of each wheel part, as well as the cam and lever assembly, to make sure nothing is worn or damaged. If lubrication is required, use molybdenum-disulfide (powder). NEVER use oil- or petroleum-based lubricants on combination locks.

NOTE

For Sargent & Greenleaf Combination Locks, the manufacturer recommends using GE-322L lubricant manufactured by General Electric.

Each time the back cover is removed, the combination should be reset. Remember to check the combination at least three times before locking the container.

Any maintenance other than changing the combination and inspecting the lock should be referred to a qualified locksmith.

3.2.3 8500 Series. These combination locks are Group 1 or 1R locks designed for added protection against most modern methods of attack, while also providing simplicity and ease of operation. Each model is available with or without a metal tube that is secured to the lock case and simplifies installation by accurately aligning the dial ring index with the lock. It also protects the spindle from door insulation.

Some 8500 Series locks have a torque adjustment feature that applies precise pressure to the wheel pack to guard against vibrating or "walking" the wheels into alignment. The torque adjustment allows the dial torque to be adjusted to individual touch. An 8500 Series lock is illustrated in Figures 9 and 10.

3.2.3.1 Opening Procedure. To open a Sargent & Greenleaf 8500 Series Combination Lock, proceed as follows:

- a) Turn the dial LEFT, stopping when the first number of the combination is aligned with the OPENING index the fourth time.
- b) Turn the dial RIGHT, stopping when the second number is aligned the third time.
- c) Turn the dial LEFT, stopping when the third number is aligned the second time.
- d) Turn the dial RIGHT to 0.

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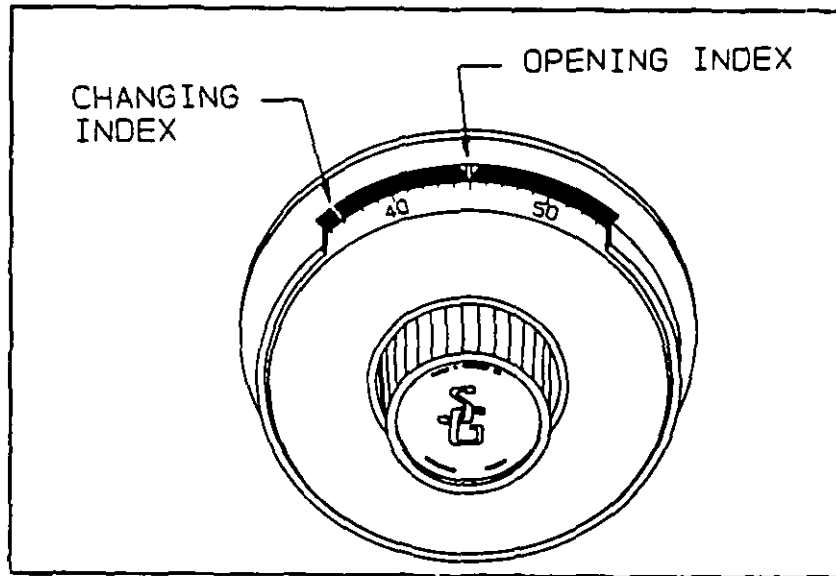


Figure 9
Front View, Sargent & Greenleaf 8500 Series Mounted
Combination Lock

e) With zero aligned with the OPENING index, push the dial IN to activate the lever assembly, release dial.

f) Turn the dial RIGHT until the bolt is fully retracted.

3.2.3.2 Securing Procedure. To secure the 8500 Series lock, turn the dial to the LEFT at least four complete revolutions.

3.2.3.3 Combination Changing Procedure. To change a combination setting, begin by selecting a new three-number sequence based on the rules presented in paragraph 2.1.3e. Record the new combination in accordance with security directives and proceed as follows:

a) Open the lock as described in paragraph 3.2.3.1.

b) With the door or container open, throw the door/drawer bolt to the locked position. If the container has a bolt interlock, it will be necessary to depress the interlock plunger before the bolt can be thrown while the unit is open. Use the procedure recommended by the unit's manufacturer.

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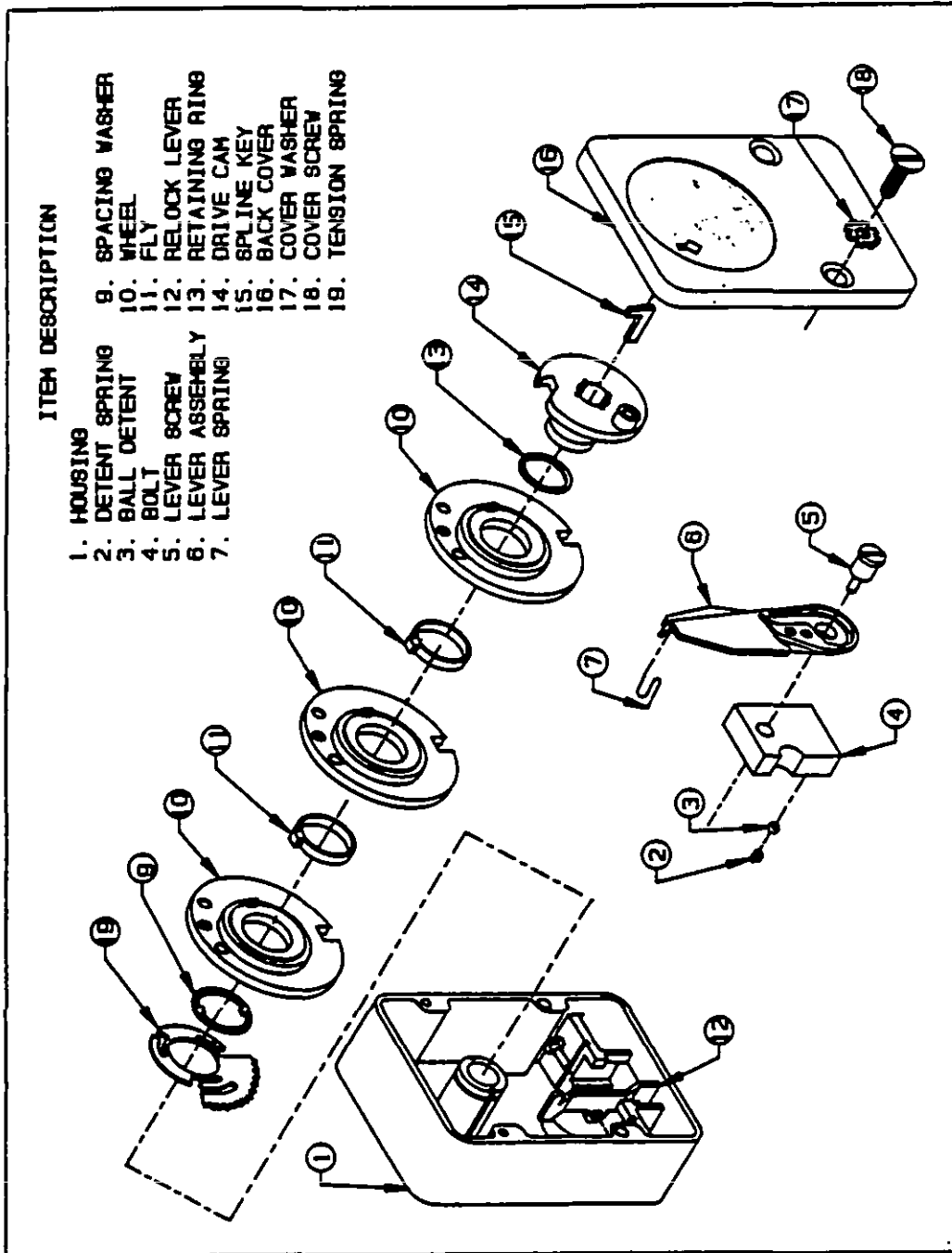


Figure 10
Exploded View, Sargent & Greenleaf 8500 Series Lock

MIL-HDBK-1013/8

c) Throw the locking bolt by using the procedure in paragraph 3.2.3.2.

d) Using the CHANGING index and the old combination, turn the dial LEFT, stopping when the first number is aligned the fourth time.

e) Turn the dial RIGHT, stopping when the second number is aligned the third time.

f) Turn the dial LEFT, stopping when the third number is aligned the second time. Hold the dial in this position.

g) Fully insert the appropriate change key in the keyhole in the back of the lock (reference paragraph 3.2.1). Rotate the key one quarter turn LEFT. This will unlock the wheels. Do not force the key.

NOTE

On some containers, it may be necessary to remove a cover or door panel to expose the back of the lock.

h) With the key in this position, turn the dial at least four complete revolutions to erase the old combination.

i) To set the new combination, turn the dial LEFT, stopping when the first number of the new combination is aligned with the CHANGING index the fourth time.

j) Turn the dial RIGHT, stopping when the second number is aligned with the CHANGING index the third time.

k) Turn the dial LEFT, stopping when the third number is aligned with the CHANGING index the second time. Hold the dial in this position.

l) Turn the change key RIGHT and remove it from the lock. The new combination is now set.

m) Work the new combination at least three times with the door or container open. If the lock cannot be opened using the new combination, it can be assumed that the new numbers were not set correctly. If this is the case, call for a qualified locksmith.

3.2.3.4 Installation Procedure. To install a Sargent & Greenleaf 8500 Series Combination Lock, proceed as follows:

a) Using the template (provided with lock), position lock in desired location.

MIL-HDBK-1013/8

b) Using the template, drill and tap four holes in mounting plate for the lock-attaching screws (1/4-20). Drill hole in mounting plate for the spindle shaft (0.813-inch (21-mm) diameter if lock has a tube, 0.625-inch (16-mm) diameter if it does not).

c) Remove the back cover of the lock.

d) Place the lock bolt in the locked or engaged position and the accelerator spring in the loaded position (Figure 11 - Note: Do not remove the drive cam).

If your lock is equipped with a tube, proceed with step e) below. If not, proceed to step h).

e) Insert tube and hold lock against the mounting plate. Place dial ring on tube and lightly tighten tube nut.

f) Measure and mark tube excess from door. Remove the lock and add 3.0 millimeters or 1/8 inch (to insert the dial ring bushing) and cut off excess tube.

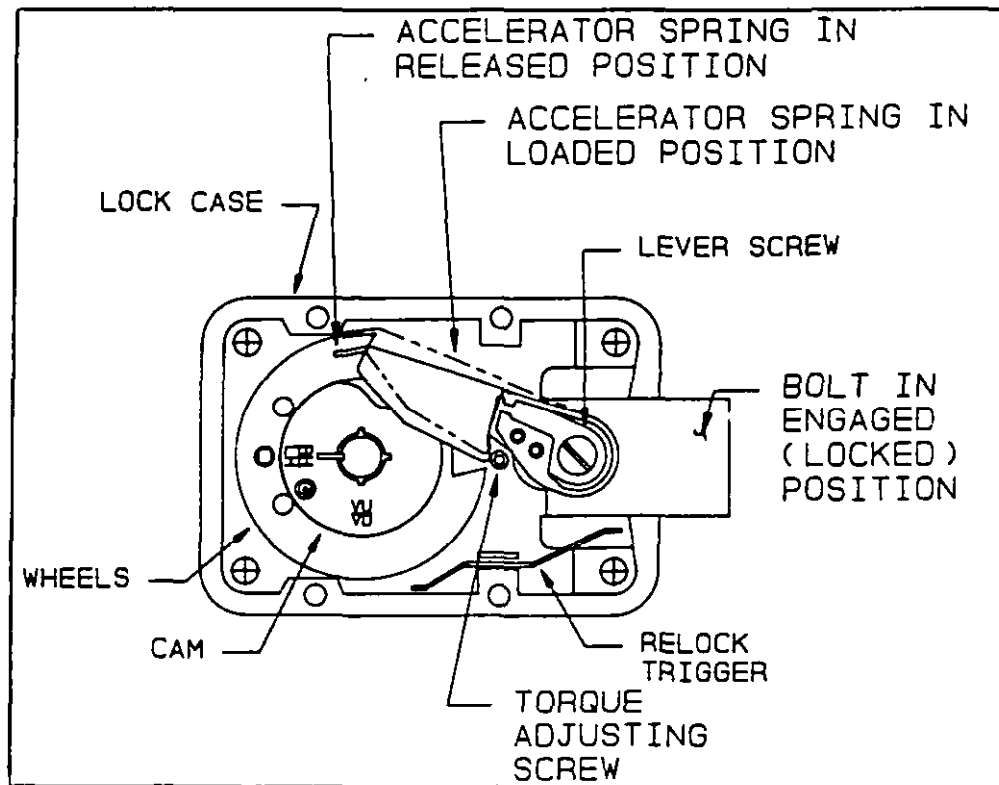


Figure 11
Sargent & Greenleaf 8500 Series With Back Cover Removed

MIL-HDBK-1013/8

- g) Remove any burrs from the end of the tube.
- h) Securely fasten the lock to mounting plate with four attaching screws and tighten.
- i) While aligning with hole in the door, lightly fasten dial ring to door using screws, and tighten tube nut (if present on lock). Dial ring opening index should be at 12 o'clock center position. Before installation of the dial ring, press the plastic bearing insert (Figure 12) into the opening in the back of the dial ring. The insert must fit flush with the dial ring.
- j) To install dial, hold the drive cam in place with one hand and thread the dial into the cam until the dial comes to a stop against the surface of the dial ring.

CAUTION

When threading dial into cam, do not allow cam to slide outward against the accelerator spring. Accelerator spring can be easily damaged in this manner.

- k) The alignment of the dial and dial ring is critical to the operation of the lock. Perfect alignment is necessary. The dial should be flush and centered with the surface of the dial ring, for true center.
- l) Measure the excess spindle that projects beyond the drive cam.
- m) Remove the dial, cut off excess spindle and remove burrs.
- n) Tighten the dial ring screws.
- o) Place a washer, compression spring, and washer on hub of dial (Figure 12).
- p) Insert dial into the lock (observe step j) CAUTION). Hold the drive cam in place to receive nose of the drop lever and thread dial into cam until the dial stops.
- q) Rotate the dial counterclockwise a MINIMUM of one full turn until the spline in the spindle is aligned with the proper spline in the cam, the cam is positioned to receive the nose of the drop lever, and the dial is on 0.

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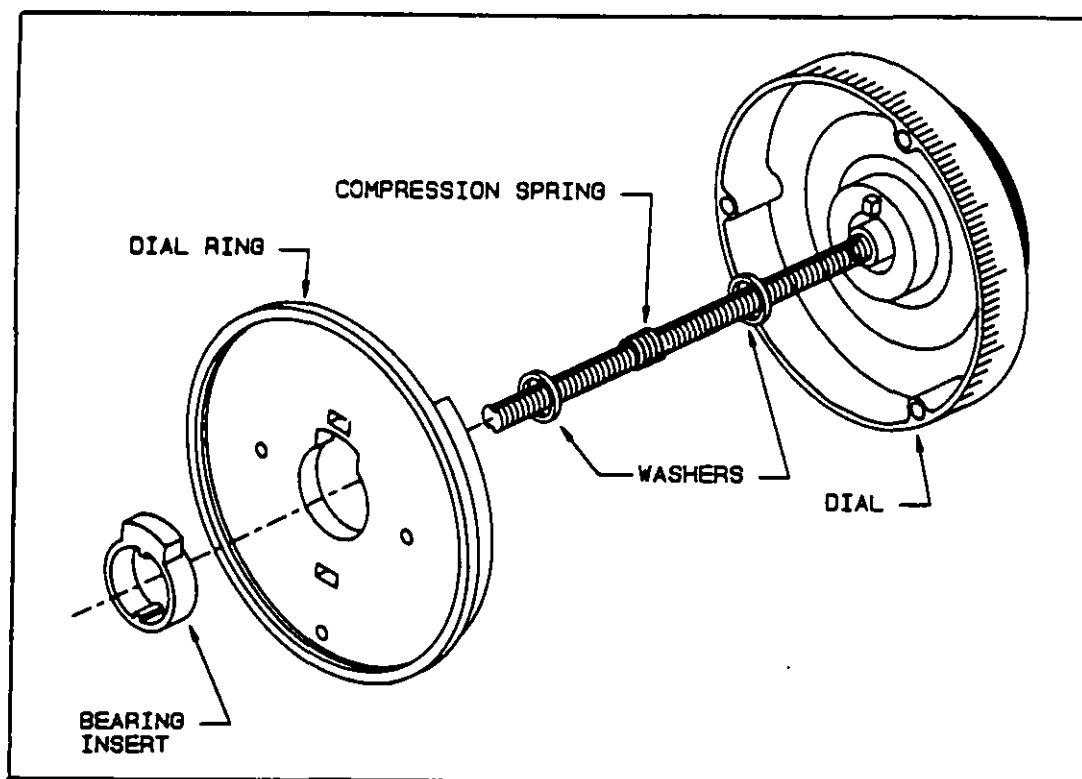


Figure 12

Sargent & Greenleaf 8500 Series, Dial, Dial Ring, and Spindle

NOTE

If the lock is mounted in the vertical-up or vertical-down position, the properly aligned spline should be marked VU/VD on the drive cam. For right- or left-hand mounting, RH/LH should be aligned (reference Figure 13).

r) Insert the spline key with the lip toward edge of cam. Tap in lightly. The dial must turn freely with no rubbing or interference.

NOTE

Before attaching cover to lock, check for proper in and out travel of dial for operation of accelerator spring.

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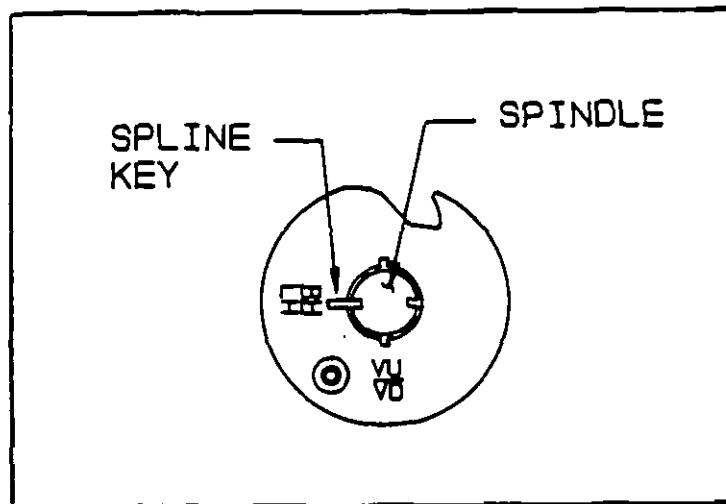


Figure 13
Sargent & Greenleaf 8500 Series, Drive Cam with
Spline Key Inserted

s) Rotate the dial at least one complete revolution and stop at 0. The accelerator spring should now be in the loaded position.

t) Hold the cover in place on the lock and push the dial in at 0. Release the dial. Remove the cover and check the position of the accelerator spring (spring should be in the released position). (If the accelerator spring is not in the released position, the dial has not been backed out of the cam far enough and the condition must be corrected. Remove spline key, hold cam and rotate dial one additional full turn counterclockwise. Reinstall the spline key and repeat steps.)

u) Rotate the dial at least one complete revolution and stop at 50. The accelerator spring should now be in the loaded position.

v) Hold the back cover in place on the lock and push the dial in at 50. The accelerator spring should not release. (If the accelerator spring does release, the spindle must be turned clockwise into the cam one complete revolution and this step must be repeated.)

w) Dial the set combination (50-25-50) on the lock and observe the drop lever falling into the drive cam. Repeat this step at least three times.

MIL-HDBK-1013/8

x) When the accelerator spring is operating properly, the cover may be attached to the lock and the new combination set.

3.2.3.5 Torque Adjustment. To adjust torque on locks equipped with an adjusting screw, remove the back cover and insert a 3/32-inch allen wrench into the adjusting screw (see Figure 11). Turn clockwise to tighten or counterclockwise to loosen.

NOTE

Adjustment should not be less than 18 inch-ounces (0.13 N·m) nor more than 24 inch-ounces (0.17 N·m) of dialing torque (a slight drag on the dial). Whenever lock torque is changed, the combination must be reset.

3.2.3.6 Maintenance Recommendations. Periodic servicing will extend the life of the lock and is essential for maintaining proper security. Each time the combination is changed, inspect the lock for wear, metal filings, drilled holes, cracks, or any other visual signs of attempts to defeat the lock by forced-entry techniques. The inspection process should include removal of the back cover of the lock, and visual examination of each wheel part, as well as the cam and lever assembly, to make sure nothing is worn or damaged. If lubrication is required, use molybdenum-disulfide (powder). NEVER use oil- or petroleum-based lubricants on combination locks.

NOTE

For Sargent & Greenleaf Combination Locks, the manufacturer recommends using GE-322L lubricant manufactured by General Electric.

Each time the back cover is removed, the combination should be reset. Remember to check the combination at least three times before locking the container.

Any maintenance, other than changing the combination and inspecting the lock, should be referred to a qualified locksmith.

3.2.4 R6700 Series. These locks, commonly referred to as "R-Locks," carry a Group 2 rating from Underwriters Laboratories. They are used only on money chests. The R6700 Series Locks have a torque adjustment feature that applies precise pressure to the wheel pack to guard against vibrating or "walking" the wheels into alignment. The torque adjustment allows the dial torque to be adjusted to individual touch. The R6700 Series is available with or without a metal tube that is secured to the lock case and

MIL-HDBK-1013/8

simplifies installation by accurately aligning the dial ring index with the lock. It also protects the spindle from door insulation. A R6700 Series lock is illustrated in Figures 14 and 15.

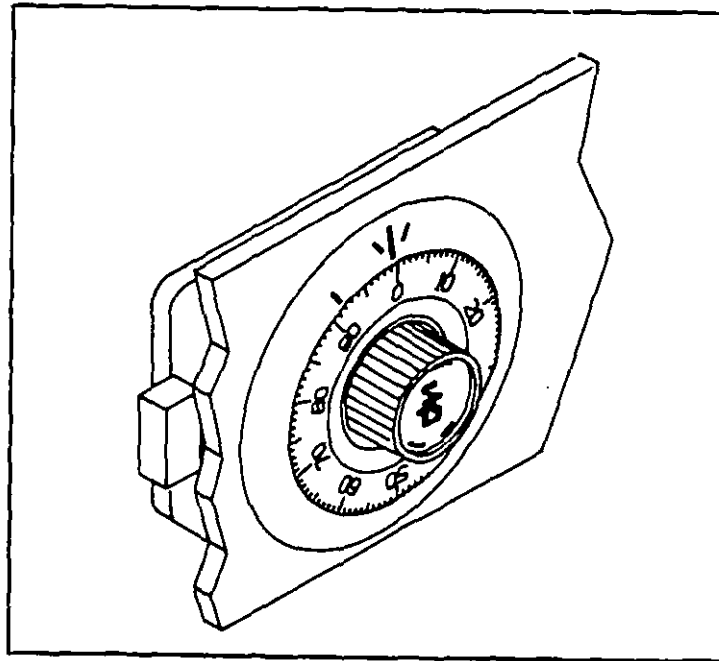


Figure 14
Front View, Sargent & Greenleaf R6700 Series Mounted
Combination Lock

3.2.4.1 Opening Procedure. To open a Sargent & Greenleaf R6700 Series Combination Lock, proceed as follows:

- a) Turn the dial LEFT, stopping when the first number of the combination is aligned with the OPENING index the fourth time.
- b) Turn the dial RIGHT, stopping when the second number is aligned the third time.
- c) Turn the dial LEFT, stopping when the third number is aligned the second time.
- d) Turn the dial RIGHT pausing momentarily at 0, and continue turning until it stops. This retracts the locking bolt.

3.2.4.2 Securing Procedure. To secure the 6700 Series lock, turn the dial to the LEFT at least four complete revolutions.

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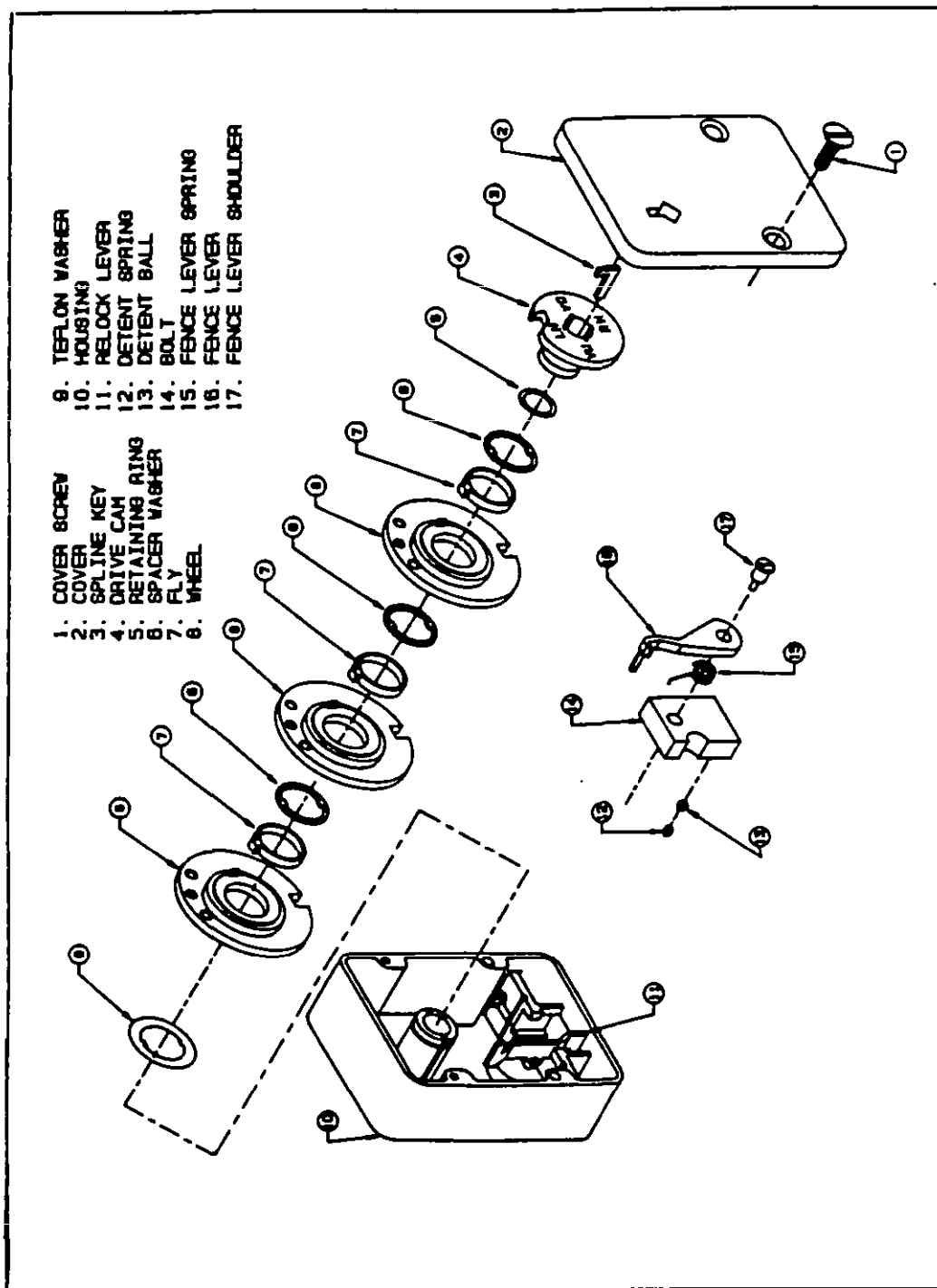


Figure 15
Exploded View, Sargent & Greenleaf R6700 Series Lock

MIL-HDBK-1013/8

3.2.4.3 Combination Changing Procedure. To change a combination setting, begin by selecting a new three-number sequence based on the rules presented in paragraph 2.1.3e. Record the new combination in accordance with security directives and proceed as follows:

- a) Open the lock as described in paragraph 3.2.4.1.
- b) With the door or container open, throw the door/drawer bolt to the locked position. If the container has a bolt interlock, it will be necessary to depress the interlock plunger before the bolt can be thrown while the unit is open. Use the procedure recommended by the unit's manufacturer.
- c) Throw the locking bolt by using the procedure in paragraph 3.2.4.2
- d) Using the CHANGING index and the old combination, turn the dial LEFT, stopping when the first number is aligned the fourth time.
- e) Turn the dial RIGHT, stopping when the second number is aligned the third time.
- f) Turn the dial LEFT, stopping when the third number is aligned the second time. Hold the dial in this position.
- g) Fully insert the appropriate change key in the keyhole in the back of the lock (reference paragraph 3.2.1). Rotate the key one quarter turn LEFT. This will unlock the wheels. Do not force the key.

NOTE

On some containers, it may be necessary to remove a cover or door panel to expose the back of the lock.

- h) With the key in this position, turn the dial at least four complete revolutions to erase the old combination.
- i) To set the new combination, turn the dial LEFT, stopping when the first number of the new combination is aligned with the CHANGING index the fourth time.
- j) Turn the dial RIGHT, stopping when the second number is aligned with the CHANGING index the third time.
- k) Turn the dial LEFT, stopping when the third number is aligned with the CHANGING index the second time. Hold the dial in this position.

MIL-HDBK-1013/8

l) Turn the change key RIGHT and remove it from the lock. The new combination is now set.

m) Work the new combination at least three times with the door or container open. If the lock cannot be opened using the new combination, it can be assumed that the new numbers were not set correctly. If this is the case, call for a qualified locksmith.

3.2.4.4 Installation Procedure. To install a Sargent & Greenleaf R6700 Series Combination Lock, proceed as follows:

a) Using the template (provided with lock), position lock in desired location.

b) Using the template, drill and tap four holes in mounting plate for the lock-attaching screws (1/4-20). Drill hole in mounting plate for the spindle shaft (0.813-inch (21-mm) diameter if lock has a tube, 0.625-inch (16-mm) diameter if it does not).

c) Make sure the bolt is in the locked or engaged position. Depending on the model of your lock, this can be done by pulling the bolt out with your fingers or by rotating the dial to the left four complete revolutions, and stopping at random.

d) Remove the back cover of the lock.

If your lock is equipped with a tube, proceed with step e). If not, proceed to step i).

e) Insert tube and hold lock against mounting plate. Place dial ring on tube and lightly tighten tube nut.

f) Measure tube excess, leaving 7/64 inch (3 mm) above tube nut.

g) Remove lock and cut off excess tube.

h) File end of tube smooth.

i) Securely fasten lock to mounting plate by installing the four lock-attaching screws and tightening.

j) While aligning hole through door, fasten dial ring to door using screws and tighten tube nut (if present on lock).

k) Insert dial into dial ring and hold snug.

MIL-HDBK-1013/8

l) Measure and cut off excess spindle from the wheel post, leaving 1/16 inch (2 mm) above the wheel post. Remove burrs.

m) Screw the drive cam onto spindle until snug, then back off until the appropriate slot in the drive cam lines up with the keyway of the spindle. Drive cam slots are labeled RH (right-hand), LH (left-hand), VU (vertical-up), and VD (vertical-down) for the four different mounting positions (reference Figures 15 and 16).

n) Insert the spline key with the key handle pointing away from the center of the cam. Drive the spline key in carefully. If the spline key becomes loose, the lock will not function properly. Make certain that the spline key is tight.

NOTE

Before screwing dial/spindle into the drive cam for the final time, lubricate the dial, dial ring, and drive cam bearing surfaces. Sargent & Greenleaf recommends G-322L lubricant manufactured by General Electric. NEVER use oil- or petroleum-based lubricants.

o) Attach the back cover using the cover mounting screws. The lock is now ready to have the new combination set.

3.2.4.5 Torque Adjustment. To adjust torque, remove the back cover and insert a 3/32-inch allen wrench into the adjusting screw (see Figure 16). Turn clockwise to tighten or counterclockwise to loosen.

NOTE

Adjustment should not be less than 18 inch-ounces (0.13 N·m) nor more than 24 inch-ounces (0.17 N·m) of dialing torque (a slight drag on the dial). Whenever lock torque is changed, the combination must be reset.

3.2.4.6 Maintenance Recommendations. Periodic servicing will extend the life of the lock and is essential for maintaining proper security. Each time the combination is changed, inspect the lock for wear, metal filings, drilled holes, cracks, or any other visual signs of attempts to defeat the lock by forced entry techniques. The inspection process should include removal of the back cover of the lock, and visual examination of each wheel part, as well as the cam and lever assembly, to make sure nothing is worn or damaged. If lubrication is required, use molybdenum-disulfide (powder). NEVER use oil- or petroleum-based lubricants on combination locks.

MIL-HDBK-1013/8

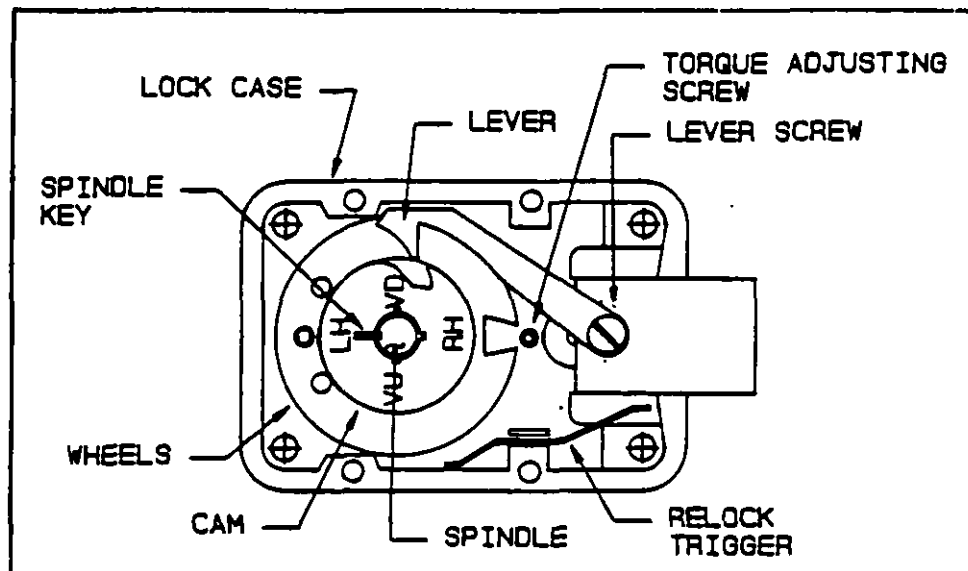


Figure 16
Sargent & Greenleaf R6700 Series With Back Cover Removed

NOTE

For Sargent & Greenleaf Combination Locks, the manufacturer recommends using GE-322L lubricant manufactured by General Electric.

Each time the back cover is removed, the combination should be reset. Remember to check the combination at least three times before locking the container.

Any maintenance other than changing the combination and inspecting the lock should be referred to a qualified locksmith.

3.2.5 8470MP Deadbolt with Combination Lock. The 8470 is a reversible, surface-mounted lock recommended for use on doors in high-security areas. It is really two locks in one: a deadbolt and a combination lock. The deadbolt section of the 8470 includes hardened steel pins and an interlocking strike and frame to prevent jamming or spreading of the door frame. The lock has an automatic deadbolt trigger and an inside release knob that allows opening the door from the inside. A 1/8-inch (3.2-mm) drill-resistant hard plate is available for installation between the Sargent & Greenleaf 8470 and the door. The 8470 is designed for use with the Sargent & Greenleaf 8400 and 8500 Series Combination Locks. The 8470 is equipped with a lock-open latch. This latch allows the dial to be "locked"

MIL-HDBK-1013/8

in the unlocked position. This is a standard feature on the newer 8470s. Existing locks can be retrofitted for this latch. The 8470 is illustrated in Figures 17 and 18. Strikes authorized for use with the Sargent & Greenleaf 8470 are illustrated in Figures 19 through 22.

3.2.5.1 Opening Procedure (8400 and 8500 Series). To open a Sargent & Greenleaf 8470MP Lock, proceed as follows:

- a) Turn the dial LEFT, stopping when the first number of the combination is aligned with the OPENING index the fourth time.
- b) Turn the dial RIGHT, stopping when the second number is aligned the third time.
- c) Turn the dial LEFT, stopping when the third number is aligned the second time.
- d) Turn the dial RIGHT to 0. Hold the dial in this position.

If the 8470MP has an 8400 Series Combination Lock:

- e) Turn the arrow knob (butterfly) in the center of the dial RIGHT as far as it will go.

CAUTION

Ensure the dial is held at zero when turning the arrow knob during opening and closing. Internal spring damage can occur, requiring lock to be replaced.

- f) Turn the dial to the RIGHT until it stops. The bolt is now fully retracted.

If the 8470MP has an 8500 Series Combination Lock, do the following:

- e) With zero aligned with the OPENING index, push the dial in to activate the lever assembly, release dial.
- f) Turn the dial RIGHT until the bolt is fully retracted.

3.2.5.2 Securing Procedure. To secure the 8470MP lock, turn the dial to the LEFT at least four complete revolutions.

MIL-HDBK-1013/8

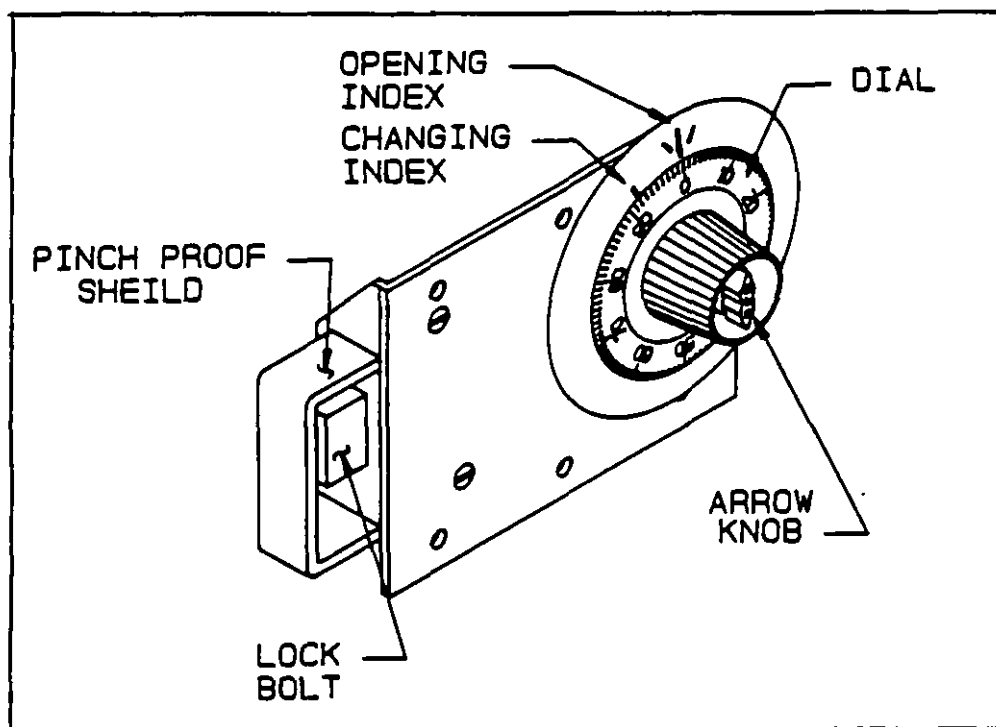


Figure 17
Front View, Sargent & Greenleaf 8470MP Deadbolt with
Combination Lock

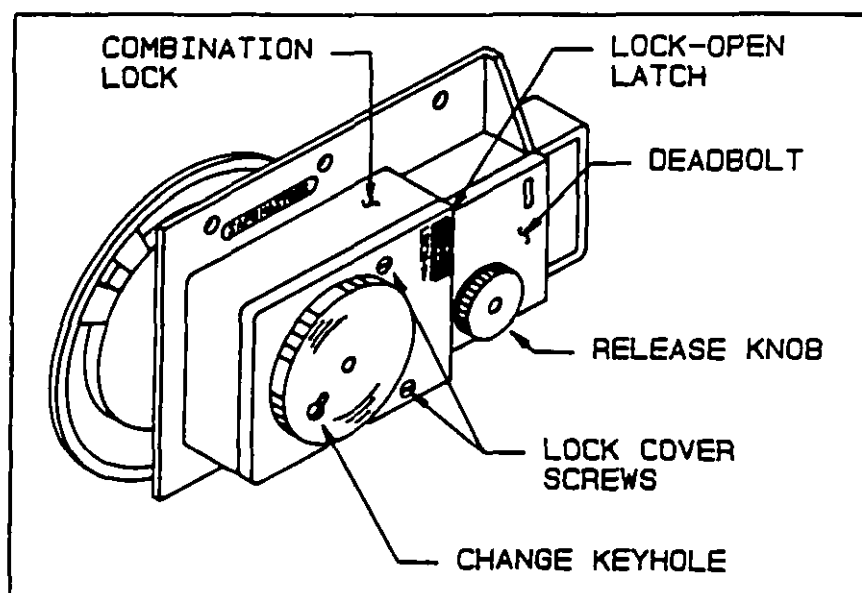


Figure 18
Rear View, Sargent & Greenleaf 8470MP Deadbolt with
Combination Lock

MIL-HDBK-1013/8

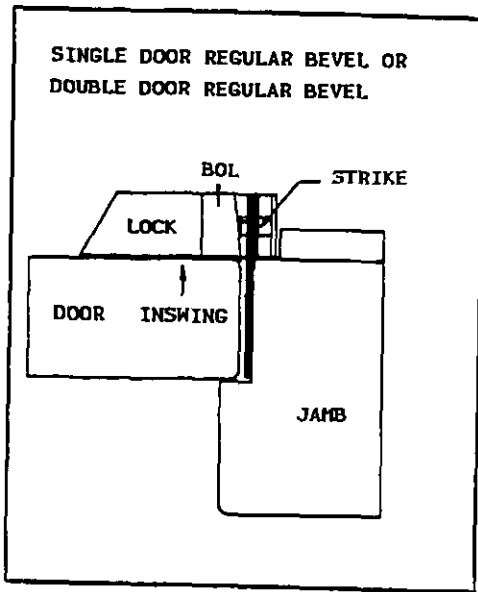


Figure 19
Sargent & Greenleaf 8470MP,
Strike No. 1

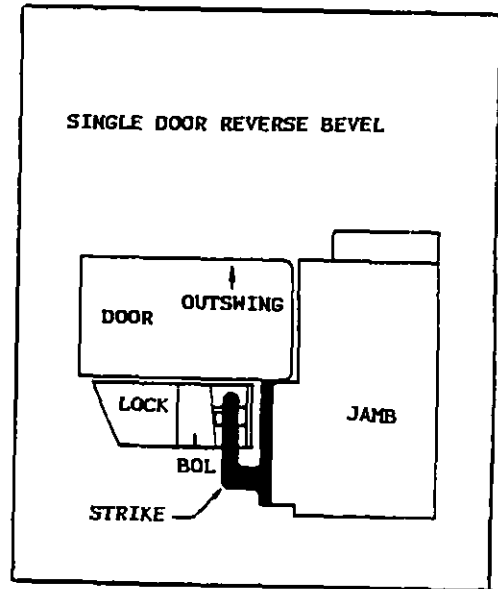


Figure 20
Sargent & Greenleaf 8470MP,
Strike No. 2

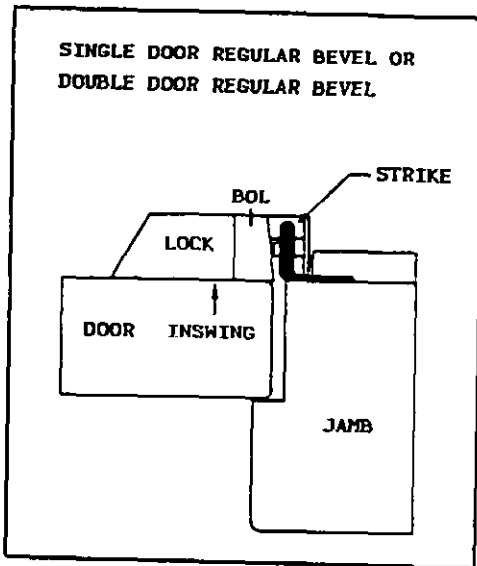


Figure 21
Sargent & Greenleaf 8470MP,
Strike No. 3

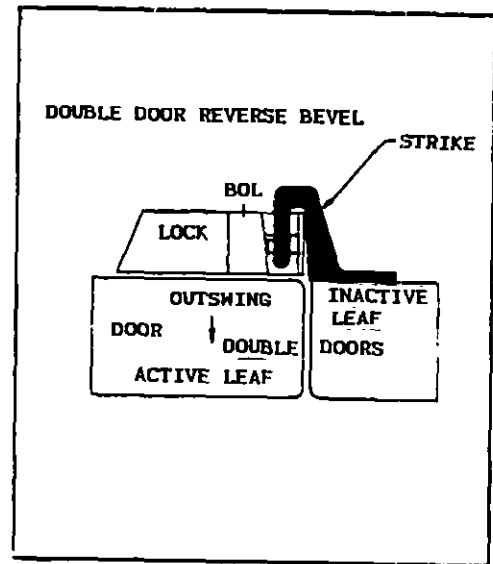


Figure 22
Sargent & Greenleaf 8470MP,
Strike No. 9

MIL-HDBK-1013/8

3.2.5.3 Combination Changing Procedure. To change a combination setting, begin by selecting a new three-number sequence based on the rules presented in paragraph 2.1.3e. Record the new combination in accordance with security directives and proceed as follows:

- a) Open the lock as described in paragraph 3.2.5.1.
- b) With the door or container open, throw the door/drawer bolt to the locked position. If the container has a bolt interlock, it will be necessary to depress the interlock plunger before the bolt can be thrown while the unit is open. Use the procedure recommended by the unit's manufacturer.
- c) Throw the locking bolt by using the procedure stated in paragraph 3.2.5.2.
- d) Using the CHANGING index and the old combination, turn the dial LEFT, stopping when the first number is aligned the fourth time.
- e) Turn the dial RIGHT, stopping when the second number is aligned the third time.
- f) Turn the dial LEFT, stopping when the third number is aligned the second time. Hold the dial in this position.
- g) Fully insert the appropriate change key in the keyhole in the back of the lock (reference paragraph 3.2.1). Rotate the key one quarter turn LEFT. This will unlock the wheels. Do not force the key.

NOTE

On some containers, it may be necessary to remove a cover or door panel to expose the back of the lock.

- h) With the key in this position, turn the dial at least four complete revolutions to erase the old combination.
- i) To set the new combination, turn the dial LEFT, stopping when the first number of the new combination is aligned with the CHANGING index the fourth time.
- j) Turn the dial RIGHT, stopping when the second number is aligned with the CHANGING index the third time.
- k) Turn the dial LEFT, stopping when the third number is aligned with the CHANGING index the second time. Hold the dial in this position.

MIL-HDBK-1013/8

l) Turn the change key RIGHT and remove it from the lock. The new combination is now set.

m) Work the new combination at least three times with the door or container open. If the lock cannot be opened using the new combination, it can be assumed that the new numbers were not set correctly. If this is the case, call for a qualified locksmith.

3.2.5.4 Strike Installation. Strikes designed for use with the Sargent & Greenleaf 8470MP are illustrated in Figures 19 through 22.

a) Using the template provided with the strike, position the strike on door jamb or inactive leaf of double door configuration (depending on which strike is being used).

b) Drill holes for attaching the strike using No. 25 drill bit (0.149-inch (4-mm) diameter).

c) Using No. 10 flat head machine screws, install the strike on the door jamb (for strike No. 1, 2, or 3), or on the inactive leaf of the double door configuration (for strike No. 9).

3.2.5.5 Lock Installation Procedure (8400 Series). The Sargent & Greenleaf 8470MP is designed for use with the Sargent & Greenleaf 8400 and 8500 Series Combination Locks. If the 8470 is equipped with an 8400 Series lock, proceed with step a) below. If it has an 8500 Series lock, refer to the procedure in paragraph 3.2.5.6.

a) Use the center of the strike as a reference to position the lock template on the door.

b) Using the template (provided with lock), drill the six 8470 deadbolt base-attaching screw holes (0.149-inch (4-mm) diameter for self-tapping screws). Drill the hole for the spindle shaft (0.813-inch (21-mm) diameter if lock has a tube, 0.625-inch (16-mm) diameter if lock does not).

c) Securely fasten the 8470 deadbolt base and drill resistant hard plate to the door by tightening the attaching screws.

If the lock has a tube, proceed with step d). If not, go to step j).

d) Make sure bolt is in the locked or engaged position. To accomplish this, rotate the dial left to 0. Turn the arrow knob in the center dial to 0, and rotate the dial left four revolutions, stop at random.

e) Remove back cover of the lock.

f) Insert tube and hold lock against the 8470 deadbolt base. Place dial ring on tube and tighten tube nut.

MIL-HDBK-1013/8

- g) Measure tube excess, leaving 1/16 inch (2 mm) above tube nut.
- h) Remove lock and cut off excess tube.
- i) File end of tube smooth.
- j) Securely fasten lock to the 8470 deadbolt base by installing the four lock-attaching screws and tightening.
- k) Fasten dial ring to door using screws and tighten tube nut (if present on lock) and align with hole through door.
- l) Insert dial into dial ring and hold snug.
- m) Measure and cut off excess spindle from the wheel post, leaving 1/16 inch (2 mm) above the wheel post. Remove burrs.
- n) Screw the drive cam on spindle until snug, then back off until the keyway lines up. Insert the spline key with the key handle pointing away from the center of the cam. Drive the spline key in carefully. If the spline key becomes loose, the lock will not function properly. Make certain that the spline key is tight.

NOTE

Before screwing dial/spindle into the drive cam for the final time, lubricate the dial, dial ring, and drive cam bearing surfaces. Sargent & Greenleaf recommends G-322L lubricant manufactured by General Electric. NEVER use oil- or petroleum-based lubricants.

- o) Cut off amount from inner spindle equal to the amount removed from the spindle. Spindle excess can be inserted over inner spindle for ease of measurement.
- p) Rotate dial to 0 and the arrow knob to 0.
- q) Insert the inner spindle. Make sure the tip of the inner spindle seats properly into the hole in the cam slide (see Figures 7 and 8).
- r) Attach the back cover using the cover mounting screws.

3.2.5.6 Lock Installation Procedure (8500 Series). The following procedure is for an 8470MP lock equipped with an 8500 Series combination lock.

- a) Use the center of the strike as a reference to position the lock template on the door.

MIL-HDBK-1013/8

b) Using the template (provided with lock), drill the six 8470 deadbolt base-attaching screw holes (0.149-inch (4-mm) diameter for self tapping screws). Drill the hole for the spindle shaft (0.813-inch (21-mm) diameter if lock has a tube, 0.625-inch (16-mm) diameter if lock does not).

c) Securely fasten the 8470 deadbolt base and drill resistant hard plate to the door by tightening the screws.

If the lock has a tube proceed with step d) below. If not, go to step i).

d) Remove the back cover of the lock.

e) Place the lock bolt in the locked or engaged position and the accelerator spring in the loaded position. (Figure 11 - Note: Do not remove the drive cam.)

f) Insert tube and hold lock against the 8470 deadbolt base. Place dial ring on tube and lightly tighten tube nut.

g) Measure and mark tube excess from door. Remove the lock and add 3.0 millimeters or 1/8 inch (to insert the dial ring bushing) and cut off excess tube.

h) Remove any burrs from the end of the tube.

i) Securely fasten the lock to deadbolt base with four attaching screws and tighten.

j) Fasten dial ring to door using screws and tighten tube nut (if present on lock) and align with hole through door.

k) To install dial, hold the drive cam in place with one hand and thread the dial into the cam until the dial comes to a stop against the surface of the dial ring.

CAUTION

When threading dial into cam, do not allow cam to slide outward against the accelerator spring. Accelerator spring can be easily damaged in this manner.

l) The alignment of the dial and dial ring is critical to the operation of the lock. Perfect alignment is necessary. The dial should be flush and centered with the surface of the dial ring for true center.

m) Measure the excess spindle that projects beyond the drive cam.

n) Remove the dial, cut off excess spindle and remove burrs.

MIL-HDBK-1013/8

- o) Tighten the dial ring screws.
- p) Place a washer, compression spring, and washer on hub of dial (Figure 12).
- q) Insert dial into the lock (observe step k) CAUTION). Hold the drive cam in place to receive nose of the drop lever and thread dial into cam until the dial stops.
- r) Rotate the dial counterclockwise a MINIMUM of one full turn until the spline in the spindle is aligned with the proper spline in the cam, the cam is positioned to receive the nose of the drop lever, and the dial is on 0.

NOTE

If the lock is mounted in the right- or left-hand position, the properly aligned spline should be marked RH/LH on the drive cam (reference Figure 13).

- s) Insert the spline key with the lip toward edge of cam. Tap in lightly. The dial must turn freely with no rubbing or interference.

NOTE

Before attaching cover to lock, check for proper in and out travel of dial for operation of accelerator spring.

- t) Rotate the dial at least one complete revolution and stop at 0. The accelerator spring should now be in the loaded position.
- u) Hold the cover in place on the lock and push the dial in at 0. Release the dial. Remove the cover and check the position of the accelerator spring (spring should be in the released position). If the accelerator spring is not in the released position, the dial has not been backed out of the cam far enough and the condition must be corrected. Remove spline key, hold cam, and rotate dial one additional full turn counterclockwise. Reinstall the spline key and repeat step s).
- v) Rotate the dial at least one complete revolution and stop at 50. The accelerator spring should now be in the loaded position.
- w) Hold the back cover in place on the lock and push the dial in at 50. The accelerator spring should not release. (If the accelerator spring does release, the spindle must be turned clockwise into the cam one complete revolution and this step must be repeated.)

MIL-HDBK-1013/8

x) Dial the set combination (50-25-50) on the lock and observe the drop lever falling into the drive cam. Repeat this step at least three times.

y) When the accelerator spring is operating properly, the cover may be attached to the lock and the new combination set.

3.2.5.7 Torque Adjustment. To adjust torque on locks equipped with an adjusting screw, remove the back cover and insert a 3/32-inch allen wrench into the adjusting screw (see Figure 11). Turn clockwise to tighten or counterclockwise to loosen.

NOTE

Adjustment should not be less than 18 inch-ounces (0.13 N·m) nor more than 24 inch-ounces (0.17 N·m) of dialing torque (a slight drag on The dial). Whenever lock torque is changed, the combination must be reset.

3.2.5.8 Maintenance Recommendations. Periodic servicing will extend the life of the lock and is essential for maintaining proper security. Each time the combination is changed, inspect the lock for wear, metal filings, drilled holes, cracks, or any other visual signs of attempts to defeat the lock by forced entry techniques. The inspection process should include removal of the back cover of the lock, and visual examination of each wheel part as well as the cam and lever assembly to make sure nothing is worn or damaged. If lubrication is required, use molybdenum-disulfide (powder). NEVER use oil- or petroleum-based lubricants on combination locks.

NOTE

For Sargent & Greenleaf Combination Locks, the manufacturer recommends using GE-322L lubricant manufactured by General Electric.

Each time the back cover is removed, the combination should be reset. Remember to check the combination at least three times before locking the container.

Any maintenance other than changing the combination and inspecting the lock should be referred to a qualified locksmith.

3.3 Sargent & Greenleaf Combination Padlocks.

3.3.1 8077AB. The 8077AB is a front-reading, dial-type, three-number, open-shackle padlock with a capacity of 125,000 combination variations. Its design will resist most modern methods of surreptitious entry. The 8077AB is for indoor applications only and offers protection against manipulation.

MIL-HDBK-1013/8

It has a 5/16-inch (8-mm) shackle made of either steel or brass. The brass shackle is for use in explosive environments. The Model 8077AB with change key is illustrated in Figure 23.

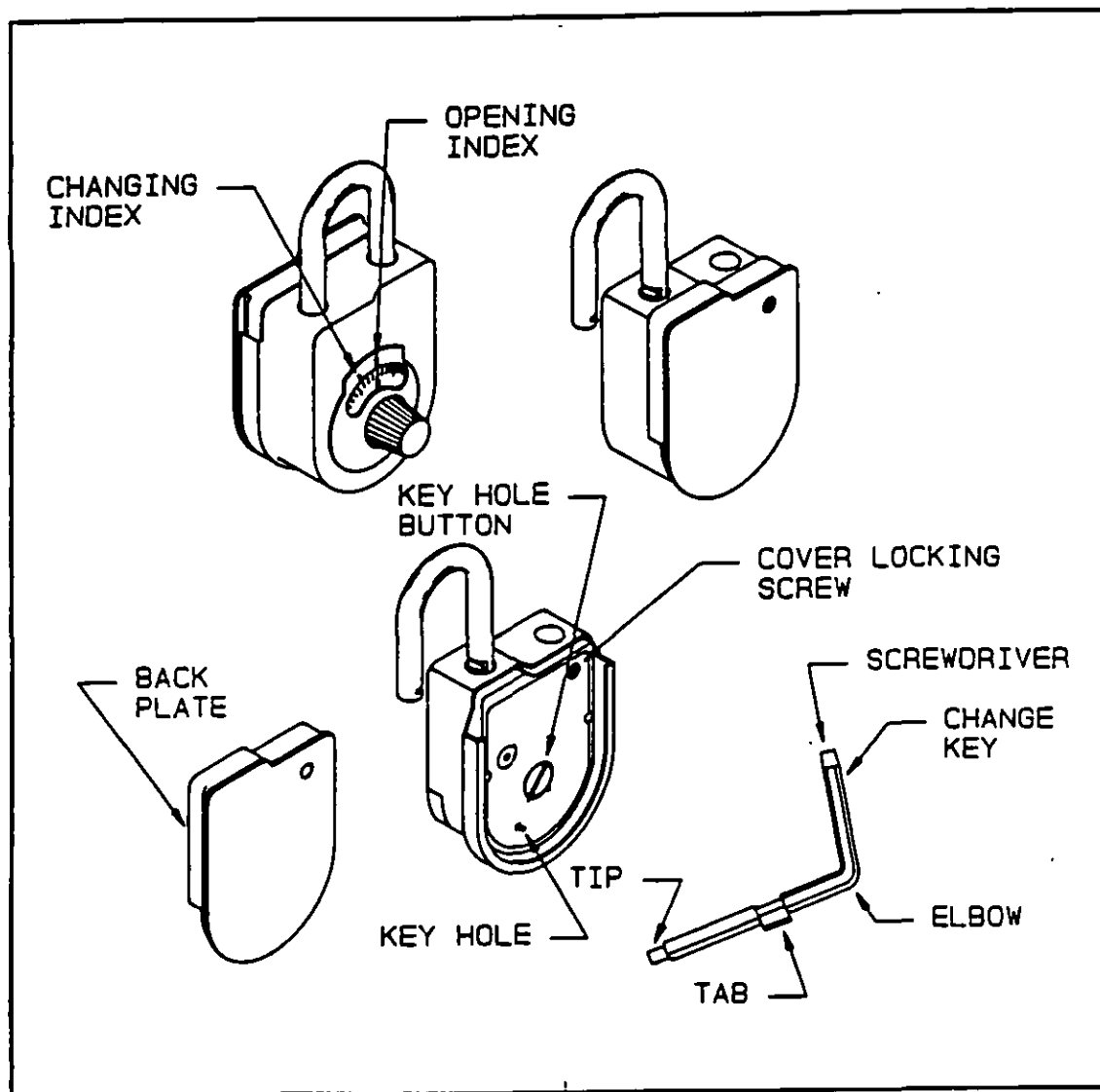


Figure 23
Sargent & Greenleaf Model 8077AB Combination Padlock

MIL-HDBK-1013/8

3.3.1.1 Opening Procedure. To unlock the Sargent & Greenleaf 8077AB, proceed as follows:

- a) Turn the dial LEFT, stopping when the first number of the combination is aligned with the OPENING index the fourth time.
- b) Turn the dial RIGHT, stopping when the second number is aligned the third time.
- c) Turn the dial LEFT, stopping when the third number is aligned the second time.
- d) Turn the dial RIGHT, and stop at 0.
- e) Pull the shackle out.

3.3.1.2 Securing Procedure. To secure the lock, push in the shackle and turn the dial at least five complete revolutions in one direction.

3.3.1.3 Combination Changing Procedure. To change the combination on the Model 8077AB refer to Figure 23 and proceed as follows:

- a) Select a new three-number sequence based on the rules presented in paragraph 2.1.3e. Due to the mechanics of this combination padlock, the restrictions placed on the selection of the third number do not apply.
- b) Do not use straight ascending or descending numbers for the combination. It is better to use a sequence that is HIGH-LOW-HIGH or LOW-HIGH-LOW.
- c) Open the lock as described in paragraph 3.3.1.1.
- d) Pull the shackle out. Use the screwdriver end of the change key and turn cover locking screw to the RIGHT until it comes to a stop. If the change key does not have a screwdriver, use a small common screwdriver.
- e) Remove the lock cover plate by sliding it upward.
- f) Retract the cover locking screw by turning it LEFT, and then relock the shackle.
- g) You may cover the opening index mark with a small piece of masking tape to prevent misdialing on the opening index.
- h) Dial the present (old) combination on the CHANGING index. All numbers of the combination, including the last number (0), are used in the combination changing procedure. Do not pull the shackle out.

MIL-HDBK-1013/8

- i) Using the elbow of the changing key (Figure 23), turn the keyhole button on the back of the lock to the RIGHT to the open position. If the button will not turn, repeat the procedure in step i).
- j) Insert the change key tip first. The change key is properly seated when the tab on the key is fully inside the lock back. Turn the key to the right one-quarter turn.
- k) Turn the dial to the LEFT five revolutions to erase the old combination.
- l) Dial the new combination, including the 0, on the CHANGING index. Use the procedure presented in paragraph 3.3.1.1, steps a) through d).
- m) Once the new combination is set, and 0 is aligned with the CHANGING index, turn the change key to the LEFT one-quarter turn and remove it. DO NOT reset keyhole button.

NOTE

To ensure that the combination is correctly set, completely redial the new combination as directed in step m). Reinsert the change key fully into the lock, but do not turn. If the key will fully insert, the combination is set correctly. Remove the change key. Failure to relock the combination by this procedure may result in an unusable lock.

- n) Dial the new combination, including the 0 on the changing index. Using the change key elbow, turn the keyhole button to the closed position.
- o) If the keyhole button will not return to the closed position, the combination is incorrectly dialed. Redial.
- p) Remove the masking tape from the opening index (if tape was used). Dial the new combination, using the OPENING index, and follow the procedure presented in paragraph 3.3.1.1. Pull out the shackle.
- q) Turn cover locking screw to the RIGHT until it comes to a complete stop.
- r) Slide the rear cover into place.
- s) Turn cover locking screw out to the LEFT until it comes to a complete stop. Relock the lock.

MIL-HDBK-1013/8

t) Work the new combination at least three times before placing the padlock in service. In accordance with security directives, record the new combination to ensure that it will not be forgotten or lost.

3.3.1.4 Maintenance Recommendations. There are no routine maintenance requirements for the Sargeant & Greenleaf 8077AB combination padlock.

3.4 La Gard Mounted Combination Locks

3.4.1 1980-A RL. The 1980-A RL is a Group 1R mounted combination lock intended for use on safes and vaults. It has an antimanipulation device inside the lock. This device is operated with each revolution of the dial and does not affect operating conditions. This lock is illustrated in Figures 24 and 25.

3.4.1.1 Opening Procedure - Factory-Set Combination. To open a La Gard Model 1980-A RL Combination Lock with a factory-set combination at 50, proceed as follows:

a) Turn the dial LEFT and pass the number 50 four times, stopping with 50 lined up on the OPENING index the fifth time.

b) Turn the dial RIGHT until the dial stops. The combination lock bolt will retract and the safe or vault may be opened.

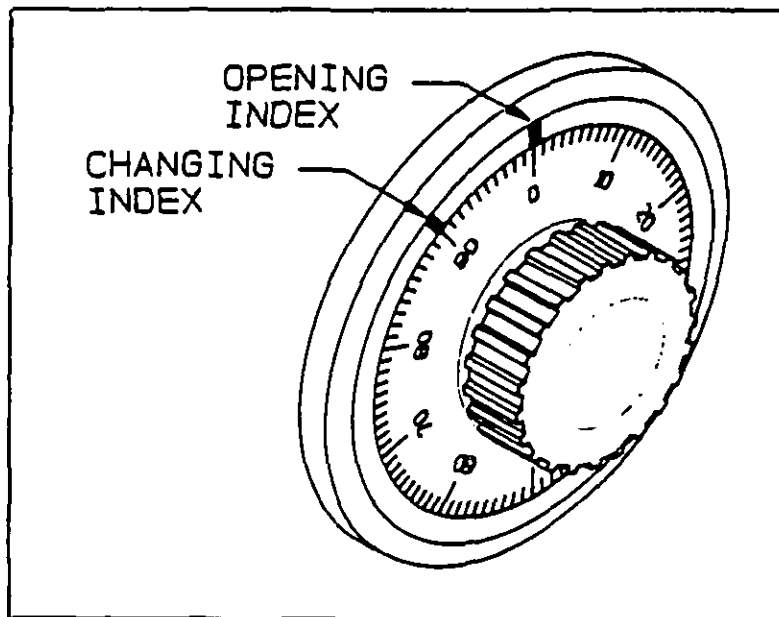


Figure 24
Front View, La Gard Model 1980-A RL Mounted
Combination Lock

MIL-HDBK-1013/8

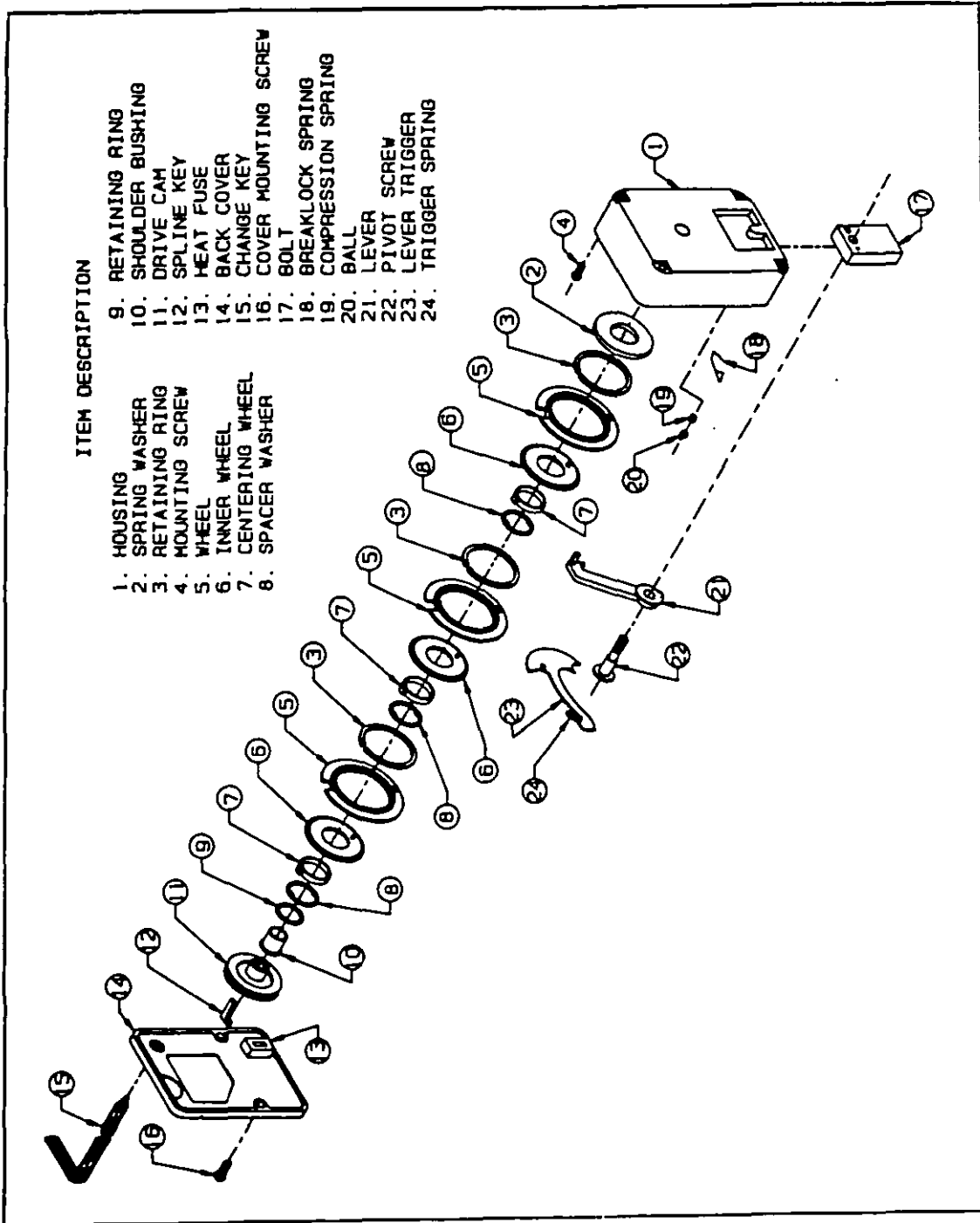


Figure 25
Exploded View, La Gard Model 1980-A RL

MIL-HDBK-1013/8

3.4.1.2 Opening Procedure - Previously Set Combination. To open a La Gard Model 1980-A RL Combination Lock using a previously set combination, proceed as follows:

- a) Turn the dial to the LEFT at least four complete revolutions to clear the combination lock.
- b) Using the OPENING index, turn the dial to the LEFT, stopping when the first number of the combination is aligned the fourth time.
- c) Turn the dial to the RIGHT, stopping when the second number of the combination is aligned with the OPENING index the third time.
- d) Turn the dial to the LEFT, stopping when the third number of the combination is aligned with the OPENING index the second time.
- e) Turn the dial to the RIGHT. When the lock is open, the dial will not continue to turn to the right.

3.4.1.3 Securing Procedure. To lock the La Gard Model 1980-A RL Combination Lock, turn the dial four complete revolutions to the LEFT.

3.4.1.4 Combination Changing Procedure. Changing the combination requires access to the existing combination and a La Gard Group 1R change key (see Figures 26 and 27). To change the combination, the lock must first be opened using the present combination. With the bolt fully retracted (lock open), verify that the dial stops between 90 and 100 on the OPENING index, and then proceed as follows:

- a) With the door or drawer open, throw the bolt(s) to the closed position. If the unit has a bolt interlock, it will be necessary to depress the interlock plunger before the bolt(s) can be thrown while the unit is open.
- b) Throw the locking bolt by turning the dial at least four revolutions in one direction.
- c) Using the CHANGING index, turn the dial LEFT, stopping when the first number of the old combination is aligned with the index the fourth time.
- d) Turn the dial RIGHT, stopping when the second number of the old combination is aligned with the CHANGING index the third time.
- e) Turn the dial LEFT, stopping when the third number of the old combination is aligned with the CHANGING index the second time. Hold the dial fixed at this position.

MIL-HDBK-1013/8

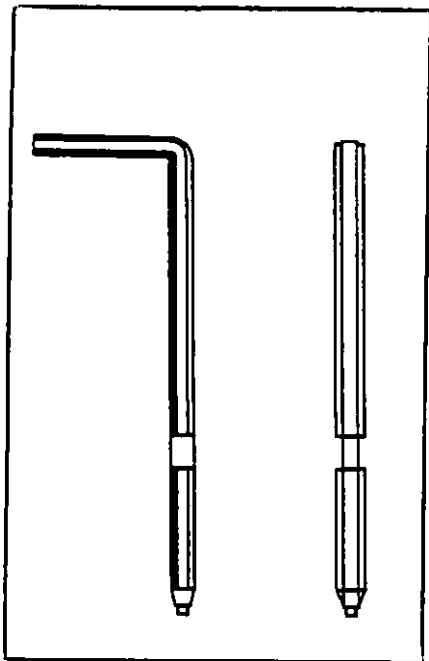


Figure 26
Change Key for the La Gard
Model 1980-A RL Position

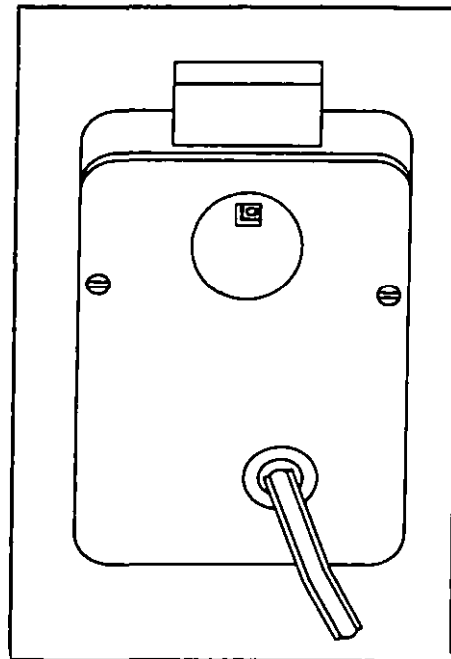


Figure 27
La Gard 1980-A RL with Change
Key Inserted

f) Insert the change key and turn it to the LEFT until it stops (approximately one-quarter turn). Leave the key in the lock and select a new combination.

NOTE

On some units, it may be necessary to remove a cover or door panel to expose the back of the lock.

Never select a number between 0 and 20 as the last number of the combination.

g) Using the CHANGING index, turn the dial LEFT, stopping when the first number of the new combination is aligned the fourth time.

h) Turn the dial RIGHT, stopping when the second number of the new combination is aligned with the CHANGING index the third time.

MIL-HDBK-1013/8

i) Turn the dial LEFT, stopping when the third number of the new combination is aligned with the CHANGING index the second time. Hold the dial fixed at this position.

j) Turn the change key to the RIGHT until it stops and remove the key.

k) Work the new combination on the OPENING index at least three times with the door or container open. Record the new combination in accordance with security directives. If the new combination fails to operate, call a qualified locksmith.

3.4.1.5 Installation Procedure. To install the La Gard 1980-A RL combination lock, proceed as follows (reference Figure 25):

a) Using template (provided with lock), position lock in desired location.

b) Using template, drill and tap four holes in the mounting plate for the lock-mounting screws (1/4-20, item 4). Drill hole in mounting plate for the spindle shaft (0.625-inch (16-mm) diameter).

c) Install a dial ring assembly with the mounting screws provided.

d) Remove the combination lock Cover Screws (16) and Back Cover (14).

e) Lift off, BUT DO NOT DISCONNECT, the Lever Trigger (23) and Trigger Spring (24).

f) Remove the Drive Cam (11).

g) Carefully thread the dial spindle onto the drive cam until snug. DO NOT FORCE DIAL. Measure the excess spindle length, unscrew, remove, and carefully cut off the excess. Remove burrs.

h) Rethread the dial spindle onto the drive cam until snug and back off to the appropriate slot in the drive cam, either RH (right-hand), LH (left-hand), VU (vertical-up), or VD (vertical-down).

To determine the "hand" of the lock: observe the back of the lock. If the combination lock bolt is pointing to the right, the correct spline position of the drive cam is right-hand or "RH." If the bolt points vertical-up, the drive cam should be splined "VU," etc.

i) Insert the Spline Key (12) into the correct slot.

MIL-HDBK-1013/8

j) With the Back Cover (14) removed, dial the combination on the Changing Index, and observe that the change key holes in the wheels are aligned properly to accept the Change Key (15).

k) Reinstall the Lever Trigger (23) and Trigger Spring (24).

l) Install the Back Cover (14) and Cover Mounting Screws(16).

IMPORTANT

Reinstall the back cover before inserting the change key, then follow the combination changing procedure.

3.4.1.6 Maintenance Recommendations. Periodic servicing will extend the life of the lock and is essential for maintaining proper security. Each time the combination is changed, inspect the lock for wear, metal filings, drilled holes, cracks, or any other visual signs of attempts to defeat the lock by forced entry techniques. The inspection process should include removal of the back cover of the lock, and visual examination of each wheel part as well as the cam and lever assembly to make sure nothing is worn or damaged. If lubrication is required, use molybdenum-disulfide (powder). NEVER use oil- or petroleum-based lubricants on combination locks.

Each time the back cover is removed, the combination should be reset. Remember to check the combination at least three times before locking the container.

Any maintenance other than changing the combination and inspecting the lock should be referred to a qualified locksmith.

3.5 Mosler Mounted Combination Locks

3.5.1 MRK 120. The Mosler MRK 120 is a Group 1 combination lock. It has an index on the face of the lock which is used for both dialing and changing the combination. There is no dial torque adjustment on this lock. Dial resistance is held within the allowable range (MIL-L-15596 Series) by the friction plug and spring. This lock is illustrated in Figures 28 and 29.

3.5.1.1 Opening Procedure. To open the Mosler MRK 120 Combination Lock, proceed as follows:

a) Turn the dial to the LEFT, stopping when the first number of the combination is aligned with the index the fourth time.

b) Turn the dial to the RIGHT, stopping when the second number of the combination is aligned the third time.

MIL-HDBK-1013/8

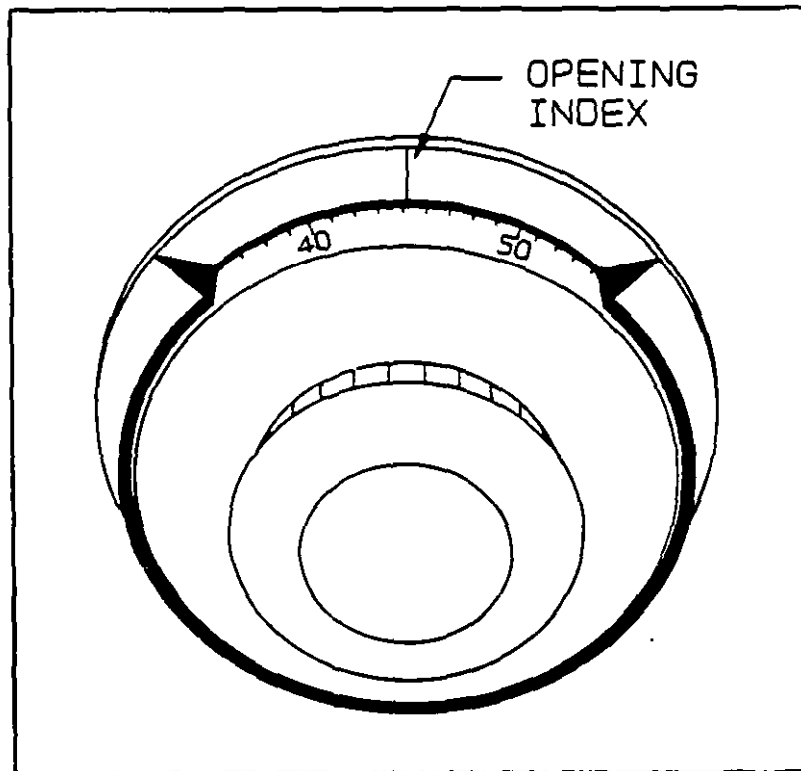


Figure 28
Front View, Mosler Model MRK 120 Mounted
Combination Lock

c) Turn the dial to the LEFT, stopping when the third number of the combination is aligned the second time.

d) Turn the dial to the RIGHT, pausing momentarily at zero, and continue turning until it stops. This retracts the locking bolt.

3.5.1.2 Securing Procedure. To lock the MRK 120, turn the dial to the LEFT at least four complete revolutions.

3.5.1.3 Combination Changing Procedure. To change the combination on the MRK 120, proceed as follows:

a) Use the guidelines in paragraph 2.1.3e. to make up a new combination. Record the new combination in accordance with local security directives.

MIL-HDBK-1013/8

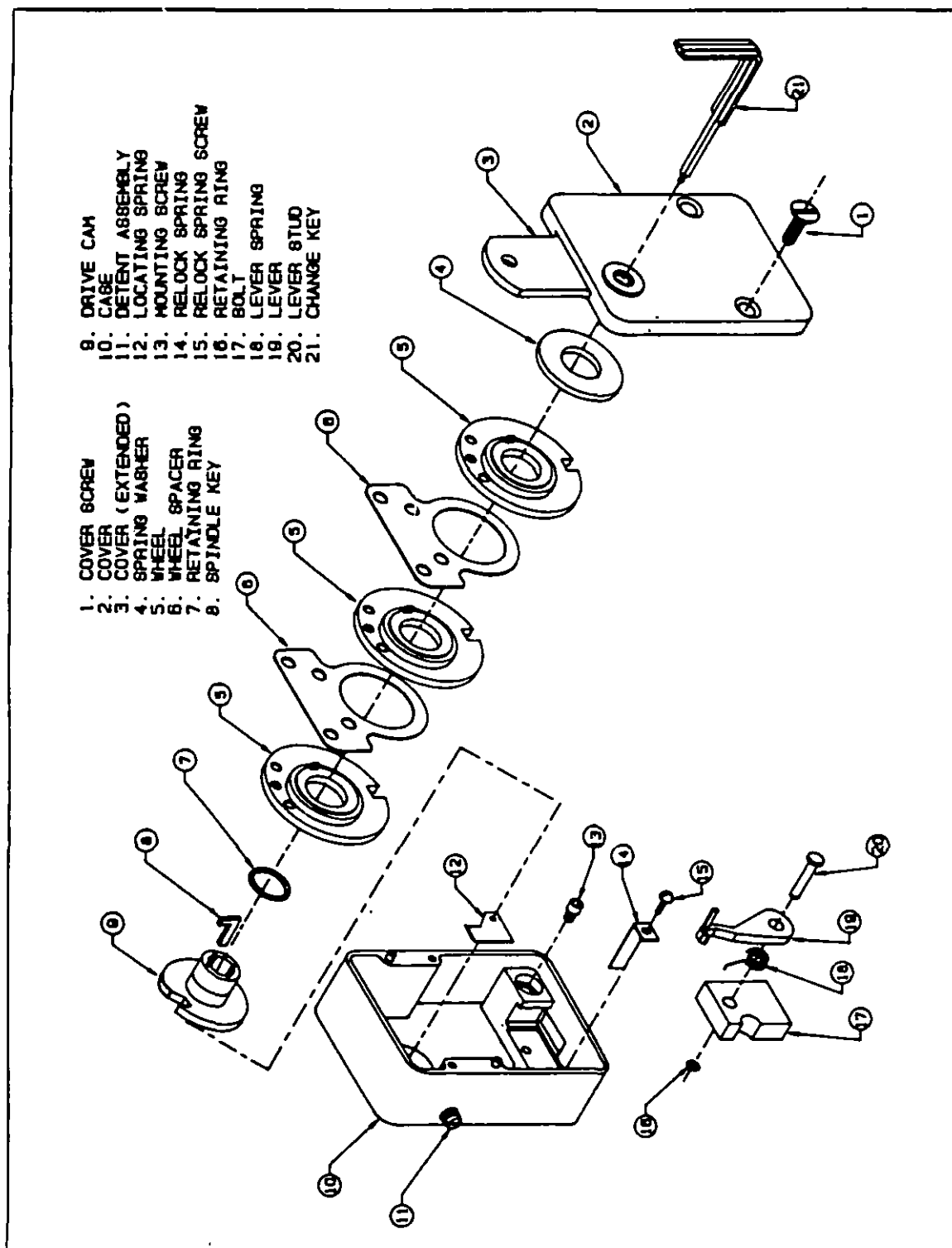


Figure 29
Exploded View, Mosler Model MRK 120

MIL-HDBK-1013/8

b) Open the door or container as outlined in paragraph 3.5.1.1.

c) With the door or container open, throw the locking bolt(s) to the locked position. If the unit has a bolt interlock, it will be necessary to depress the interlock plunger before the bolt(s) can be thrown to a locked position.

d) With the locking bolt in the locked position, turn the dial at least *four revolutions in one direction*.

e) Add 10 to each number of the old combination. Proceed to open the lock as directed in paragraph 3.5.1.1, steps a) through c). Do not execute step d). For example, if the old combination is 20-71-31, adding 10 will yield 30-81-41. The dial is stopped and held in place after the last number, 41, is dialed.

f) Insert the change key into the keyhole in the back of the lock (refer to Figures 30 and 31). The key is fully inserted when the bend in the key reaches the cover plate. Turn the key in the direction indicated on the back of the lock until it will not turn any farther. Do not force the key.

NOTE

On some units, it may be necessary to remove a cover or door panel to expose the back of the lock.

g) Add 10 to each number of the new combination.

h) Turn the dial LEFT, stopping when the first number of the new combination plus 10 aligns with the index the fourth time.

i) Turn the dial RIGHT, stopping when the second number plus 10 aligns the third time.

j) Turn the dial LEFT, stopping when the third number plus 10 is aligned the second time. Hold the dial in this position.

k) Turn the change key in the direction opposite to the arrow on the lock and remove the key.

l) Work the new combination at least three times with the door or container open to verify that the combination is properly set and the lock is operating smoothly. If the new combination fails to operate, call for a qualified locksmith.

MIL-HDBK-1013/8

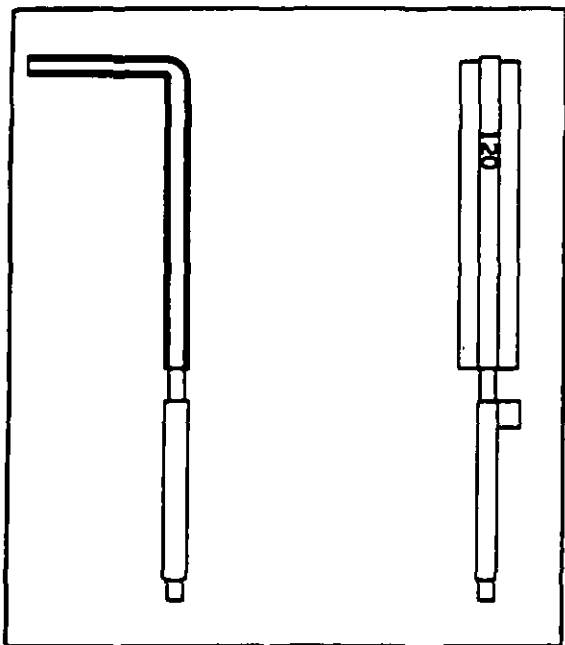


Figure 30
Change Key for the Mosler
Model MRK 120

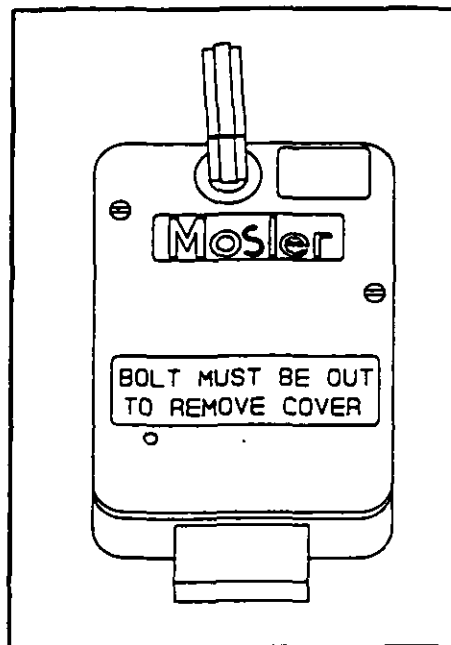


Figure 31
Mosler Model MRK 120 Backplate
with Change Key in Inserted
Position

3.5.1.4 Installation Procedure. To install a Mosler MRK 120 Combination Lock, proceed as follows:

- a) Using template (provided with lock), position lock in desired location.
- b) Using template, drill and tap four holes in the mounting plate for the lock-attaching screws (1/4-20). Drill hole in mounting plate for the spindle shaft (0.625-inch (16-mm) diameter).
- c) Make sure bolt is in the locked or engaged position by pulling the bolt out with fingers.
- d) Remove back cover of the lock.
- e) Securely fasten lock to mounting plate by installing the four lock-attaching screws and tightening.
- f) Fasten dial ring to door using screws and tighten tube nut (if present on lock) and align with hole through door.

MIL-HDBK-1013/8

- g) Insert dial into dial ring and hold snug.
- h) Carefully thread the dial spindle onto the drive cam until snug. DO NOT FORCE DIAL.
- i) Measure the excess spindle length, unscrew, remove, and carefully cut off excess, leaving 1/16 inch (2 mm) above drive cam. Remove burrs.
- j) Rethread the dial spindle onto the drive cam until snug and back off until the keyways in the spindle and drive cam line up.
- k) Insert the spline key. Drive the spline key in carefully. If the spline key becomes loose, the lock will not function properly. Make certain that the spline key is tight.
- l) Attach the back cover using the cover mounting screws. The lock is now ready to have the new combination set.

3.5.1.5 Maintenance Recommendations. Periodic servicing will extend the life of the lock and is essential for maintaining proper security. Each time the combination is changed, inspect the lock for wear, metal filings, drilled holes, cracks, or any other visual signs of attempts to defeat the lock by forced entry techniques. The inspection process should include removal of the back cover of the lock, and visual examination of each wheel part as well as the cam and lever assembly to make sure nothing is worn or damaged. If lubrication is required, use molybdenum-disulfide (powder). NEVER use oil- or petroleum-based lubricants on combination locks.

Each time the back cover is removed, the combination should be reset. Remember to check the combination at least three times before locking the container.

Any maintenance other than changing the combination and inspecting the lock should be referred to a qualified locksmith.

3.5.2 MRK 302-402. The Mosler MRK 302-402 Groups 1 and 1R combination locks have a unique manipulation-resistant cam mechanism. Two audible impulses can be heard when the dial is turned past the zero area. The purpose of this feature is to defeat manipulation by the use of audio instruments. When the MRK 302-402 was first introduced, the dial and dial ring remained the same as the MR 302-402 Hand-Change lock (i.e., one index on the face of the lock used for opening the lock and changing the combination). If your MRK 302-402 has only one index, refer to paragraphs 3.2.1.1 and 3.2.1.3 of this handbook for opening and combination changing procedures. The more recent MRK 302-402 has both an opening index and a changing index on the face of the lock. The difference between the MRK 302 and the MRK 402 is that the 302 has three wheels and a three-number combination whereas the 402 has four wheels and a four-number combination. There is no dial torque

MIL-HDBK-1013/8

adjustment on these locks. Dial resistance is held within the allowable range (MIL-L-15596F) by the friction plug and spring. The MRK 302-402 is illustrated in Figures 32 and 33.

3.5.2.1 Opening Procedure. To open the Mosler MRK 302-402 Combination Lock, proceed as follows:

- a) Turn the dial to the LEFT, stopping when the first number of the combination is aligned with the OPENING index the fourth time.
- b) Turn the dial to the RIGHT, stopping when the second number of the combination is aligned with the OPENING index the third time.
- c) Turn the dial to the LEFT, stopping when the third number of the combination is aligned with the OPENING index the second time.

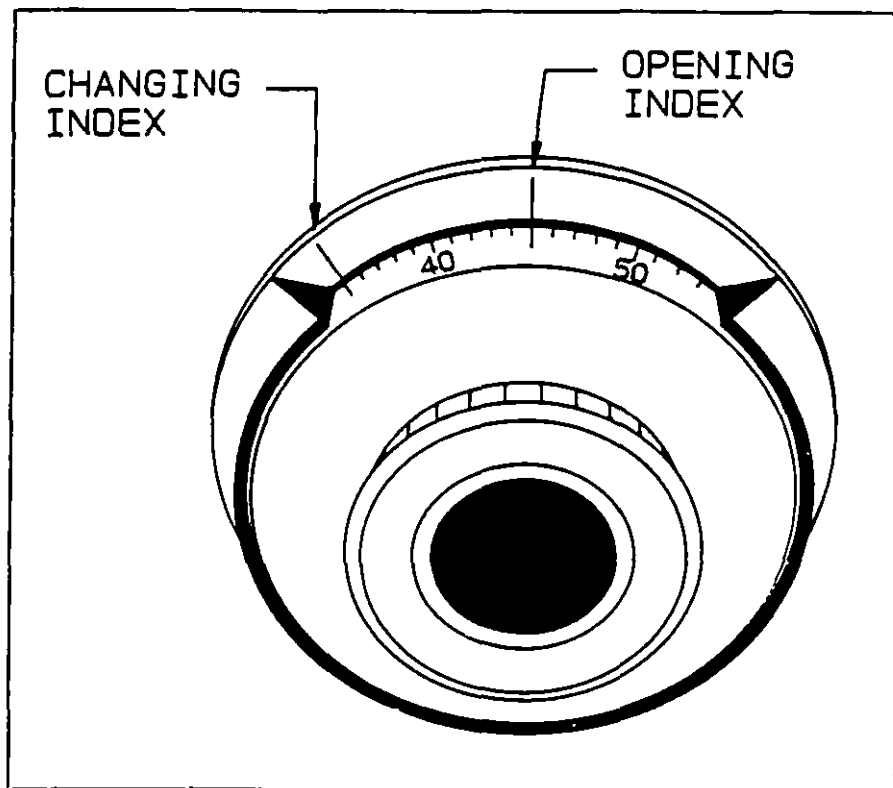


Figure 32
Front View, Mosler Model MRK 302-402 Mounted
Combination Lock

MIL-HDBK-1013/8

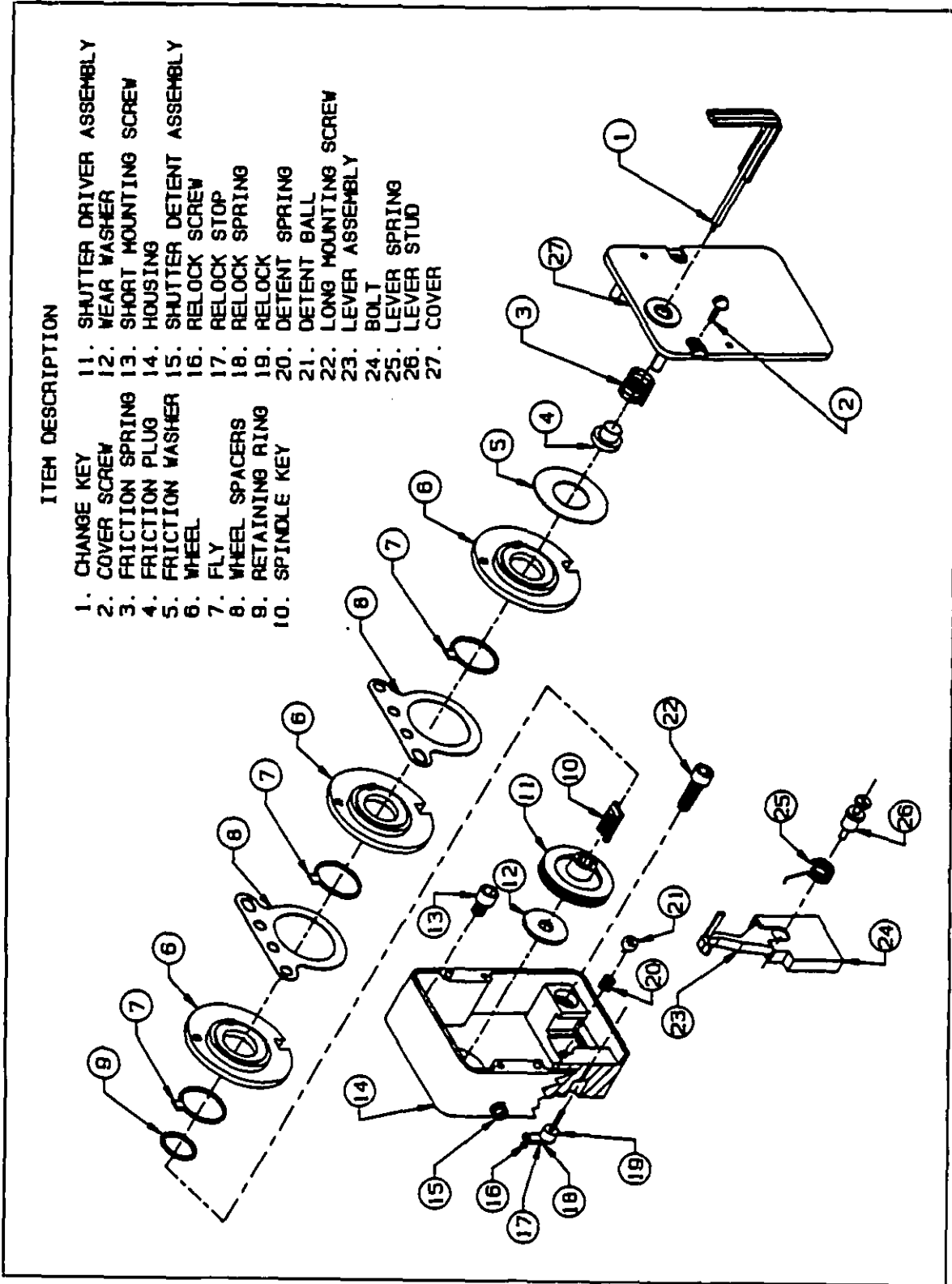


Figure 33
Exploded View, Mosler Model MRK 302-402

MIL-HDBK-1013/8

d) Turn the dial to the RIGHT, pausing momentarily at zero, and continue turning until it stops. This retracts the locking bolt.

3.5.2.2 Securing Procedure. To lock the MRK 302-402, turn the dial to the LEFT at least four complete revolutions.

3.5.2.3 Combination Changing Procedure. If there is both an opening and changing index on the face of the MRK 302-402, proceed with step a) to change the combination. If the lock has only an opening index, the combination changing procedure is identical to that of the Mosler MRK 120. Use the procedure in paragraph 3.5.2.1, and 3.5.1.3, steps c) through k).

a) Use the guidelines in paragraph 2.1.3e to make up a new combination. Record the new combination in accordance with security directions.

b) Open the door or container as outlined in paragraph 3.5.2.1.

c) With the door or container open, throw the locking bolt to the locked position. If the unit has a bolt interlock, it will be necessary to depress the interlock plunger before the bolt can be thrown to a locked position.

d) With the locking bolt in the locked position, turn the dial at least four revolutions in one direction.

e) With the present (old) combination, use the same procedure as when opening the unit except work the combination to the CHANGE index instead of the OPENING index. On reaching the last number, stop and hold the dial in place.

f) Insert the change key (see Figure 34) into the change key hole in the back cover. Turn the key in the direction indicated by the arrow until it stops. Leave the change key in this position (see Figure 35).

NOTE

On some units, it may be necessary to remove a cover or door panel to expose the back of the lock.

g) Turn the dial at least four revolutions in one direction. This will erase the old combination.

h) With the new combination, turn the dial to the LEFT, stopping when the first number aligns with the CHANGING index the fourth time.

i) Turn the dial to the RIGHT, stopping when the second number is aligned with the CHANGING index the third time.

MIL-HDBK-1013/8

j) Turn the dial to the LEFT, stopping when the third number is aligned with the CHANGING index the second time. Stop and hold the dial in this position.

k) Turn the change key in the opposite direction indicated on the lock and remove the change key.

l) Work the new combination at least three times with the door or container open to verify the combination is properly set and the lock is operating smoothly. If the new combination fails to operate, call for a qualified locksmith.

3.5.2.4 Installation Procedure. To install a Mosler MRK 302-402 Combination Lock, proceed as follows:

a) Using template (provided with lock), position lock in desired location.

b) Using template, drill and tap four holes in the mounting plate for the lock-attaching screws (1/4-20). Drill hole in mounting plate for the spindle shaft (0.625-inch (16-mm) diameter).

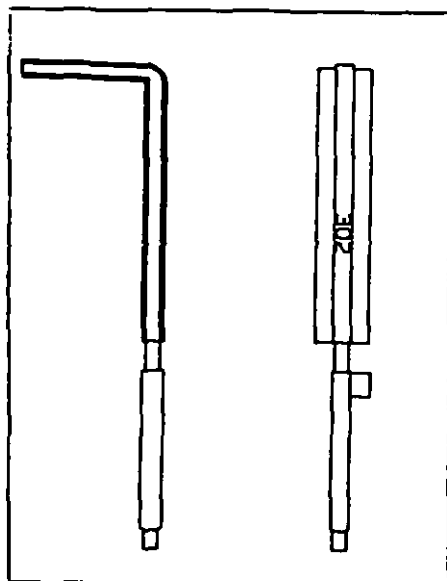


Figure 34
Change key for the Mosler
Model MRK 302-402



Figure 35
Mosler MRK 302-402 Backplate
with Change Key in Inserted
Position

MIL-HDBK-1013/8

- c) Make sure bolt is in the locked or engaged position by pulling the bolt out with fingers.
- d) Remove back cover of the lock.
- e) Securely fasten lock to mounting plate by installing the four lock-attaching screws and tightening.
- f) Fasten dial ring to door using screws and tighten tube nut (if present on lock) and align with hole through door).
- g) Insert dial into dial ring and hold snug.
- h) Carefully thread the dial spindle onto the drive cam until snug. Do not force dial.
- i) Measure the excess spindle length, unscrew, remove, and carefully cut off excess, leaving 1/16 inch (2 mm) above drive cam. Remove burrs.
- j) Rethread the dial spindle onto the drive cam until snug and back off until the keyways in the spindle and drive cam line up.
- k) Insert the spline key. Drive the spline key in carefully. If the spline key becomes loose, the lock will not function properly. Make certain that the spline key is tight.
- l) Attach the back cover using the cover mounting screws. The lock is now ready to have the new combination set.

3.5.2.5 Maintenance Recommendations. Periodic servicing will extend the life of the lock and is essential for maintaining proper security. Each time the combination is changed, inspect the lock for wear, metal filings, drilled holes, cracks, or any other visual signs of attempts to defeat the lock by forced entry techniques. The inspection process should include removal of the back cover of the lock, and visual examination of each wheel part as well as the cam and lever assembly to make sure nothing is worn or damaged. If lubrication is required, use molybdenum-disulfide (powder). NEVER use oil- or petroleum-based lubricants on combination locks.

Each time the back cover is removed, the combination should be reset. Remember to check the combination at least three times before locking the container.

Any other maintenance other than changing the combination and inspecting the lock should be referred to a qualified locksmith.

MIL-HDBK-1013/8

Section 4: HAND-CHANGE LOCKS

4.1 General. Hand-change locks require disassembly before new combinations can be set. The wheels inside the lock have graduations from 0 to 100 on their outer ring and a removable serrated-edge disk in the center. The position of the center disk determines the combination setting. Before changing the combination of any lock, read the entire change procedure carefully. Read installation instructions thoroughly before beginning an installation procedure.

4.2 Mosler Mounted Combination Locks

4.2.1 MR 302-402. The Mosler MR 302-402 Groups 1 and 1R combination locks have a unique manipulation-resistant cam mechanism. Two audible impulses can be heard when the dial is turned past the 0 area. The purpose of this design feature is to defeat manipulation by the use of audio instruments. The difference between the MR 302 and the MR 402 is that the 302 has three wheels and a three-number combination, whereas the 402 has four wheels and a four-number combination. There is no dial torque adjustment on these locks. Dial resistance is held within the allowable range (MIL-L-15596 Series) by the friction plug and spring. The MR 302 is illustrated in Figures 36 and 37.

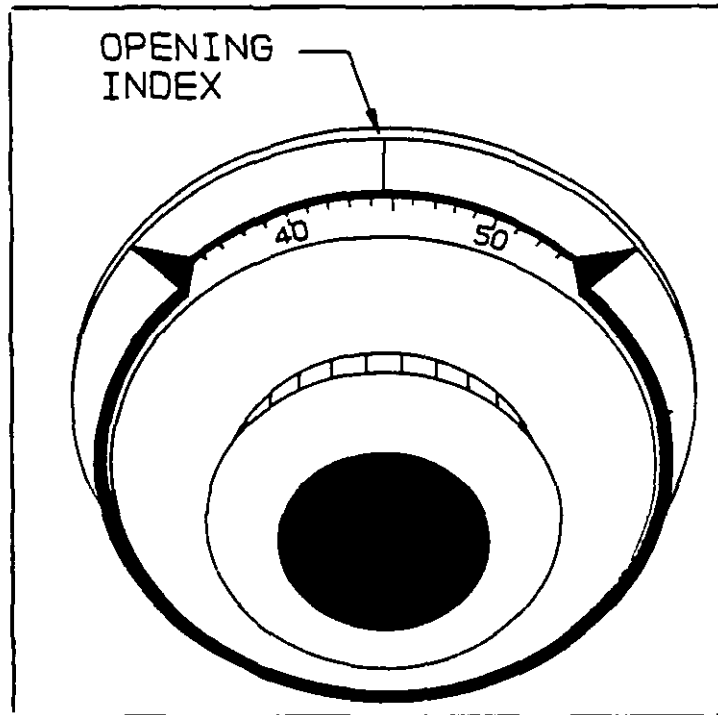


Figure 36
Front View, Mosler Model MR 302-402 Mounted
Combination Lock

MIL-HDBK-1013/8

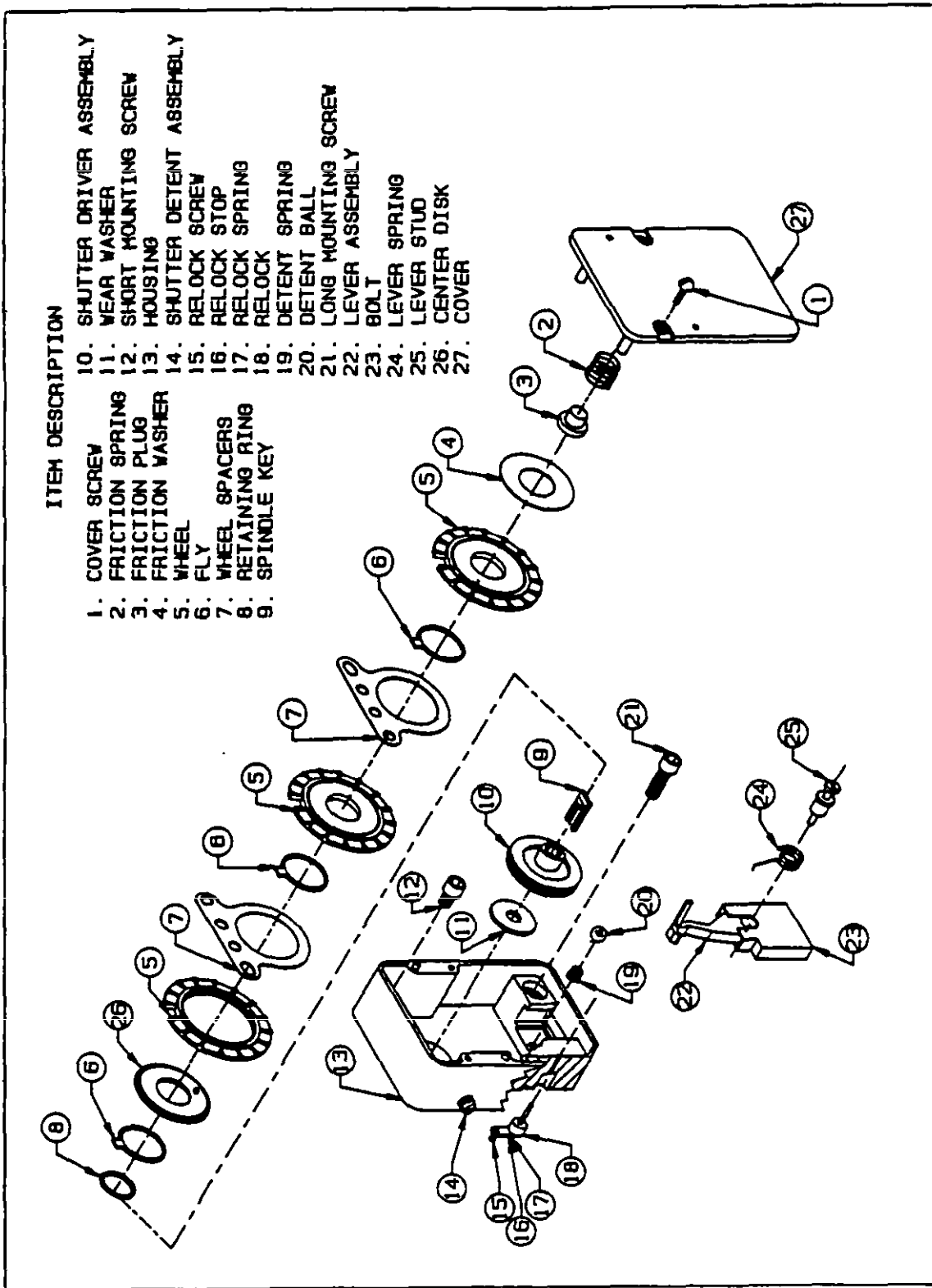


Figure 37
Exploded View, Mosler Model MR 302-402

MIL-HDBK-1013/8

4.2.1.1 Opening Procedure. To open the Mosler MR 302-402 Combination Lock, proceed as follows:

- a) Turn the dial LEFT, stopping when the first number of the combination is aligned with the OPENING index the fourth time.
- b) Turn the dial RIGHT, stopping when the second number is aligned with the OPENING index the third time.
- c) Turn the dial LEFT, stopping when the third number is aligned with the OPENING index the second time.
- d) Turn the dial RIGHT, pausing momentarily at 0, and then continue turning until the locking bolt is retracted.

4.2.1.2 Securing Procedure. To lock the MR 302-402, turn the dial LEFT at least four full revolutions.

4.2.1.3 Combination Changing Procedure. To change the combination on the MR 302-402, proceed as follows:

- a) Select a new three-number sequence based on the rules in paragraph 2.1.3e. Record the new combination in accordance with security directives.
- b) With the old combination, open the lock as described above.
- c) With the door or drawer open, throw the bolt(s) to the closed position. If the unit has a bolt interlock, it will be necessary to depress this interlock plunger before the bolt(s) can be thrown while the unit is open. Use the procedure recommended by the unit's manufacturer.
- d) Throw the locking bolt by turning the dial LEFT.
- e) Remove the two back cover screws in the back of the lock. Remove the cover. This will expose the wheel pack.

NOTE

On some units, it may be necessary to remove a panel or small circular cover to expose the back of the lock.

CAUTION

Whenever disassembling the wheel pack in order to change the combination, the components MUST be reassembled in the same sequence as they were removed from the wheel post.

MIL-HDBK-1013/8

f) Remove the retaining ring from the wheel post.

g) Remove the wheels and spacers. The wheels are numbered sequentially on the outer plastic ring (reference Figure 38). Wheel number 1 is set at the first number of the combination and is the wheel adjacent to the back cover plate.

h) Hold the number 1 wheel assembly with the numbers facing upward and push the center disk up until it is removed from the outer ring. Rotate center disk until the setting index is aligned with the desired number on the ring (Figure 38). Press the center disk back into position until it is flush with the outer plastic ring. Observe that numbers increase counterclockwise on the wheels. Change the combination settings on the remaining wheels in the same manner.

i) Replace the parts on the post in the proper sequence. To help identify wheels for proper reassembly, each Mosler wheel has a number 1, 2, or 3 molded next to one side of the gate (reference Figure 38). Further confirmation is gained by observing that the gate (cutout) of the middle wheel (wheel No. 2) is 180 degrees opposite 0. There may be more than one tension washer at the base of the wheel post. The numbered sides of the wheels face upward. When the retaining ring is replaced, check to ensure that it is properly seated in the groove on the post and that all wheels and spacers are properly mounted on the wheel post.

j) After making sure that the dial is not set at zero, replace the cover and screws. Tighten screws firmly.

k) Try the new combination at least three times with the door or container open. If the new combination does not work properly, remove the wheel assembly and check the combination setting.

4.2.1.4 Installation Procedure. To install a Mosler MR 302-402 Combination Lock, proceed as follows:

a) Using template (provided with lock), position lock in desired location.

b) Using template, drill and tap four holes in the mounting plate for the lock-attaching screws (1/4-20). Drill hole in mounting plate for the spindle shaft (0.625-inch (16-mm) diameter).

c) Make sure bolt is in the locked or engaged position by pulling the bolt out with fingers.

d) Remove back cover of the lock.

e) Securely fasten lock to mounting plate by installing the four lock-attaching screws and tightening.

MIL-HDBK-1013/8

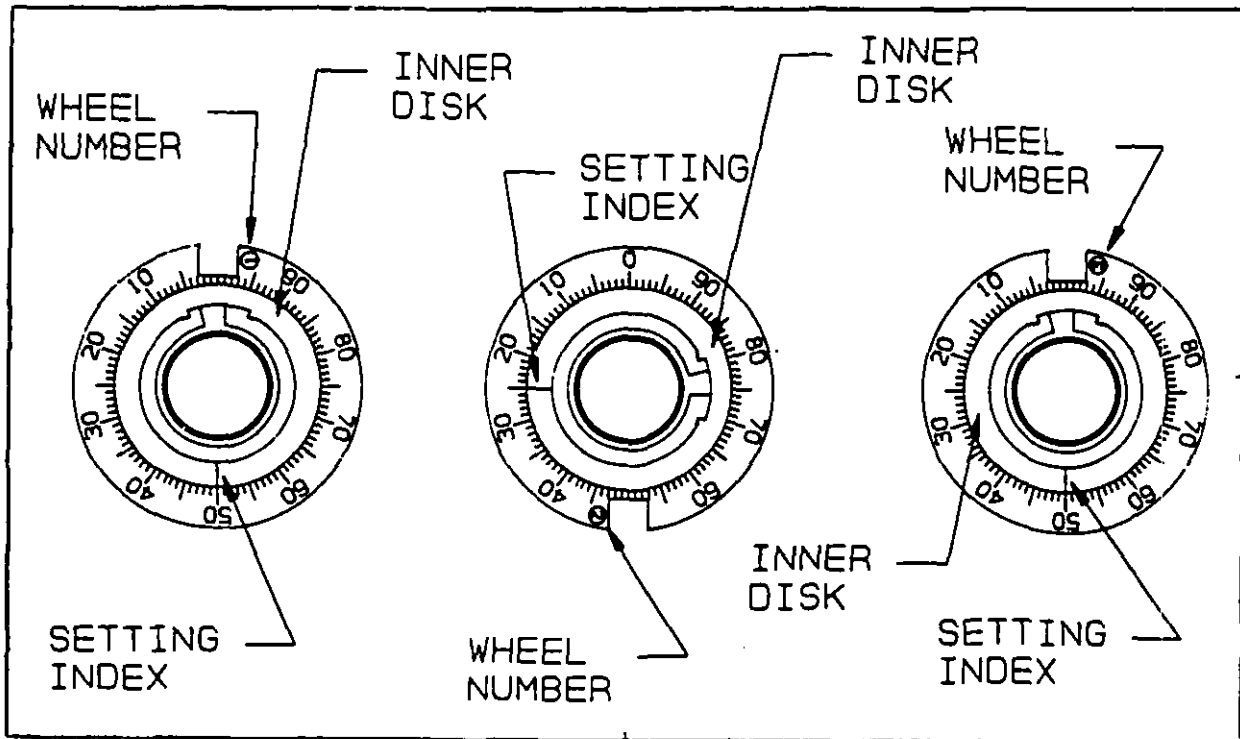


Figure 38
Mosler MR 302, Wheels

- f) While aligning hole through door, fasten dial ring to door using screws.
- g) Insert dial into dial ring and hold snug.
- h) Carefully thread the dial spindle onto the drive cam until snug. DO NOT FORCE DIAL.
- i) Measure the excess spindle length, unscrew, remove, and carefully cut off excess leaving 1/16 inch (2 mm) above drive cam. Remove burrs.
- j) Rethread the dial spindle onto the drive cam until snug and back off until the keyways in the spindle and drive cam line up.

MIL-HDBK-1013/8

k) Insert the spline key. Drive the spline key in carefully. If the spline key becomes loose, the lock will not function properly. Make certain that the spline key is tight.

l) Attach the back cover using the cover mounting screws. The lock is now ready to have the new combination set.

4.2.1.5 Maintenance Recommendations. Periodic servicing will extend the life of the lock and is essential for maintaining proper security. Each time the combination is changed, inspect the lock for wear, metal filings, drilled holes, cracks, or any other visual signs of attempts to defeat the lock by forced entry techniques. The inspection process should include removal of the back cover of the lock, and visual examination of each wheel part as well as the cam and lever assembly to make sure nothing is worn or damaged. If lubrication is required, use molybdenum-disulfide (powder). NEVER use oil- or petroleum-based lubricants on combination locks.

Each time the back cover is removed, the combination should be reset. Remember to check the combination at least three times before locking the container.

Any maintenance other than changing the combination and inspecting the lock should be referred to a qualified locksmith.

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REFERENCES

NOTE: Unless otherwise specified in the text, users of this handbook should utilize the latest revisions of the documents cited herein.

FEDERAL/MILITARY SPECIFICATIONS, STANDARDS, BULLETINS, HANDBOOKS, AND NAVFAC GUIDE SPECIFICATIONS:

The following specifications and standards form a part of this document to the extent specified herein. Unless otherwise indicated, copies are available from Commanding Officer, Naval Publications and Forms Center, ATTENTION: NPODS, 5801 Tabor Avenue, Philadelphia, PA 19120-5099.

SPECIFICATIONS

FED-SPEC FF-P-110	Padlock, Changeable Combination (Resistant to Opening By Manipulation and Surreptitious Attack)
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STANDARDS

MIL-L-15596	Locks, Combination (Safe and Safe Locker)
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NON-GOVERNMENT PUBLICATIONS:

The following publications form a part of this document to the extent specified herein. Unless otherwise indicated, copies are available from Underwriters Laboratories, 333 Pfingsten Road, Northbrook, Illinois 60062:

UL-768	Standard for Combination Locks
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