

**LOCKS, SAFES, AND SECURITY**

**LSS+ Version 5.0**

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**Master Exhibit Summary: Locks, Safes, and Security**



Multimedia segments

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LSS101: Interview with Jeremy Bramah



Alfred Hobbs was able to bypass the Bramah lock. Courtesy of Hans Mejlshede.



Locksmith training in Denmark, in comparison to the United States. Courtesy of Hans Mejlshede.

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Macro lens, Courtesy of Hans Mejlshede.



Data back for documentation of images. Courtesy of Hans Mejlshede.



Photographic equipment requirements. Courtesy of Hans Mejlshede.



Ring strobe is a necessity for forensic photography. Courtesy of Hans Mejlshede.



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LSS201: Procedure for making keys with a clay mold. Courtesy of MSC.



LSS201: Making keys by silicone impression, Courtesy of MSC



LSS202: Kaba-Ilco Quattrocode key machine, Courtesy of Steve Fish.



LSS202: The Ultracode key machine, Courtesy of Steve Fish.



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LSS203: HPC BlueSHARK third generation key cutting machine.



Keys can be copied through the use of clay molds. Courtesy of Hans Mejlshede.



Keys can be produced from codes, courtesy of Harry Sher.



LSS203: Easy entrie key machine demonstration



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Reading wafer locks, courtesy of Harry Sher.

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Figure LSS+1615 The status of driver and bottom pins in the locked and plug rotating unlocked position.



The use of a pin tray or setup tray is required for forensic disassembly of a lock. Courtesy of Hans Mejlshede.



Producing pins for cylinders. Courtesy of Hans Mejlshede.



Forensic issues regarding the bypass of security and mushroom tumblers. Courtesy of Hans Mejlshede.



Decoding the Best removable core lock for the control key, courtesy of Harry Sher.



LSS101: Ikon factory, Berlin, Germany: How locks are made.



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LSS204: Brian Chan discussing balanced drivers

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Abloy master keying theory, Courtesy of Hans Mejlshede.



Forced entry of Abloy locks, and forensic indications, Courtesy of Hans Mejlshede.



The Peter Field (Medeco) patent for a security tumbler. Courtesy of Hans Mejlshede.



Forensic analysis of the Medeco cam lock. Courtesy of Hans Mejlshede.

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Figure LSS+2101 The EVVA ELMO system  
Figure LSS+2102 The IKON CLIQ System

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- Figure 22-1 TrioVing programmable card lock
- Figure 22-2 TrioVing dual bore cylinder
- Figure 22-3 Master Lock programmable pin system
- Figure 22-4 Winfield programmable lock
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- Figure 22-6 Fort Gem high-security axial pin tumbler lock
- Figure 22-7 Best removable core lock
- Figure 22-8 LeFebure programmable lever lock
- Figure 22-9 S&G programmable lever lock
- Figure LSS+2201 Instakey programmable lock
- Figure LSS+2202 Instakey depth and spacing table for small format interchangeable core lock
- Figure LSS+2203 Step key sequence for Instakey cylinder
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- Figure 23-5 Shimming a padlock
- Figure 23-6 Heel and toe locking of the shackle
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- Figure 23-8 S&G 8088 combination padlock
- Figure 23-9 Chubb Conquest padlock
- Figure 23-10 Mogul lock for prisons
- Figure 23-11 Folger-Adam high-security detention lock
- Figure 23-12 Push button lock
- Figure 23-13 Weigand card
- Figure 23-14 Briggs and Stratton sidebar lock
- Figure 23-15 General Motors VATS key
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- Figure LSS+2301 The English thumbscrews developed in the seventeenth century
- Figure LSS+2302 Early Scandinavian padlock design.
- Figure LSS+2303 Examples of Persian padlocks 17-18th century, and 1966 model of the same lock.
- Figure LSS+2304 An early Chinese padlock.
- Figure LSS+2305 Example of seventeenth century Spanish padlock and key.
- Figure LSS+2306 Puzzle locks
- Figure LSS+2307 A French padlock from the seventeenth century.
- Figure LSS+2308 Flemish padlock, sixteenth century
- Figure LSS+2309 German padlock, seventeenth century
- Figure LSS+2310 Screw action padlock
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- Figure LSS+2314 Padlock and key, eighteenth century
- Figure LSS+2315 Ball padlock
- Figure LSS+2316 Eighteenth century padlock
- Figure LSS+2317 Ne Plus padlock by George Price
- Figure LSS+2318 Padlock diagram of simple locking dog
- Figure LSS+2319 German Abus padlock, 1970
- Figure LSS+2320 Chubb Hercules padlock, 1971

## LSS+ MASTER EXHIBIT LISTING

Figure LSS+2321 Chubb Conquest padlock  
Figure LSS+2322 Diagram of the ratchet locking mechanism of the Club.  
Figure LSS+2323. A modified Club that has been converted into a shotgun.  
Figure LSS+2324. The Silca RW2 Transponder decoder and copier.  
Figure LSS+2325 Railroad mail clerk badge and antique mail locks  
Figure LSS+2326 Post office locks, including the famous Andrus lock that was patented in 1914  
Figure LSS+2327 Arrow eight lever post office box lock, and lever tumbler  
Figure LSS+2328 Rotary registered mail lock produced by the U.S. Postal Service



Discussion of transponder theft. Courtesy of Hans Mejlshede.



Bypass of push button locks. Courtesy of Don Shiles.



Discussion of Simplex push button lock, by Harry Sher



Use of tryout keys, courtesy of Harry Sher.



LSS202: Ross Anderson on smart card technology

### **Chapter 24 Investigation and Evidence Involving Locks and Keys**

No Exhibits



A forensic investigation involving the theft of a BMW automobile. Courtesy Hans Mejlshede.



Doing research on different bypass techniques is important for the forensic investigator. Courtesy of Don Shiles.



Analysis of a case involving forensics. Courtesy of Don Shiles.



Case example, burglary investigation. Courtesy of Don Shiles



Case example of hotel lock bypass. Courtesy of Don Shiles.



Case example, Courtesy of Hans Mejlshede.



Analysis of a case involving forensic locksmithing. Courtesy of Don Shiles.



Mail slot bypass device. Courtesy of Hans Mejlshede.



Keys can be copied by taking a 1:1 image using a copier machine. Courtesy of Hans Mejlshede.



Master key records. Courtesy of Hans Mejlshede.



Investigative clues that develop during a case. Courtesy Jim Bickers.



Pickability or ease with which a lock can be picked. Courtesy of Hans Mejlshede.

### **Chapter 25 Forensic Examination: Specifications, Operations, and Security**

Figure 25-1 Partially picked axial pin tumbler lock  
Figure LSS+2501 Forensic investigation forms  
Figure LSS+2502 Forensic evidence log-in report by Hans Mejlshede  
Figure LSS+2503 Sample forensic analysis form by Hans Mejlshede

## LSS+ MASTER EXHIBIT LISTING



Art Paholke is the father of modern forensic locksmithing. Courtesy of Hans Mejlshede.



Many car thefts are simulated for insurance claims. Courtesy of Hans Mejlshede.



It is essential to save the pins from a lock that has been the subject of a burglary attack. Courtesy of Hans Mejlshede.



Pressure will often be applied to the forensic locksmith during the course of an investigation to change the results of a report. Courtesy of Hans Mejlshede.



A clean work area for the forensic locksmith is a necessity. Courtesy of Hans Mejlshede.



Care must be exercised in cleaning of components. Courtesy of Hans Mejlshede.



The Forensic locksmith is often called upon to investigative covert entry. Courtesy of Hans Mejlshede.



The forensic investigator must prepare detailed reports. Courtesy of Hans Mejlshede.



Evidence in car theft investigations. Courtesy of Don Shiles.



Analysis of vehicle locks. Courtesy of Hans Mejlshede.



Analysis of vehicle theft cases. Courtesy of Hans Mejlshede.



Simulation of vehicle theft. Comments on investigation. Courtesy of Hans Mejlshede.



Investigations involving vehicle fires. Courtesy of Hans Mejlshede.



Analysis of marks produced by a slim jim bypass tool. Courtesy of Hans Mejlshede.



Use of rubber or silicone-coated tweezers. Courtesy of Hans Mejlshede.



Discussion regarding microscopes for use in forensic analysis. Courtesy of Hans Mejlshede.



Issues regarding crime scene sketches. Courtesy of Don Shiles.



Evidence handling techniques. Courtesy of Don Shiles.



Methods of forensic analysis. Courtesy of Don Shiles.



The investigative locksmith as a witness. Courtesy of Don Shiles.



Required background of the forensic locksmith and investigator. Courtesy of Don Shiles.



Definition of a forensic locksmith.



Use of photograph. Courtesy of Don Shiles





























What is an investigative locksmith? Courtesy of Don Shiles.



An introduction and summary of forensic locksmithing. Courtesy of Hans Mejlshede.

## LSS+ MASTER EXHIBIT LISTING

-  Forensic locksmithing history and the role of Art Paholke. Courtesy of Hans Mejlshede.
-  Was the lock picked? Courtesy of Don Shiles.
-  Macro lens, Courtesy of Hans Mejlshede.
-  Data back for documentation of images. Courtesy of Hans Mejlshede.
-  Photographic equipment requirements. Courtesy of Hans Mejlshede.
-  Ring strobe is a necessity for forensic photography. Courtesy of Hans Mejlshede.
-  Use of plastic tweezers. Courtesy of Hans Mejlshede.
-  Recovering stamped numbers from keys and locks. Courtesy of Hans Mejlshede.
-  Opinions of examiner, and certainty of their opinions. Courtesy of Hans Mejlshede.
-  Logging receipt of evidence. Courtesy of Hans Mejlshede.
-  Issues regarding investigative reports. Courtesy of Hans Mejlshede.
-  It is difficult to bypass laser track locks through the use of jiggle keys. Courtesy of Hans Mejlshede.
-  Definition of an Investigative locksmith. Courtesy of Don Shiles.
-  Forensic marks and their observation with proper lighting. Courtesy of Don Shiles.
-  The investigative locksmith gets involved in insurance fraud cases. Courtesy of Hans Mejlshede.
-  Marks on the back of the lock from bypass. Courtesy of Hans Mejlshede.
-  Use of WD-40 to clean and lubricate. Courtesy of Hans Mejlshede.
-  Oxidation and dating of marks in a forensic examination. Courtesy of Don Shiles.
-  Forensic implications of using a shim to open a lock prior to analysis. Courtesy of Hans Mejlshede.
-  An attempt may be made to mask pick marks so that the perpetrator is not identified. Courtesy of Hans Mejlshede.
-  Obtaining all keys that fit a particular cylinder. Courtesy of Hans Mejlshede.
-  Removal of cylinder and its analysis must be done correctly. Courtesy of Hans Mejlshede.
-  Changing or removal of top pins. Courtesy of Hans Mejlshede.
-  Preliminary issues in the examination of a lock. Courtesy of Don Shiles.
-  Examination of a lock and disassembly. Courtesy of Don Shiles.
-  Examination of a lock and marks that are visible. Courtesy of Don Shiles.





Information during a forensic investigation. Courtesy of Don Shiles.



Opening a lock using a blank key and a shim. Courtesy of Don Shiles.



LSS202: Forensic investigation and the locksmith, by Don Shiles

### **Chapter 26 Forensic Examination: Tool Marks and Trace Evidence**

Figure 26-1a Cutting plugs

Figure 26-1b Examining cut plugs

Figure 26-2 Irregular marks on the inter-chamber area

Figure 26-3 Corrosion within the plug

Figure 26-4 Normal keyway striations

Figure 26-5 Normal marks on bottom of pin tumblers

Figure 26-6 Curved pick marks

Figure 26-7 Mechanical snap pick gun marks

Figure 26-8 Rake pick marks

Figure 26-9 Electric vibrating pick marks

Figure 26-10 Conventional curved pick marks

Figure 26-11 Rake pick marks

Figure 26-12 Electric vibrating pick marks

Figure 26-13 Comb pick marks

Figure 26-14 Scoring within the cylinder wall

Figure LSS+2601 Cutaway view of plug, showing location of pick and tension wrench marks

Figure LSS+2602 A cylinder that has been picked and raked (left) and picked, then a forced entry tool was utilized.

Figure LSS+2603 An electric pick gun was utilized to open the lock on the left; impressing and picking was utilized to open the lock on the left.

Figure LSS+2604 Impression, rake picking marks in plug

Figure LSS+2605 Normal use marks, and those from impressing

Figure LSS+2606 Forensic marks from picking within lock body

Figure LSS+2607 Forensic marks on, normal pin from the factory

Figure LSS+2608 Forensic marks on pin from electric pick gun

Figure LSS+2609 Forensic marks on pin caused by impact tool such as pick gun

Figure LSS+2610 Forensic picking marks caused by a manual pick on surface of pin

Figure LSS+2611 Forensic marks on pin from pick gun and a rake pick

Figure LSS+2612 Forensic marks on pin caused by use of a key, a pick, and electric pick gun

Figure LSS+2613 Forensic marks on pin caused by conventional picking

Figure LSS+2614 Forensic marks on pin from a pick gun

Figure LSS+2615 Forensic marking on pin from a 999 key or bump key

Figure LSS+2616 Scanning electron microscope configuration, Jeol 5900

Figure LSS+2617 SEM photograph of pick tracks within lock, 220x magnification

Figure LSS+2618 SEM photograph of pick tracks within lock, 1000x magnification

Figure LSS+2619 SEM photograph of pick tracks within plug, 400x magnification

Figure LSS+2620 SEM photograph, surface of pick at 220x magnification

Figure LSS+2621 SEM photograph of pick marks on pin at 1000x magnification

Figure LSS+2622 SEM photograph of pick marks on plug

Figure LSS+2623 SEM photograph of surface of pick at 50x magnification

Figure LSS+2624 SEM photograph of surface of pick at 50x and 500x magnification

Figure LSS+2625 SEM photograph of surface of pick at 100x magnification



LSS101: Scanning electron microscope Part I: Michael Platek



























LSS101: Scanning electron microscope Part II: Michael Platek



LSS101: Scanning electron microscope Part III: Michael Platek

## LSS+ MASTER EXHIBIT LISTING

-  LSS203: The forensic investigation of locks and keys, by Hans Mejlshede.
-  Marks produced by methods of entry, courtesy of Harry Sher.
-  Forensic indication of the use of a ""999"" or "bump" key, Courtesy Hans Mejlshede
-  The age of picking marks can sometimes be determined through the analysis of corrosion within the lock. Courtesy of Mejlshede.
-  Destructive analysis of locks is often required in an investigation. Courtesy of Hans Mejlshede.
-  Analysis of marks within the plug after it has been cut apart. Courtesy of Hans Mejlshede.
-  Marks left from a turning wrench. Courtesy of Don Shiles.
-  Use of a scanning electron microscope (SEM). Courtesy of Hans Mejlshede.
-  The use of pick guns with profile locks. Courtesy of Hans Mejlshede.
-  Forensic analysis of pick gun marks. Courtesy of Hans Mejlshede.
-  Pick gun marks and order of picking. Courtesy of Hans Mejlshede.
-  Dust motes, visible in forensic analysis. Courtesy of Don Shiles.
-  Marks on wafers from picking. Courtesy of Hans Mejlshede.
-  Pick marks may appear on surface of wafers. Courtesy of Hans Mejlshede.
-  Analysis of presence of grease on wafers in forensic investigation. Courtesy of Hans Mejlshede.
-  Marks produced from turning wrenches are identifiable. Courtesy of Don Shiles.
-  Forensic indications of the use of an electric pick gun. Courtesy of Hans Mejlshede.
-  Cylinders may be opened by rapping them. Courtesy of Hans Mejlshede.
-  A forensic examination takes five minutes or less. Courtesy of Hans Mejlshede.
-  Forensic investigations involving locks that have been impressioned. Courtesy of Hans Mejlshede.
-  Forensic analysis of gang, jiggle, or tryout keys. Courtesy of Hans Mejlshede.
-  Marks on Ford wafer locks produced by gang, jiggle, or tryout keys. Courtesy of Hans Mejlshede.
-  Wear information and tests on pins. Courtesy of Hans Mejlshede.
-  Wear marks on pins. Courtesy of Hans Mejlshede.
-  Markings on components by manufacturers. Courtesy of Don Shiles.

## LSS+ MASTER EXHIBIT LISTING



Milling marks on pins during manufacture. Courtesy of Don Shiles.



Forensic marks and their observation with proper lighting. Courtesy of Don Shiles.



Bypass techniques must be known to the forensic investigator. Courtesy of Hans Mejlshede.



An analysis of latches and bolts may be required. Courtesy of Hans Mejlshede.



Loids may be utilized to bypass latches and bolts. Courtesy of Hans Mejlshede.



Virgin areas of the plug will provide an indication that the locks was picked. Courtesy of Hans Mejlshede.



Normal appearance of pins and what type of marks appear. Courtesy of Hans Mejlshede.



Forensic marks from the use of a lock pick. Courtesy of Hans Mejlshede.



Pickability or ease with which a lock can be picked. Courtesy of Hans Mejlshede.



Turning wrench or torque wrench will leave identifiable tool marks. Courtesy of Hans Mejlshede.



Tool mark comparison. Courtesy of Hans Mejlshede.



Picking marks on wafers from vehicle locks. Courtesy of Hans Mejlshede.



Marks produced by raking. Courtesy of Don Shiles.



Marks produced from keys making contact with pins. Courtesy of Don Shills.



Different marks are created from various lock picks. Courtesy of Don Shiles.

### **Chapter 27 Forensic Examination of Keys**

Figure 27-1 Key cut by code vs. key cut by hand

Figure 27-2a Cutting wheels

Figure 27-2b Patterns for cutting teeth

Figure 27-3 Factory original code cut keys and duplicates

Figure 27-4 Tool marks from tracing stylus

Figure 27-5 Speed and design of cutting wheel

Figure 27-6 The bitting of a key can be disguised

Figure LSS+2701 Schlage 922 wafer lock diagram and photograph

Figure LSS+2702 A milled blank is made to fit a restricted keyway



Bypass of a Schlage 922 series wafer lock. Courtesy of Don Shiles.



Metal filings at the scene of a safe burglary. Courtesy of Don Shiles.



Investigations may require a determination of whether a key has been copied. Courtesy of Hans Mejlshede.



Marks from key duplication. Courtesy of Don Shiles.

### **Chapter 28 General Introduction to Bypass**

No Exhibits



Discussion of different bypass techniques. Courtesy of Don Shiles.



Bypass of an American Padlock Series 700. Courtesy of Don Shiles.



Forensic analysis of gang, jiggle, or tryout keys. Courtesy of Hans Mejlshede.



Marks on Ford wafer locks produced by gang, jiggle, or tryout keys. Courtesy of Hans Mejlshede.



External bypass of a solenoid using a magnetic field. Courtesy of Don Shiles.



LSS303: Analysis of bypass techniques, by John Falle



LSS204: Brian Chan on the disassembly of a lock and derivation of the TMK

### **Chapter 29 Picking**

Figure 29-1 Paracentric keyways

Figure 29-2 Double Detainer Locking theory

Figure 29-3 Tolerance errors

Figure 29-4 Rake picks

Figure 29-5 Rocker picks

Figure 29-6a Mechanical pick guns

Figure 29-6b Wire snap pick

Figure 29-7a Electric pick guns

Figure 29-7b Early vibrating pick gun

Figure 29-8 Comb pick

Figure 29-9 Security tumblers

Figure 29-10 Professional pick set

Figure 29-11 HPC stainless steel pick set

Figure 29-12 Ball picks

Figure 29-13 Diamond and half-diamond picks

Figure 29-14 Hook and deep hook picks

Figure 29-15 "999" key

Figure 29-16 Torque wrenches

Figure 29-17 John Falle professional torque wrenches

Figure 29-18 HPC spinner wrench

Figure 29-19 Round spring loaded tension wrench

Figure 29-20 HPC tension wrench

Figure 29-21 HPC skeleton keys for warded padlocks

Figure 29-22 Rake picks for double-bitted wafer locks

Figure 29-23 SEA laser track key

Figure 29-24 Two-in-one picking tool

Figure 29-25 Two-in-one picks for lever locks

Figure 29-26 Martin Newton two-in-one pick

Figure 29-27 False or serrated gates within a lever tumbler

Figure 29-28 Brush pick

Figure 29-29 Bypassing ASSA sidebar locks

Figure 29-30 Decoding tool for Medeco sidebar lock

Figure 29-31 Decoder for Chicago tubar pin tumbler lock

Figure 29-32 Early bypass tools

Figure 29-33 Silvera's complex picking tool

Figure 29-34a Custom tools for bypassing complex locking systems

Figure 29-34b Specialized bypass tools

Figure LSS+2901 Application of torque when picking

Figure LSS+2902 HPC Flip-it tool, proper use

Figure LSS+2903 Insertion of pick into the lock

Figure LSS+2904 Comb pick by John Falle

## LSS+ MASTER EXHIBIT LISTING

Figure LSS+2905 MSC (Hamburg) produces different shaped torque wrenches  
Figure LSS+2906 MSC produces a spring-loaded tension wrench like HPC  
Figure LSS+2907 Warded lock diagram of keys and lock  
Figure LSS+2908 Warded keys used to open locks, including burglars skewer  
Figure LSS+2909 Warded skeleton keys  
Figure LSS+2910 An axial cylinder, picked and locked  
Figure LSS+2911 Axial pick and decode tool setup  
Figure LSS+2912 Axial pick tool inserted into a lock  
Figure LSS+2913 Axial lock picked and decoded  
Figure LSS+2914 MSC Sputnik picking and decoding tool  
Figure LSS+2915 MSC Sputnik detail of construction  
Figure LSS+2916 MSC Sputnik tool; the wires drive individual pins  
Figure LSS+2917 MSC Sputnik tool, internal detail of wire guides  
Figure LSS+2918 MSC Sputnik tool, wires protruding to control pins  
Figure LSS+2919 MSC Sputnik tool, one wire protruded  
Figure LSS+2920 MSC Sputnik tool, pins can be moved to any position  
Figure LSS+2921 The John Falle pick set detail  
Figure LSS+2922 The John Falle two-in-one wheel pick set and two locks that it will open. Courtesy of John Falle.  
Figure LSS+2923 A set of "jiggers" to bypass lever locks. Courtesy of John Falle.  
Figure LSS+2924 A variety of lever lock picking tools are produced by John Falle.  
Figure LSS+2925, Diagram showing order of picking, and the misalignment of the five chambers.  
Figure LSS+2926 Plug partially picked.  
Figure LSS+2927 John Falle comb pick set  
Figure LSS+2928 Safe opening tools for lever locks  
Figure LSS+2929 The theory of lock picking  
Figure LSS+2930 The use of a comb pick  
Figure LSS+2931 The MSC cross pick  
Figure LSS+2932 The MSC Electropick allows controlled manipulation of pin tumblers.  
Figure LSS+2933 MSC acoustic picking tool.  
Figure LSS+2934 Kromer Convar lever lock  
Figure LSS+2935 Kromer Novum lever lock  
Figure LSS+2936 Stuv lever lock  
Figure LSS+2937 Rosengrens ABN1 lever lock  
Figure LSS+2938 Rosengrens RKL10 lever lock  
Figure LSS+2939 Markings on levers to aid picking  
Figure LSS+2940 Axial lock pick and decoding tools by A-1 and Peterson Manufacturing.  
Figure LSS+2941 The Peterson pick tools for the Schlage Everest cylinder  
Figure LSS+2942 A rake pick for a dimple lock



The theory behind the use of the 999 key, Courtesy of Hans Mejlshede.



The proper technique for the use of the 999 or bump key, Courtesy of Hans Mejlshede.



Residue may be present when a dimple lock has been bypassed. Courtesy of Hans Mejlshede.



Order of picking. Courtesy of Hans Mejlshede.



The use of pick guns and forensic analysis of locks. Courtesy of Hans Mejlshede.



Use of a pick gun requires skill. It also leaves forensic indications. Courtesy of Hans Mejlshede.



LSS201: MSC Assortment of tension wrenches, courtesy of Mahmud Abu Shanab



LSS201: MSC "Sputnik" bypass tool, courtesy of MSC.



LSS202: The use of the "bump key" or "999" key, by Hans Mejlshede.

## LSS+ MASTER EXHIBIT LISTING



Use of a bump key, by Harry Sher



Procedure to open a lever lock with the "drill and pick" technique. Courtesy of Harry Sher.



Picking Medeco locks. A discussion by Harry Sher.



A discussion regarding the impact pick gun, by Harry Sher.



How does impact picking work? Courtesy of Harry Sher.



Feel-picking individual pins, courtesy of Harry Sher.



Use of a plug spinner, courtesy of Harry Sher.



LSS203: Demonstration of the MSC cross pick on a lock with four rows of tumblers



LSS203: Demonstration of the MSC electropick on a profile cylinder



LSS203: MSC Acoustic picking tool demonstration



LSS204: Owe Bengtsson on picking lever locks and utilizing markings on the levers.



LSS204: Owe Bengtsson on picking the Kromer Convar lock



LSS204: Owe Bengtsson on picking the Kromer Novum lever lock



LSS204: Owe Bengtsson on picking the Stuv lever lock.



LSS204: Owe Bengtsson on opening the Rosengrens ABN1 lever lock.



LSS204: Owe Bengtsson on opening the Rosengrens RKL10 high security lever lock



LSS204: MSC Sputnik II with audio probe

### **Chapter 30 Impressioning**

Figure 30-1 File marks during impressioning

Figure 30-2 HPC vice grips tool for impressioning

Figure 30-3 Original impressioning tool

Figure 30-4 Round holding tool

Figure 30-5 Impressioning with parallel striations

Figure 30-6 Preparing surface of key for impressioning

Figure 30-7 Quality of impressioning marks

Figure 30-8 Newton's plasticine key impressioning kit for lever locks

Figure 30-9 Bates impressioning system

Figure 30-10 Martin composite key for impressioning

Figure 30-11 Martin impressioning system

Figure 30-12 Composite lead and brass key

Figure 30-12a Foil impressioning system

Figure 30-12b Falle foil impressioning system

Figure 30-13a Falle foil impressioning system

Figure 30-13b Foil-covered die

Figure LSS+3001 The impressioning light box allows viewing of keys during covert operations

Figure LSS+3002 Use of a pippin file for impressioning

Figure LSS+3003 John Falle self-impressioning system for lever locks



## LSS+ MASTER EXHIBIT LISTING

Figure LSS+3004 Falle foil impressing system for specific dimple locks  
Figure LSS+3005 Foil impressing system for dimple locks by John Falle  
Figure LSS+3006 Special dies for the Foil dimple impressing system



A clever device for impressing lever locks has been developed in Bulgaria. Courtesy of Hans Mejlshede.



The usefulness of the impressing technique. Courtesy of Hans Mejlshede.



How does impressing work? A discussion by Harry Sher.



A discussion about impressing, by Harry Sher.



LSS301: Foil impressing system, by John Falle



LSS304: DOM Dimple foil impressing system, by John Falle

### **Chapter 31 The Decoding of Locks: Theory, Procedures, and Technologies**

Figure 31-1 Falle magnetic key generation system for Medeco lock  
Figure 31-2 Japanese segmented variable key system  
Figure 31-3a Falle variable key system  
Figure 31-3b Falle variable key system  
Figure 31-4 HPC key micrometer  
Figure 31-5 Lever lock special decoder  
Figure 31-6a HPC Handheld decoder  
Figure 31-6b HPC Decoder data card  
Figure 31-7 HPC TKPD-1 decoder  
Figure 31-8 Falle Universal belly reader  
Figure 31-9 Falle basic lever decoder  
Figure 31-10a Falle Pin and Cam system  
Figure 31-10b Pin-kit for the Pin and Cam system  
Figure 31-11a Keys made by modified Falle Pin and Cam decoder  
Figure 31-11b Overlay cylinder on the CISA lever lock  
Figure 31-12a Falle European lever lock pick and decoder set  
Figure 31-12b Tools for measuring the bitting and reproducing the key for lever locks  
Figure 31-13 Falle European lever lock decoder  
Figure 31-14a Falle Lips lever lock decoder kit and pick  
Figure 31-14b Falle skirt lock wheel pick kit  
Figure 31-15 Falle decoder and pick set  
Figure 31-16a LeFebure impressing and decoding system  
Figure 31-16b LeFebure impressing and decoding system  
Figure 31-17 Fichet monopole lock  
Figure 31-18 Fichet "H" series lock  
Figure 31-19 Falle pick and decoder for the fitchet 787 pump lock  
Figure 31-20 Falle decoder kit for the Mottura Serrablocca pump lock  
Figure 31-21 code finding key  
Figure 31-22 Decoders for the Abloy Disklock  
Figure 31-23 Falle decoder for the Abus Granit Disklock  
Figure 31-24 Abloy Disklock Pro decoder and key generation system  
Figure 31-25 R&D Briggs and Stratton sidebar decoder  
Figure 31-26 Decoding wafers within a sidebar lock  
Figure 31-27 Falle decoder system for laser-track locking mechanisms in automobiles  
Figure 31-28a Pin Lock Decoder  
Figure 31-28b Pin Lock Decoder  
Figure 31-29 Medeco cam lock configuration tryout keys  
Figure 31-30 Falle decoding system for Medeco sidebar locks  
Figure 31-31 Falle BiLock system  
Figure 31-32 HPC picking and decoding tool for axial locks



## LSS+ MASTER EXHIBIT LISTING

Figure 31-33a HPC "Peanut tool"  
Figure 31-33b HPC axial decoding and picking tools  
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## LSS+ MASTER EXHIBIT LISTING

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Discussion of endoscope and borescope. Courtesy of Hans Mejlshede.



The John Falle lever decoder system. Courtesy of Hans Mejlshede.



Bypass of laser track or sidewinder locks. Courtesy of Hans Mejlshede.



Master key records. Courtesy of Hans Mejlshede.



A discussion of reading the belly of a lever. Courtesy of Hans Mejlshede.



Forensic implications of the bypass of lever locks. Courtesy of Hans Mejlshede.



Forensic implications of picking or decoding the Abloy lock. Courtesy of Hans Mejlshede.



The A-1 GM 10 cut pick system, courtesy of Harry Sher.



Pick tools for the sidebar lock, courtesy of Harry Sher.



Reading a Chrysler lock with an EZ Reader tool, by Harry Sher



Decoding of keys, courtesy of Harry Sher.



The Peterson PRO-1 tool, courtesy of Harry Sher.



LSS301: Abus decoder, by John Falle



LSS301: European lever lock decoder, by John Falle























LSS301: Ford Galaxy decoding system, by John Falle



LSS302: Medeco lock decoding system, by John Falle

## LSS+ MASTER EXHIBIT LISTING

-  LSS302: Universal pin lock decoder, by John Falle
-  LSS302: European lever lock pick, by John Falle
-  LSS302: Axira lock decoding system, by John Falle
-  LSS302: BMW lock decoder system, by John Falle
-  LSS303: Pin and cam system for CISA and other European locks, by John Falle
-  LSS303: BiLock decoder system, by John Falle
-  LSS303: Abloy decoder system, by John Falle
-  LSS303: Universal pin and cam system, by John Falle
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-  LSS304: Key turning system for lever locks, by John Falle
-  LSS304: DOM Diamond decoder and pick system, by John Falle.
-  LSS304: Chubb AVA pick and decoder system, by John Falle
-  LSS305: EVVA 3KS pick and decoder system, by John Falle
-  LSS305: Pin lock decoder system with pin and cam technology, by John Falle.
-  LSS203: Matt Blaze on shimming a cylinder to determine all pin segments
-  LSS203: Brian Chan on TMK extrapolation
-  LSS203: Harry Sher on the decoding of a top level master key
-  LSS203: Matt Blaze on the extrapolation of a top level master key
-  LSS203: Harry Sher on covert methods of entry
-  LSS204: Harry Sher on picking axial pin tumbler locks

### **Chapter 32 Destructive Entry: Tools and Techniques**

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- Figure 32-2 Hole saw used to remove the plug from a cylinder
- Figure 32-3 Drilling the retaining screws
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- Figure 32-5 Drilling through the plug
- Figure 32-6 Slam-hammer
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- Figure 32-8 Using a metal screw to pull a plug or cylinder
- Figure 32-9 Dent puller kit
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Figure 32-39 Broco portable thermic lance  
Figure 32-40 Broco thermic lance  
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Figure 32-42 Shove-knife

Figure LSS+3201 Sigma Baby ram  
Figure LSS+3202 Explosive Wall Breaching System  
Figure LSS+3203 Sigma Firecracker ram  
Figure LSS+3204 Sigma Mitts  
Figure LSS+3205 Sigma Ripper  
Figure LSS+3206 Power actuated tool



Figure LSS+3207 External - Right hand inward opening timber door with standard Yale type lock; Internal - Left hand inward opening steel gate in confined area armed with single deadlock. Courtesy Ian Bauchop.



Figure LSS+3208 External - Left hand outward opening solid timber door with two locks; Internal - Left hand inward opening steel grille. Confined space with one deadlock and two sliding bolts



Figure LSS+3209 Internal concertina mild steel window grilles behind 6 mm float glass casement window



Figure LSS+3210 Right hand inward opening solid timber door with multipoint locking system



Figure LSS+3211 External - Right hand outward opening steel gate, slightly recessed with single lock and cover plate lock side on two rising butt hinges; Internal - Right hand inward opening timber door

## LSS+ MASTER EXHIBIT LISTING



Figure LSS+3212 External - Steel cage protecting front door with right hand outward opening single lock with now cov plate. External steel grilles protection windows; Internal - Inward opening solid timber door



Figure LSS+3213 Right hand inward opening flush solid timber door with one visible lock



Figure LSS+3214 Internal view of LSS+3213 detailing timber braces and additional deadlock and night chain



Figure LSS+3215 Right hand inward opening solid timber door with four individual locks. Attack made with chain saw c hinge side



Figure LSS+3216 External - Right hand opening steel gate with single lock, full cover plate and rising butt hinges; Inter Right hand outward opening solid timber door, locks unseen



Figure LSS+3217 External - Right hand outward opening steel gate, single lock, no cover plate and standard butt hinge Internal - Right hand inward opening solid timber door, one lock visible



Figure LSS+3218 External - Right hand outward opening timber and glass door with single lock; Internal - Right hand opening timber and glass paneled door with two locks



Figure LSS+3219 Recessed Left hand inward opening solid timber door with multilocking system, set in steel frame pl additional top lock



Figure LSS+3220 External - Flush with building right hand outward opening steel paneled gate with steel mesh and full cover plate; Internal - Standard timber door with glass panel



Figure LSS+3221 Left hand outward opening recessed solid timber fire door with steel panel



Figure LSS+3222 External - Heavy duty right hand outward opening steel gate proud of building line with single lock an cover plate; Internal - Right hand inward opening timber door, locks unseen



Figure LSS+3223 External - Recessed right hand outward opening steel gate with three standard butt hinges and no c strip; Internal - Right hand inward opening timber paneled door with two locks visible

Figure LSS+3224 A sigma forced entry team shows the technique for breaching a door.

Figure LSS+3225 MSC Lock Force tool is similar to that produced by SIGMA

Figure LSS+3226 There are various dies for the MSC LOCK FORCE tool to fit different profiles

Figure LSS+3227 The use of the MSC LOCK FORCE tool is straightforward

Figure LSS+3228 The BROCO thermic lance is a small self contained package

Figure LSS+3229 The BROCO control nozzle and chemical self starter for the thermic lance

Figure LSS+3230 The KIBB security lock and strike system makes bypass difficult

Figure LSS+3231, an attack on a file cabinet safe with a variety of tools.

Figure LSS+3232 A hole saw can be used to ream out the entire plug.

## LSS+ MASTER EXHIBIT LISTING

Figure LSS+3233 A new shear line is created by drilling the plug.

Figure LSS+3234 The mounting for the cylinder is cast and can be fractured, allowing removal of the lock.

Figure LSS+3235 Knob locks should not be used as the sole protection on exterior doors.

Figure LSS+3236 Rim locks must be mounted properly to increase their resistance to attack.

Figure LSS+3237 Cylinders can be pried loose if not mounted properly.

Figure LSS+3238 The cylinder was pounded through the mounting.

Figure LSS+3239 A pipe wrench can be utilized to twist loose a key-in-knob or cylinder lock.

Figure LSS+3240 The ease by which a cylinder can be removed by shearing the setscrew.



Cylinders can be forcibly removed by applying torque and destroying internal setscrews. The setscrews can also be removed during business hours to allow the cylinder to be unscrewed at a later time. Courtesy of Don Shiles.



A wrench attack on cylinders can be very effective. Courtesy of Don Shiles.

Figure LSS+3241 A diagram showing the principle of jamb spreading.

Figure LSS+3242, Examples of burglary tools found at the scene of a safe job.



Cylinders can be forcibly removed by applying torque and destroying internal setscrews. The setscrews can also be removed during business hours to allow the cylinder to be unscrewed at a later time. Courtesy of Don Shiles.

Figure LSS+3243, a special drill bit for removing plugs, called a rotary pick.

Figure LSS+3244 A lock can be drilled by raising all drivers above shear line.

Figure LSS+3245 A lock can be drilled to create a new shear line.

Figure LSS+3246 A lock can be drilled and then shimmed with a fine wire.

Figure LSS+3247 Peterson Manufacturing IC removal tool

Figure LSS+3248 The Stealth Lock Systems tool to open Medeco cam locks



Sigma analysis of the Kibb interlocking strike plate, with Ian Bauchop.



Demonstration of different forced entry techniques on doors utilizing the Kibb interlocking strike plate design.



A wrench attack on cylinders can be very effective. Courtesy of Don Shiles.



Forensic evidence of forced entry. Courtesy of Hans Mejlshede.



Opening a padlock by bouncing the locking dog. Courtesy of Don Shiles.



A discussion of covert entry by Harry Sher



A discussion of GSA containers and covert entry, by Harry Sher



A discussion of surreptitious entry and government containers, by Harry Sher



The use of the nose puller, courtesy of Harry Sher.



LSS201: MSC Lock Force tool, courtesy of MSC



LSS201: Forced entry tools produced by Sigma. Courtesy of Ian Bauchop.



LSS202: Broco Thermic lance description and use, by Tom Joos.



LSS203: Demonstration of the use of a loid, by MSC

### Chapter 33 The Origin, Development, and Design of Safes, Vaults, and Strong rooms

Figure 33-1a Vault door

## LSS+ MASTER EXHIBIT LISTING

Figure 33-1b Vault layers  
Figure 33-1c Safe or vault door components  
Figure 33-2 Israeli jewelry safe diagram  
Figure 33-3 S&G relocker  
Figure 33-4a Relocker system patent  
Figure 33-4b Secondary relocker in Chubb safe  
Figure 33-4c Thermal relocker  
Figure 33-5 National Safe-Deposit Company in London  
Figure 33-6a Strong room  
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Figure 33-6c Modern strong room components  
Figure 33-7 Barrier reinforcements  
Figure 33-8 S&G three chronometer mechanical time lock  
Figure LSS+3301 A seventeenth century German strongbox  
Figure LSS+3302 German chest lock, seventeenth century and a French chest, sixteenth century  
Figure LSS+3303 German chest locks, seventeenth century, and fifteenth century.  
Figure LSS+3304 Record safe with internal component layout.  
Figure LSS+3305 The money safe and internal view.  
Figure LSS+3306 Examples of composite safe, cladode safe, and combination safe.  
Figure LSS+3307, an example of a floor safe and SMNA labels for fire and burglary rating.  
Figure LSS+3308 Examples of fire protected file cabinets.



LSS101: Discussion of safe design by Bill Sherlock.

### **Chapter 34 Combination Locks**

Figure 34-1 Chatwood five-wheel combination lock  
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Figure 34-5 Driver group components  
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Figure 34-9b Change wheel construction  
Figure 34-10 Wheel within a wheel pack  
Figure 34-11 Relocker trigger  
Figure 34-12 Handing of a lock  
Figure 34-13 Boltwork components  
Figure 34-14 Cutaway view of lever lock  
Figure 34-15 Lever fence and its components  
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Figure 34-18 Relock trigger within an S&G lock case  
Figure 34-19 Dial indication  
Figure 34-20 "The forbidden zone"  
Figure 34-21 S&G 6400 series group 1 manipulation proof lock  
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Figure 34-23 Change key  
Figure 34-24 Chubb time lock

Figure LSS+3401 S&G Model 6600 Series (1950Version)  
Figure LSS+3402 S&G Model 6600 Series (1960Version)  
Figure LSS+3403 S&G 6600 SERIES (1960 VERSION) DISASSEMBLED  
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Figure LSS+3406 Mosler 302 MR Hand Change Lock  
Figure LSS+3407 Mas-Hamilton Group X-07 Electromechanical Lock  
Figure LSS+3408 Diebold Model 180 Series  
Figure LSS+3409 Puzzle locks, 18th and 19th century



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Figure LSS+3410 Tobacco box and lock  
Figure LSS+3411 Yale and S&G three wheel locks, circa. 1948  
Figure LSS+3412 Hand-change combination lock procedure  
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Figure LSS+3414 Screw-change combination lock procedure  
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Figure LSS+3416 S&G 6700 MP combination lock  
Figure LSS+3417 S&G 6730 MP combination lock  
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Figure LSS+3421 S&G 8550 combination lock  
Figure LSS+3422 LaGard 1980 combination lock  
Figure LSS+3423 Pillard time lock  
Figure LSS+3424 UL tolerance for Group 1 and Group 2 combination locks  
Chatwood Invincible Key Lock  
Dalton Permutation  
Damon's Patent Lock  
Day and Newell Parautoptic Safe Key  
Dodds MacNeale & Urban's "Excelsior"  
W.B. Dodds  
Hall's Double Dial Premier (mid-size) with Consolidated Time Lock  
Hall's Premier (mid-size)  
Hall's Crescent  
Hall's Crescent  
Hall's Safe Lock  
Hall's Single Dial Premier (mid-size) with Consolidated Time Lock  
Herring, Farrel, and Sherman Double Dial  
Herring Grasshopper Key Lock  
H.C. Jones Patent Combination Lock  
"Hobnail" (Early American) Safe Key  
Lillie (attributed) Click Lock with Key  
Lillie (attributed) Dial Lock w/Knob  
Lillie (Lewis) "Click Lock" Safe Key  
Miller Combination Lock Patent Model  
Rosengrens Safe Lock  
Safe-Deposit Lock-1  
Sargent's Magnetic Lock #2 (early)  
Sargent & Greenleaf #3 Fire Proof Lock  
Sargent & Greenleaf #1 Vault Door Lock  
T. J. Sullivan  
Yale Double Dial Bank Lock Earliest pat. Date-July 14, 1857  
Yale Double Dial Split-Bolt Vault Lock  
Yale Pin Dial Time Lock (56 hour, 2 movement)  
Yale 101-1/2 Double Dial  
Yale Quadruplex Safe Key



LSS101: Discussion of the X-07 and X-08 with Joe Cortie  
Opening the 6730 MP and 8400 Mp, by Harry Sher

### **Chapter 35 Destructive Entry of Safes: Tools and Techniques**

Figure 35-1 Punching  
Figure 35-2 Peeling  
Figure 35-3 Torching a safe  
Figure 35-4 Thermic lance  
Figure 35-5 Plasma torch  
Figure 35-6 Carbide tipped and diamond drills  
Figure 35-7 Lever rig  
Figure 35-8 Lever drill rig

## LSS+ MASTER EXHIBIT LISTING

Figure 35-9 457 Magnum magnetic drilling  
Figure 35-10a Magnum drilling rig  
Figure 35-10b Positioning Magnum drill  
Figure 35-11 Critical drill points within a combination lock  
Figure 35-12 Drill template  
Figure 35-13 Dial segment template  
Figure 35-14a Drilling a safe  
Figure 35-14b Drilling a safe  
Figure 35-15 Fixed drill template  
Figure 35-16 Barrier material  
Figure 35-17 Barrier material  
Figure 35-18 Punches  
Figure 35-19 Drilling a new set of gates  
Figure 35-20 Removing a dial with a slam hammer  
Figure 35-21 Drilling hole to scope the fence  
Figure 35-22 Removing the fence  
Figure 35-23 Drilling the pivot screw that attaches the lever and bolt  
Figure 35-24 Drill pins  
Figure LSS+3501 Chemical composition of tear gars  
Figure LSS+3502 Tear gas canister  
Figure LSS+3503 Table of Explosives  
Figure LSS+3504 Emergency dials  
Figure LSS+3505 Fire and record safes  
Figure LSS+3506 Money safes  
Figure LSS+3507 Cash safes  
Figure LSS+3505 Fire and record safes  
Figure LSS+3506 Money safes  
Figure LSS+3507 Cash safes

Figure LSS+3508. Punching involves the wheel pack being forced inward  
Figure LSS+3509, diagram showing how a safe is peeled by gaining an access point to remove layers of metal.  
Figure LSS+3510. In this figure, peeling was accomplished from the corner using a cold chisel.  
Figure LSS+3511 This was a peel and punch attack to access the bolts (left). A classic peel attack is shown (right)  
Figure LSS+3512, examples of peeling of the outer skin on the top of the container and the rivets popped.  
Figure LSS+3513 Prying and wedging.  
Figure LSS+3514 A safe that has had the door pulled loose by the application of extreme pressure.  
Figure LSS+3515, (ISP 38-3563 left, and 39-3563 right). The result of pounding of components.  
Figure LSS+3516, Bolts were sheared from shock waves through the use of the welded bar to the front of the door.  
Figure LSS+3517. Example of punching. Pressure was applied to the hinge side.  
Figure LSS+3518. This was a pound attack. The door was pounded with many hits.  
Figure LSS+3519, An attack by the use of a wedge to pry apart and separate portions of the container.  
Figure LSS+3520, The top of the safe was cut into to provide access to the bolt works.  
Figure LSS+3521 Attacks by torch. In the middle picture, an inept attempt to open the safe by cutting through the side.  
Figure LSS+3522. Attack using a torch where there was obviously no knowledge of where to cut.  
Figure LSS+3523 Additional examples of the use of a torch. In the photographs, the lock box is burned out.  
Figure LSS+3524 Lines scored by an oxyacetylene torch in the outer shell of a Chubb safe.  
Figure LSS+3525, examples of torch attack. Incorrect tools were utilized on the side of the safe.  
Figure LSS+3526, attack by torch that did not result in an opening.  
Figure LSS+3527, A torch attack where burglars cut a portion from the door for access.  
Figure LSS+3528, Examples of attack by oxyacetylene.  
Figure LSS+3529. The thermic lance develops high temperature and can be utilized virtually anywhere.  
Figure LSS+3530 An example of a safe attacked with a thermic lance.  
Figure LSS+3531 An example of arc welding with cutting rods.  
Figure LSS+3532, A free-standing Chubb safe was attacked with explosives.  
Figure LSS+3533 A safe was open with explosives, after being filled with water.  
Figure LSS+3534 A fixed drill rig.  
Figure LSS+3535 A burglary where it is suspected that a drill rig caused the fracture of the outer skin of the door.  
Figure LSS+3536 Core drill can produce a large hole for access to the bolt works or lock box.  
Figure LSS+3537 Critical drill points are shown. This is a rear view, with the lock case removed.

## LSS+ MASTER EXHIBIT LISTING

Figure LSS+3538 (ISP 23-2963) Deflector plates made of angle iron are added to deter drilling.  
Figure LSS+3539 (ISP 104-3563) The bolt is punched out of the way in order for the handle cam to be rotated.  
Figure LSS+3540 Burglars drilled into the side of the safe to punch and drive the bolt out of the way.  
Figure LSS+3541 A scope is inserted to obtain a view of the wheel pack.  
Figure LSS+3542 The fence is a prime target for drilling, either the soldered link or the actual fence material.  
Figure LSS+3543 Progression of movement of the fence into the gate of the wheel pack.  
Figure LSS+3544 A 90 degree angle view with a borescope using a mirror on a Mosler MR 302.  
Figure LSS+3545 Locating the fence for drilling.  
Figure LSS+3546 A lever fence that has been drilled, and then removed.  
Figure LSS+3547 Drilled relockers and zoom view.  
Figure LSS+3548 Mosler MR-302 point of penetration.  
Figure LSS+3549 Hole drilled through cover plate.  
Figure LSS+3550 Side drilling and scoping the lock case.  
Figure LSS+3551 Floor safe that has been angle drilled to view wheel pack.  
Figure LSS+3552 Safe drilled from the top of safe to lock box to view the wheel pack.  
Figure LSS+3553 Many burglaries are simulated.  
Figure LSS+3554 The burglar uses a drill without much knowledge of the safe.



3563-15 Individual must have knowledge



3563-16 Tool knowledge of the burglar



3563-17 Time limit for burglary



3563-1819 Proficiency in burglarizing types of safes



LSS201: A primer on the burglary of safes, Courtesy of Bill Sherlock.



LSS201: Forensics and locks, Courtesy of Bill Sherlock.



LSS202: Steve Mattoon on the use of explosives to gain entry.



Use of the change-key hole for reading wheels, by Harry Sher



LSS204: Owe Bengtsson on opening safes



LSS204: Owe Bengtsson introduction to opening safes



LSS204: Owe Bengtsson on the forced entry opening of safes



LSS204: Owe Bengtsson on the opening of high security safes

### **Chapter 36 Non-Destructive Methods of Entry**

Figure 36-1 ITL robot dialer  
Figure 36-2 Flow chart of an automatic dialer  
Figure 36-3 Contact points for manipulation  
Figure 36-4 Drop in area  
Figure 36-5 Quantifying contact point measurements  
Figure 36-6 Geometry of the contact area  
Figure 36-7 Production tolerance  
Figure 36-8 Charting contact points  
Figure 36-9 True center grid  
Figure 36-10 Magnetic magnifying glass  
Figure LSS+3601 Mas-Hamilton Soft Drill system  
Figure LSS+3602 Soft Drill display screens during manipulation

## LSS+ MASTER EXHIBIT LISTING

Figure LSS+3603 Parallax error can cause problems during manipulation



2963-42 The use of robot dialers



Use of ultra violet to determine which keys have been depressed on a keypad. Courtesy of Don Shiles.



LSS201: Mark Bates on Manipulation



LSS201: Mark Bates on the Soft Drill



A discussion of Mas-Hamilton and the Soft Drill, by Harry Sher



Background on Mas-Hamilton and the development of the Soft Drill, by Harry Sher

### **Chapter 37 Standards and Testing**

Figure LSS+3701 UL Label

Figure LSS+3702 UL Label designations and nomenclature

Figure LSS+3703 SMNA Label designations

FF-L-2740 Federal Specification for Combination Locks

### **Chapter 38 Security: Analysis and Reduction of Risk**

LSS202: Ross Anderson on security engineering

### **Chapter 39 Security: Physical Protective Measures**

Figure 39-1 Window joints

Figure 39-2 Glazing with unprotected sealant

Figure 39-3 Glazing with glass mountings

Figure 39-4 Insulating glass

Figure 39-5 Glass bricks

Figure 39-6 Steel bars within glass bricks

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Hinges and forensic evidence. Courtesy Don Shiles.



Case example: removal of sliding glass door. Courtesy of Don Shiles.



LSS202: Ross Anderson on biometrics

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LSS401: E Field protection



LSS401: Buried Cable sensors



LSS401: Fence alarm system



LSS401: Microwave sensor systems



LSS401: Outside passive infrared sensors



LSS401: Photoelectric sensors



LSS401: Thermal imaging and sensing



LSS401: Video logging and capture systems



LSS401: Alarm contact devices, including magnetic switches



LSS401: Discussion regarding pressure mats



LSS401: Embedded screen wires



LSS401: Alarm foil



LSS401: Grid wires in alarm systems



LSS401: Ribbon switch material as a sensor



LSS402: Shock sensors for glass break detection



LSS402: Other types of shock detection sensors



LSS402: Trip wires in alarm systems



LSS402: Alarm monitoring systems



LSS402 Defeat techniques for different sensor technologies



LSS402: Glass break sensors and how they work



LSS402: Issues with microwave sensors



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LSS402: Alarm sounders and notification devices



LSS402: Ultrasonic alarm sensors



LSS402: Proximity sensor technology



LSS402: Alarm defeat methods for dual technology devices



LSS402: Passive infrared sensor technology



LSS403: Fiber optic fence sensors



LSS403: Shock sensors utilized to protect fences



LSS403: Magnetic point sensors



LSS403: Dual technology devices utilized in outside environments



LSS403: Ross Anderson on alarm system monitoring



LSS403: Magnasphere technology



LSS403: DOE on perimeter sensors and their defeat



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LSS403: DOE on sensor technology



LSS403: DOE on layers exterior protection



LSS403: DOE on a typical plan of attack on a facility



LSS403: Defeat of magnetic switches, including BMS