Shepherd 220A/AT
Operations Manual

Rev 3.0

ArrowVision
YOUR KEYS ARE ON YOUR FINGERTIPS

The ArrowVision DL 220A/AT is a door lock featuring:

- Fingerprint or passcode for keyless access
- Self-contained operation with no external wiring
- Programmable at the door with no computer or external devices needed
- Physical compatibility with Schlage or Kwikset cylindrical locks
- Manual mode for no-lock access when desired
- Mechanical key backup
- Power by AA batteries (typically lasting two years)
- Capacity for up to a total of 50 users
- Option for a recorded audit trail of entries and attempts

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1. Introductory Notes

1.1. As with many advanced technologies, the use of biometrics for identification involves a learning process. The DL220A uses exciting technology and design that allows the opening of a locked door simply by pressing a finger on the lock, but users must learn the best positioning and pressure to use.

1.2. Generally, the center of the vortex of the fingerprint pattern is the key data point; ideally, it is placed in the center of the small glass window in a consistent way. Your finger should be flat, motionless and held with firm pressure in the same way each time. See some guiding drawings on next page.

1.3. A very firm pressure when placing the finger gives the best image, but the finger must not move during scanning.

1.4. Moist fingers give better images than dry ones. If on cold, dry days you have difficulty, for example, try moistening your finger with your breath or a little moisture.

1.5. Dirty fingers are obviously not recommended, not only because the fingerprint might not be clearly seen but because there is a risk of scratching the window.

1.6. The DL220A allows setting of security thresholds to determine how precisely you must place your finger to open the lock, thus giving customers a range in the tradeoff between security and convenience.
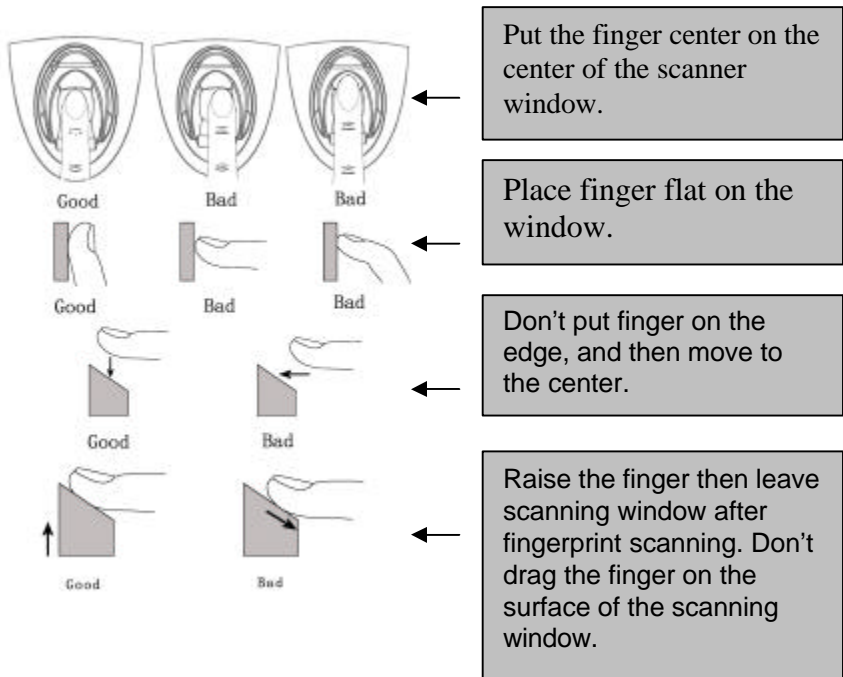
| | Put the finger center on the center of the scanner window. |

| | Place finger flat on the window. |

| | Don't put finger on the edge, and then move to the center. |

| | Raise the finger then leave scanning window after fingerprint scanning. Don't drag the finger on the surface of the scanning window. |

Figure 1

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2. Definitions and Explanations

2.1. Outside – The side of the lock that would be on the outside of the locked room or house. On this side is the scanning window, the display and the five buttons.

2.2. Inside – the side of the lock opposite from the **Outside**.

2.3. Registering, Enrolling or Programming of Fingerprints – This is the process of acquiring the image of fingerprints of authorized persons and storing them into the lock's memory. Two images of each finger are scanned in the process, with the same finger being placed two separate times on the window. (Section 5)

2.4. Power Off/Time Out – The lock maximizes both security and battery life by automatically powering off if no action is taken for 5 to 10 seconds (depending on function), which the user will hear as a motor noise inside the lock. During the fingerprint registration and other programming functions, the **time out** function requires you to move quickly in the programming sequence. Delaying too long will mean you must start over in the sequence.

2.5. Security Levels – Five thresholds are available for users to optimize convenience versus security for their particular application. (Section 10.2)

2.6. Management Levels – The DL220A has **TWO** permission levels: **Administrator,** and **User**. They are designated and identified by ID numbers that correspond to their stored fingerprints or passcodes as follows:

    2.6.1. **Administrators:** ID numbers 01 through 05

    2.6.2. **Users:** ID numbers 06 through 50

    2.6.3. In general, the **Administrators** can add/delete their own level and user level IDs and mass-delete all stored fingerprints and codes. The **User** only can unlock the lock.

    2.6.4. The first people Registered will be automatically assigned **Administrator** IDs. The first Administrator can register a secondary **Administrator** ID. Thereafter, either of the first two

Administrators can designate the level for each new registrant. If no designations are made, the new registrants will be assigned User IDs starting with ID #06.
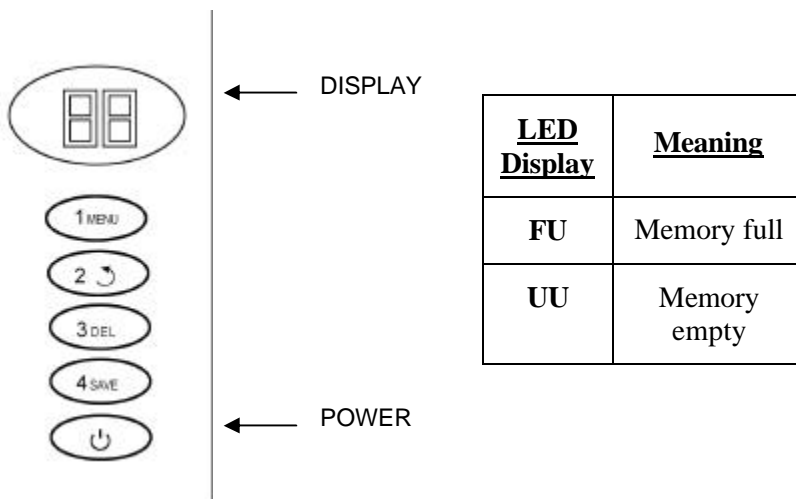
2.7. Outside Control Panel and Display

LED Display	Meaning
FU	Memory full
UU	Memory empty

Figure 2

3. Basic Door Operation

3.1. Unlocking Door from Outside (Refer Section 7, 8 for details)

3.1.1.   **Using fingerprint**: Open the scanner cover. Place your registered finger onto window for verification. When the fingerprint matches, two beeps will be heard. Use the lever to open the door.

3.1.2.   **Using a 7-digit passcode**: Press **POWER** button. Wait for the display to show "0". Punch in the passcodes. If it matches a previously registered passcode, a sound and 2 beeps will be heard. Use the lever to open the door.

3.1.3.   **Using the emergency key**: Pry off the cap on the handle with a small knife or screwdriver. Insert key to open the door.

3.2. No Disturb Function

3.2.1.   While the **Power is OFF**, press the black button at the top of the lock on the INSIDE of the door. This turns off all power to the lock and disables entry from the outside.

3.2.2.   To return to normal operation, hold down the door handle on the INSIDE until you hear a click, then power on the system (ether press **POWER** button or open the scanner cover).

3.3. Door Always Unlocked Function

3.3.1.   After you gain access, while **Power is ON**, press black button at the top of the lock on the INSIDE. The lock now remains in the unlocked position.

3.3.2.   To return to normal operation, hold down the door handle on the INSIDE until you hear a click, then power on the system (ether press **POWER** button or open the scanner cover).

3.4. Quick Power Off

If you don't want to wait for the lock to power off by itself after unlocking or finished programming, you can press the **POWER** button to short cut the wait for power off.

4. General Information and Hints

4.1. Before getting into the specific procedures, it might be useful to explain the general scheme of the different operations.

4.2. Registering Users

Registering, enrolling or programming are different words to describe the functions of authorizing users for access to the lock (both for unlocking and for changing users). These can be done with passcodes punched onto the buttons or by fingerprint. For each method, there are two levels of users: **Administrators** and **Users**.

4.3. To enter the different programming modes, you must be an Administrator and gain access to the lock, i.e. unlock it. This can be done by previously registered passcode or fingerprint.

4.4. In general, after gaining access and before the lock times out, you either press the **DEL(3) OR SAVE(4)** buttons. The lock makes a long beep and allows you to enter programming modes and functions using the buttons as follows:

Function Keys	Basic Function
1 MENU	Passcode #1.
2	**SELECT** key. Also is passcode #2.
3 DEL	**DELETE** key. Also is passcode #3.
4 SAVE	**SAVE** key. Also is passcode #4.
(power)	**POWER** key. Also is passcode #5.

4.4.1. The **(1)** button is for passcode #1 only.

4.4.2. The **SELECT(2)** button is used to select choices within other button domains or passcode #2. It also can be used to check the current user ID and available positions for more users.

4.4.3. The **DEL(3)** button is used to enter the Delete function or passcode #3

4.4.4. The **SAVE(4)** button is to enter the Enrolling function of adding fingerprints or passcode #4

4.4.5. The **POWER(5)** button is the power on/off function or passcode #5. When it is not in a passcode entry mode, it toggles power on and off

4.5. In all modes, the lock will automatically power off if left idle for about 10 seconds.

4.6. Sometimes it is useful to cycle around a series of choices while you decide what to do next, thereby keeping the lock active so you don't time out and have to start all over again.

4.7. Since positioning, pressure and condition of your finger are important in opening the lock, it may take a little practice to be consistent. It is possible (and sometimes recommended) for individuals to program their fingers several times, especially if they have weak fingerprint images and/or have difficulty getting accepted. Multiple images of a fingerprint in storage increases the chances of making a match the first time.

Also, it is possible for an individual to register more than one finger if it is anticipated that his/her fingers could be taped, scarred, etc.

4.8. The bottom-most button (**POWER**) is the Power On button for using passcodes and lifting the cover is the Power On switch for using fingerprints.

4.9. The top push-down button on the inside of the lock disables all functions. Entry from the outside is then no longer possible. To return to normal operation, you must operate the door handle on the INSIDE until you hear a click.

4.10. The small Phillips screw in the inside of the door holds the battery cover, under which are the 6 AA batteries.

4.11. Wait for the Power Off tone when going from one programming sequence to another, or to enter a different function.

5. Registering Fingerprints

5.1. On the first two registrations, there is no need to assign management levels as they will be assigned Administrators automatically, but on subsequent registrations, have in mind what level you wish to assign, by using the different range of ID numbers described above. (Review Para. 2.6 above.)

5.2. Hint: *Before starting, decide what finger you wish to use and practice placing the finger onto the window in the same way you intend to open the door later. Practicing will give you a feel for the window and help you be consistent in how you place your finger each time.*

5.3. Procedure for registering first Administrator:

5.3.1.   Open cover, which powers on the lock for fingerprint operation.

5.3.2.   Listen for a long beep. (With no fingerprints or passcodes registered, the door will unlock and remain active for about 10 seconds.)

5.3.3.   Press the **SAVE(4)** button and hold for about 3 seconds until you hear a long beep. (The display will show **"01"**, designating the first Administrator ID)

5.3.4.   Place your chosen finger on the window and with your other hand press and hold **SAVE(4)** for about 3 seconds until you hear a long beep and the red light blinks. Your finger will be scanned once.

5.3.5.   When you hear a short beep, remove and reposition your finger quickly for a second scan. You will see the red light flash again and when you hear 2 beeps and see a green light come on, your fingerprint has been accepted, stored and you are registered. If you hear 3 beeps, the second scan was not accepted and you need to repeat the two scans again. Just hold the **SAVE(4)** button again, repeating Section 5.3.3 and be sure to hold your finger firm and steady on the scanning window.

5.3.6.   Test by first closing the cover and letting the lock power off by either pressing the **POWER** button or waiting until the lock times out.

5.3.7.   Open the cover, place your finger on the window exactly as you had earlier, listen for 2 beeps and a flash of green light. That means your fingerprint was recognized and the lock will unlocked.

5.3.8.   If you hear 3 beeps and see a red light, your fingerprint was not recognized. Close the cover, and then try again from 5.3.7.

5.3.9.   **Hint**: *If you have lots of difficulty activating the lock and your rejection rate is more than half the time, consider re-registering your fingerprint with a different finger, different pressure/position, etc. To do so, apply a **start up or mass delete** per Section 9.1 or Section 9.2. Then start over from 5.3.1.*

5.4. Procedure for registering additional fingerprints:

5.4.1.   An Administrator must first gain access to the lock with his fingerprint (Ref. Section 5.3.6 or Section 7) or with an administrative passcode (Ref. Section 08)

5.4.2.   Listen for 2 beeps, after which you have ten seconds to proceed.

5.4.3.   Press the **SAVE(4)** button for about 3 seconds until you hear a long beep (The display will show **"xx"**, designating the ID number that will be registered next)

You can cycle through the categories by pressing the **SELECT(2)** button. If the fingerprint you want to register is in the User category, you would stop at the numbers between #06 and #50.

For example, if you see: 3 – 7 displayed, that means you have already registered two Administrators and one User. By default it will select the next User ID number available.

5.4.4.   Follow the procedure starting at 5.3.4 for more fingerprint registrations.

6. Registering Passcodes (must be 7-digits long)

6.1. First: Gain access:

    6.1.1.   If the lock has not had any fingerprints registered yet, power up the lock with the **POWER** button – wait for the display to show **"0",** or

    6.1.2.   If there has been an Administrator already registered, the Administrator must first gain access by using fingerprint (See Section 7) or Passcode to gain access(See Section 8).

6.2. During the next steps, **keep the fingerprint detection window cover CLOSED**.

    6.2.1.   Press the **SAVE(4)** button and hold for about 3 seconds until you hear a long beep and see **"xx"** in the display signifying the ID is about to be registered. (Reference Para. 2.6)

    You can cycle through the categories by pressing the **SELECT(2)** button. If the passcode you want to register is in the User category, you would stop between #06 and #50.

    6.2.2.   Press and hold the **SAVE(4)** button for about 3 seconds again until the display shows **"0".**

    6.2.3.   **You must now enter your 7-digit passcode twice. (Note: While entering your passcode, the display will count your digits for you so you know when you get to 7 – it is not showing what digit you are entering.)**

    6.2.4.   After entering the passcode the first time, you will hear a beep and see **"0"** in the display again. That is when you enter the passcode a second time for confirmation.

    6.2.5.   When you hear 2 beeps, the passcode is accepted. The display will show the next available ID number.

    6.2.6.   If you hear 3 beeps, your passcode was not accepted. In most case it is because the two passcodes you entered do not match and you should repeat from step 6.2.3 until the two passcodes match. If you timed out, you can start from step 6.1.

7. Unlocking the Door with a Registered Fingerprint

7.1. Open scanner cover

7.2. Press finger firmly on the scanner window exactly as you did during registration and wait…

7.3. If successful, you will hear the lock mechanism and 2 beeps. You also will see the green light flashes. You will have about 10 seconds to push down on the door handle, after which it will automatically lock again.

7.4. If there are **3** beeps, the fingerprint was rejected. This means the finger was positioned and/or pressed in a way that did not match the registration. Close the cover, then open cover and try again. With a little practice, you will unlock the door every time. (Note: Section 10) describes how to set the threshold level, and how to trade-off ease of acceptance with tight security.)

8. Unlocking the Door with a Registered Passcode

8.1. Press the **Power** button (bottom-most button)

8.2. Wait for a **"0"** to appear in the display

8.3. Punch in a 7-digit passcode that was previously registered.

8.4. When you hear 2 beeps, the door is unlocked. You have about 10 seconds to open the door.

8.5. Otherwise if you hear 3 beeps, and see **"0"** in the display, that means the passcode is not correct. **You have 4 more chances to reenter the correct passcode. After five erroneous tries, the lock will be disabled for 5 minutes!**

9. Deleting Fingerprints

9.1. Mass Delete

9.1.1.   First, an Administrator must gain access to the lock, either with fingerprint or passcode.

9.1.2.   Press **DEL(3)** and **SAVE(4)** simultaneously for about 3 seconds until you hear 2 beeps and display shows **UU**. That means all users been deleted.

9.2. Special Start up Delete

If only one or two Administrators have been registered and no other Users, both Administrators can be deleted by simply pressing and holding the **DEL(3)** and **POWER** buttons for about 3 seconds until there is a long beep and display shows **UU. This returns the lock to its start up condition and is for the convenience of first time users during the training period.**

9.3. Deleting individual fingerprints

9.3.1.   Administrators can delete anyone. Users cannot delete.

9.3.2.   The Administrator must know the ID number of the person being deleted.

9.3.3.   The Administrator must first gain access to the lock with his fingerprint (Ref. 7 or with an administrative passcode (Ref. 8)

9.3.4.   Press the **DEL(3)** button and hold for about 3 seconds till hear a long beep. Display will display a registered ID.

9.3.5.   Press the **SELECT(2)** button to cycle around to the ID of the passcode or fingerprint to be deleted.

9.3.6.   Press and hold the **DEL(3)** button for about 3 seconds until the display goes blank.

9.3.7.   That individual has been deleted.

9.3.8.   The display returns with registered IDs again; others can be deleted by repeating the procedure starting with 9.3.5.

10.   Setting Security / Threshold Level

10.1.   As explained earlier, fingerprint recognition is not a black and white process like a key or entry of a passcode. Rather, it is a variable for which the user can set the level of recognition criteria.

10.2.   Five triggering thresholds are available: S0 through S4. The lowest level, called the **Training Level**, is S0, with increasingly more stringent thresholds up to S4.

At S0, the algorithm matches a minimal number of fingerprint characteristics and therefore is more forgiving in terms of exact placement of finger, dirt on the finger, and image quality, etc. It also means there is the risk that a random fingerprint could be matched with a registered image, although any stranger to the system would have to know the buttons to push and the procedure used to open the door.

At S4, the fingerprint image must match perfectly with a registered fingerprint, which means there is no risk of a false acceptance, but the users must learn to place their fingers consistently and present an excellent image in order to be admitted. S1 through S3 are intermediate levels.

10.3.   In addition to the direct setting of threshold level for the lock, thereby determining ease of entry for fingerprint access, there is also an indirect way to make entry easier without sacrificing security. You can register a user many times with the same finger as if he/she is many people. If a person has programmed a finger many times with slight variations in position or pressure, there is a higher probability he/she will be recognized when trying to open the door.

10.4.   Only one security level is set for the lock at a time. Different security levels cannot be set for different individuals.

10.5.   **Setting Security Level**

10.5.1. If you have a new lock and no fingerprints or passcodes have been registered, press **POWER** button once -- wait to hear 2 beeps, then skip the next step and go to 10.5.3 below.

10.5.2. If there are Administrative passcodes or fingerprints already registered, ether use the passcode or fingerprint to gain an access (refer to section 7 and section 8)

10.5.3. Press and hold three buttons **SELECT (2), DEL(3), and SAVE(4)** all together -- wait to hear a long beep, then see the levels of security **Sx** (e.g. S0) on display.

10.5.4. Cycle through the Levels with the **SELECT(2)** button.

When starting out, set Security Level to **level 0** by stopping at **S0** on the display and pressing the **SAVE(4)** button and hold it for approximately 3 seconds till the display goes off and 2 beeps sound.

11. Retrieving the Audit Trail Record

11.1. Software Installation

Figure 3

a. Insert the CD disk into the computer's CD-ROM;

b. The auto-start window will pop up. (If the program doesn't run automatically, double click the "SETUP.EXE" located on the CD disk)

c. Follow on screen instruction to finish the installation.

d. After the software is installed, you can run the "Lock Audit" program.

11.2. Connecting the Data Cable

11.2.1. Connect provided data cable from the computer's RS-232 serial port to the connector located under button of inside lock unit (see Figure 4).
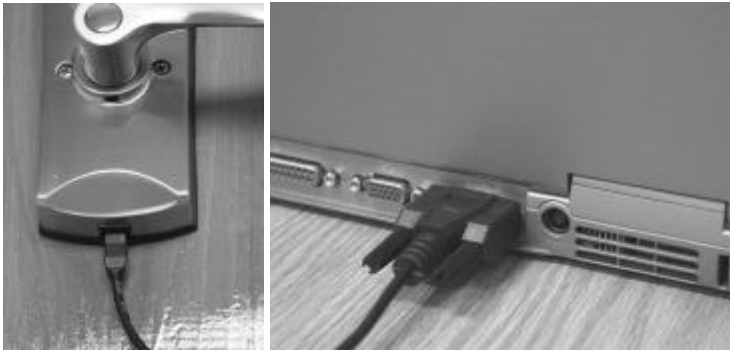
Figure 4

Note: The connector on the lock is similar to mini USB type but it is IEEE 485 interface. Never try to plug-in a USB cable in to the lock. Otherwise you will damage the lock!

11.2.2. Note: The software is designed to accept data from multiple locks, so the same cable can be plugged into one lock at a time for collecting data.

11.3.   Communicating with Lock

11.3.1. Run the Lock Audit program, the program window will appear as shown in Figure 5.

11.3.2. Select the Serial Port as available for your computer, for example Com1. Then select Communication manual, the window shown in Figure 6

11.3.3. Gain access to the lock by fingerprint or passcode. (Reference Sections 7 or 8) The lock will automatically try to establish a communication link with computer.

11.3.4. Once the communication link is established, you can synchronize the lock clock with the computer clock, thus setting the correct time of day on the lock.
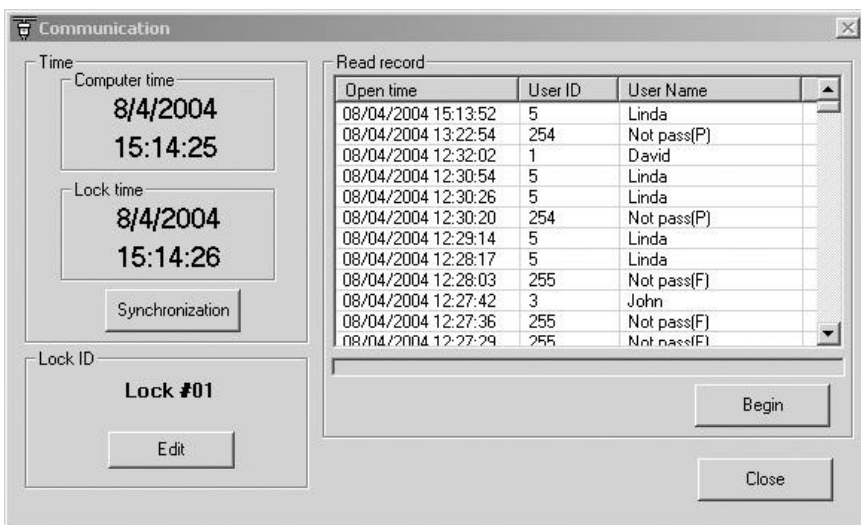
Figure 5

Figure 6

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11.3.5. If the lock is communicating with the system for the first time, the "Lock Info" (Figure 7) will automatic pop up. You can click "Edit" to change the lock names and location. Click "Save" to save the setting and close the "Lock Info" window. If you don't want edit the lock info, click "Close" to close the window.

Note: If the lock is already existing in the system, you still can click "Edit" in "Communication" window (Figure 6) to open the "Lock Info" window (Figure 7) for editing.
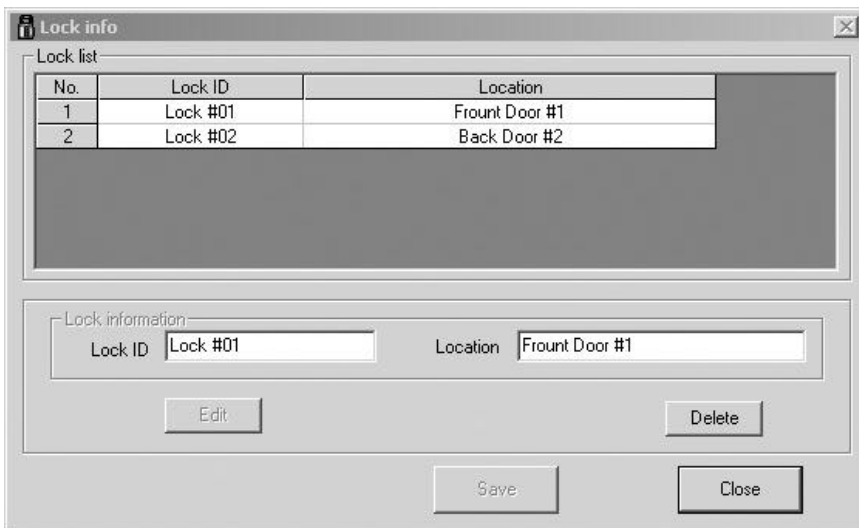
Figure 7

11.4.   Reading the Records

In the "Communication" window (Figure 6), click "Begin" to download the records. The progress bar shows the downloading progress.

11.5.   Setting the User ID

Select "User Management" (Figure 8) to edit the user information. Click "Add" to add a new user. Click "Edit" to edit an existing user. After adding or editing, click "Save" to save changes. You also can delete an existing user by selecting an existing user and clicking "Delete".
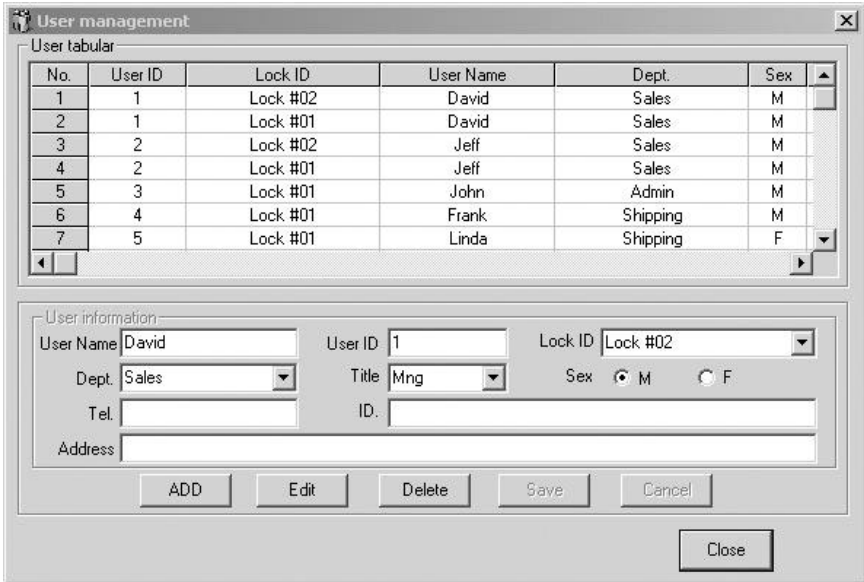
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Figure 8

11.6. Processing the Records

Select "Record List" to open the window as shown in Figure 9 to process the records:

Search: Select records to display sorted by date, time, lock ID and user name.

Save As: Save records in Comma Separated Values (CSV) format. You can use a spreadsheet software, such as Excel, to open and edit the file.

Open: Open a record file from disk.

Print: Print the records to your computer printer.

Delete: Delete all recodes in the computer buffer.

Close: Close the "Record List" window without effecting the data in the computer buffer.

Figure 9

12. Troubleshooting

Problem 1: I keep getting 3 beeps and red flashes of the light when storing a fingerprint or unlocking the door with a fingerprint.

Cause 1: During programming, the finger was not placed on the scanner in time.

Solution 1: Place the finger on the fingerprint scanner first, hold it steady, THEN press **SAVE** button.

Cause 2: The finger was not placed properly.

Solution 2: Referring to Section 1, carefully place the finger on the scanner and try again.

Cause 3: The fingertip is too wet or too dirty.

Solution 3: Wipe the finger and try again.

Cause 4: During registration, the fingerprint quality is not good enough for acceptance.

Solution 4: Change to another finger and try again.

Cause 5: The battery is depleted. Low voltage alert sounds when lock is powered on.

Solution 5: Change to six new AA batteries.

Problem 2: The system is unable to power on.

Cause 1 : the No Disturb switch is not released

Solution 1: Turn the inside door lever to release the switch.

Cause 2: Batteries are dead

Solution 2: Change batteries

13. SPECIFICATIONS

Fingerprint Management Unit	
Fingerprint capture type	CMOS Optical
User capacity	50 users
Audit trail records	250 Attempts
Verification Type	1: N
Scanning time	< 0.4s
Recognition time	< 0.2s/per fingerprint
False Accept Rate (FAR)	< 1/100000
False Reject Rate (FRR)	< 3/100
Translation tolerance	± 0.1"
Rotation tolerance	$< \pm 15°$
Power supply	AA-size alkaline battery x 6 (9VDC)
Dimensions	Outdoor: 10 13/16" x 3" x 1 23/32"
	Indoor: 10 13/16" x 3" x 1 7/16"
	Lock tongue: 3 15/16" x 2 3/8" x 1"
Weight	10 lbs
Environments	
Operating Temperature	Approx. 32°F - 113°F
Humidity	10%-85%
Door thickness	1 ½" – 2 3/4"
Door edge width	1-1/2" to 4 1/2"