User Manual

Fingerprint Scan System
FPC1381
User Manual

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2. Introduction

This user manual gives an overview of the basic using of the FingerPrintScan System (FPS-S) P 1381.

3. Disclaimer

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4. Function Mode

The FPS-S enables control functions to be processed using the unique biometric characteristics of individuals. The system uses the biometric characteristics of fingerprints. The fingerprint is recorded on a scanner using a “thermal line sensor”. Recording is performed by noting temperature differences on the fingerprint, evaluating the print and its unique characteristics (minutiae) and finally storing the information in the system. If the print is recognised in further scan processing, then attributed functions are carried out (e.g. opening doors, arming/disarming an IDS).

5. Modes of Operation

The system can be used in two basic modes of operation

Operation Mode 1 (BA1):
For general use without requirements or dependencies: For switching functions four isolated switch relays are provided. Each relay can be programmed for different operation modes.

Operation Mode 2 (BA2):
Specially design for arming/disarming intruder detection systems. The evaluation of signals for the so-called “inevitability” is guaranteed. In this operation mode relay 1 is provided for the arming of an intrusion alarm control unit. The other three relays are available for individual programming.

6. Fundamentals

The FingerPrintScan System consists of the P1381 controller and the P1384 / P1385 scanner. The system operates on 12 V. Communication between the controller and the scanner takes place over an RS – 485 data bus. Four two-way switch relays and three 12 V outputs are provided for display purposes. The P1384 scanner has a buzzer as well as 3 LEDs for displaying status. The P1385 scanner has a buzzer as well as 2 multi-coloured LEDs for displaying status.

7. Data Protection

Fingerprints are recognised through their minutiae, distinctive points in the fingerprint pattern (e.g. bifurcations, terminations). The system extracts such minutiae from each print read and stores the position and angle of each. A reconstruction of the full print using the minutiae is not possible, thus guaranteeing data protection and unlimited use.

8. Definitions

Evaluation Unit (EU):
The evaluation unit is the controller of the fingerprint system FPC-1381. Hereafter abbreviated as EU.

Intruder Detection System (IDS):
An IDS is a hazard detection system which recognises e.g. an intrusion into property and as the case may be, the notification of a security firm by means of a transmitter.

False Rejection Rate (FRR):
The percentage of admissible users who were mistakenly not admitted by the biometric system.

False Acceptance Rate (FAR):
The percentage of prohibited users who were mistakenly admitted by the biometric system.

Minutiae:
Branches in the grooves, occlusions, crossovers, short lines as well as ends of grooves are the characteristic structures in a fingerprint. These patterns are detected wherever the grooves in the skin disperse or terminate. The points are named minutiae.

Minutiae based process:
Comparison of the fingerprint (the current image) with a reference image (template) for the determination of the following:

compliance with the accuracy of position
compliance with the type of minutiae
compliance with the direction of the minutiae

Characteristics:

Minimum number of minutiae:	15 minutiae
False Rejection Rate (FRR)	7-9.5%
False Acceptance Rate (FAR)	$9*10^{-6} = 0.0009\%$

Lock plate contact (LPC):
The device built into the lock plate, e.g. contact or sensor, through which the latch activates the lock (Source VdS).

Template:
A template is a record of a fingerprint. This record also contains personal identification numbers, finger numbers and minutiae.

Inevitability (IE):
A method which prevents an IDS which is not completely functional, from being armed or an armed IDS from unintentionally being triggered by means of an external or distant alarm. (Source VdS).

9. The Function of the Thermal Line Sensor

Layout: The thermal sensors are located in a narrow, elongated block.
Function: If a finger is placed over the block, the thermal sensors register temporal temperature changes.
The temperature differences between the lines and grooves of a fingerprint are so large that they can be recognised by the line sensor. The temperature differences are digitally processed by a micro controller and a greyscale image is calculated. The accuracy of the line sensor is such that a picture with a resolution of approx. 500dpi can be generated. From this picture the lines of the finger are digitally measured. The angle and position of distinct points (minutiae) are determined. Finally, these minutiae are either compared with information in the database or stored.

10. Scanner Displays

The FP1384 and FP1385 scanners have optical and acoustic displays. Their meanings are summarised in the following table:

Scanner FPL1384			Scanner FPL1385		Both FPL	Meaning
LED green	LED yellow	LED red	LED left	LED right	Buzzer	
Briefly lighting up every 5 seconds	-	-	Briefly flashing blue every 5 sec	Briefly flashing blue every 5 sec	-	Status display: everything OK!
-	Briefly lighting up every 5 seconds	-	Briefly flashing blue every 5 sec	Briefly flashing blue every 5 sec	-	Status display: scanner in standby mode, everything OK!
Briefly lighting up every 5 seconds	-	Briefly lighting up every 5 seconds	Briefly flashing blue every 5 sec	Briefly flashing red every 5 sec	-	No communication with EU! check data lines
2 sec	-	-	2 sec green	-	1 sec	Positive acknowledgement: e.g. finger is successfully incorporated
2 sec	-	2 sec blinking	2 sec green	Blinking red 2 sec	1.5 sec intermittent	Finger recognised but action cannot be performed!
-	-	2 sec blinking	-	Blinking red 2 sec	1.5 sec intermittent	Negative acknowledgement : finger is not recognised or drawn incorrectly over sensor
2 sec	blinking	-	2 sec green	Blinking yellow	1 sec	Acknowledged for arm/disarm, but EU waits for arm/disarm signal from hazard detection system
-	shining	-	Shining yellow	Shining yellow	1 sec.	2 finger or 4 eye principle active. Wait for second finger or EU waits for arm/disarm acknowledgement from the hazard detection system after an arm/disarm request
Flash yellow 3x with approx. 1 sec pause					-	Incorporate finger. Draw over 3 more times
Flash yellow 2x with approx. 1 sec pause					-	Incorporate finger. Draw over 2 more times
Flash yellow 1x with approx. 1 sec pause					-	Incorporate finger. Draw over 1 more time

The LEDs and the buzzer can also be externally controlled, e.g. to implement the disarmed – display of a hazard detection system. See page: ***Fehler! Textmarke nicht definiert.***: ***Fehler! Verweisquelle konnte nicht gefunden werden.***. ***Fehler! Verweisquelle konnte nicht gefunden werden.*** and page: ***Fehler! Textmarke nicht definiert.***: ***Fehler! Verweisquelle konnte nicht gefunden werden.***. ***Fehler! Verweisquelle konnte nicht gefunden werden.***

11. Successfully Drawing Finger Over Scanner

The way a finger is drawn over the scanner is critical to having the scanner recognise the print as easily as possible. With some practice the user can keep the FRR (false rejection rate) lower than that which the statistics reflect.

Include as much of the surface of the finger (outermost finger limb) as possible. Set the finger onto the uppermost limit of the guide, not coming in contact with the sensor. Then let the finger fall onto the surface of the sensor and immediately draw the finger down at a steady rate and with light pressure on the sensor. Perform this freely but not rapidly. If the finger jerks over the sensor, it is a sign that too much pressure is being applied. The finger must be pulled far enough over the sensor until it no longer touches the thermal line sensor. Only then the scan is complete.

Learn to finger scan successfully - “how to do it”

Put the finger at the very top of the guide.
Do not touch the sensor yet.

Place the finger onto the sensor.

Press lightly.

...and at a steady rate...

... draw the finger completely across the sensor.

12. Operation

12.1. Menu Navigation

↓ / ↑ - button: main menu
← / → - button: menu selection
“OK” - button: perform action / open submenu

12.2. Basic Menu

The basic menu of the EU shows date / time:

```
    FPC-1381
14:35   29.05.13
```

Pressing ↓ or ↑ brings the user into the main menu.
Pressing “OK” jump into the info menu : last finger (see page *13: 12.6.3 Last Finger*).

12.3. Access Levels

There are three different access levels. Everyone, Operator and Installer.

- Everyone:
  If the operator and installer passwords have been set then everyone has access to the info menu (See page: 13: 12.6.

Main Memory Item: Info)

- Operator account:
  This access level is shown when
  a) an installer password but no operator password has been set or
  b) an installer and an operator password have been set and the operator has logged in with his password.
- Installer account:
  This access level is shown when an installer password has been set and the installer has logged in with his password.

12.4. Login

If an installer password or an operator password has been set, one must login as follows:
In the basic menu press ↓ or ↑. Enter the code:

```
  code-entry
>A     < >Abbr.<
```

Using the arrow keys one can enter the code and confirm the input with “OK”.

12.5. Logout

If a time passes without input then the basic display is automatically shown. When one wishes to continue only ↓ or ↑ must be pressed and then one can work at the same operating level as before without re-entering the code. The access level will only return to the former level automatically after 10 minutes. If the access level was previously changed then one can press the "OK" key, allowing one to view the "Last Finger" display. This display discards the last previously inputted code and in order to continue one must enter the code again.

12.6. Main Memory Item: Info

This main menu serves to show information concerning the state of the system. Press „↓“ in the basic menu and then confirm with "OK".

```
►info
 Learn finger
 Delete
 Settings
 PC-Communicat.
 Back
```

```
►Free space
 Active relays
 Last finger
 Scanner-info
 Event log
 Back
```

12.6.1. Free Space

In this menu one can seek out a free personal ID number in a reader. Select the scanner address and the initial personal ID number and confirm with OK. The EU displays the first free personal ID number.

```
   Free space
S:1 P:  1 >Abbr<
```

12.6.2. Active Relay

This shows the state of the four programmable relays. On or off

```
R1:off  R2: on
R3: on  R3:off
```

12.6.3. Last Finger

Here the last recognised finger is displayed.
With the keys → and ← further information can be requested:

```
  Last Finger
S:1 P:  1  R**--
```
→
```
  Last Finger
Tommy
```
→
```
  Last Finger
Q: 61  No:   1
```

S: scanner address
P: personal ID number
R**--: activated relay (*), inactive relay (-)
Hans: name
Q: quality of the fingerprint read
Nr: finger number, if several fingers of the same person with the same relay configuration were stored.

Pressing again on → displays the current software version of the EU:

```
    FPC-1381
Version:   V1.48
```

12.6.4. Scanner Info

The number of scanners recognised and learned by the system is displayed, or whether the scanner has no contact with the EU.

```
 Scanner - Info
1 F - - - - - -
```

1: scanner 1 is learned and communicating
F: scanner 2 is learned but not connected
-: scanners 3 to 8 are not learned

12.6.5. Protocol

In this menu the event protocol can be displayed or by means of an interface converter, sent to a PC:

```
►Watch events
 Send events
```

12.6.5.1. Show Protocol

Here the most recent event is shown

```
[B05E2] 29.05.12
19:35 F detected
```

B: operator
S: system

Depending on which event is shown, pressing → shows further information about the event.

12.7. Main Menu Item: Learn Finger

When learning a finger, print information recorded over the scanner is linked to personal information and control information (relay). This is then stored into the database of the selected scanner.

Up to 10 fingers can be learned with different functions (relay assignments) associated to the person.

The function of the finger is defined in the evaluation unit (controller).

```
 Learn finger
S:1 P:  1 R:*---
```

S: here the scanner (1-8) is selected for which the finger is learned and which finger functions are valid
P: here the person is selected (1-200)
R: here the function (relay) which the finger is assigned to is selected
* = ON (active)
- = OFF (inactive)
The first place holder represents Rel1 and the last, Rel4.

12.7.1. The Process of Leaning One Finger:

Learning a finger involves a total of three scans. The system then compares all three prints and stores the best image in the database.

- After the learning process has been started with „OK“, the EU displays >input< and the LED of the selected scanner blinks three times. After a short pause it blinks again three times.
- Now the selected finger must be drawn over the scanner (see page 9: 11. Successfully Drawing Finger Over Scanner)
- After scanning the finger, a green LED briefly shines green, which means that the finger has been successfully recognised. If a red LED or no LED shines then the finger was not recognised and must be scanned again.
- Now the yellow LED blinks only two times => The finger must be drawn over the scanner two more times.
- Scan the same finger again.
- If the finger has been recognised successfully then the yellow LED will blink only once.
- Scan the same finger one last time.
- If the third scan was successful then the system will begin to compare the fingerprints with each other. If all prints are in order then the green LED will issue with a 3 second long beep. The EU now shows „- i.O.-„ in the display. The finger print is now stored in the database and is immediately valid.
- If the three finger prints are too varied or show too few characteristics (minutiae), the red LED shines, a buzzer signals and the EU displays „Template unclear“. In this case the learning procedure has failed and must be repeated.
- If a repeated attempt fails then it can be attempted to slightly reduce the security level (See pate: ***Fehler! Textmarke nicht definiert. Fehler! Verweisquelle konnte nicht gefunden werden. Fehler! Verweisquelle konnte nicht gefunden werden.***)

12.8. Main Menu Item: Delete

```
►Delete person
 Del. data base
 Delete Name
 DeleteAll Names
 Back
```

12.8.1. Delete Person

This submenu deletes all finger information about a single person in a scanner

```
 Delete person
S:1 P:  1 >abor<
```

S: the scanner address from where the person should be deleted
P: the personal ID number of the finger which should be deleted

Caution: if the finger data has been deleted it cannot be recovered.

12.8.2. Delete Database

Here all fingers in a scanner can be deleted.

```
Delete data base
S: 1   >abort<
```

S: the scanner address

CAUTION: when the fingers have been deleted once, they can never be recovered

12.8.3. Delete Name

Here the personal ID number can be selected of a person whose name in the system should be deleted.

```
 Delete Name
P:   1 Tommy
```

P: personal ID number, of the person whose name should be deleted. This number represents the currently registered name in the system.
Pressing → brings up the cancel menu

12.8.4. Delete All Names

Here a complete table of persons can be deleted, however no finger templates are deleted.

```
Delete all Names
  >yes<   >no<
```

By pressing the keys → and ← the security question can be confirmed or unconfirmed.

12.9. Main Menu Item: Settings

Here the following submenu selections are possible:

```
►Set Date
 Set Time
 Person list
 SystemParameter
 User Code
 Back
```

12.9.1. Set Date

Here the date can be set. The date and time values are buffered in the EU. The integrated clock can run several days without the power supply being connected.

```
 Set Date
30.07.13 >abort<
```

Using the arrow keys the correct date can be set and after pressing “OK” the setting is confirmed.

12.9.2. Set Time

Here the time can be set. The date and time values are buffered in the EU. The integrated clock can run several days without the power supply being connected.

```
 Set Time
16:54:12 >abort<
```

Using the arrow keys the correct time can be set and after pressing “OK” the setting is confirmed.

12.9.3. List of Persons

Every person can be assigned a name with a maximum of 16 characters. This name is stored in the event memory for a recognised finger of this person.

```
Name:  1 >abort<
Tommy
```

At first using the ↑ and ↓ keys the personal ID number can be selected. After pressing → the cursor moves to the first letter of the name. The letters can be selected by using ↑ and ↓ keys to go through the alphabetically listed letters. When the desired letter appears, pressing → lets you continue with the selection of the next letter. When the name is completely spelled out, press "OK" and the name is stored. Giving names on the PC makes entering information easier. For this the optional interface converter is necessary. (See page: ***Fehler! Textmarke nicht definiert.****: **Fehler! Verweisquelle konnte nicht gefunden werden.**. **Fehler! Verweisquelle konnte nicht gefunden werden.***)

12.9.4. System Parameters

In this submenu all system relevant parameters are set. With the keys → and ← the individual parameters can be selected. With ↑ they are set or activated and with ↓ they are deleted or deactivated.

12.9.4.1. Key tone

Off: No acoustic signal when pressing keys
On: When pressing keys a short beep tone is issued in the EU.

12.9.4.2. Error tone

Off: No acoustic signal when an error occurs
On: When an error occurs (e.g. scanner not connected) a short beep tone is issued in the EU.

12.9.4.3. User Code

This parameter activates the operator code for the operator level. If this parameter is activated (on) the operator has access to the system only after entering the operator code. The operator code can be activated only in conjunction with the installer code. The 1-6 character code is entered in the menu operator code.

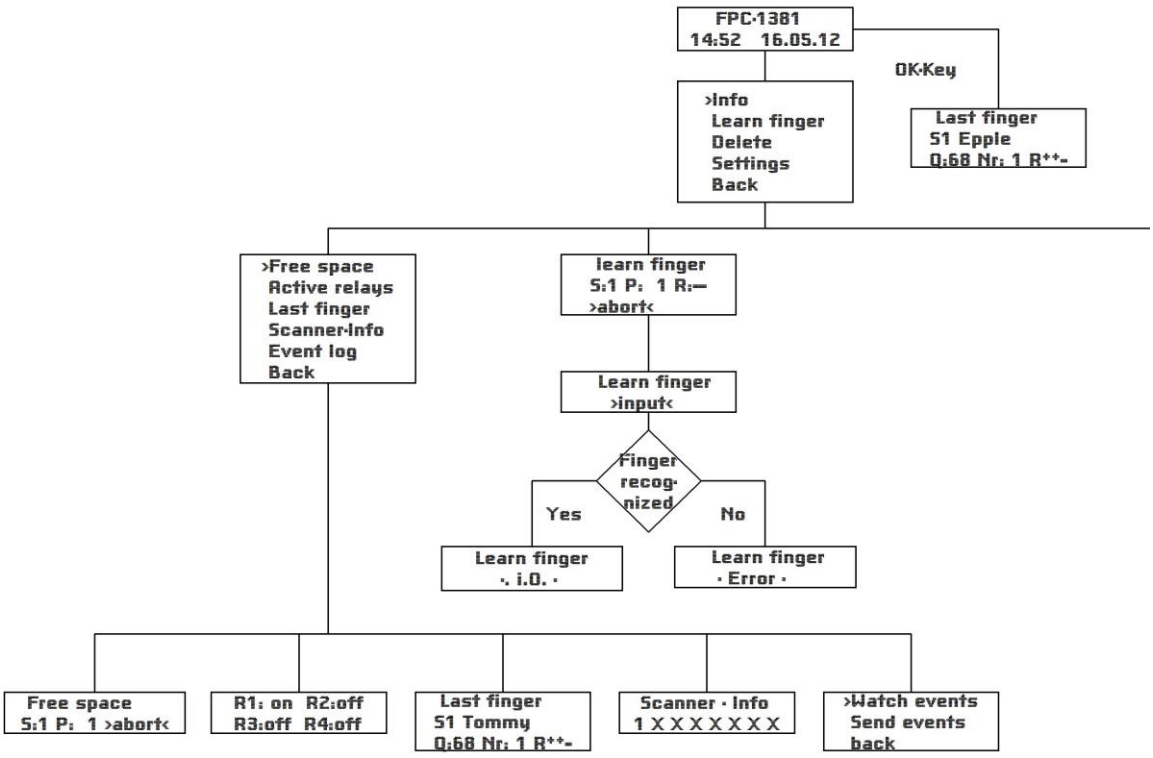
12.9.5. User Code

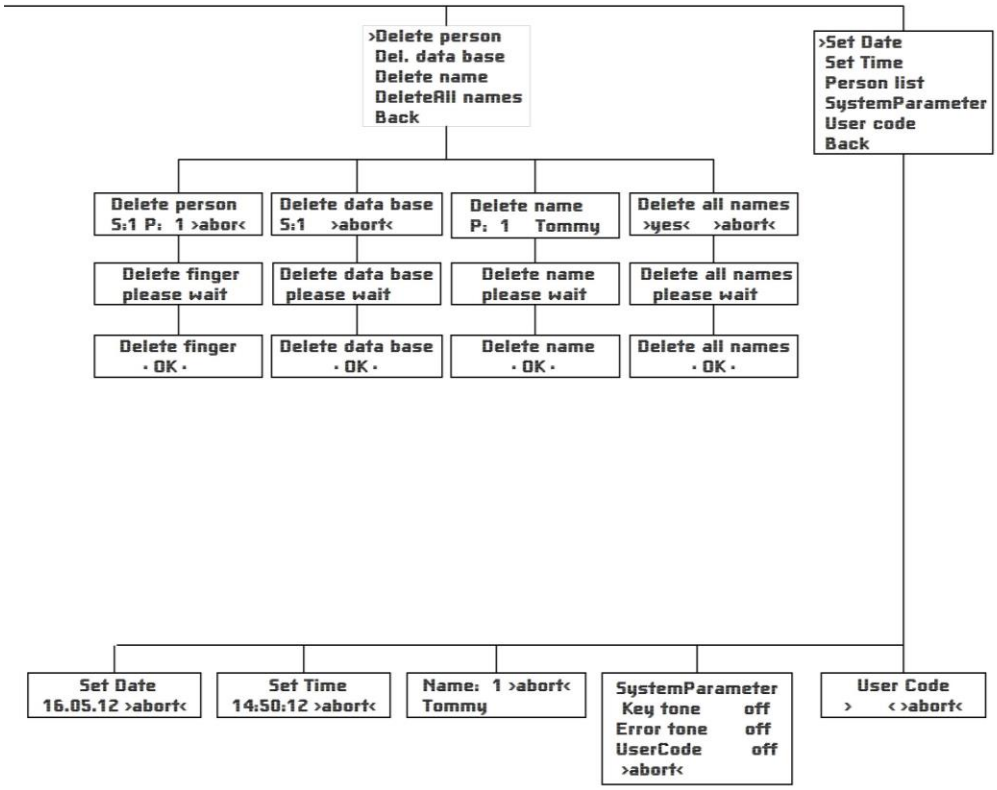
Here an operator code can be defined.

```
    User-Code
>    < >Abbr.<
```

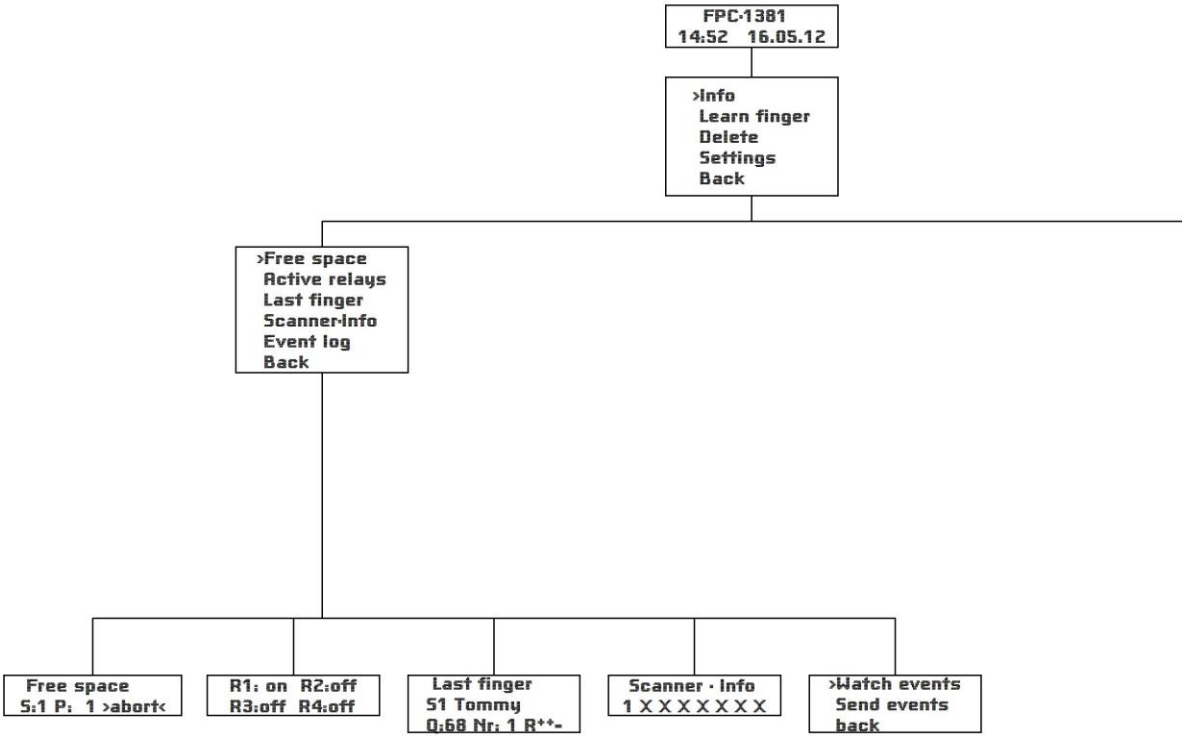
Using the keys ↑ and ↓ in alphabetical order the letter of the currently selected position can be changed. With the → and ← keys the position can be selected. Pressing "OK" confirms the code.

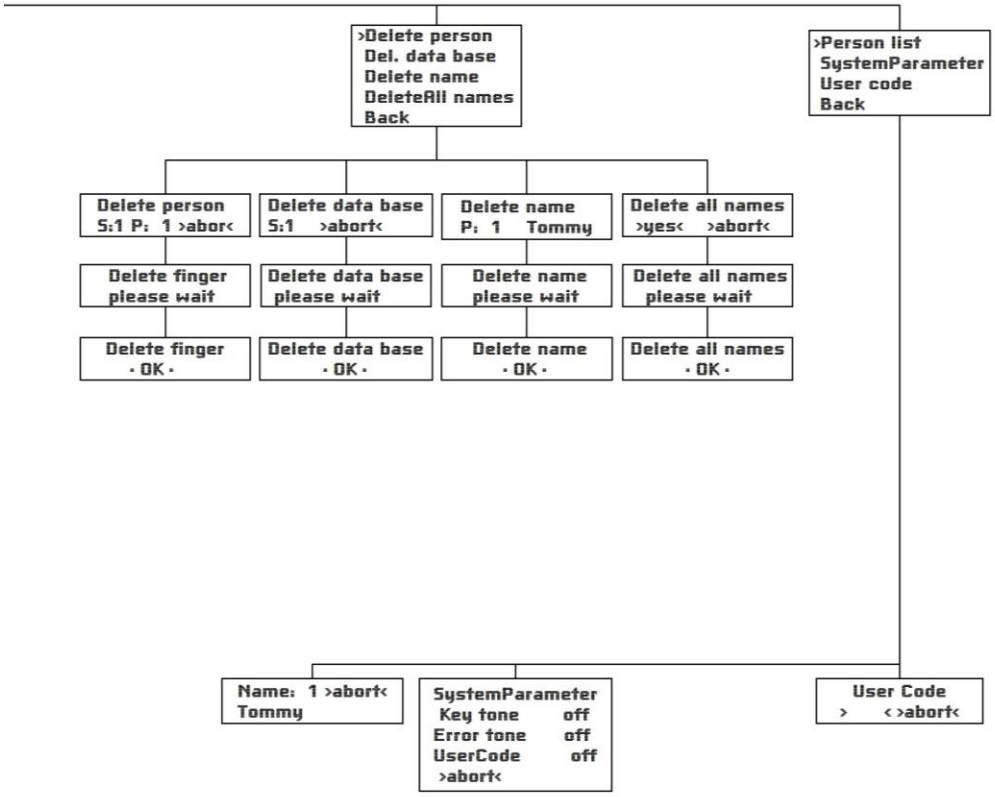
13. User Menu


FPC-1381
14:52 16.05.12
OK-Key
>Info
Learn finger
Delete
Settings
Back
Last finger
51 Epple
Q:68 Nr: 1 R++-
>Free space
Active relays
Last finger
Scanner-Info
Event log
Back
learn finger
S:1 P: 1 R:—
>abort<
Learn finger
>input<
Finger recog-nized
Yes
No
Learn finger
·. i.O. ·
Learn finger
· Error ·
Free space
S:1 P: 1 >abort<
R1: on R2:off
R3:off R4:off
Last finger
51 Tommy
Q:68 Nr: 1 R++-
Scanner · Info
1 X X X X X X X
>Watch events
Send events
back


>Delete person
Del. data base
Delete name
DeleteAll names
Back
>Set Date
Set Time
Person list
SystemParameter
User code
Back
Delete person
S:1 P: 1 >abor<
Delete data base
S:1 >abort<
Delete name
P: 1 Tommy
Delete all names
>yes< >abort<
Delete finger
please wait
Delete data base
please wait
Delete name
please wait
Delete all names
please wait
Delete finger
· OK ·
Delete data base
· OK ·
Delete name
· OK ·
Delete all names
· OK ·
Set Date
16.05.12 >abort<
Set Time
14:50:12 >abort<
Name: 1 >abort<
Tommy
SystemParameter
Key tone off
Error tone off
UserCode off
>abort<
User Code
> < >abort<

14. User Menu with Active VdS-Operation




>Delete person
Del. data base
Delete name
DeleteAll names
Back
>Person list
SystemParameter
User code
Back
Delete person
S:1 P: 1 >abor<
Delete data base
S:1 >abort<
Delete name
P: 1 Tommy
Delete all names
>yes< >abort<
Delete finger
please wait
Delete data base
please wait
Delete name
please wait
Delete all names
please wait
Delete finger
· OK ·
Delete data base
· OK ·
Delete name
· OK ·
Delete all names
· OK ·
Name: 1 >abort<
Tommy
SystemParameter
Key tone off
Error tone off
UserCode off
>abort<
User Code
> < >abort<