Creating USER DEFINED PASS-THRU Format Options

The user has the ability to add custom defined PASS-THRU formats to the VeriAdmin software. These will be added to the dropdown list in the BII_UNIT PARAMETER SETTINGS dialog box. In the installation directory there is a file called WFORMAT.DAT that contains all displayed Wiegand formats.

WFORMAT.DAT contains both pre-defined formats and PASS-THRU formats. See below for and example contents of that file. All lines that begin with '//' are ignored. PRE-DEFINED formats follow the format:

WIEGAND <MV1100_Code> <#bits> <text_string(no spaces)>

WARNING: These should NOT be changed or added to unless directed by Bioscrypt TECHNICAL SUPPORT. Any modifications to this section could cause unreliable Wiegand communications using PRE-DEFINED formats.

The next section shows the PASS-THRU Formats and follows the format:

WIEGAND_PASS <label> <TOTAL_BITS> <ID_START_BIT> <ID_NUM_BITS>

Where:WIEGAND_PASS is the identification that this is a PASS_THRU format

<label> is the Description shown in the dropdown list (no spaces)

<TOTAL_BITs> is the total number of bits in the entire Wiegand String (maximum is 64)

<ID_START_BIT> is the starting bit of the ID FIELD(where the first bit is 0)

<ID_NUM_BITS> is number of bits in the ID FIELD (must be contiguous)

For Example:

Standard 26-bit Wiegand is -- PSSSSSSSSDDDDDDDDDDDDDDDDP

(1 Parity bit, 8 SITE CODE bits, 16 ID bits, 1 Parity)

- 26 total bits
- ID Start Bit is 9 - (where first bit is 0)
- ID Number of Bits is 16

This would be represented as:

WIEGAND_PASS 26-Bit-Pass_Thru 26 9 16

And the text, “26-Bit-Pass_Thru” would be added to the dropdown box. Selection of this option would show the data in the associated boxes.

As seen below, one special format (CUSTOM –1 –1 –1) is also added. When this is selected, the user can enter the TOTAL_BITS, ID_START_BITS, and ID_NUM_BITS directly into the VeriAdmin user interface. These values can then be sent to the BII_UNIT. The values are NOT saved to the WFORMAT.DAT file however. To add items directly to the file, any standard text editor will work since WFORMAT.DAT is a text file.

```
//
// format is: IDENTIFIER MV1100_Code #bits text_string(no spaces)
//
WIEGAND 0 26 Standard
WIEGAND 1 44 Apollo
WIEGAND 2 34 Northern
WIEGAND 3 34 Northern(no_parity)
WIEGAND 4 34 Ademco
WIEGAND 5 35 HID_Corporate
WIEGAND 6 37 HID
//
// format is: IDENTIFIER text_string(no spaces) TOTAL_BITS ID_START_BIT ID_NUM_BITS
//          (* note: ID_START_BIT is zero-based *)
//
WIEGAND_PASS 26-Bit-Pass_Thru 26 9 16
WIEGAND_PASS Kantech-XSF 39 22 16
WIEGAND_PASS CUSTOM -1 -1 –1
```

AUX PORT SECURITY

This allows the Administrator to set a password for the AUX port to DISABLE unauthorized AUX Port communications. The purpose is to prevent unauthorized users from accessing the AUX port unless the password is supplied to re-ENABLE the port.

In the dialog, the current state is shown. The Administrator would select DISABLE and supply a numeric password, and press the SET button. The supplied numeric password should be remembered since it is required to ENABLE the AUX port while communicating on the AUX port.

Once the AUX port is disabled, no communications are accepted over the AUX port unless ENABLE PORT option is chosen in 1 of 2 ways.

- If communicating over the HOST PORT
  - the ENABLE PORT command will enable AUX port communications and a password is NOT required. This allows the unit to be reset over the HOST port if the AUX password is forgotten. VeriAdmin allows this since the network is considered secure.
- If communicating over the AUX PORT
  - The ENABLE PORT command will enable AUX port communications ONLY if the correct password is supplied. All other commands will return an error indicated a 'locked port' until the port is enabled properly

Bioscrypt recommends that the AUX port be disabled and password protected

When an Administrator needs to communicate with the device using the AUX Port, the procedure would be:

- connect to the AUX port,
- use VeriAdmin to bring up the BII_UNIT PARAMETER SETTINGS dialog
- choose ENABLE PORT, supply the correct password, and press SET

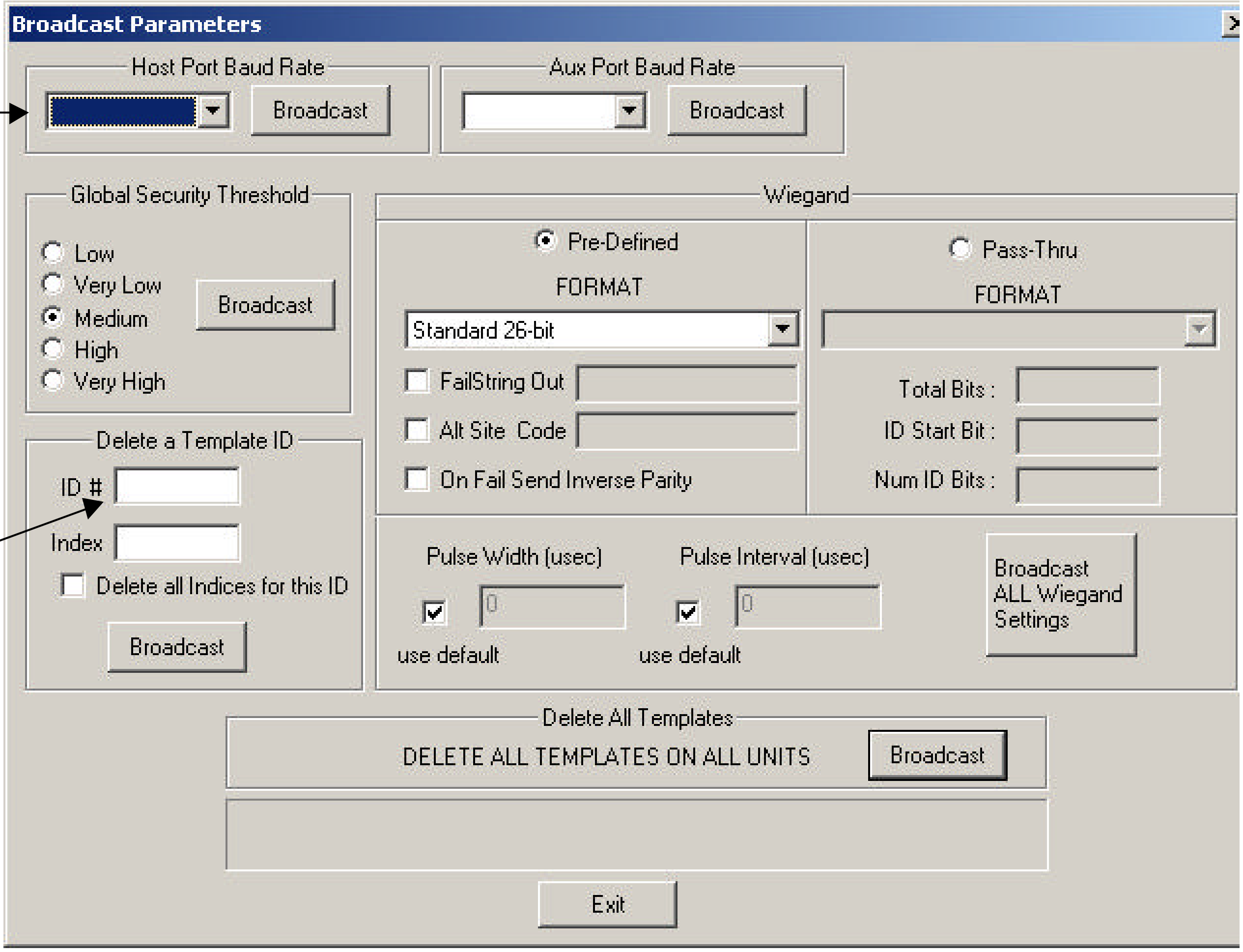
All communications would then be allowed. Once all data is gathered, the Administrator would then disable the AUX port by:

- use VeriAdmin to bring up the BII_UNIT PARAMETER SETTINGS dialog
- choose DISABLE PORT, supply a new password, and press SET

This would once again protect the AUX port from unauthorized use.

Broadcast Parameters

The Broadcast window allows you to modify settings on all units in a networked environment at the same time (See Appendix B). Under most circumstances, you will use this window when communicating over the Host Port (recall that the Aux Port primarily is for communicating with a single unit). You will note that the window is similar to the Unit Parameters window.



Broadcast Parameters

Host Port Baud Rate

Aux Port Baud Rate

Global Security Threshold

○ Low
○ Very Low
● Medium
○ High
○ Very High

Wiegand

● Pre-Defined

FORMAT: Standard 26-bit

☐ FailString Out

☐ Alt Site Code

☐ On Fail Send Inverse Parity

○ Pass-Thru

FORMAT

Total Bits :

ID Start Bit :

Num ID Bits :

Pulse Width (usec): ☑ use default 0

Pulse Interval (usec): ☑ use default 0

Delete a Template ID

ID #

Index

☐ Delete all Indices for this ID

Delete All Templates

DELETE ALL TEMPLATES ON ALL UNITS

The PC baud rate will update automatically.

Enter the ID#, then either: enter the Index#, or check the *Delete all indices…* box

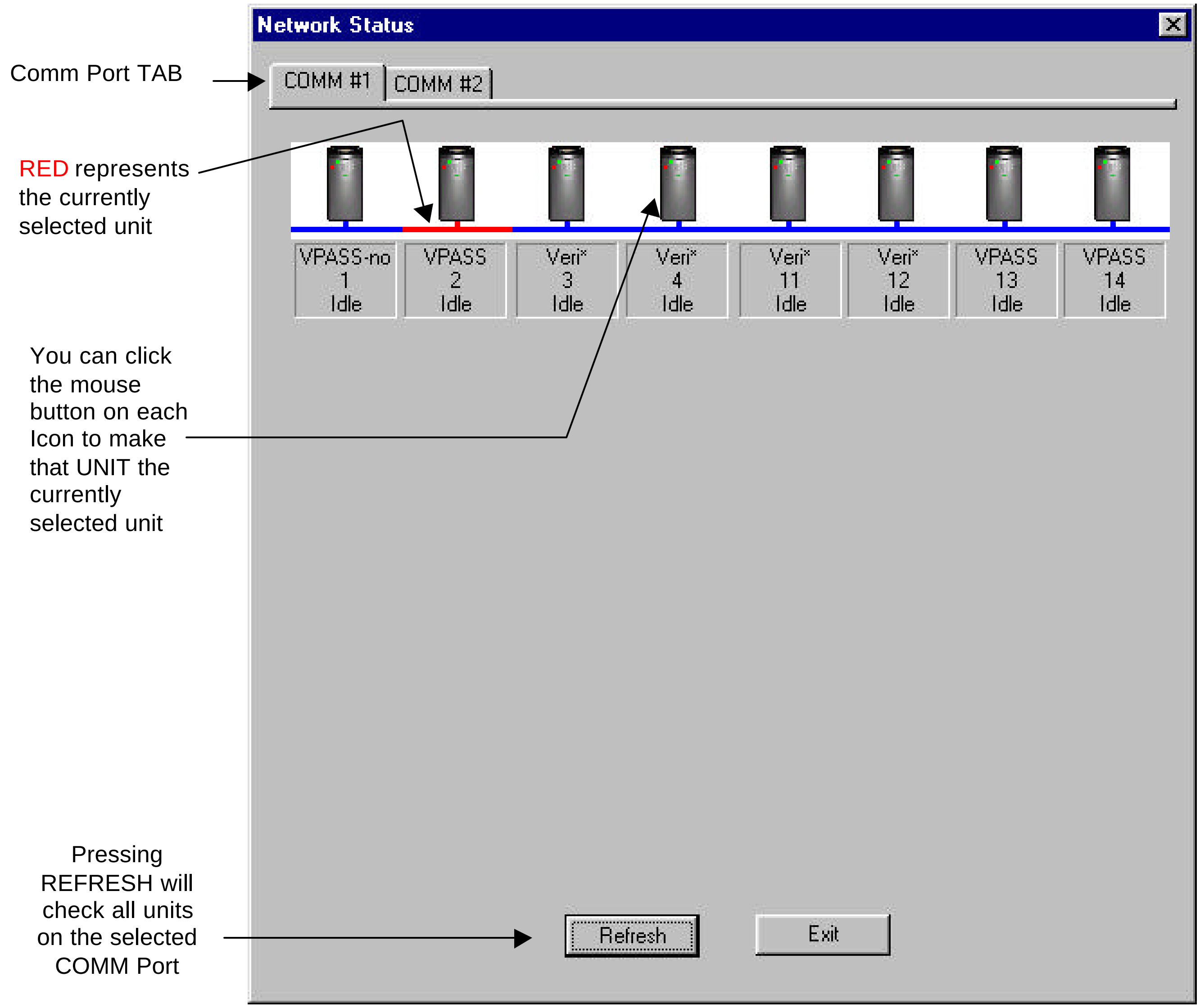
Figure 21: Broadcast Parameters Window

Note: As with the BII_Unit Parameter Settings window, change one setting at a time and click the Broadcast button after each change.

For example: if you wish to change the Security Threshold and the Wiegand Out string: 1) change the threshold; 2) click the Broadcast button in the security section; 3) change the string; and, 4) click the Broadcast button in that section.

Network Status

The Net Status window displays the condition of all units networked.



Comm Port TAB

RED represents the currently selected unit

You can click the mouse button on each Icon to make that UNIT the currently selected unit

Pressing REFRESH will check all units on the selected COMM Port

Figure 226: Network Status Window

Each unit defined in the UNITIDS.DAT file is represented with a TAB for each defined Communications Port. 3 lines of text identify:

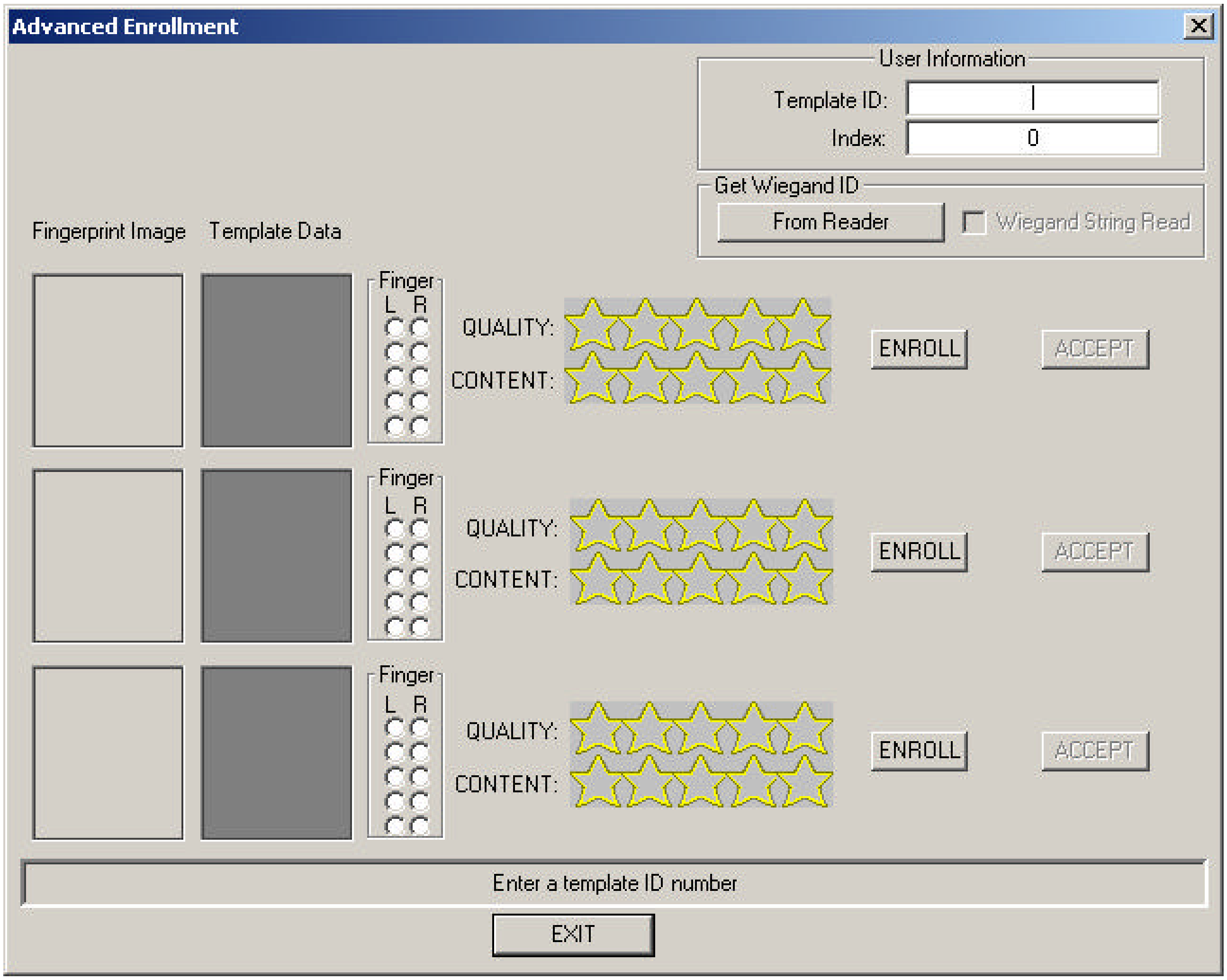
- The Type of unit (Veri*, V-PASS or V-PASS-no) as defined in UNITIDS.DAT file
- The Network ID
- State (Idle, Busy, No Response)

The Veri* designates a unit is a VeriProx or VeriFlex. V-PASS designates a V-PASS product and “V-PASS-no” represents a V-PASS product with Auto Finger Detect turned OFF. A type of ‘MISMATCH’ indicates the UNITIDS.DAT file does not match the actual unit on the network.

Advanced Enrollment

The Advanced Template Enrollment is the recommended tool for enrolling all templates. This allows multiple templates to be sampled and the corresponding template created. Users can sample different finger or multiple enrollments of the same finger. Each time an enrollment is sampled, the “best” template is identified between the current 3 samples. Users then have the option of ACCEPTing the enrollment of their choice. **NOTE: No enrollments are saved until 1 of the 3 ACCEPT buttons is pressed.**

This tool can be used to train users by demonstrating how proper finger placement is a critical aspect in obtaining a good enrollment. This tool can also show how different fingers on the same person can have very different QUALITY and CONTENT ratings.



Template ID:

Index: 0

☐ Wiegand String Read

Enter a template ID number

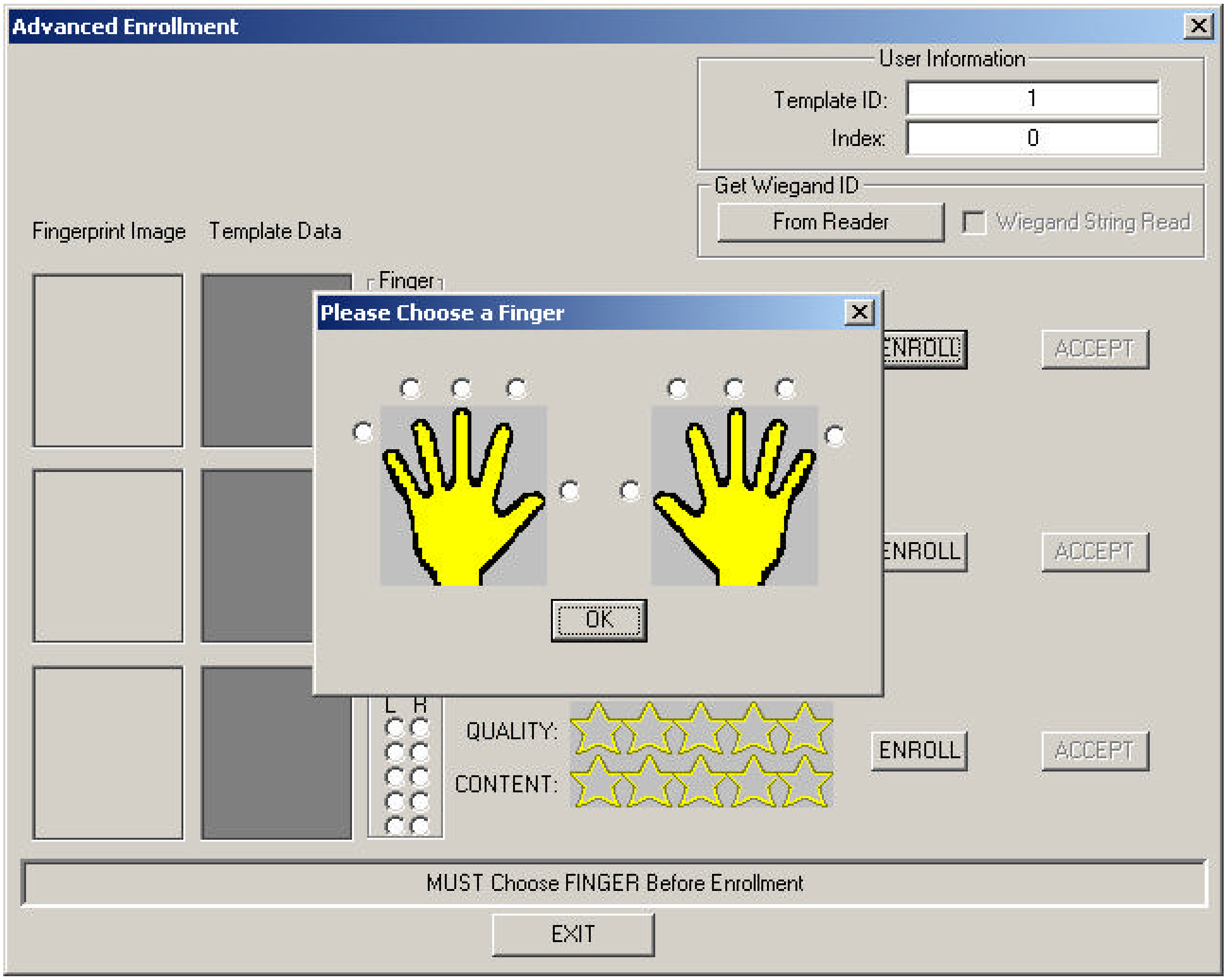
Figure 27: The Advanced Enrollment Screen

The Advanced Enrollment process is as follows:

1. In the *Template ID* field, type in the Template ID (the template ID should be the proximity card ID number for the VeriProx or if a Wiegand IN device is used. Do not include a site code designation.) **OR** Press the FROM READER button and wave the card in front of the Wiegand INPUT device to read the ID from the card.

2. In the Index field, enter the index of the template.

3. Click any ENROLL button.



Advanced Enrollment

User Information

Template ID: 1

Index: 0

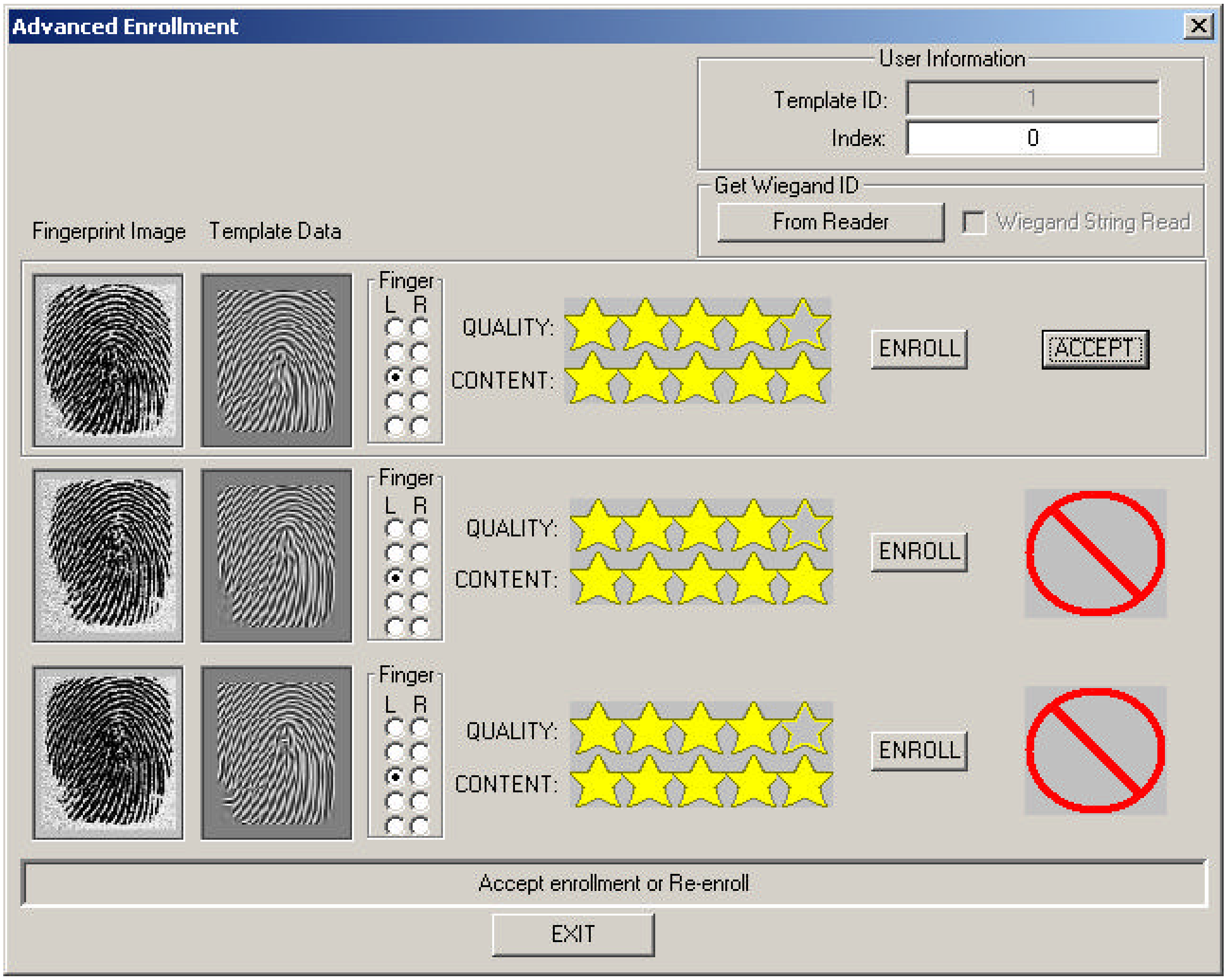
MUST Choose FINGER Before Enrollment

Figure 28: Advanced Enrollment – Finger Selection

4. A pop-up dialog box will allow the User to choose the finger to ENROLL. Choose which finger by clicking the corresponding checkbox.

5. The light on the current unit will glow amber requesting the enrollee to place a finger on the sensor. Nestle the Ridgelock into the first joint line on the finger. An image is scanned and both the image and corresponding template are displayed. The finger may be removed when the amber light goes out.

6. The Advance Enrollment tool will then choose the best template among the 3 and indicate which Enrollment should be ACCEPTed.



Advanced Enrollment

User Information

Template ID: 1

Index: 0

Get Wiegand ID

☐ Wiegand String Read

Accept enrollment or Re-enroll

Figure 29: Advanced Enrollment – Recommended Choice

7. Repeat Steps 3-6 to Enroll additional sample templates. A current template can be replaced by choosing the finger to be Enrolled and pressing the ENROLL button.

NOTE: Users can indicate which finger by selecting the corresponding checkbox in the FINGER sub-window. The checkboxes represent the fingers as if both hands where placed flat on the display with fingertips touching as shown in Figure 26.

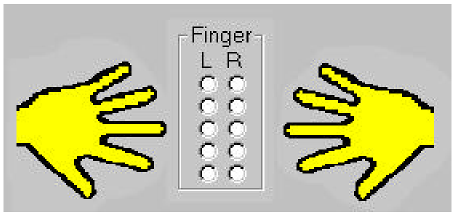
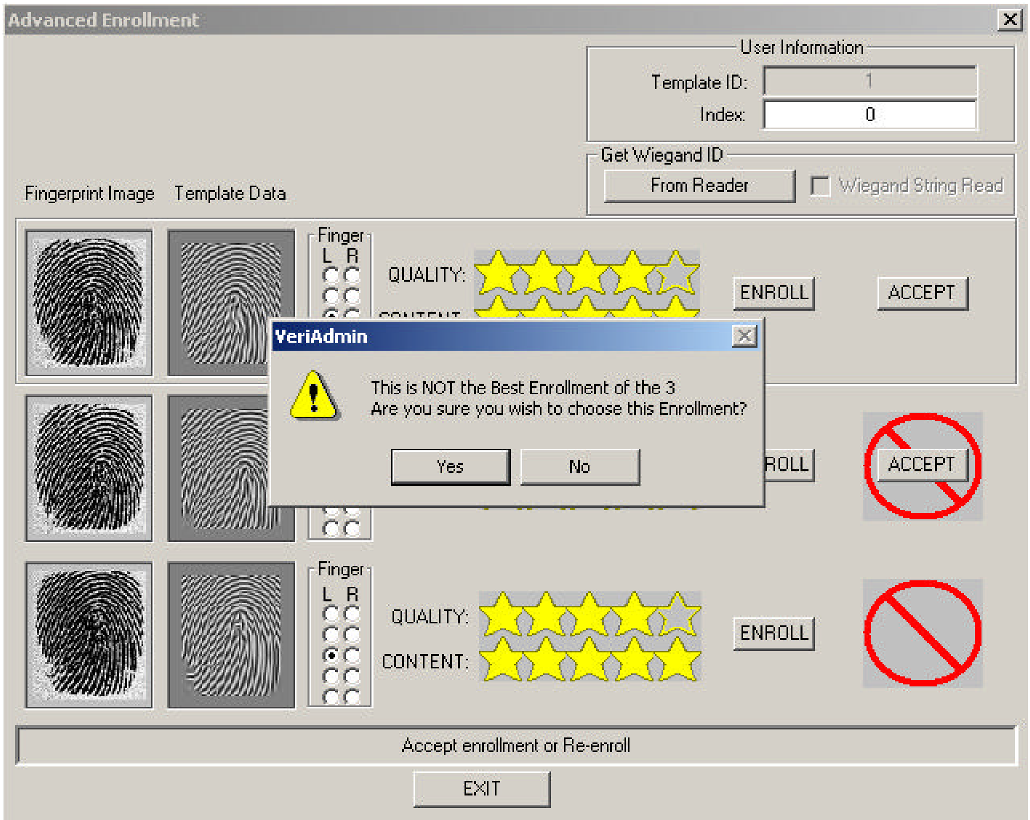


Figure 30: Advanced Enrollment – Finger Selection Option

8. Although NOT recommended by Bioscrypt, users have the option of choosing a different Enrollment other then the one recommended. Simply press the ACCEPT button even though it is hidden by the red "NO" symbol. A warning message will be displayed to confirm this un-recommended action is desired.



Template ID: 1
Index: 0

This is NOT the Best Enrollment of the 3
Are you sure you wish to choose this Enrollment?

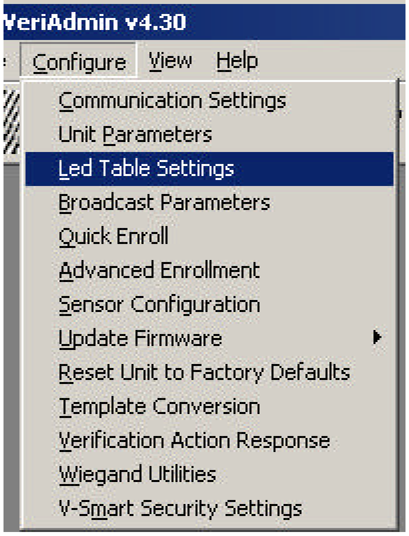
Accept enrollment or Re-enroll

Figure 31: Advanced Enrollment – OVERRIDE Recommended Choice

9. Once an Enrollment has been selected, the normal EDIT TEMPLATE window appears so that fields can be verified and additional data added. Here is where the *User* Type and *Security Threshold* can be set. See the section is this manual on *EDIT TEMPLATES* for more details on saving the template to either the current unit or the PC disk.

LED Table Settings

Choosing the LED Table Settings menu item will allow the user to define how the reader's LED will function under specific operations. Selecting this option will display the dialog shown in figure 30. The dropdown selection box chooses the *function* (enroll, verify, idle, etc.) to modify. Below that is each possible *state* for the selected operation. Line 1 represents GREEN LED, Line 2 represents RED LED, and Line 3 represents the Buzzer.



In the example shown, the ENROLL *function* is chosen. The first two *states* are disabled since they have no meaning for the ENROLL function.

Both Line 1 and Line 2 are chosen to indicate PLACE FINGER. This will turn GREEN and RED LEDs on creating a YELLOW LED.

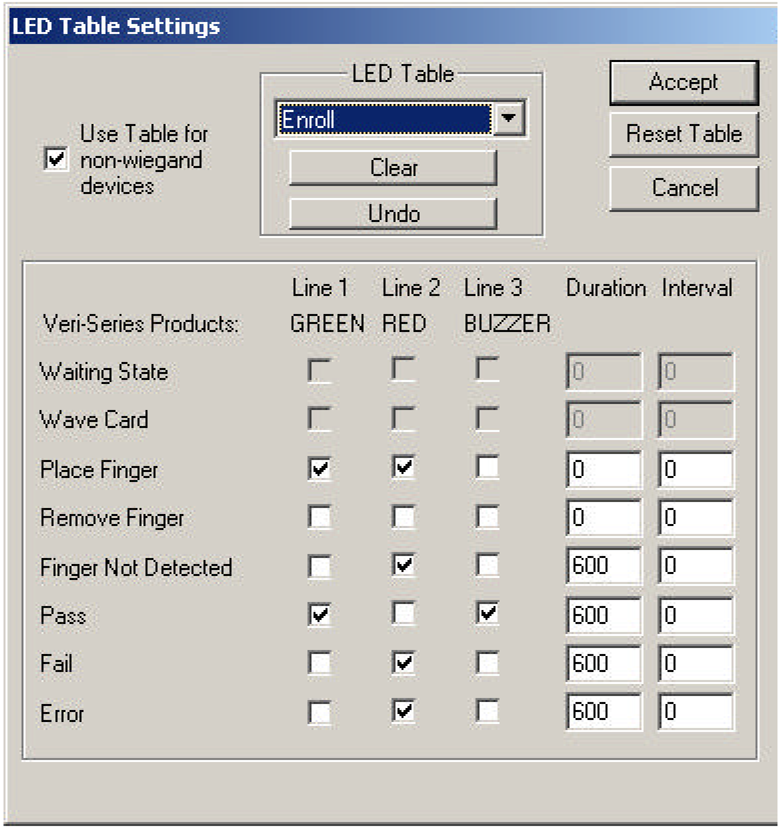
The REMOVE FINGER operation is signaled by clearing all LEDs, thus making the LED turn off.

If a FINGER NOT DETECTED happens, then the RED LED is shown for 600 milliseconds.

A PASS is indicated by both turning the LED GREEN and sounding the BUZZER for 600 milliseconds.

To indicate a FLASHING LED, choose the duration and set the INTERVAL time (1350 is normal).

Figure 32: LED Table Setting



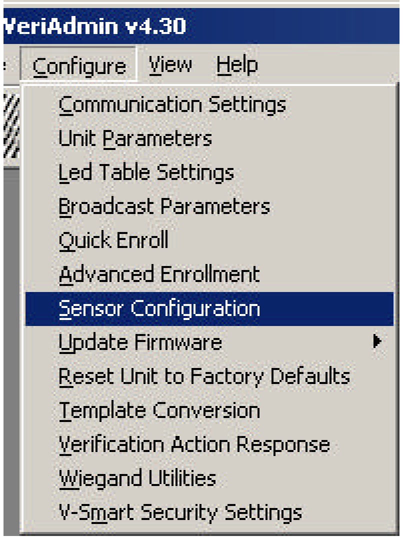
☑ Use Table for non-wiegand devices

LED Table: Enroll

Veri-Series Products:	Line 1 GREEN	Line 2 RED	Line 3 BUZZER	Duration	Interval
Waiting State	☐	☐	☐	0	0
Wave Card	☐	☐	☐	0	0
Place Finger	☑	☑	☐	0	0
Remove Finger	☐	☐	☐	0	0
Finger Not Detected	☐	☑	☐	600	0
Pass	☑	☐	☑	600	0
Fail	☐	☑	☐	600	0
Error	☐	☑	☐	600	0

Figure 33: LED Table Settings

The USE TABLE checkbox indicates whether to use these setting for non-Wiegand initiated commands (like commands coming from PC). Repeat process of other *functions* then press the ACCEPT to transfer to the current unit. If the ACCEPT is not pressed, the changes are ignored.



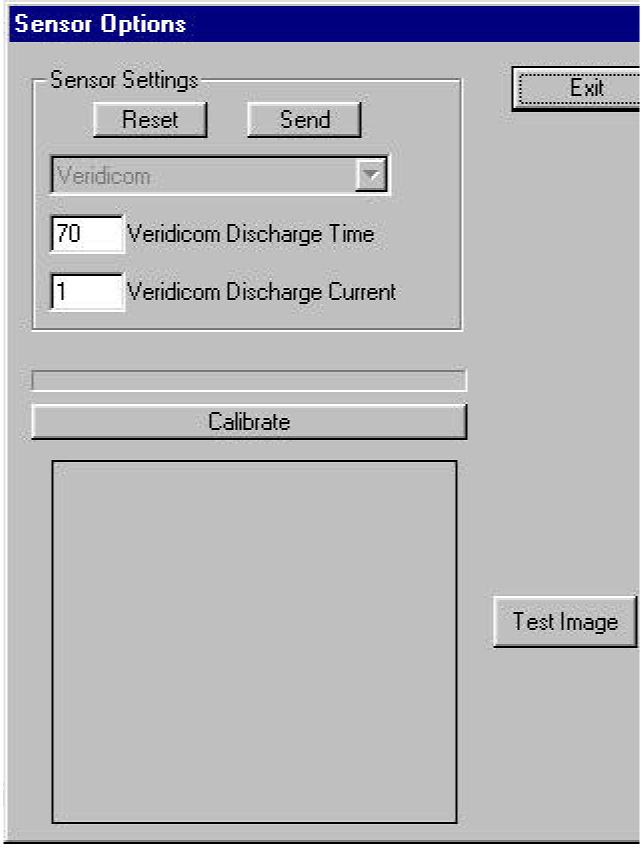
Sensor Configuration

Note: *This feature has been disabled in recent versions of VeriAdmin, including v4.3*

Choosing the Sensor Configuration menu item will allow the reader's sensor settings to be altered. It is recommended that only advanced users attempt to modify these settings since they can drastically affect the fingerprint reader's performance. Please call Bioscrypt Technical Support with any questions before attempting modifications.

The Bioscrypt sensor needs to be calibrated for optimal performance.

Figure 34: Sensor Configuration Men



Veridicom

70 Veridicom Discharge Time

1 Veridicom Discharge Current

For **Veridicom** Sensors:

To perform this task the user should place their finger on the sensor of the reader identified by the current Communication settings. Next, press the **CALIBRATE** button and hold the finger steady until the progress bar completes. The new values will be displayed and the VeriAdmin software will ask if you want to see a test image. With the finger still on the sensor, select YES. An image will be scanned and displayed. If the image looks good, choose YES to accept the new values.

For **Authentec** Sensors:

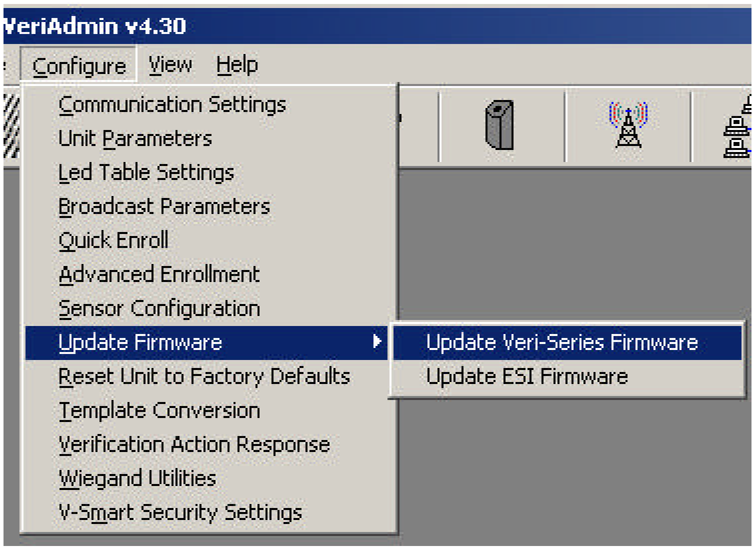
To perform this task the user should NOT place their finger on the sensor of the reader. Press the **CALIBRATE** button.

The **TEST IMAGE** button will scan and display a fingerprint image.

F

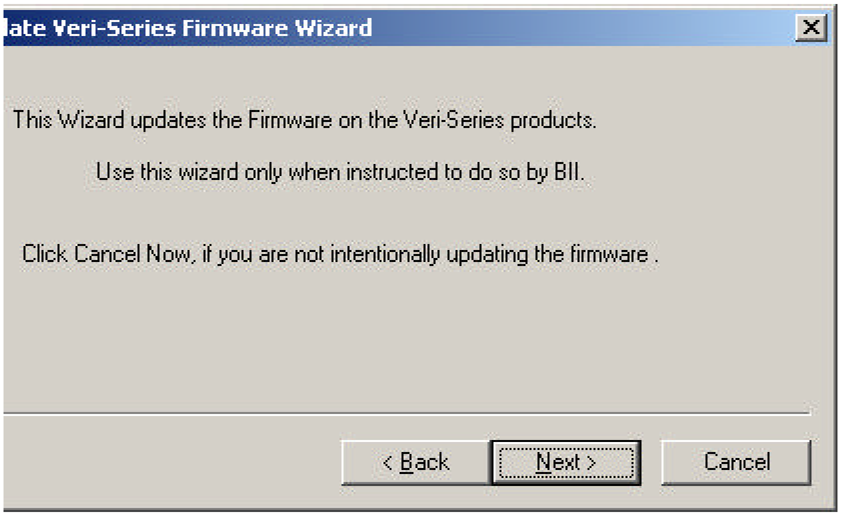
NOTE: A Network ID of –1 is NOT valid for these operations

Update Firmware



Choosing the Update Firmware menu item will allow the reader's DSP firmware to be field-updated. Also, for V-Smart units, the external storage device (ESI) can also be programmed in the field. It is recommended that only advanced users attempt to perform this operation. Please call Bioscrypt Technical Support with any questions.

Figure 36: Update Firmware Menu Option



This Wizard updates the Firmware on the Veri-Series products.

Use this wizard only when instructed to do so by BII.

Click Cancel Now, if you are not intentionally updating the firmware .

Choosing this option will begin the Update Firmware Wizard. Follow the steps and choose the correct firmware file. This process can take between 1-10 minutes depending on the current baud rate settings.

Figure 34: Update Firmware

NOTE: Before attempting this operation, make sure the current communication settings are correct and that the PC and reader are communicating properly. It is recommended that the HELP, ABOUT VERIADMIN menu option is used both before and after this operation to ensure the firmware version changed. Depending on the prior version, downloading a new firmware version may also cause an extra step to be performed after the firmware download. If this happens, the user will be given informational messages indicating the additional steps. Although not necessary, it is recommended that all templates be backed-up to the PC before a firmware update. If power is disconnected during a firmware update, the Bioscrypt unit may become inoperable.

Figure 37: Update Firmware Menu Option

Restore Factory Defaults

Choosing the Restore Factory Defaults menu item will allow the Bioscrypt reader to be reset to the default firmware setting. It is recommended that only advanced users attempt to use this operation. Please call Bioscrypt Technical Support with any questions.

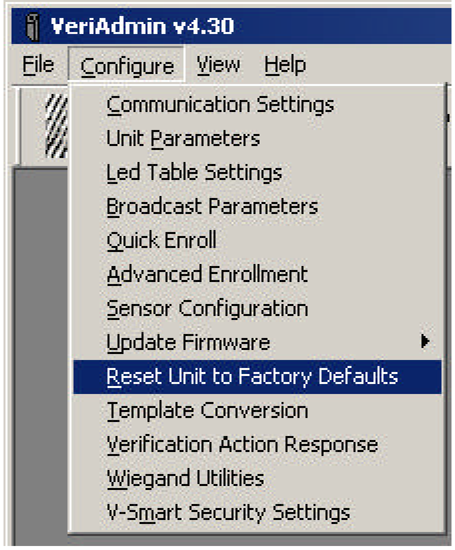
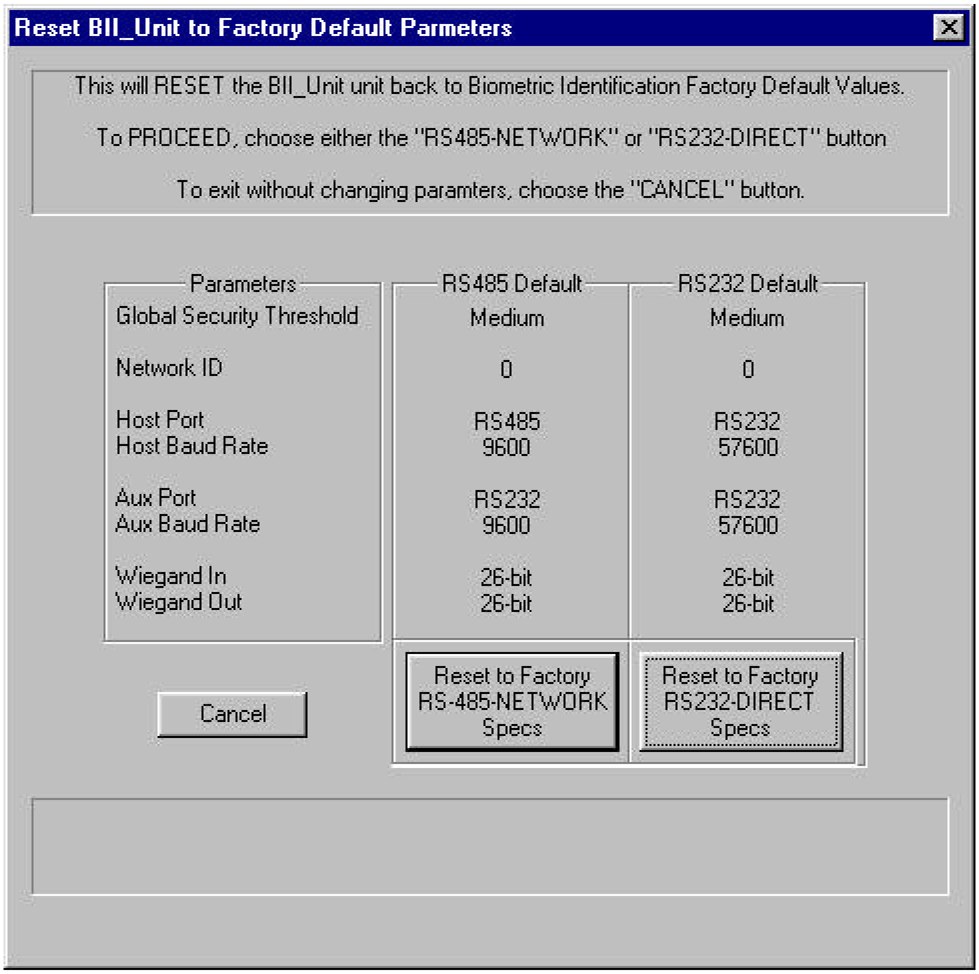


Figure 38: Reset BII_Unit to Factory Defaults Menu Option

Two options are given: RS-485 Default and RS232. The associated Factory Default settings are identified for each option. Proper communication must be established with the reader before this operation can successfully performed.

Press the button of the option desired and each Parameter will be set on the reader.



Reset BII_Unit to Factory Default Parmeters

This will RESET the BII_Unit unit back to Biometric Identification Factory Default Values.

To PROCEED, choose either the "RS485-NETWORK" or "RS232-DIRECT" button

To exit without changing paramters, choose the "CANCEL" button.

Parameters	RS485 Default	RS232 Default
Global Security Threshold	Medium	Medium
Network ID	0	0
Host Port	RS485	RS232
Host Baud Rate	9600	57600
Aux Port	RS232	RS232
Aux Baud Rate	9600	57600
Wiegand In	26-bit	26-bit
Wiegand Out	26-bit	26-bit

Cancel
Reset to Factory RS-485-NETWORK Specs
Reset to Factory RS232-DIRECT Specs

Figure 39: Reset Parameters

NOTE: A Network ID of –1 is NOT valid for this operation.

Template Conversion

Choosing the Template Conversion menu item will allow the user to convert templates stored on the PC from the larger Searching templates used with the V-PASS to the smaller 1:1 Verification Templates used with the VeriProx and VeriFlex (see Appendix C for details).

It is recommended that only advanced users attempt to perform this operation. Please call Bioscrypt Technical Support with any questions.

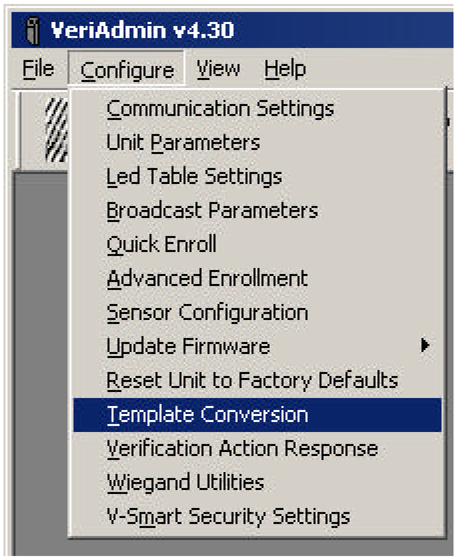


Figure 40: Template Conversion Menu

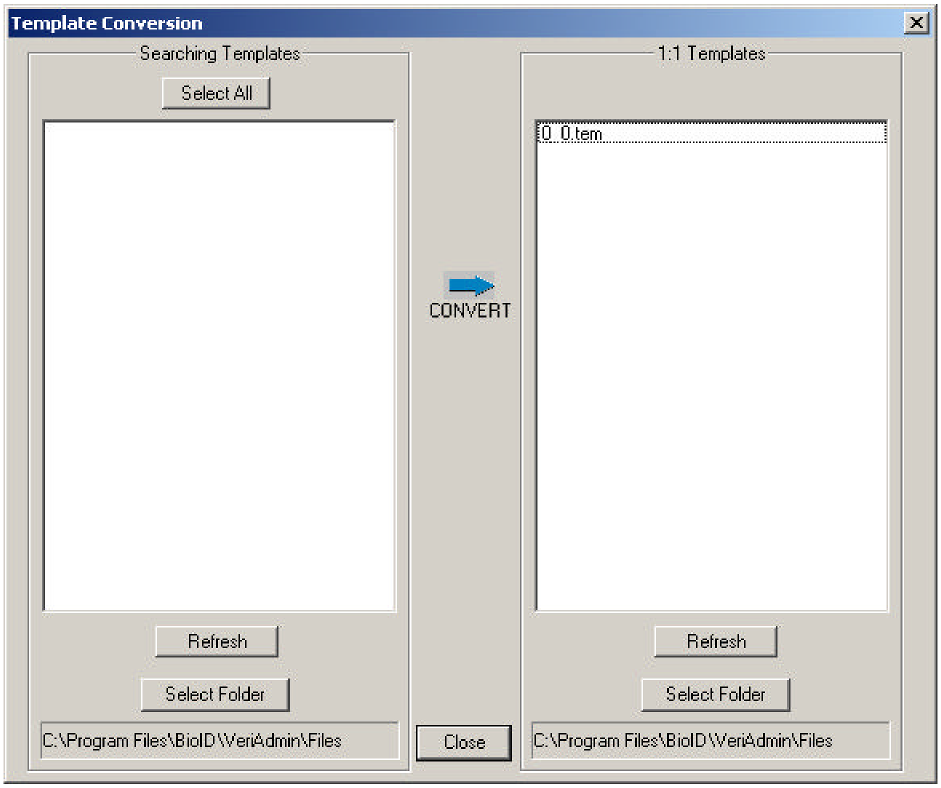


Figure 41: Template Conversion Dialog

Using the Template Conversion Dialog, users can choose the Source (V-PASS template) and Destination (VeriProx/VeriFlex template) directories by pressing the appropriate STORAGE FOLDER button and selecting the desired directory.

Next, highlight the V-PASS Searching templates that you wish to convert (or press the SEL ALL button to select all appropriate templates in the selected directory).

Pressing the Right Arrow button will convert all selected V-PASS templates to VeriProx/VeriFlex templates. The names will remain the same, but the extension will change from ".mtm" to ".tem".

Verification Action Response

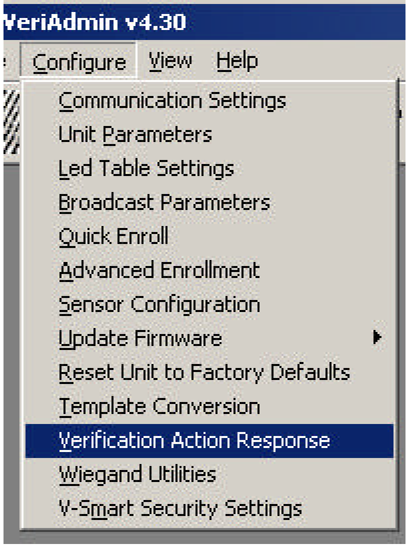


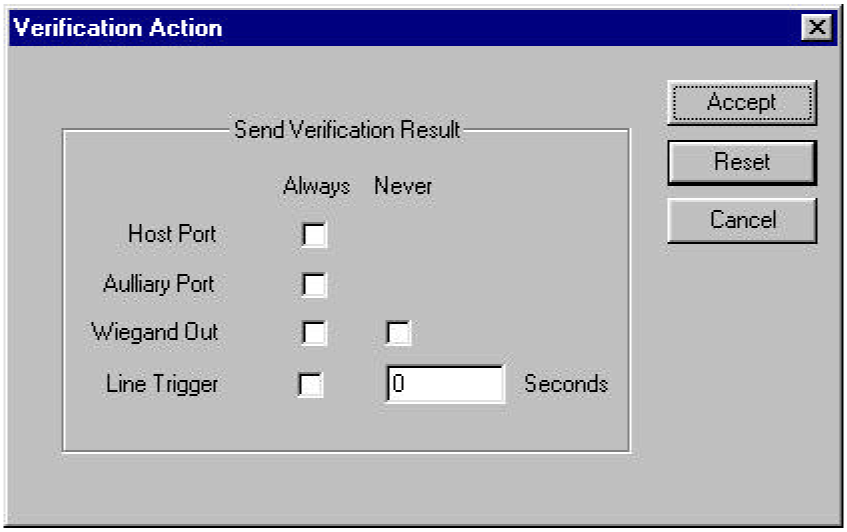
Figure 42: Verification Action Respons

Choosing the Verification Action Response menu item will allow users to customize the way the unit responds to a Verification Action.

Under *Normal* operations, the Veri-Series unit will respond based on how a Verification Action was initiated. When a Wiegand INPUT initiates the action, a Wiegand OUTPUT is used to respond. When a Verification Action is initiated over a communications port by using the Bioscrypt DLL or low-level commands (described in the MV1100 SDK), then the response packet is returned on the same communication port (either HOST or AUX). This menu allows the user to select other Verification Responses ***in addition to*** the normal response.

The Line Trigger is a signal line that will trigger for the defined number of seconds on a successful verification. Although not a true TTL level signal, this trigger could be used to initiate a relay or other device. The Line Trigger is the GREEN wire on the Veri-Series pigtail.

It is recommended that only advanced users who are working with the SDK and writing their own custom software attempt to enable the HOST or AUX ALWAYS operations. Please call Bioscrypt Technical Support with any questions.



Send Verification Result

	Always	Never
Host Port	□	
Aulliary Port	□	
Wiegand Out	□	□
Line Trigger	□	0 Seconds

Figure 43: Verification Action Dialog

Wiegand Utilities

(* requires firmware v3.2 or higher)

Choosing the Wiegand Utilities menu item will allow users to define specific Administrator IDs that will not require a fingerprint to initiate the ENROLL and DELETE actions.

Under *Normal* operations, ENROLL and DELETE COMMAND CARDS require a fingerprint verification to be performed that ensures the correct person is using the ADMIN card.

The Wiegand Utilities Dialog allows Administrators to create specific IDs that can initiate the following operations:

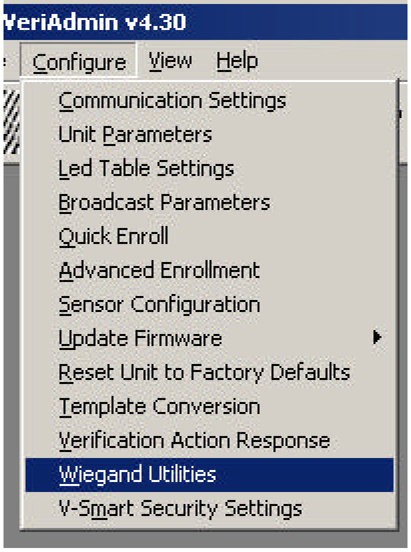
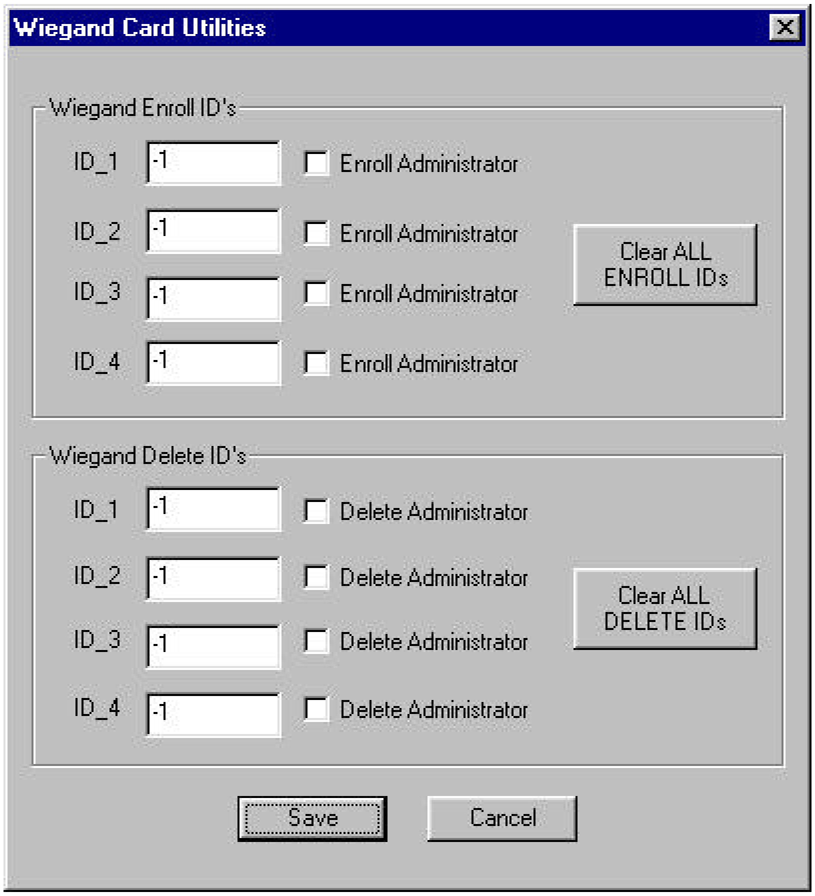


Figure 44: Wiegand Utilities

- Create ENROLLMENT Administrator Command Card
- Enroll User/Card
- Create DELETE Administrator Command Card
- Delete User/Card

By entering a Card ID in the appropriate box and pressing the SAVE key, that ID will be stored in the VeriSeries Unit memory. When a card that contains that ID is presented to the VeriSeries Product, the appropriate action will be initiated.

This feature has been added to allow installers to create ENROLL and DELETE ADMIN Command Cards without a PC if the unit has been properly pre-configured for specific card IDs by using this feature. Once these initial cards have been created, we recommend deleting the pre-configured IDs with the CLEAR ALL buttons.


Wiegand Card Utilities

Wiegand Enroll ID's

ID_1 -1 □ Enroll Administrator
ID_2 -1 □ Enroll Administrator
ID_3 -1 □ Enroll Administrator
ID_4 -1 □ Enroll Administrator

Wiegand Delete ID's

ID_1 -1 □ Delete Administrator
ID_2 -1 □ Delete Administrator
ID_3 -1 □ Delete Administrator
ID_4 -1 □ Delete Administrator

Figure 45: Wiegand Card Utilities Dialog

Getting Service and Support

Bioscrypt, Inc. is available to provide information and assistance. Contact Bioscrypt using methods discussed below.

Before calling, copy down the following version information about your unit:

- Software
- DLL
- Algorithm
- Kernel
- PIC
- ESI (if applicable)

This can be found in the Help menu under the About menu. The ESI version can be found under the Smart Card Manager in the upper left (V-Smart only).

Technical Support

For assistance with technical matters, contact the Technical Support Department by sending e-mail to support@bioscrypt.com. To speak directly with a technician, call (818) 501-3908.

Customer Service and Sales Support

Bioscrypt is here to assist you with your questions. Contact our Customer Service and Sales support departments by calling (818) 501-3908.

World Wide Web Site

See our World Wide Web site for breaking information, and other services. The address is www.bioscrypt.com.

Appendix A – Quality and Content

Section A.1 - Basic Biometric Concepts

Biometric Definitions

Enrollment is the operation of scanning a fingerprint, determining the quality of the fingerprint scan, and storing a good template with associated data within the memory of the Veri-Series product.

Verification is the operation of presenting the user ID, either by waving a proximity card or typing the ID into the Verify dialog box, requesting the user to place their finger on the fingerprint sensor, scanning the finger, comparing the current scan against stored fingerprint templates for that user, and then notification of a successful validation or a failure.

Searching is the operation of the user placing their finger on the V-PASS fingerprint sensor, scanning the finger, comparing the current scan against ALL stored fingerprint templates for V-PASS unit, and then notification of a successful validation or a failure. Searching is only possible on a V-PASS.

Fingerprint Template is the term used to describe the data stored on the VeriProx that mathematically represents the ridge pattern of an enrolled fingerprint. This data is not the raw image of the fingerprint, but the result of processing a raw image through our unique algorithmic process, preparing the data for later comparisons, and compressing the data for maximum storage. An image of the uncompressed template data does resemble the raw image, but whereas a raw image is 90K bytes, the compressed template is only 348 bytes for the VeriProx or VeriFlex and 2352 bytes for the V-PASS.

Fingerprint Core is the term used to describe distinguishing print characteristics usually found in the area of the print where the topography shows the tightest curvature. Although the entire fingerprint has significant data, the “core” is the most data-intensive area and therefore very important.

Scanning an Image

When the unit properly reads a fingerprint, it looks for image *quality* and fingerprint *content*. When a raw image is collected from the sensor, the Veri-Series unit searches for the **fingerprint core.**

Content scores are based upon the amount of non-ambiguous data in the region of the core. The higher the content, the greater the degree of useful information. See Section A.3 for a thorough discussion of content

Quality scores are based on how well the ridge pattern is defined within the image. For best image *quality*, be sure that the sensor window is clear of dirt, residue, or other material that can block the BII_Units view of the fingerprint. See Section A.3 for a thorough discussion on quality.

Once the image is scanned, the BII_Unit then creates and stores the resulting fingerprint template.

Storing User Templates on the Unit

The Veri-Series unit recognizes users by matching current images to stored templates of previously enrolled fingerprints. Along with the fingerprint, the VeriProx and VeriFlex require a proximity card with a unique user ID number.

The Veri-Series readers allow associating **multiple fingerprints** with a single Template ID. Each instance of a template with a specific ID has a unique index (up to 256 indices possible (0-255)). This allows a VeriProx and VeriFlex users to have a single proximity card, but be able to enroll multiple fingers. During *VERIFICATION,* a user waves their card at the VeriProx / VeriFlex reader and places their finger on the sensor. The unit will then scan the current fingerprint and compare it against all enrolled templates for that specific ID. If there are multiple templates enrolled under one ID, then the VeriProx / VeriFlex will check templates in the numerical order based on their index.

Example: On Card # 123, a person *ENROLLs* both their left and right index fingers. The next time that user goes to verify, they wave Card # 123 and place a finger on the sensor. The VeriProx scans the current finger and compares it against the first template (the right index finger, Template ID 123 0). If a match is found, the *VERIFICATION* is PASSED and the operation ends. If a match is not found, the VeriProx will check the second print (the left index finger, Template ID 123 1). If a match is found, the *VERIFICATION* is PASSED and the operation ends. If the match is not found and since all templates have been compared, the *VERIFICATION* is FAILED.

NOTE: The initial finger scan takes ~0.5 seconds and each comparison takes ~0.5 seconds. So if the first template results in a successful verification, the total time is ~1.0 seconds. Successful verification on the second templates requires ~1.5 seconds, and so on.

Section A.2 - Proper Finger Placement

The basics for successful operation of the Veri-Series units are simple but important. System performance improves dramatically with ***consistent finger placement.*** It is important to make sure that the position of the finger allows the unit to record the unique features of the print. Here are the steps to follow for trouble-free fingerprint recognition.

- Bioscrypt has designed the Ridge-Lock to create "simple user instruction" and "consistent" finger position. With the fingertip raised, position the finger so that the Ridge-Lock rests comfortably within the first indentation of the finger. Next, lower the finger onto the sensor and apply moderate pressure.

Common mistakes

Correct finger placement is a significant component for reliable fingerprint imaging. The following list some common mistakes to avoid.

- Sliding the fingertip into place instead of lowering it onto the sensor will cause distortion of the fingerprint and will degrade image quality. Keep the fingertip raised while locating the Ridge-Lock, then lower the fingertip.

- Rotating the finger into position also will cause distortion of the fingerprint, subsequently making verification less reliable.

- Positioning the finger to one side and leaving a portion of the sensor exposed will degrade image quality.

- Placing the finger at an angle to the finger guide is another common mistake. Rotation of the fingertip will not provide a reliable image of the fingerprint.

Image quality

Dry skin is another factor that can contribute to an unreliable image of a fingerprint. A normal amount of moisture on the skin makes the ridges and valleys of the fingerprint stand out to the sensor. Too little moisture makes the image "noisy" and will "cause the Veri-Series unit to reject the image during processing. Lightly moisturizing the finger will enhance the contrast of the print and provide more reliable verification. The increased sensitivity of the silicon sensor is dramatically reducing problems in this area.

Image consistency

Once a user's fingerprint template has been enrolled, the best performance in the candidate matching process depends on consistency. Obviously, the user must use the same finger for ID verification as was used to form the original template. It also is important to position the finger correctly for each verification, as was done when the template was enrolled, so the Veri-Series unit "sees" approximately the same information each time.

Section A.3 - Using Content and Quality during Enrollments

As described in section A.1, Quality and Content scores are returned in the enrollment process. These scores give an indication of the performance of the template enrolled. To a large degree, the verification algorithm compensates for deficiencies in image quality and loss of information content. Nonetheless, knowledge of these parameters and what they mean helps ensure optimal performance.

False Acceptance and False Rejection

In order to understand the effects of poor image quality and poor information content it is necessary to understand how to measure performance. Performance of the Veri-Series unit is presented in terms of False Rejection and False Acceptance.

> False Rejection indicates that the unit incorrectly rejected a fingerprint that corresponds to the person's template. False Rejections rarely occur and primarily result from the inability to get a good image of the finger.
>
> False Acceptance indicates that the unit accepted a fingerprint that does not correspond to the template it was compared against. False Acceptances also are rare and primarily result when a fingerprint template is characterized by low information in the enrolled print.

The algorithm on the Veri-Series units has been tuned so that the false acceptance and false rejection rates are equal at the medium security level (level 3), delivering the industry leading accuracy. This is known as the Equal Error Rate. Increasing the security (e.g., changing the security level from 3 to 1) will decrease the chance for false acceptance at the expense of increased false rejection. Reducing the security (e.g., changing the security level from 3 to 5) will decrease the chance of a false rejection at the expense of false acceptance. The table below indicates the expected error rates at the different security levels.

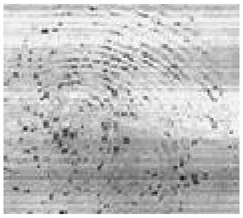
Security Level	**False Rejection Rate**	**False Acceptance Rate**
Very Low (5)	1 / 10,000	1 / 100
Low (4)	1 / 5000	1 / 200
Medium (3)	1 / 1000	1 / 1000
High (2)	1 / 200	1 / 5000
Very High (1)	1 / 100	1 / 20,000

Quality

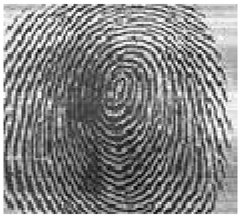
The quality score is based on how well the ridge pattern is defined within the fingerprint image that was enrolled. In other words, quality measures how clearly the unit imaged the fingerprint. Poor quality enrollments can result in an elevated rate of false rejection making it difficult for the user to verify reliably.

The score is given in stars (★) and ranges from zero to five stars, with five being the best quality (rarely obtained) and zero being the worst. Quality scores of three stars and higher perform well with the Bioscrypt verification algorithm. In this range, the algorithm readily compensates for differences in fingerprint quality. It statistically is still true that the larger the quality score the better the performance of an enrollment.

As a general rule of thumb, quality scores less than three stars require intervention on the part of the Enroller or administrative software. Sources of low scores include dry fingers and dirty sensors.



Very Low



Very High

If the quality score falls below three stars, Bioscrypt recommends the following options:

- Ensure that the sensor and finger are clean.
- If the finger and sensor are clean and a dry finger is suspected, try re-enrolling one more time, leaving the finger on the sensor for several seconds prior to enrollment. Frequently finger moisture accumulates over time to provide a good image.
- Fingerprint quality can vary among individual fingers for the same person. Try enrolling an alternate finger to see if the score improves.
- Alter the security level *for that particular template* by decreasing the threshold a minimum of 1 level (e.g., change the value from medium [3] to low [4]). This will offset the false rejection for that template by making it easier to match. If use of that template indicates that raising the threshold one level still produces false rejections, try setting the value to its lowest security (level 5).

  Warning: Decreasing a template's security may increase the risk of a false acceptance for that template.

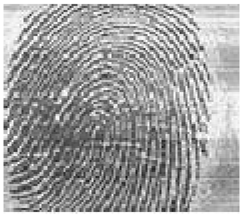
A thorough enrollment procedure will ensure streamlined and reliable verification for users. It is recommended that all four options be performed in the order listed above to maximize the performance of the device.

Content

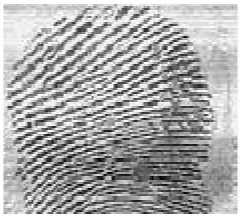
The Content score is based upon the amount of usable information the Veri-Series unit sees in the fingerprint. Templates that are characterized by low content scores may result in elevated rates of false acceptance.

Again, the score is given in stars (★) and ranges from zero to five stars, with five being the most content and zero being the least. Content scores of three stars and higher perform well with the Bioscrypt Algorithm. In this range the algorithm has enough information to distinguish between different fingerprints with a high level of accuracy. Templates with content scores above two stars do not vary in terms of the error rates.

Content scores less than three stars require intervention on the part of the Enroller or administrative software. Sources of poor content include improper finger positioning and extremely bland fingerprints.



Very High



Low Content

If the content score falls below three stars, Bioscrypt recommends the following options:

- Try re-enrolling the same finger if finger positioning seems to be the issue (see section A.2). Ensure that the user can comfortably place the finger on the sensor while maintaining the core region in the image.
- Fingerprint content can vary among individual fingers for the same person. Try enrolling an alternate finger to see if the score improves.
- Alter the security level *for that particular template* by increasing the threshold a minimum of 1 level (e.g., change the value from medium [3] to high [2]). This will offset the false acceptance for that template by making it more difficult to match. If use of that template indicates that raising the threshold one level still produces false rejections, try setting the value to its highest security (level 1).

Warning: Increasing a template's security may increase the risk of a false rejection for that template.

A thorough enrollment procedure will ensure streamlined and reliable verification for users. It is recommended that all three options be performed in the order listed above to maximize the performance of the device.

Content and Quality Summary

Table 1: Quality and Content Minimum Thresholds

Score	**Poor Range**	**Normal Range**
Quality	Less than three stars	Three or more stars
Content	Less than three stars	Three or more stars

Table 2: VeriAdmin Management application map of score versus category

Score	**Quality/Content Category**
★	Very poor
★★	Poor
★★★	Fair
★★★★	High
★★★★★	Very high

Recommended Enrollment Process

- Have the user pick one of the following fingers for enrollment: Left Index, Left Middle, Right Index, or Right Middle.
- Enroll the chosen finger and note the quality and content results.
- If either is below the minimum threshold, follow the directions outlined in the previous section.
- If both are above their minimum thresholds, either accept the created template, or attempt another finger trying to achieve the best quality possible.

- If multiple fingers are attempted and only one finger is required, choose the template where both quality and content are above the threshold, and which the quality is maximized.

Appendix B – Understanding the BROADCAST option in RS-485 Based Networks

The BROADCAST feature allows a command to be sent to ALL units connected on the same PC COMM Port. Using a NETWORK ID of –1 enables "Broadcast Mode". Although this is often a very convenient feature, it also has some inherent issues that the user should be aware of and understand. Bioscrypt recommends that only advance users attempt the BROADCAST features.

NO REPLIES. When in Broadcast mode, no replies from the receiving unit are possible. This is because that since all units receive the command at the same time, all units would then normally reply at the same time. On a RS485 network, it more then one unit is communicating at the same time, the communications electrically *collide* and cannot be understood. This is an inherent shortcoming of the RS485 protocol. This *collision* will also happen if 2 or more units are the same NETWORK ID, since they will both respond at the same time and cause the same problem. When in Broadcast mode, the Bioscrypt readers are instructed NOT to REPLY.

NO ERROR CHECKING. The Bioscrypt communication protocol has various error checking methods built into the interface. This error checking requires two-way communication between the PC and the Bioscrypt reader to ensure that command packets where received and all data contained. Because NO REPLIES are possible, the error checking is disabled in Broadcast mode.

This can become an issue when using a network of Bioscrypt readers since the reader itself cannot process a communication packet during Verification. Although this time is very short, if a command is received during portions of a Verification the unit would normally respond with a BUSY error code. However, if in Broadcast mode, no response can be given and the VeriAdmin will not know that the command was ignored by that particular unit (even though it would have been accepted by all other units.) Manual verification is often required to ensure all units successfully received a Broadcast command. An example of this can be seen in the *BROADCAST PC TEMPLATE* section. The VeriAdmin Software will Broadcast the TRANSFER command, but then manually verify that the template was successfully transferred to each and every unit after the Broadcast command is complete.

Since Broadcast commands cannot have the Bioscrypt reader reply, using a Network ID has been disabled in Reset to Factory defaults and Sensor Settings.

NOTE: A Broadcast command will be received by all units on the same PC COMM port. If a network consists of multiple COMM ports, the Broadcast command will have to be sent on each COMM port in order to reach all units on the network. This is automatically done by the VeriAdmin Software for BROADCAST PC TEMPLATES and for all commands in the BROADCAST PARAMETERS window based on the UNITIDS.DAT file. However, this is not for other commands where the user specifies a Network ID of –1.

Appendix C – V-PASS Template Differences

The V-PASS product is similar in size and shape to both the VeriFlex and VeriProx products. However, it incorporates a very different biometric comparison process. The VeriFlex and VeriProx perform a 1:1 verification. One finger is compared with one template to decide if there is a match. A Template ID is mandatory to determine which of the stored templates to compare with the current live fingerprint image.

The V-PASS performs a "searching" algorithm that will compare the current live fingerprint image with ALL templates that reside on the V-PASS unit (up to 200 with firmware version 3.0). This is often referred to as 1:many (one to many) or "identification". Whereas the VeriProx and VeriFlex are typically used with a proximity card or external device to indicate a user's ID, the V-PASS no longer requires this extra form of identification, only the fingerprint is required.

To perform this quick database search of all enrolled templates, the V-PASS requires a fingerprint template that is different then the fingerprint templates required for the VeriFlex and V-Pass. The VeriFlex / VeriProx templates are 348 bytes of data, whereas the V-PASS template is 2,532 bytes of data.

The V-PASS template contains all the data from a VeriFlex/VeriProx template and more. Bioscrypt provides a way to generate a 1:1 VeriFlex / VeriProx template from a V_PASS template. This conversion is available in our SDK for software developers, or as part of the *VeriAdmin Management Software* for end-users.

Users should be aware of the following:

1. V-PASS templates are **different** then VeriFlex / VeriProx templates.
2. V-PASS templates should use the default extension of "**.mtm**"
3. VeriProx / VeriFlex templates should use the default extension of "**.tem**"
4. Only a V-PASS can create ("enroll") a V-PASS template.
5. A V-PASS template **CAN BE** converted to a VeriFlex / VeriProx template.
6. A VeriProx / VeriFlex template **CANNOT** be converted to a V-PASS template.
7. Administrators need to be aware of these differences if BOTH products are used.
8. A Veri-Series unit will **reject** a template if the wrong type is sent. This means that a VeriProx / VeriFlex will return an error if a V-PASS template is sent to that unit. The same is true if a V-PASS unit is sent a VeriFlex / VeriProx template.
9. Administrators should use caution when attempting Broadcast commands on a "Mixed" Network.. Broadcast commands will work, but #8 above will apply. Contact Bioscrypt Technical Services for more information.

For installations using a “Mixed” network where both V-PASS units and VeriFlex / VeriProx /V-Smart units are used, Bioscrypt recommends the follow guidelines to help manage templates:

1. A PC-based enrollment stations using the VeriAdmin software should be used for all template enrollments.
2. All enrollments should be done using a V-PASS and stored on the PC.
3. V-PASS templates can be converted to VeriProx / VeriFlex templates using the VeriAdmin Software (see the *Template Conversion* section). After this process, the Administrator will have both a V-PASS compatible template and a VeriProx / VeriFlex compatible template for each user.
4. Use the Bioscrypt designated extensions of “.tem” for VeriFlex / VeriProx templates and “.mtm” for V-PASS templates.

Example:

- PC Enrollment station is setup with an attached V-PASS unit and running the VeriAdmin Management software.
- Using the Advanced Enrollment dialog, the Administrator will enter an ID (ex: 1122) and sample enroll 3 different fingers and chose the best one as indicated by the software.
- This fingerprint template will be save to the PC (ex: 1122_0.mtm).
- The Administrator will use the Template Conversion utility to create a VeriFlex / VeriProx template (ex: 1122_0.tem).
- Template 1122_0.mtm will then be transferred to all V-PASS units.
- Template 1122_0.tem will then be transferred to all VeriFlex / VeriProx / V-Smart units.

Appendix D – V-Smart Operations

The V-Smart product is similar in size and shape to both the VeriFlex and VeriProx products. However, it incorporates a new method for template management. The V-Smart incorporates a contactless smart card reader using MIFARE™ technology. This allows a user's template to be written to a smart card during enrollment and then later read from the smart card during verification. Since the template is stored on the card itself, there is no need for network-based template management operations typically associated with biometric installations.

Smart cards used by the V-Smart can now be used by another application. V-Smart operation uses only the part of the Smart Card defined by the layout, so that other applications can now use any remaining free sectors.

Contact your Bioscrypt Sales representative when purchasing smart cards to ensure they will work correctly with the V-Smart.

Administrator's Note

The Administrator / Enroller needs to understand the different states that the V-Smart operates to effectively use the unit. The most important aspect to understand is the difference between HOST and SLAVE mode. HOST mode is the normal operating state of the V-Smart. In this mode, the unit is actively looking for a smart card with a template on it. When a card is seen, one or both templates is automatically read and a Verification action is started. While the Verification action is happening, the V-Smart cannot process other commands coming over the AUX channel from the PC. The only time this becomes an issue is when using the VeriAdmin software.

When writing a template to the smart card as part of the enrollment process, it is important to wait for VeriAdmin to display a message saying, "PLACE SMART CARD CLOSE TO READER". If the Administrator places the card before the message, the V-Smart may treat this as described above, and initiate a Verification action. The V-Smart will then be busy trying to verify a live image and will not be able to process the Enrollment. You can tell when this happens because the top LED will turn yellow. If this does happen, simply place a finger and let the V-Smart complete the Verification attempt. Then press the SAVE TO SMART CARD button and wait for the "PLACE SMART CARD CLOSE TO READER" prompt.

NOTE: It is essential that the Administrator read and fully understand the information presented in *Appendix E: Administrator SiteKey Management*. Failure to use the V-Smart in the proper way can make the V-Smart less secure and potentially unusable if Site Keys are forgotten or compromised.

V-Smart Terminology

V-Smart – Term used to designate the complete hardware product. The V-Smart actually contains an embedded MV1200 with expanded I/O functionality, an *External Storage Interface (ESI)* module and a MIFARE smart card reader.

External Storage Interface (ESI) – This module is internal to the V-Smart and acts as an interface between the MV1200 and the smart card reader. External pigtail wires connect the MV1200 and ESI together.

Primary Template – This is the template that resides in the first template slot on the smart card. When a verification is initiated, this primary template is the first fingerprint that is used in that verification process.

Secondary Template – This is an optional second template stored on the smart card. Currently, in the v5.80 (or later) V-Smart firmware, this second template will also be used in the verification process if the primary template verification fails.

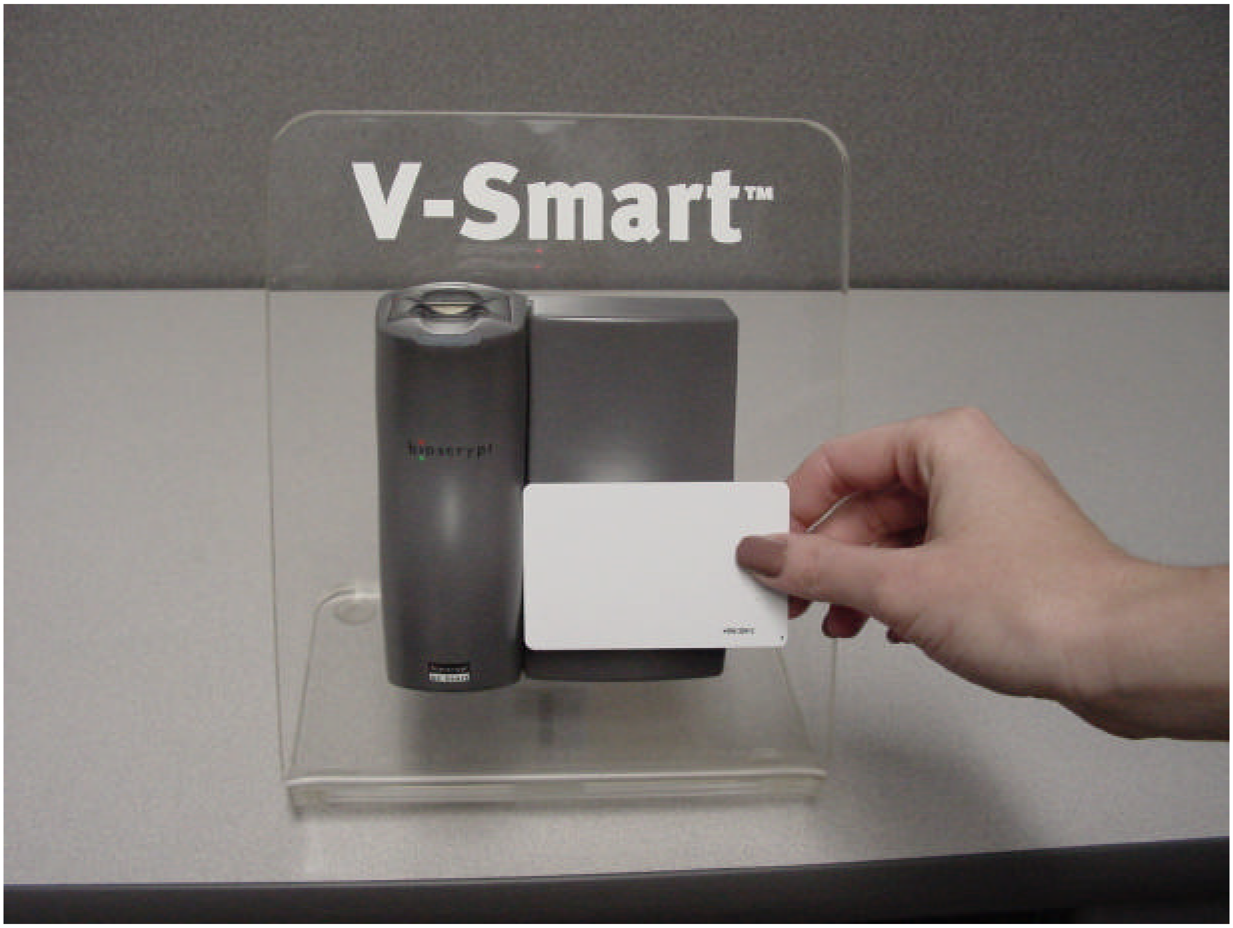
Administrator SiteKey – This is a key (or password) used by the V-Smart to encrypt data stored on the smart card. This key is stored on the ESI and must match the key used by the smart card in order for the V-Smart to read the smart card data. See the next section for further details regarding Administrator Site Keys.

WARNING! *It is extremely important that Administrators do not forget the SiteKey used. If the SiteKey is forgotten, the administrator will not be able to ENROLL, DELETE or read templates from the smart card, nor will they be able to CHANGE the SiteKey.*

Site Key Verification – Certain VeriAdmin and V-Smart processes are only allowed if the Administrator enters the correct Site Key. The SiteKey entered in VeriAdmin must match the key stored on the V-Smart and the key used to encrypt the smart card data. See Appendix E for father details.

V-Smart Smart Card Placement

The picture below demonstrated the proper placement of the smart card so the V-Smart can read the data stored on the card or write data to the card.



Section D.1 – HOST Mode versus SLAVE Mode Operation

The V-Smart has two modes of operation that the Administrator needs to be familiar with. These are HOST mode and SLAVE mode.

HOST MODE

HOST mode is the normal mode of operation and simply means that the V-Smart is waiting for a smart card to be presented to the unit. When a smart card is “seen”, the card ***Site Key*** (see next Appendix) is compared with the V-Smart’s Site Key. If they match, the template is read from the card and the V-Smarts attempts a Verification operation. The top LED will turn amber indicating the user should “PLACE FINGER ON SENSOR”. When a finger placed, a live image is recorded. When the live image is done recording, the top LED will go off. At this time, the user can remove their finger. The V-Smart will then compare the live image against the template read from the smart card. If a successful match made, the top LED will turn GREEN. A RED LED indicates a failed comparison. Once a Verification attempt has been made, the card must be moved away from the reader and then brought close again to re-attempt Verification.

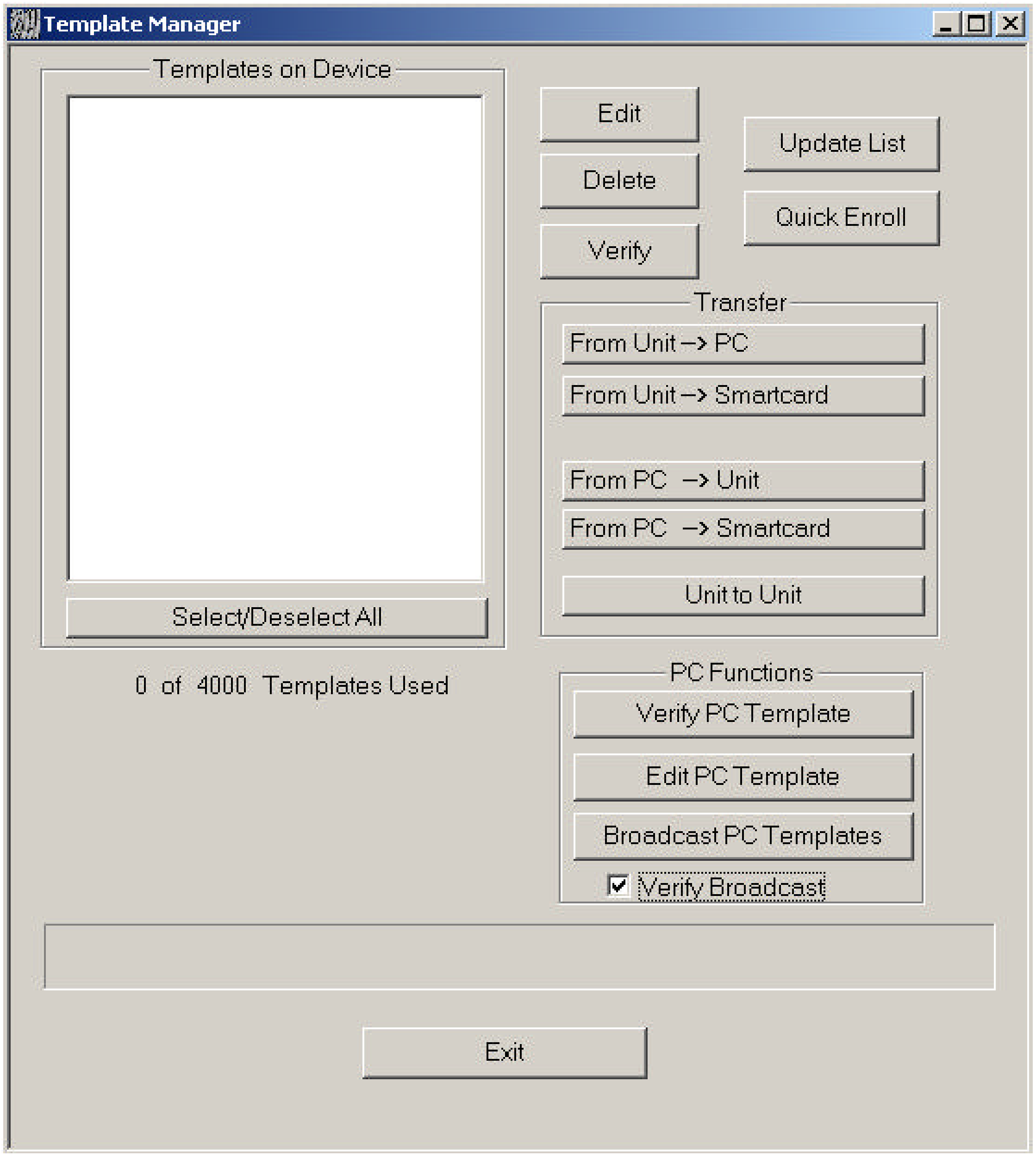
SLAVE MODE

SLAVE mode is when the V-Smart is communicating with the PC. When a serial command is received by the V-Smart on the AUX communications port, SLAVE mode is automatically entered. While in SLAVE mode, the V-Smart will NOT make Verification attempts when a card is “seen”. This makes it easier for Administrators to place the card, near the reader and perform various operations like enrollments without the unit performing a Verification just because a card is sensed. The V-Smart will return to HOST mode in one of two ways:

1) a command is sent to the V-Smart telling it to specifically return to HOST mode
2) 180 seconds have passed since the last communication on the AUX port

In VeriAdmin, when you bring up the SMART CARD MANAGER, the V-Smart is put into SLAVE mode because a STATUS is sent to the ESI as the dialog is brought up. When the user exits the SMART CARD MANAGER by pressing the OK or CANCEL buttons, VeriAdmin will instruct the V-Smart to return to HOST mode.

Section D.2 – Transferring a Template to a Smart Card



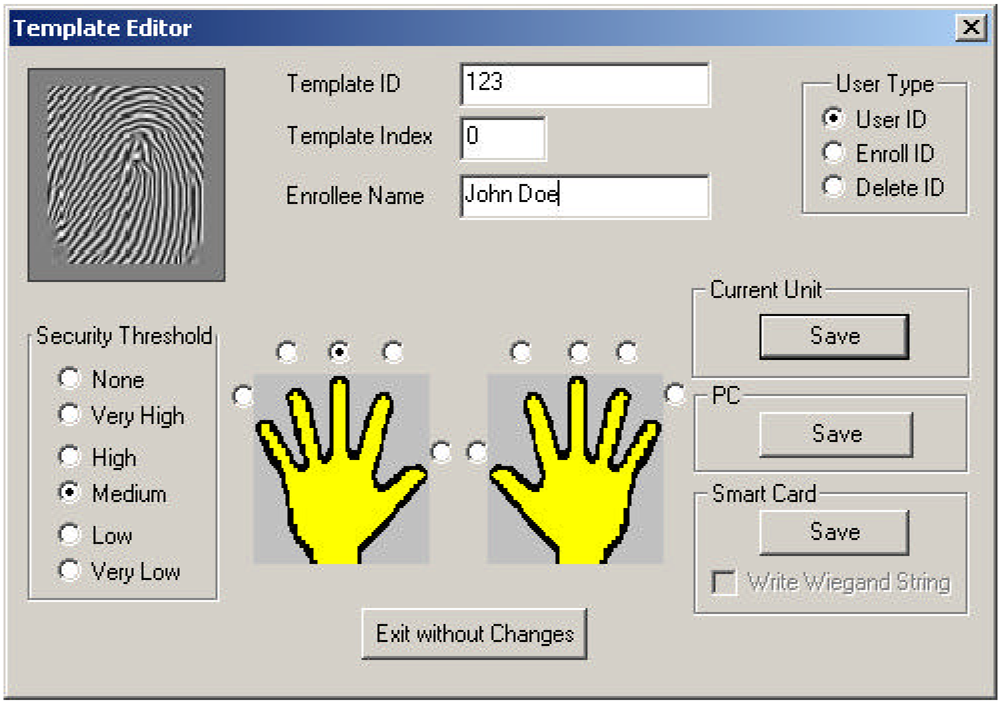
0 of 4000 Templates Used

☑ Verify Broadcast

VeriAdmin version 4.00 adds a new capability to transfer a previously enrolled fingerprint template to a smart card. The user can either transfer a template from the PC to a smart card or from the internal memory on the V-Smart to a smart card. To transfer a previously enrolled template that is currently stored on the PC to a smart card, press the FROM PC → SMARTCARD button. The user will be allowed to browse to the desired PC template. Once the template is chosen, the EDIT TEMPLATE dialog is brought up and the template data is displayed. Pressing the SAVE TO SMART CARD button will then attempt to write template data to the smart card. This process involves a SiteKey verification window to appear (see appendix E). Once the proper Site Key is entered, the user is prompted to place the smart card near the V-Smart. When this is done, the template is then copied to the smart card.

Section D.3 – Enrolling a Template Directly to a Smart Card

Using VeriAdmin, the smart card Enrollment process is very similar to a typical enrollment procedure as described in the QUICK ENROLL section or in the ADVANCED TEMPLATE ENROLLMENT section. Once a finger is registered and a template created and accepted, the EDIT TEMPLATE window is displayed as described in the TEMPLATE MANAGER section. However, for release v4.0 and above the EDIT TEMPLATE window has been modified to allow for saving the template directly to a Smart Card. As seen below, options now exist to save the template to the CURRENT UNIT, the PC, or a SMART CARD. By pressing the SAVE button under SMART CARD, the V-Smart will attempt to write the template to a smart card held near the smart card reader. Note that a SiteKey verification is performed before the data is written to the smart card (see appendix E for details).



Template Editor

Template ID: 123

Template Index: 0

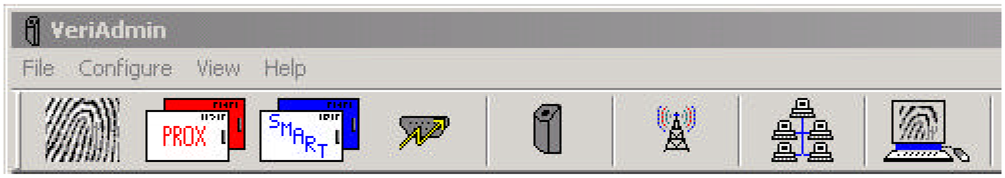
Enrollee Name: John Doe

User Type
- ● User ID
- ○ Enroll ID
- ○ Delete ID

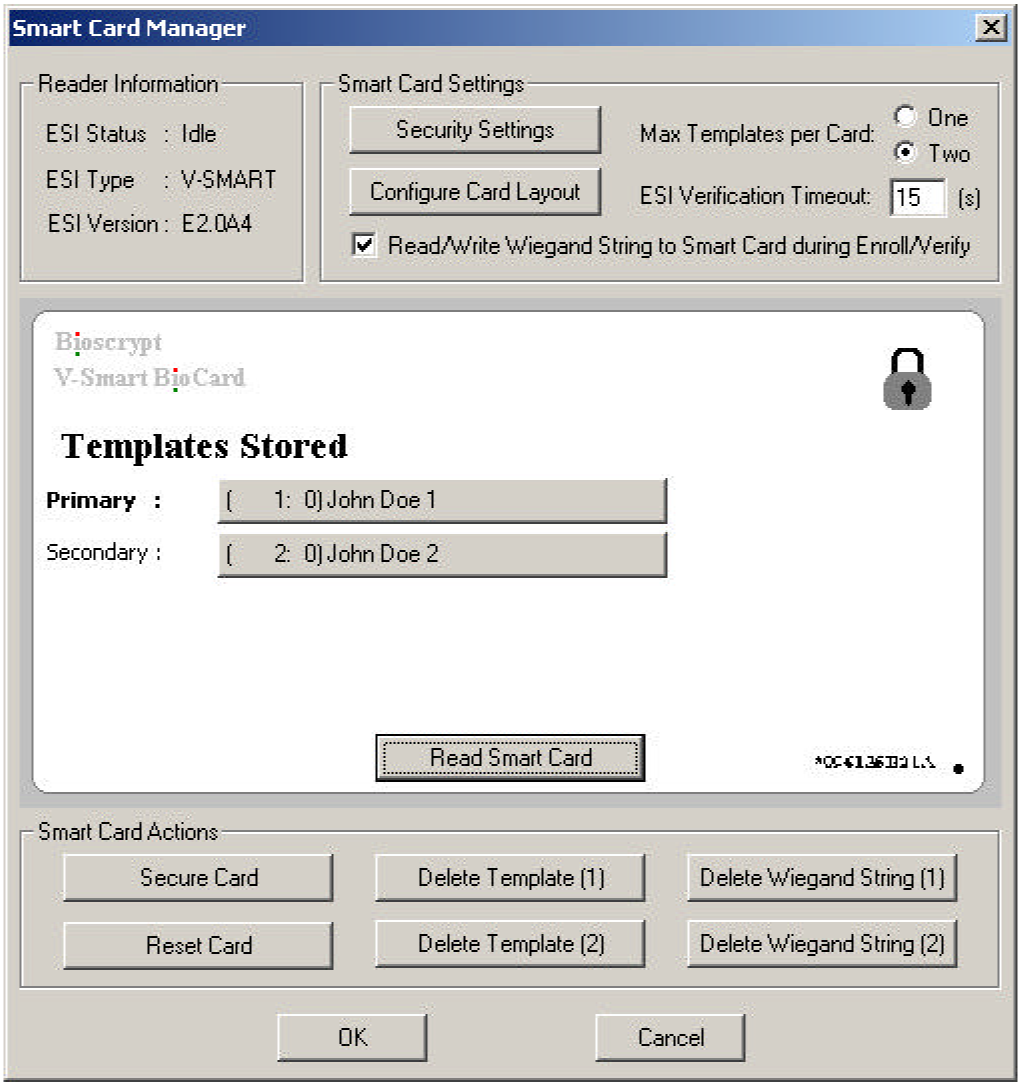
Security Threshold
- ○ None
- ○ Very High
- ○ High
- ● Medium
- ○ Low
- ○ Very Low

□ Write Wiegand String

Section D.4 – Using the Smart Card Manager



VeriAdmin version 4.00 adds a new toolbar option (shown above) for accessing the Smart Card Manager dialog box. Pressing the “SMART” button will bring up a dialog box like the one shown below.


Smart Card Manager

Reader Information

ESI Status : Idle

ESI Type : V-SMART

ESI Version : E2.0A4

Smart Card Settings

Max Templates per Card: ○ One ● Two

ESI Verification Timeout: 15 (s)

☑ Read/Write Wiegand String to Smart Card during Enroll/Verify

Bioscrypt V-Smart BioCard

Templates Stored

Primary : (1: 0) John Doe 1

Secondary : (2: 0) John Doe 2

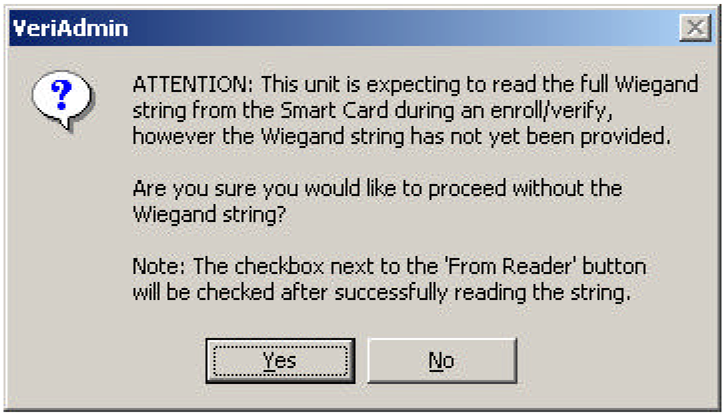
This dialog initially shows the ESI information and a blank card. Pressing the **READ SMART CARD** button will instruct the V-Smart to read the template list from the card and display the list of stored templates. In the example shown, there are two templates. The display shows the Template ID:INDEX followed by the NAME field from the template. The upper right hand corner of the card has symbol indicating the card is secured.

Pressing either template button (primary or secondary) will instruct the V-Smart to attempt to read the full fingerprint template data from the smart card. VeriAdmin will prompt the user for the Site Key (depending on security settings) and if the Site Key entered matches the Site Key stored on both the V-Smart and the smart card, the template will be read and the normal Template Editor window will be displayed.

Note: It is possible to edit a template on the card and change either the ID or the Index, then save the template back to the card. This is **NOT** recommended because any Wiegand data associated with the original template will not be saved with the new template.

The **DELETE TEMPLATE (1)** button will instruct the V-Smart to erase the primary template stored on the smart card. VeriAdmin will perform a Site Key verification before allowing the erase to take place. The **DELETE TEMPLATE (2)** button will instruct the V-Smart to erase the secondary template stored on the smart card.

Version 4.2 (and above) of VeriAdmin includes a checkbox for **READ/WRITE WIEGAND STRING TO SMART CARD DURING ENROLL/VERIFY**. This is a setting which tells the V-Smart to attempt to read a Wiegand string from the Smart Card during a verify, and send this Wiegand string out the Wiegand out lines if successful. This check box also means that VeriAdmin will attempt to save the Wiegand string onto a Smart Card when enrolling. To do so, it will require that a Wiegand string be read from an external Wiegand input device (the **FROM READER** button during Quick or Advanced Enroll). Once you have read in the Wiegand string, a check box (**WIEGAND STRING READ**) next to this button will be checked. If VeriAdmin has not received the Wiegand string, the following dialog will be displayed:



ATTENTION: This unit is expecting to read the full Wiegand string from the Smart Card during an enroll/verify, however the Wiegand string has not yet been provided.

Are you sure you would like to proceed without the Wiegand string?

Note: The checkbox next to the 'From Reader' button will be checked after successfully reading the string.

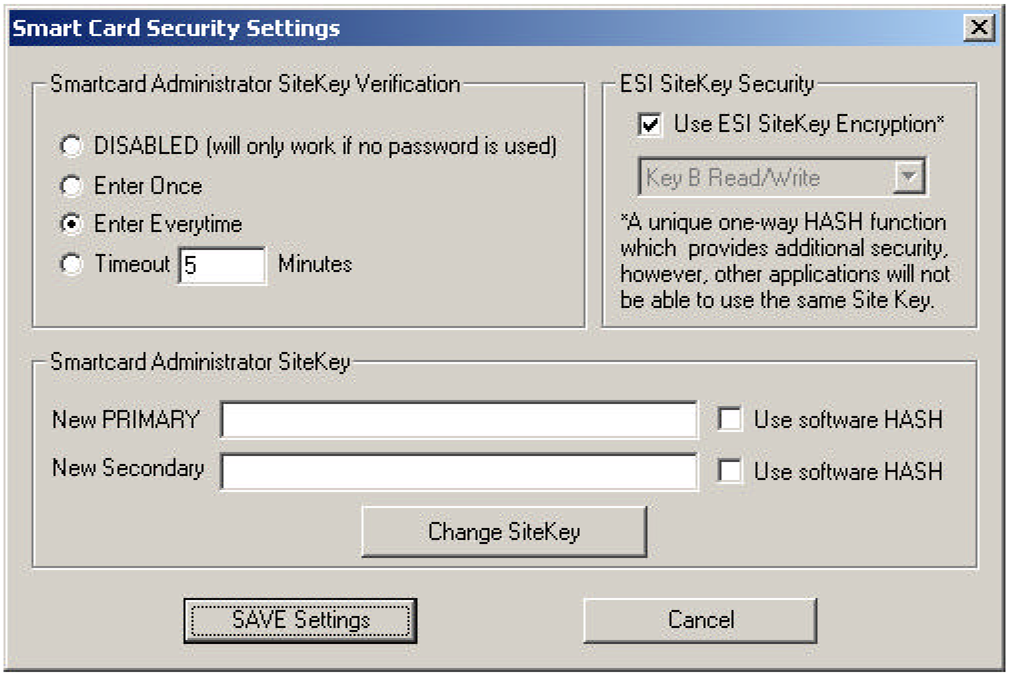
Also, when you have this setting checked, VeriAdmin will remind you that it is saving the Wiegand string when saving to a Smart Card. The **WRITE WIEGAND STRING** checkbox below the "Save" button for Smart Cards will be checked.

As of VeriAdmin version 4.3, there is also the ability to delete Wiegand Strings associated with a template. The **DELETE WIEGAND STRING (1)** button will prompt the user for a Site Key and then delete the Wiegand string associated with the Primary Template. The **DELETE WIEGAND STRING (2)** will perform the same task for the Secondary Template. It is possible to use this function even if a Wiegand String has not been associated with a template, so long as a "*User Data*" block has been placed in the Smart Card layout (see the section on Smart Card Layout).

Also new to version 4.3 of VeriAdmin is the ability to secure and un-secure (Reset) smart cards. The **SECURE CARD** button will secure a new smart card which has not been updated with the proper Site Key (i.e., it still has the manufacturer's default keys). You will not need to enter the current Site Key to perform this function. Simply press this button and present the card to the reader. Only the sectors of the smart card being used by the V-Smart will be secured; all other sectors will remain untouched. Performing this function on a smart card which has already been secured will have no effect, but is allowed. The **RESET CARD** button will allow the user to un-secure a smart card (the reverse process) after providing the proper Site Key. This will **ERASE** all V-Smart data on the card, including templates, Wiegand Strings, and other user data, as defined in the smart card layout and set the Site Key back to the original manufacturer's default. This will essentially transform the card back into a fresh, unused card, with the exception of those sectors not defined in the layout (sectors used by another application, for example). Currently three manufacturer's settings are supported: Gem+ Flow A, Gem+ Flow B, and HID Flow B. Please refer to the documentation provided by these manufacturers or from whom you received your smart cards for more information.

At the top of the SMART CARD MANAGER dialog, you will see a radio button to select the **MAX TEMPLATES PER CARD**. Currently, this can be set to either one or two templates, although future cards with more memory may support additional templates. If **two** templates option is selected, the Smart Card Layout *must* have two templates defined. Otherwise when attempting to save a second template to the card, the user will receive an "Invalid Smart Card Layout" error. If the maximum is set to only **one** template, attempting to save a second template to a card will result in the error message "ESI – Storage Space is FULL". The **ESI VERIFICATION TIMEOUT** is a user definable setting which controls how long the ESI will wait between verification from one card to the next. When a smart card is presented, the ESI will read the template(s) and Wiegand data (if available), go into SLAVE mode, and send the data to the main unit for verification with the live finger image. It will then wait for a number of seconds (default is 15) before returning to HOST mode, where it can accept a new card. This is the verification delay.

Pressing the **SECURITY SETTINGS** button will bring up the following dialog box:



Smart Card Security Settings

Smartcard Administrator SiteKey Verification

○ DISABLED (will only work if no password is used)
○ Enter Once
● Enter Everytime
○ Timeout 5 Minutes

ESI SiteKey Security

☑ Use ESI SiteKey Encryption*

Key B Read/Write

*A unique one-way HASH function which provides additional security, however, other applications will not be able to use the same Site Key.

Smartcard Administrator SiteKey

New PRIMARY ☐ Use software HASH
New Secondary ☐ Use software HASH

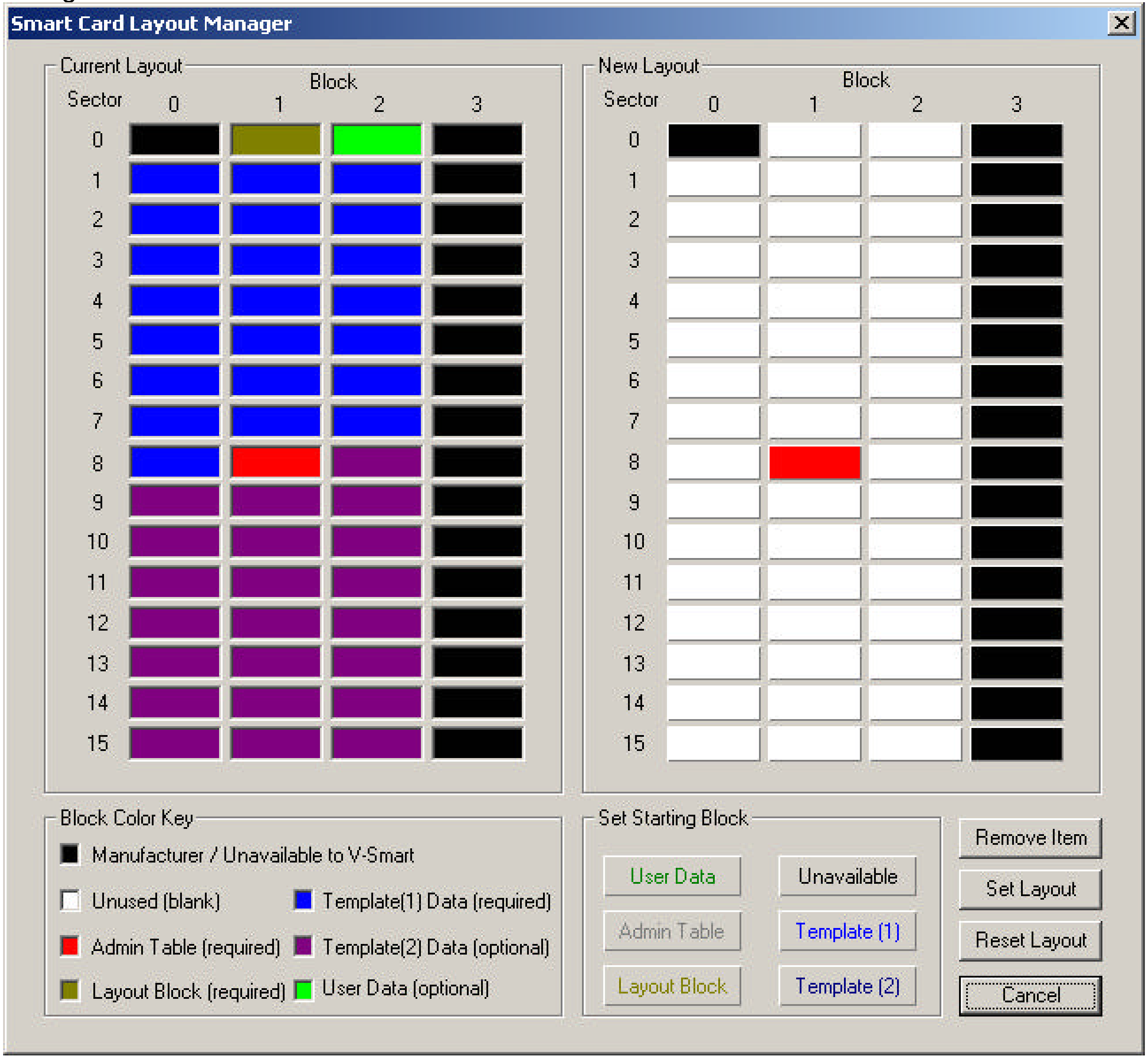
This dialog will allow the user to adjust how often the Site Key verification is performed. The default is EVERYTIME and VeriAdmin will reset to this default setting every time the application is started. To change, select the desired choice and press the SAVE ADMIN SETTINGS button. A Site Key verification is performed before the change is accepted.

This dialog also contains two checkboxes to enable the use of a 1-way hashing function on the Site Key prior to sending to the V-Smart (**Use software HASH**). This is an extra security step that will convert a simple text password to a 120-bit encrypted string every time it is transmitted to the V-Smart. See *Appendix E: Administrator SiteKey Management* for precautions related to changing Site Keys and using the hashing function.

The VeriAdmin Security Settings dialog box also allows the Administrator to change the Primary and Secondary SiteKeys and to chose whether those new keys will be hashed or not. Pressing the CHANGE SITEKEY button will **always** perform a Site Key Verification before changing the current primary and secondary keys regardless of the timeout settings.

A new addition to this dialog is the ESI Site Key Security option. The checkbox **USE ESI SITEKEY ENCRYPTION** is used in conjunction with the drop-down box. This deals with how Site Keys are managed on the smart card itself and there are 3 available settings. The default setting is use ESI Site Key Encryption with Key B for Read/Write. The other two available options do not use ESI Site Key Encryption, and are provided for compatibility with other applications which want to read and/or write data to the smart card. The checkbox must be unchecked to enable these options. Note that Key A and Key B do not correspond to PRIMARY and SECONDARY Site Keys; please read the manufacturer's documentation for more information. Only advanced users should change this setting!

Pressing the **CONFIGURE CARD LAYOUT** button will bring up the Smart Card Manager dialog box:



Current Layout

Sector	Block 0	Block 1	Block 2	Block 3
0	⬛	🟫	🟩	⬛
1	🟦	🟦	🟦	⬛
2	🟦	🟦	🟦	⬛
3	🟦	🟦	🟦	⬛
4	🟦	🟦	🟦	⬛
5	🟦	🟦	🟦	⬛
6	🟦	🟦	🟦	⬛
7	🟦	🟦	🟦	⬛
8	🟦	🟥	🟪	⬛
9	🟪	🟪	🟪	⬛
10	🟪	🟪	🟪	⬛
11	🟪	🟪	🟪	⬛
12	🟪	🟪	🟪	⬛
13	🟪	🟪	🟪	⬛
14	🟪	🟪	🟪	⬛
15	🟪	🟪	🟪	⬛

New Layout

Sector	Block 0	Block 1	Block 2	Block 3
0	⬛	⬜	⬜	⬛
1	⬜	⬜	⬜	⬛
2	⬜	⬜	⬜	⬛
3	⬜	⬜	⬜	⬛
4	⬜	⬜	⬜	⬛
5	⬜	⬜	⬜	⬛
6	⬜	⬜	⬜	⬛
7	⬜	⬜	⬜	⬛
8	⬜	🟥	⬜	⬛
9	⬜	⬜	⬜	⬛
10	⬜	⬜	⬜	⬛
11	⬜	⬜	⬜	⬛
12	⬜	⬜	⬜	⬛
13	⬜	⬜	⬜	⬛
14	⬜	⬜	⬜	⬛
15	⬜	⬜	⬜	⬛

Block Color Key

- ⬛ Manufacturer / Unavailable to V-Smart
- ⬜ Unused (blank)
- 🟦 Template(1) Data (required)
- 🟥 Admin Table (required)
- 🟪 Template(2) Data (optional)
- 🟫 Layout Block (required)
- 🟩 User Data (optional)

This dialog will allow the user to define a custom layout for all MIFARE™ compatible smart cards.

Bioscrypt recommends that only advanced users attempt to configure the smart card layout. Improper changes made to the layout may render the unit unusable with some smart cards.

This section should be read completely before attempting to change the default layout provided by Bioscrypt (as shown on the left above). The Smart Card Layout used by the V-Smart consists of the following components: A layout block (brown), an Admin block (red), a PRIMARY template (blue), a SECONDARY template (purple, optional), and User Data (green, optional).

The Smart Card Layout Manager will NOT allow a user to configure a layout which is missing the Admin block, the Layout Block, or a PRIMARY template. These are the minimum layout components required to enable normal operation.

The memory structure for MIFARE™ compatible smart cards consists of 16 sectors (numbered 0 through 15) of 4 blocks each (numbered 0 through 3). Each block contains 16 bytes. The first block at sector 0, block 0 contains manufacturer information and is not available. Also, the last block of each sector contains Site Key and access information which secures that sector and is thus unavailable for application data. Unavailable blocks are shown in VeriAdmin in black and do not allow layout components to be placed there. This leaves 47 available blocks of 16 bytes each, for a total of 752 available bytes. The Bioscrypt default layout contains space for two templates and Wiegand information (stored in the green User Block) and will use all available space. If space for non-Bioscrypt data is desired, include only the PRIMARY Template (Template (1)) or do not include a User Block.

Place components on the layout on the right (under the "New Layout" section) by clicking one of the buttons under the "Set Starting Block" section. You will then see flashing text which instructs you to select one of the white, unused blocks above. Since the one-to-one templates used by the V-Smart are 348 bytes, they will require 22 blocks of space (348 bytes / 16 bytes-per-block = 22 blocks). All other layout components require a single block of space. You will notice when placing a template on the layout that the blocks will wrap around whatever blocks are in the way, consuming blocks from top to bottom. Templates may NOT wrap around from bottom to top, and if there is insufficient space for a template, a warning will pop up and you will not be able to place the template. If you would like to move a layout component or take if off of the layout, you must remove it by first clicking on the **Remove Item** button and then clicking on the item which is to be removed.

You will notice when you first enter the Smart Card Layout Manager that the Admin Block has already been placed for you in sector 8, block 1. You may remove it and place it elsewhere, however it is recommended that the Admin Block be left in this sector. The reason for this is that the ESI will be able to read cards with a different layout than the one which is defined here so long as the Admin Block is in this location. This allows for some flexibility with different card layouts, however Bioscrypt still recommends that each site or facility use the same layout for each card.

Layout Placement: It is recommended that the Admin Block be left in sector 8, block 1. Bioscrypt recommends first placing the Layout Block, then the PRIMARY Template, and finally a User Data block to hold the Wiegand Strings associated with each template. **Note:** If you do not place at least ONE User Data block, VeriAdmin will be unable to read or write Wiegand String data, and you will receive an error during enrollment. As of version 4.3, only TWO User Data blocks may be placed on the layout. If two are placed, the first will be used for Wiegand data (if used) and the second will be available for user data. These two blocks may be written to or read using the Bioscrypt SDK, but not using VeriAdmin. When all other blocks have been placed and there is sufficient space, place the SECONDARY template. You will not be able to place Template (2) if you have placed two User Blocks because there will be insufficient space. Finally, there is a convenient way to make the V-Smart layout wrap around sectors where non-

Bioscrypt data is located (or is planned to go). Select the **Unavailable Block** button, then hold down the SHIFT key to place multiple blocks. Do this before placing the other layout items so that when they are placed they will automatically wrap around those blocks. Click **Set Layout** to finalize the layout. You will need to provide the current Site Key. Upon successfully setting the layout, the Smart Card Layout Manager will close, returning to the Smart Card Manager.

If at any time you would like to **RESET** the layout back to Bioscrypt defaults, click on the **Reset Layout** button and provide the current Site Key. This will set the layout as shown in the screen shot shown above.

There are some things to keep in mind when changing the Smart Card layout. First, note that the number of templates defined on the layout should be greater than or equal to the **Max Templates per Card** option. In other words, you should NOT define only one template and set the maximum templates per card to TWO. This will result in an ESI Storage Full error upon enrollment of a second template. Second, remember that changing the layout after some Smart Cards have already been created with a different layout may cause those cards not to work properly with the V-Smart. You will see a flashing or steady red LED on the unit when trying to verify or you will receive an error in VeriAdmin indicating that the ESI cannot recognize the layout. Third, it is important to realize that although you may write both Bioscrypt data and non-Bioscrypt data to a Smart Card, each sector has its own Site Key which unlocks data on that sector. Data may only be read from or written to a particular block if the proper Site Key for that sector is provided. The ESI will use the same Site Key for all sectors being used by the V-Smart, including sectors where only one or two blocks are actually being used. It is recommended that any non-Bioscrypt data be placed on different sectors so that different keys may be used for that data. Finally, keep in mind that if a third party application is used to read/write any of the V-Smart data or the same Site Key is to be used for the entire card, the ESI Site Key Encryption MUST use one of the un-hashed modes for compatibility. Please refer to the documentation from the manufacturer from whom you have purchased your Smart Cards.

Section D.5 – Verification Using a Smart Card

After enrolling a template on a smart card, you can then use the card to perform a Verification. Exit the SMART CARD MANAGER dialog so the V-SMART is placed back into HOST MODE. Place the smart card near the reader as shown earlier in this section. The Top LED will indicate:

Indicator	Meaning
YELLOW	Template READ; Place Finger on Sensor
RED	No Template on smart card
FLASHING RED	Invalid SiteKey, can not read card data

In our example, the top LED should turn YELLOW, indicating "PLACE FINGER". Remove the card, place your finger and hold until the LED goes blank. Once the LED goes blank, you can remove your finger. The LED will then either turn RED or GREEN indicating a FAIL or a PASS.

Indicator	Meaning
RED	Not Verified
GREEN	Verified / Enrollment Accepted

Best Performance Practices / Finger placement

The V-Smart unit should be mounted in a position that takes these factors into consideration: ease of use, at a height that allows for proper finger placement, in line with other switch plates or fixtures, and in accordance with *Americans with Disabilities Act* where applicable. Recommended mounting height is 48-54" from floor to sensor level.

Typically, using either the index or middle finger provides the best performance. We recommend you do NOT use thumbs or pinkies (little finger), but we do recommend that you enroll an alternate finger on your other hand (total of 2 fingers enrolled). Please refer to APPENDIX A for more details about maximize fingerprint performance

Appendix E – V-Smart Administrator *SiteKey* Management

It is essential that the Administrator understand the use of V-Smart SiteKeys and handles them appropriately. SiteKeys are the mechanism used by the V-Smart and the smart cards to ensure that only authorized smart cards are used.

In this appendix, the following topics will be covered:

- **What is a SiteKey?**
- **Why do I Need a SiteKey?**
- **What is the "Default" SiteKey?**
- **Where is the SiteKey Stored?**
- **What is the Difference Between PRIMARY and SECONDARY SiteKeys?**
- **How do I Initially Set a SiteKey for V-Smarts at My Installation?**
- **How do I Set the SiteKey on Individual Smart Cards?**
- **How do I Change the SiteKey if I Already Have a User Base of Previously Created Smart Cards?**
- **What Happens if I FORGET My SiteKey?**
- **What Happens if Someone Else Learns My Installation's SiteKey?**
- **What is the 1-Way Hashing Function Option in VeriAdmin for SiteKeys?**

What is a SiteKey?

A SiteKey is a "password" used by VeriAdmin, the V-Smart and the smart cards. Each of the 3 must use the same "password" to communicate and transfer information. If the SiteKey stored in the V-Smart does not match the SiteKey used by the smart card, that V-Smart will not be able to read or write to that smart card. By checking the SiteKey each time, the V-Smart ensures that only authorized smart cards are used at a specific installation. Similar to a computer logon password, if the smart card's SiteKey does not match the V-Smart's SiteKey, that card will not be allowed to be used by that unit.

The V-Smart uses a maximum of 120-bits (15 characters) for the SiteKey.

Typically, the Administrator will set all V-Smart's at a single installation to the same SiteKey.

Why do I Need a SiteKey?

Each installation must set their own SiteKey to distinguish their V-Smart smart cards from every other installation of V-Smarts. If SiteKeys are not used, then *any* V-Smart would accept smart cards created by *any* other V-Smart and a site's installation could easily be compromised. By using a unique SiteKey at each installation, you ensure that the only smart cards that are accepted by V-Smarts are your site, are smart cards personally created at your site. It also ensures that data on the smart cards created at your site can not be read by anyone that does not know your chosen SiteKey.

What is the "Default" SiteKey?

All V-Smarts are shipped from Bioscrypt with the SiteKey set to an empty string (120 bits of all zeros). This allows Administrators to use the V-Smart in a non secure mode until they are ready to set their personal SiteKey and secure the system. When using the Default SiteKey in non secure mode and VeriAdmin performs a SiteKey Validation, simply do not enter any key and just press the OK button. After the V-Smart verifies it is using the default SiteKey and it verifies the smart card is also using the default SiteKey, the operation will be performed.

Where is the SiteKey Stored?

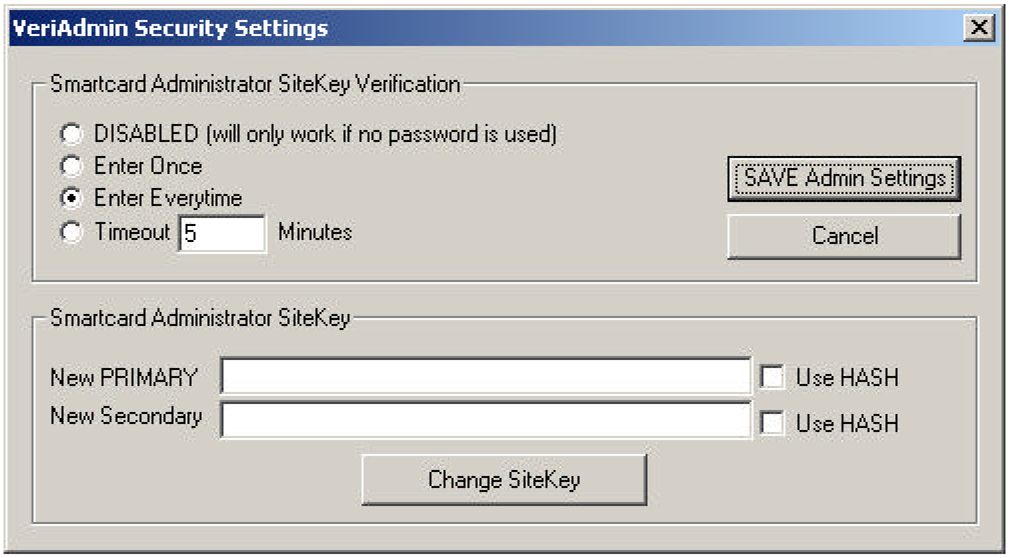
The SiteKey is stored within the internal memory of the V-Smart and is encrypted and stored on the smart card itself. The SiteKey is NOT stored within VeriAdmin, they are NOT stored on the PC, and they can NOT be retrieved from the V-Smart. ***It is the responsibility of the Administrator to remember the SiteKey and take measure to prevent the SiteKey from being forgotten.***

What is the Difference Between PRIMARY and SECONDARY SiteKeys?

The V-Smart can store two SiteKeys. The PRIMARY SiteKey is used in normal operations and is the SiteKey the Administrator used with performing a SiteKey verification operation within VeriAdmin. The SECONDARY SiteKey is only used to update older cards when a new PRIMARY SiteKey is set. See "**How do I Change the SiteKey if I Already Have a User Base of Previously Created Smart Cards?"** for further details on how and when to use the SECONDARY SiteKey.

How do I Initially Set a SiteKey for V-Smarts at My Installation?

You will need to set your installation's SiteKey prior to creating secure user smart cards. Once you become familiar with V-Smart operations and are comfortable enrolling users, you should then chose your own SiteKey. The SMART CARD MANAGER section of VeriAdmin allows the user to create and change SiteKeys.



VeriAdmin Security Settings

Smartcard Administrator SiteKey Verification

○ DISABLED (will only work if no password is used)
○ Enter Once
● Enter Everytime
○ Timeout 5 Minutes

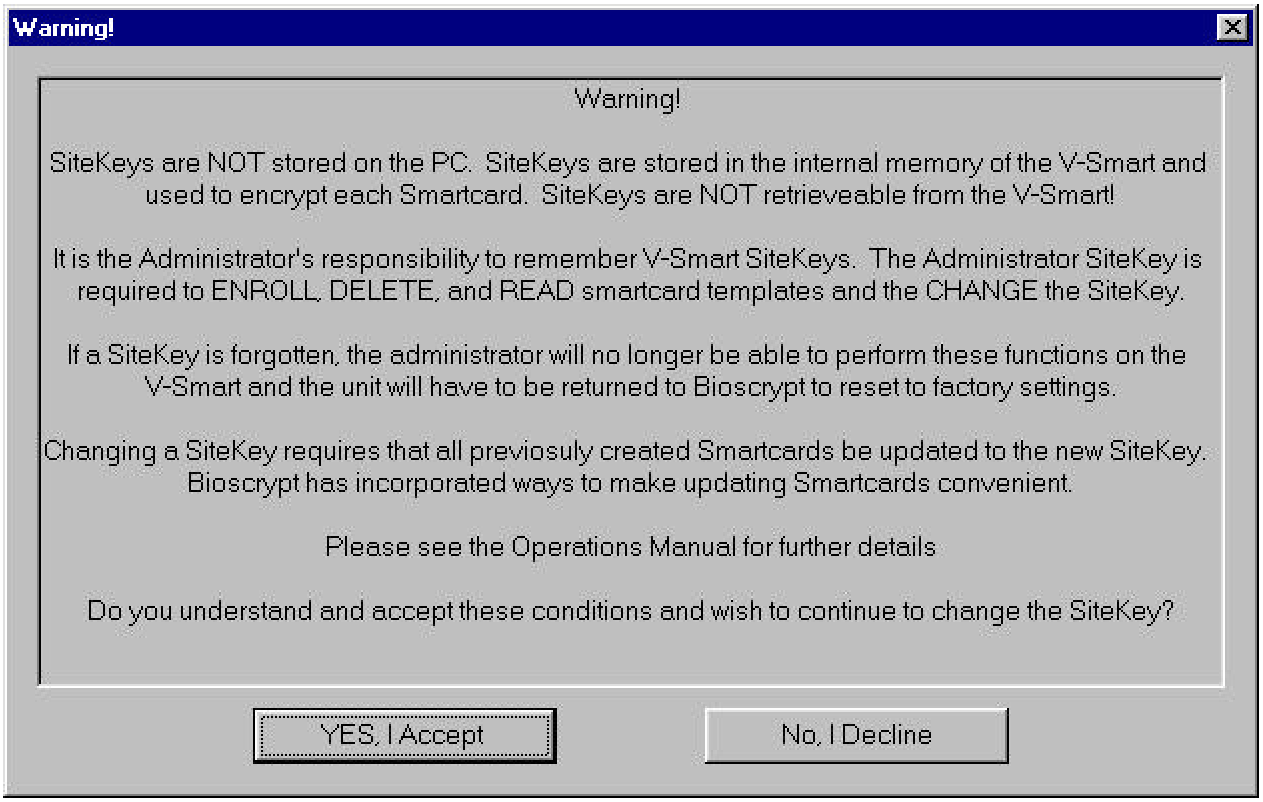
Smartcard Administrator SiteKey

New PRIMARY □ Use HASH
New Secondary □ Use HASH

1) Enter your desired SiteKey in the NEW PRIMARY box
2) Enter the previous SiteKey in the NEW SECONDARY box if you are changing SiteKeys and you already have a user base of smart cards created with the previous SiteKey and you want to update those cards to the NEW PRIMARY SiteKey. If there is not a previous user base of cards that need updated, then enter a "-1" in the Secondary box to turn off the auto SiteKey update function.

   NOTE: DO NOT leave the NEW SECONDARY box blank unless you truly want to update all Default SiteKey smart cards to the NEW PRIMARY SiteKey. This could compromise security since *any* smart card created by *any* V-Smart using the Default SiteKey would automatically be updated to the new Primary SiteKey

3) Press the CHANGE SITEKEY button
4) You will be presented the following Warning dialog box



Warning!

SiteKeys are NOT stored on the PC. SiteKeys are stored in the internal memory of the V-Smart and used to encrypt each Smartcard. SiteKeys are NOT retrieveable from the V-Smart!

It is the Administrator's responsibility to remember V-Smart SiteKeys. The Administrator SiteKey is required to ENROLL, DELETE, and READ smartcard templates and the CHANGE the SiteKey.

If a SiteKey is forgotten, the administrator will no longer be able to perform these functions on the V-Smart and the unit will have to be returned to Bioscrypt to reset to factory settings.

Changing a SiteKey requires that all previosuly created Smartcards be updated to the new SiteKey. Bioscrypt has incorporated ways to make updating Smartcards convenient.

Please see the Operations Manual for further details

Do you understand and accept these conditions and wish to continue to change the SiteKey?

5) Read the information carefully press the YES button if you accept.
6) You will be prompted to enter the CURRENT Primary SiteKey (this will be the Default SiteKey if this is the first time you are changing the SiteKey)
7) If the CURRENT SiteKey entered is correct, you will be presented with a dialog box indicating the changes were made.
8) Now all newly created smart cards from this specific V-Smart will use the NEW PRIMARY SITEKEY and all older smart cards that use the defined SECONDARY SITEKEY will be updated to the NEW PRIMARY the next time they are used by the V-Smart.
9) You will need to set the same PRIMARY SITEKEY on all V-Smarts in your installation in order for the smart cards to work at each V-Smart.

How do I Set the SiteKey on Individual Smart Cards?

The V-Smart will attempt to set the SiteKey on the smart card during the enrollment process.

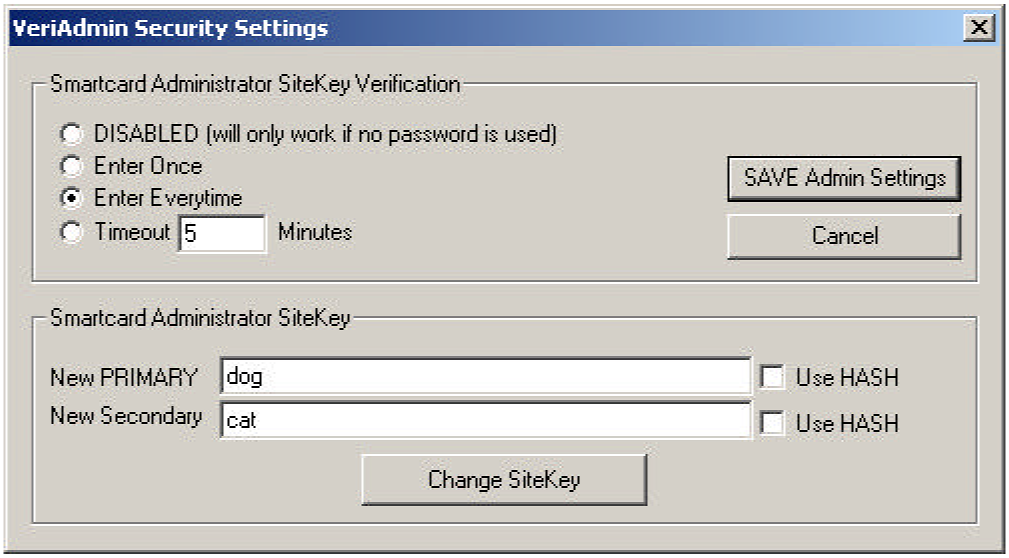
- When an attempt is made to store a template on a smart card, the V-Smart will check the key currently used by the Smart Card. If the V-Smart Primary SiteKey matches the key on the smart card, the template is written.
- If the above fails, the V-Smart will check if its Secondary SiteKey matches the key on the smart card. If they match, the key on the smart card is updated to the V-Smart's Primary SiteKey and the template is written (this adds ~0.5 seconds to the process).
- If both Primary and Secondary SiteKeys fail, the V-Smart will compare the smart card key with the standard default MIFARE smart card key. If they match, the key on the smart card is updated to the V-Smart's Primary SiteKey and the template is written.
- If all of the above 3 fail, the V-Smart can not read or write to that smart card

How do I Change the SiteKey if I Already Have a User Base of Previously Created V-Smart Smart Cards?

Let's say you initially set the SiteKey during installation. For example, the Primary SiteKey was set to "cat" and the Secondary was set to "-1" because you have no previous SiteKeys to update. You then enrolled 100 users and created 100 smart cards. The smart card key on each of those cards would be "cat".

Now you want to change the password because the SiteKey of "cat" was compromised when non-authorized personnel where told the SiteKey and the installation is no longer completely secure. Let's say you want to change the SiteKey from "cat" to "dog".

- In the Smart Card Security Settings window, enter "dog" as the New PRIMARY and enter "cat" as the New SECONDARY



VeriAdmin Security Settings

Smartcard Administrator SiteKey Verification

○ DISABLED (will only work if no password is used)
○ Enter Once
● Enter Everytime
○ Timeout 5 Minutes

Smartcard Administrator SiteKey

New PRIMARY: dog ☐ Use HASH
New Secondary: cat ☐ Use HASH

- Press the CHANGE SITEKEY button and you will again be presented with the warning that you need to always remember the SiteKey.
- After pressing the ACCEPT button, you will be prompted for the CURRENT PRIMARY SiteKey. Enter "cat" since that is the currently stored SiteKey on the V-Smart.
- You should then be presented with a dialog indicating the SiteKey was changed. Typically, you will need to repeat this "change" process on all V-Smarts at your installation.
- At this point, all previously created smart cards still contain the previous key of "cat". However, when a smart card is presented to the V-Smart it will follow the following steps:

    1. When a card is presented and the V-Smart tries to read the data from the card, the V-Smart will check the key currently used by the Smart Card. Since the key on the card is "cat" and the V-Smart Primary key is now "dog", this key check will fail.

2. Next, the V-Smart will check if its Secondary SiteKey matches the key on the smart card. In our example, they do match so the key on the smart card is changed (updated) to the V-Smart's Primary SiteKey. This "update" adds ~0.5 seconds to the process, but only happens the first time the older card is presented. After that, the new Primary is already on the smart card step #1 above will PASS from now on.

If neither the Primary nor the Secondary SiteKey on the V-Smart matches the smart card's key, the V-Smart will not be able to use that card. You must use the previous SiteKey as the SECONDARY SiteKey or all previously created smart cards will be unusable.

Once the entire user base of cards has been updated to the NEW PRIMARY SiteKey, you should once again perform the "change SiteKey process". This time keep the primary SiteKey the same, but enter a "-1" for the Secondary SiteKey. This will disable the 'auto update' feature and any remaining smart cards with "cat" on them will no longer work.

What Happens if I FORGET My SiteKey?

DO NOT LET THIS HAPPEN! If an Administrator forgets the Primary SiteKey then all previously created smart cards will continue to work, but the following will happen:

- They can no longer create new smart cards
- They will not be able to READ templates from current smart cards
- They will not be able to CHANGE the SiteKey on the V-Smarts
- The V-Smarts will have to be returned to Bioscrypt for reprogramming and once reprogrammed, the previously enrolled smart cards will no longer be usable.

What Happens if Someone Else Learns My Installation's SiteKey?

SiteKeys need to be protected just like computer passwords and should not be told to unauthorized personnel. In the event that the SiteKey has been compromised, follow the steps defined in the previous '**How do I Change the SiteKey if I Already Have a User Base of Previously Created Smart Cards?"** section to change the SiteKey and automatically update all user base smart cards.

What is the 1-Way Hashing Function Option In VeriAdmin for SiteKeys?

VeriAdmin allows Administrators to add additional security by optionally performing a 1-way Hash function on entered SiteKeys. This is DIFFERENT from the ESI SiteKey Encryption option. This function will take the user-entered password and create an encrypted 120-bit SiteKey from that password. This encrypted version is then used as the SiteKey for the V-Smart and smart cards in place of the user-defined password. In extreme cases, this can make it more difficult for criminals to “sniff” internal networks and capture passwords during serial communications. DO NOT USE THIS OPTION IF YOU INTEND TO SHARE SMART CARD DATA WITH OTHER APPLICATIONS!

To the Administrator, this all happens behind the scenes and you never have to remember anything other then the simple password. You just have to make sure that if you set a NEW SiteKey with the HASH checkbox selected, then afterwards you need to also check the “Hash the CURRENT SiteKey” so that each time the SiteKey Verification process happens, a hashed current SiteKey will be compared with the stored hashed Primary SiteKey.

The HASH function check box is ignored if the SiteKey textbox is empty (for non secure V-Smart default key use), or if “-1” is entered the SECONDARY SiteKey text box (for turning OFF the auto update feature).

PLEASE NOTE:

The HASH function check box has been moved from the Security Settings Dialog to the Site Key Dialog for VeriAdmin v4.10. Each time the Site Key is entered, the check box determines whether to HASH the key for the Current Key.

Bioscrypt Contact Information

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