



TechTrex SecurePro Overview

1 Executive Summary

1.1 Introduction

TechTrex would like to thank you for the opportunity to present our product and consideration of **TechTrex SecurePro™** as our solution for EMV card personalization.

SecurePro™ formerly known as CardPro. Name Changed to SecurePro™ to represent our new markets in NFC for handling Secure Devices, Secure Elements in addition to Cards

With **SecurePro™**, we empower card issuers to quickly deliver high-margin, value-added EMV solutions to meet existing customers' needs and attract new ones - quickly, reliably and profitably.

SecurePro™ gives issuers complete, top-to-bottom, automated control over the entire card production process. Its unique packaging of complete card personalization and card production features revolutionizes accuracy and virtually eliminates errors associated with competitive processes.

With proven success in multi-vendor, multi-technology environments, **SecurePro™** enables issuers to attain production efficiencies and grow revenues without growing operating costs.

SecurePro™ will enable the customer to:

- 🔄 Accelerate delivery of differentiated, value-added EMV programs including loyalty;
- 🔄 Reduce production costs;
- 🔄 Profitably deploy EMV cards over multiple technologies, equipment and networks;
- 🔄 Optimally use resources;
- 🔄 Easily migrate to new equipment and new technologies; and
- 🔄 Reliably scale EMV card production to meet skyrocketing demand.

Once again, thank you for the opportunity to earn your business, and please feel free to contact any member of our TechTrex team with questions. We look forward to working with you.

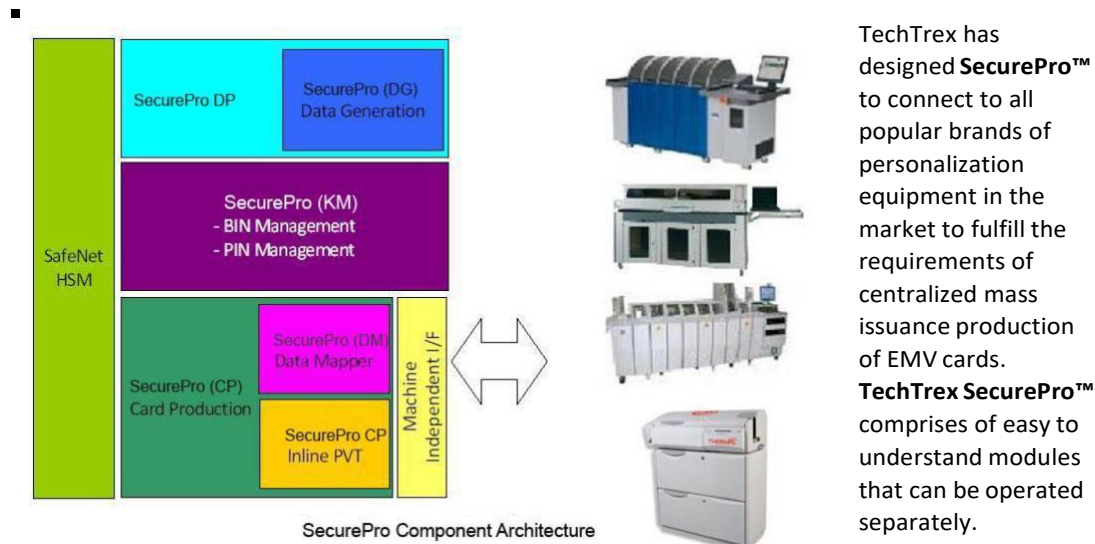
Yours Sincerely,

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TechTrex SecurePro™ Overview

TechTrex SecurePro™ is a proven and complete high volume EMV card production system that was designed and developed over many years of experience in the arena of card issuance and is the *only complete EMV personalization solution in the world that is not associated with any personalization equipment vendor or a card manufacturer.*



TechTrex has designed **SecurePro™** to connect to all popular brands of personalization equipment in the market to fulfill the requirements of centralized mass issuance production of EMV cards. **TechTrex SecurePro™** comprises of easy to understand modules that can be operated separately.

TechTrex SecurePro™ Component Architecture is fully modular and add-ons are possible to handle future requirements such as a customer loyalty program.

Unique in the industry and available as a standard feature to our EMV personalization solutions, **TechTrex SecurePro™** includes a selectable inline Personalization Validation Tool (PVT), to validate the chip content of the newly personalized card.

Key Differentiators of the TechTrex SecurePro™ Solution

Personalization Machine Independence: As TechTrex is not related to any personalization machine vendor, we have no bias towards any brand of personalization machines. We have developed a machine independent interface that will interoperate with the following personalization machines.

- Datacard
- NBS
- Matica
- CIM
- Ruhlmat
- HID (Fargo)
- Zebra

Chip Card Independence: As TechTrex is not related to any chip card vendor, we have no bias towards any brands of chip cards. We have developed a universal chip card interface and already have support for the following card types.

GlobalPlatform Java card VSDC &M/Chip
NXP JCOP10, JCOP21, JCOP30, JCOP J2A020Y
JTOPv15
G&D Convego, SmartCafe
Gemalto GXP4, GXP7, Clarista CV4, PV5, GFX2, GFX3
KONA
Oberthur Cosmo
Ubivelox
Plastic Card Enterprise Petoral
STMicroelectronics STPAY

GlobalPlatform Java card PBOC2.0
KONA PBOC2.0
Watchdata PBOC2.0
Datang Microelectronics Technology PBOC2.0
UbiVelox UBJ21-G22 PBOC3.0

GlobalPlatform Java card DPAS / RuPay
KONA
UbiVelox
STMicroelectronics STPAY
Gemalto
NXP

GlobalPlatform Java card CPA
KONA

MULTOS
MULTOS MCCA
MULTOS M/Chip4
MULTOS MICA M/Chip4 + PayPass
MULTOS M/Chip 2.05, 2.06
MULTOS VSDC + payWave
MULTOS D-PAS / RuPay
MULTOS PBOC2.0, PBOC 3.0
MULTOS Pure
MULTOS SPAN2
MULTOS step/one MICA
MULTOS step/one M/Chip4
MULTOS step/one M/Chip 2.05

Native
Trüb Combos DDA M/Chip and VSDC
Oberthur MoneytIC Chrysalis VSDC
Gemalto GemGalleon M/Chip and VSDC
Gemalto GemValue Vision VSDC
Gemalto e-Galleon VSDC
G&D StarDC M/Chip and VSDC
Morpho EMV Pro Y
Morpho EMV Plus M/Chip and VSDC
Morpho EMV Plus CL M/Chip and VSDC
Toshiba FS Sigma 14 M/Chip and VSDC
Toshiba FS Sigma 201 M/Chip and VSDC
Inside MP2323 M/Chip Advance and VSDC
Advantis VSDC
Mifare

Fast Delivery and Responsiveness: TechTrex prides itself in our ability to rapidly delivery high quality solutions to our customers. Our turn-around times for new card types are outstanding and are about 6 weeks from start of engagement.

Superior Technical Support: Our international client base benefit from our 5 days a week 18 hours a day direct technical support in Canada, US and China Standard time.

Cost Effective and Customer Friendly Commercial Terms: TechTrex has developed avery attractive program to address the needs of our customers. In summary of the commercial and technical terms, we will provide:

- ➡➡ **No limitation on number of supported BIN and Issuer** – Many vendors have separate charges for BIN and Issuers – TechTrex is unique in that it has eliminated these up charges.
- ↻ **No risk implementation methodology** – We can provide our customer with a risk free, migration path to our TechTrex **SecurePro™** software. The TechTrex solution also allows our customer to avoid mandatory, unreasonable, and expensive annual maintenance fees common with other vendors. Additionally, our software can co-exist with other competitor’s software and accordingly we developed a straightforward method by which to migrate between other vendor software and **SecurePro™**.
- ➡➡ **TechTrex understands the demands of the Customer’s EMV needs.** TechTrex understands that in the case that the customer already has EMV software installed, TechTrex will deliver the new TechTrex software on a new personal computer equipped with an HSM. This approach ensures no disturbance is introduced to the operational EMV card production environment, and allows the customer to continue to issue cards using its existing software on all currently supported card types in parallel to issuing the new card type using the **SecurePro™**solution.

Overview

This document is presented in 2 mainsections;

Section 1 is the Executive Summary and will introduce TechTrex as a company as well as its product and solution offerings. Section 1 also provides an overview description of the key requirements of a smart (chip) card personalization system, starting with a section that provides an introduction on EMV bank card personalization. This background is then used to further relate how the **TechTrex SecurePro™** solution fits into the overall solution.

Section 2 will explain the TechTrex SecurePro solution will meet EMV chip personalization requirements. Accordingly, TechTrex solution architecture will be presented along with all of the necessary Solution Support and Professional Services that will be included tofully deploy and validate the solution.

Scope of Discussion

Based on our understanding of the requirements of EMV chip card personalization, we will listed the options offered by TechTrex to fulfill the needs of customer. Accordingly, we will provide a complete EMV solution that encompasses the required software, hardware(not including the client's personalization machine), solution support, and professional services.

1.1.1 TechTrex Overview

TechTrex Inc. (TTI) is a leader in POS, card issuance technology and custom application development exclusively for the card payment and issuance industry. TTI's strength lies in its ability to provide cost-effective, flexible solutions ranging from the most basic dial terminal to custom applications to branding to complex networking solutions. The Company designs, develops, manufactures, and markets card personalization solutions, POS hardware, consulting services, and software. TechTrex Inc. has operations in Canada, the United States, China, Korea and authorized dealers worldwide.

TechTrex SecurePro™, TechTrex's EMV card personalization solutions are deployed and operational in 34 countries worldwide. The installations cover both mass issuance and in-branch instant issuance.

1.1.2 TechTrex Corporate Infrastructure and Development Capabilities

As an international company, TechTrex has development and support facilities around the world. We have R&D centres in Toronto, Canada and Qingdao, China. TechTrex is naturally able to leverage its international development and manufacturing capabilities to deliver world-class solutions faster and at a much lower price point than current competitors.

Our objective is to stay ahead and provide industry leading technology, quality and support at an aggressive price.

Not only does TechTrex have a strong corporate infrastructure, employing a large number of technical personnel, but we also have very strong project deployment experiences.

Card Type Delivery Capabilities

Our past project experiences include support for more than twenty types of EMV cards featuring many native cards. Our turn-around time has been historically excellent on delivery of new card types. Currently, we can supply a new card type within six weeks, once we have done one or two projects with the customer and develop a working relationship; we expect to achieve efficiencies that will allow the turn around-time to be trimmed to about 1-2 weeks within six months after the start of our engagement.

1.1.3 References for TechTrex SecurePro™

The following references are provided to illustrate a scope and diversity of TechTrex SecurePro installations worldwide. This list contains some of the many projects TechTrex is handling to support financial institutions to migrate to EMV standards or that implement instant issuance at their bank branches.

The list of references provided contains many card personalization bureaus and banks.

Country	Details	Year	Machine
Ghana	Central Issuance for a bank	2020	CIM Combi 500
DR Congo	Central Issuance for a bank	2020	Matica S7000
Ghana	Central Issuance for a bank	2020	Datacard MX1100
India	Instant Issuance for 2 bankbranches	2019	Datacard CE840
USA	Data Preparation for a CardScheme	2018	DataCard 9000
China	Central Issuance for a personalizationbureau	2018	NBS Horizon
Canada	Instant Issuance for 9 bankbranches	2017	Zebra ZXP3
China	Central Issuance for a personalizationbureau	2016	Datacard MX1100
India	Central Issuance for a bank	2016	Datacard 9000
Korea	Central Issuance for a personalizationbureau	2015	Datacard MX6000
Greece	Instant Issuance for 178 bankbranches	2014	CIM 821
Thailand	Central Issuance for a personalizationbureau	2014	Matica many models
Canada	Data Preparation for a bank	2014	NA
S. Africa	Central Issuance for a personalizationbureau	2013	Matica many models

1.1.4 Business Benefits for the Customer

TechTrex SecurePro™ is a complete EMV personalization solution that is not associated with any personalization equipment vendor or a card manufacturer. The TechTrex solution is not restrictive to any card type or personalization machine system. The TechTrex system is fully capable of supporting any EMV native platforms or open card platform cards on the market.

1.2 EMV Technical Overview and SecurePro™

1.2.1 EMV Bank Card Personalization Overview

The purpose of this section is to illustrate the life cycle of a typical EMV card personalization process, and further relate how the TechTrex solution fits into the overall card production environment.

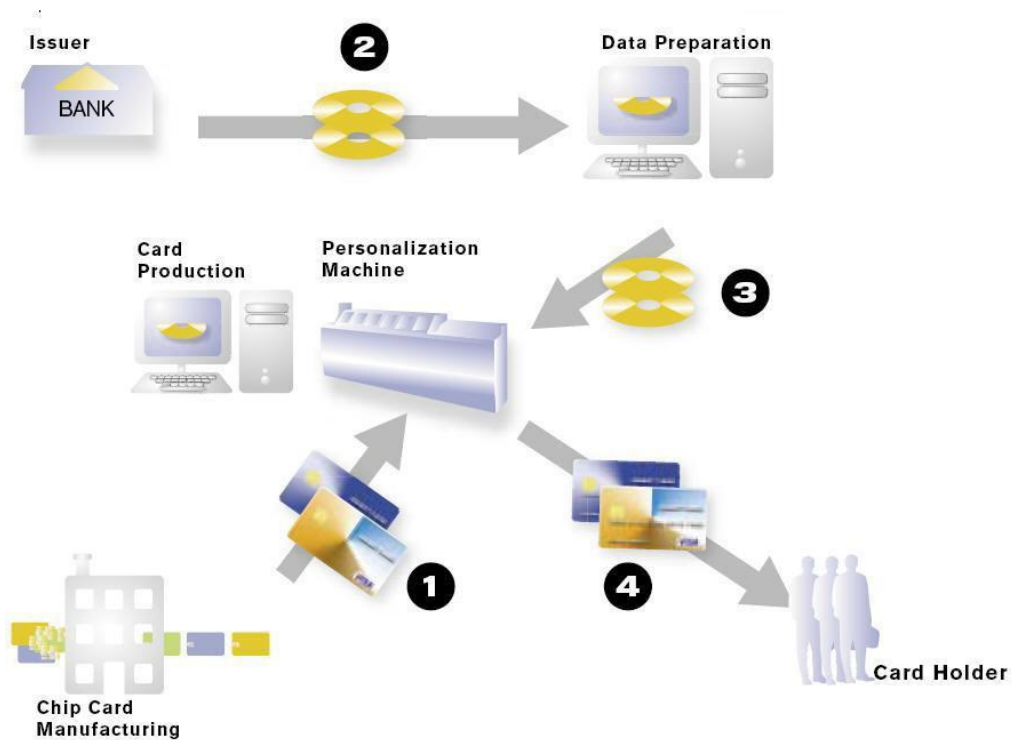
The following sequence description and diagram depicts each stage of the EMV card personalization using TechTrex SecurePro™ software.

1. Card manufacturer sends card to personalization location, ordered by the Issuer.

2. Issuers traditionally prepare the card personalization data, typically represented as a personalization data file, once verified the data is then ready for the EMV Data Preparation (DP) process.

3. The EMV Data Preparation process provides for customization of the original Card personalization information to meet your specific requirements of EMV compliant personalization card to the end customers. **A Data Preparation system allows you to perform card design, generate and format all the necessary data required for graphical, magnetic and electrical card personalization.** A customized data file is prepared and typically input into the Card Production (CP) Personalization system.

4. **Upon receiving of the output file from the Data Preparation process, the Card Production Personalization system performs the actual smart card personalization by interacting with the issuer's smart card personalization equipment.** The EMV card is now personalized according to the final cardholder's profile. The card may then be included into any fulfillment or packaging process for delivery to the cardholder.



EMV PERSONALIZATION PROCESS

The following sections provide details that relate the aforementioned card personalization processes to the SecurePro™ solution.

1.2.2 TechTrex SecurePro™ Product Architecture and Characteristics

The TechTrex **SecurePro™** product fully supports the Data Preparation and Card Production processes as previously described, and accomplishes this with a straightforward implementation

approach. The SecurePro™ solution is composed of the PC based hardware platform that will host the **SecurePro™** software, a PCI Express x4 based HSM, and the **SecurePro™** software system itself (composed of DP, KM and CP).

TechTrex SecurePro™ Hardware Platform

TechTrex SecurePro is operated on industry standard Microsoft Windows platforms. It can be installed on a standalone PC or integrated in a client/server environment with several PCs, as a member of the clients IT environment.

Recommended minimum configurations for the **TechTrex SecurePro** personal computer (PC):

- Intel Dual Core 2.2 GHz (E2200), 1GB RAM, 160GB Hard Disk
- The selected Motherboard must contain a PCI-E slot that supports PCI Express version 1.1.
- Windows 7 Professional 64Bit

TechTrex SecurePro™ CP operates directly connecting to personalization equipment that is connected to the Smart Card programming station.

The overall **TechTrex SecurePro™** software runs on a PC with a PCI Express x4 based Hardware Security Module – HSM. In our implementation, TechTrex SecurePro™ employs the SafeNet ProtectServer Internal Express 2 (PSI-E2) PCI Express x4 Adapter based Hardware Security Module – HSM. ProtectServer Internal Express 2 is a FIPS 140-2 Level 3 PCI Express x4 HSM that provides high-performance secure cryptographic processing in server systems and supports applications requiring high-performance symmetric and asymmetric cryptographic operations. Employing the SafeNet ProtectServer Internal Express 2 (PSI-E2) HSM fulfills the latest security requirements of Visa International and MasterCard Worldwide and greatly simplifies the steps for chip personalization bureau certifications.

1.2.2.1 TechTrex SecurePro™ DP (Data Preparation) Module

Data preparation is an essential component of EMV card issuance. The **TechTrex SecurePro™ DP** module allows EMV (Visa, MasterCard or Discover) users to use well-defined card and application profiles in order to generate the necessary output files that will be used in the later stages of card personalization. In the TechTrex architecture **SecurePro™ DP** is used in conjunction with **SecurePro™ KM** whereby the necessary cryptographic keys are generated and securely transferred to the Hardware Security Module.

Using ICC Key size 786, PEK Size 1152, **TechTrex SecurePro™ DP** can process approximately 48,000 card records per hour for the SDA profile and about 14,000 card records per hour for the

DDA profile. This is more competent and efficient than other brands of traditional Personalization Preparation Process such as P3¹.

HSM	VSDC AP Template	SecurePro™ DP # of records produced per hour
PSI-E2 PL25	9 (SDA)	4700
PSI-E2 PL25	10 (DDA)	1100
PSI-E2 PL1500	9 (SDA)	50000
PSI-E2 PL1500	10 (DDA)	15000

DP PERFORMANCE SUMMARY (TYPICAL)

Using information received from the input data file, the culmination of the Data Preparation process results in the generation of a data file (output).

This data file fundamentally contain information for traditional embossing and encoding of the card magnetic data stripe issued by the standard issuer card management system and also the required chip card data associated with a set of parameters defined for a specific bank profile or a dedicated card profile designed for the finalcardholder.

During the data preparation process, data defined by the payment application profile is connected to a cardholder specific keyset.

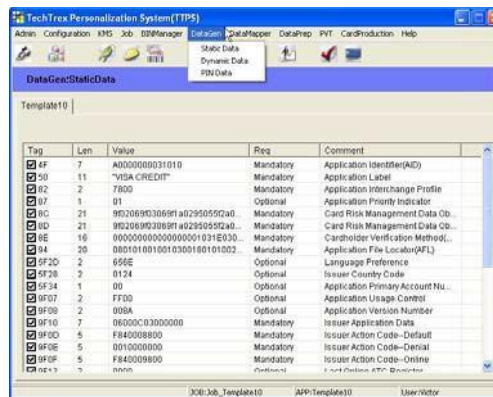
All cryptographic data (i.e. icc key) is securely generated and transferred within an HSM. This HSM securely stores the secret master keys of issuer and perform 3DES applicative key diversifications internally.

TechTrex SecurePro™ DP requires an input data file that contains a record for each individual card for production. **TechTrex SecurePro™** is based on an industrial standard file format. Nevertheless, it is possible to modify this format to comply with individual customer requirements on a project-by-project basis.

TechTrex SecurePro™ DG (Data Generation) Module

Data Generation is a standard part of **TechTrex SecurePro™ DP**. It is a configuration tool which defines the data to be handled during the data preparation process. It also defines whether an EMV Tag, and its associated length and value, will be included.

¹ P3 file input feature allows the EMV system to accept industrial popular EMV P3 files as input. When employing this feature, the data preparation component (P3 File generation) is not offered by TechTrex— but is provided by some other 3rd parties (such as Thales or Cryptomathic).



TECHTREX SECUREPRO™ DGMODULE

1.2.2.2 TechTrex SecurePro™ CP (Card Production) Module

The **TechTrex SecurePro™ CP** module is personalization software designed to work with high output personalization equipment. This module has the capability to communicate directly with the personalization equipment through TechTrex’s machine independent interface. The **TechTrex SecurePro™ CP** module also communicates with **SecurePro™** Key Management and realizes the online cryptographic operation during the card personalization stage.

TechTrex SecurePro™ CP module can optimize the chip personalization process. Capitalizing on TechTrex’s strong background and experience on software, personalization equipment and card service bureau operational experience, this module comes with a set of well- conceptualized, adequately ordered and secured commands that perfectly fit with the requirements of card personalization.

TechTrex SecurePro™ CP software is part of the overall card personalization production process. It extends the personalization features by providing the electric (chip) personalization capability.

TechTrex SecurePro™ CP module provides chip personalization process and runs in parallel with existing graphic and magnetic personalization. An important feature of **SecurePro™** is that electric (chip) personalization capacity does not affect the graphic process. With **SecurePro™**, the personalization of other graphic features, such as embossing and magnetic stripe encoding, may be integrated without jeopardizing the overall performance of chip personalization.

Specific formatted data that is contained in the personalization equipment input file that was previously generated during the Data Preparation stage will be interpreted by **TechTrex SecurePro™ CP** modules.

Once the command for one card profile (as identified by a BIN) and one application type are received, the module then passes the data and uses it to generate device compliant instruction sequences.

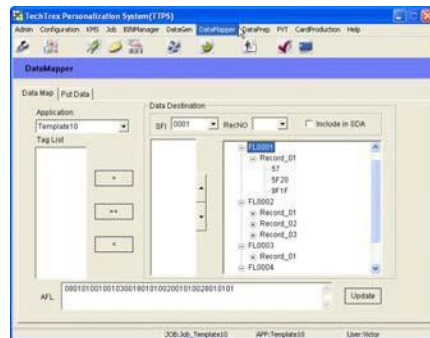
To ensure the privacy of data, some of the data may have been encrypted during the preparation process and this allows the **TechTrex SecurePro™ CP** module to interact with an external Cryptographic module loaded with suitable key sets.

TechTrex SecurePro™ Data Mapper (MP) Module

Data Mapper is a standard part of **TechTrex SecurePro™ CP**. It is a configuration tool which defines what data is to be written to specific locations within the card.

Data Destination Type includes:

- DGI (GP Common Perso --- CPS)
- SFI (GP Conventional Perso)
- Files (Native Cards)
- ALU (MULTOS Cards)



TechTrex SecurePro™ DataMapper

TechTrex Standard Inline Personalization Verification Tool (PVT)

In addition to its basic function of providing chip personalization, the **TechTrex SecurePro™ CP** module also has a very powerful standard feature; that is the inline **Personalization Verification Tool (PVT)**.

The **PVT** process may be optionally enabled (user selectable) after the chip personalization stage. The newly personalized card will be powered off and power on again. A sequence of checks and read back will be performed on the chip to ensure its validity.

A verification log file report will be produced after reading the Chip.

- All data is displayed in terms of its individual primitive tags, fields or bit positions, making it extremely easy to view.
- Decode all tags meaning
- Display Put Data
- Display explanation messages
- Validation of SDA & DDA

1.2.2.3 TechTrex SecurePro™ KM (Key Management) Module

The **TechTrex SecurePro™ KM** is a module that interfaces to the HSM. A set of smart card and smart card readers from the HSM manufacturer is included to allow back up and restoration of secured key database.

Without limitation, this module provides encryption and decryption operations, PIN related operation, symmetric key generation and diversification and RSA key pair generation.

This security level ensures that neither keys nor sensible data are in clear outside the HSM, and thus it holds and ensures the privacy of cardholder’s data during the entire issuance process.

Without any breach of security, keys generated during data preparation phase may be securely and remotely transferred to the Hardware Security Module when used together with the **TechTrex SecurePro™ DP** module.

In the card production process, **TechTrex SecurePro™ KM** module is called by **TechTrex SecurePro™ CP** components to extract card specific keys and encrypt appropriate personalization commands.

The **TechTrex SecurePro™ KM** module also has the capabilities to generate, import and export keys and key components.

ZMK

- Multiple Key components injections
- Import /Export

Key Component(s)

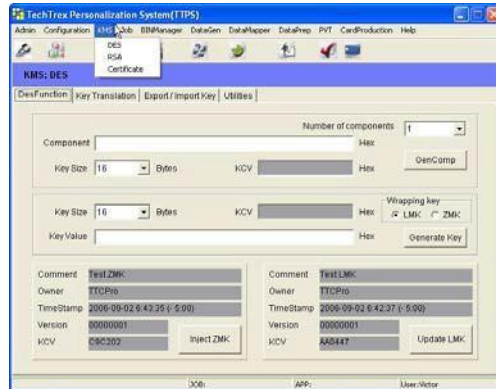
- Generation/Export

DES

- Key Generation/Export

RSA

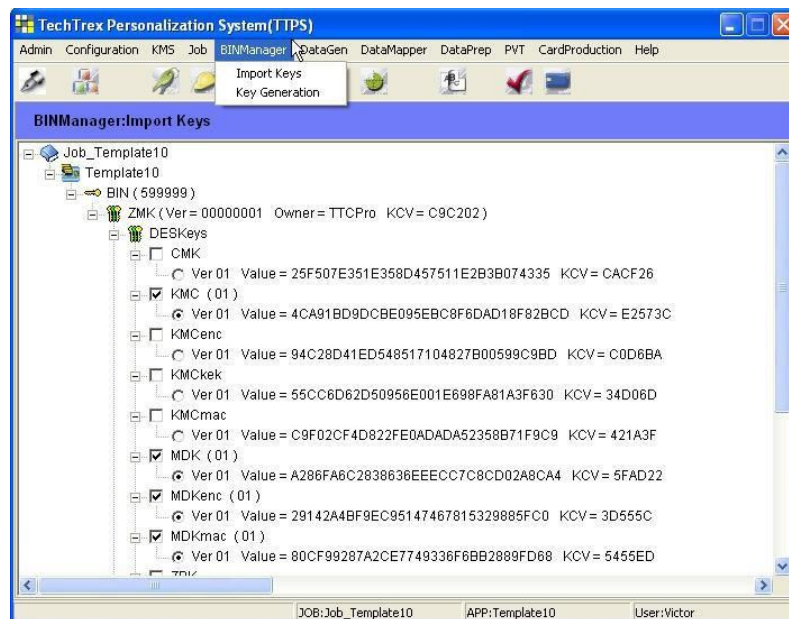
- Key Pair / Import /Export



TechTrex SecurePro™ Key

TechTrex SecurePro™ Bin Manager (BM)

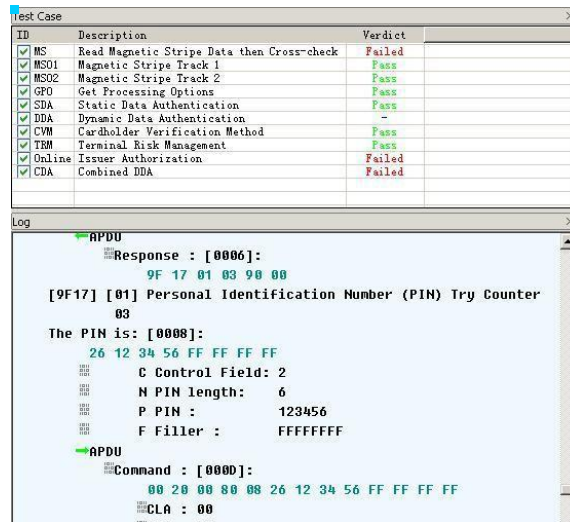
A BIN Manager is standard with SecurePro and part of the SecurePro Key Management module. It is provided to manage the keys and key certificates associated to a BIN.



TechTrex SecurePro™ Bin Manager

1.2.2.4 Optional components --- TechTrex Personalization Verification Tool (PVT) Professional

As an optional add-on, the TechTrex Personalization Verification Tool (PVT) Professional is a user friendly, easy to use PC-based tool for verifying, inspecting and automatically validating EMV card personalization data.



PVT PRO, EMV SMART CARD VERIFICATION AND QUALIFICATION TOOL FOR THE REAL WORLD ...

Unique in the industry, when a user is using TechTrex SecurePro™ system for EMV personalization, PVT Professional can access the issuer's live keys to perform validation of card personalization data. This can be achieved without an extra HSM or key exchange.

PVT professional helps an organization to eliminate costs and other impacts of issuing wrongly personalized cards. It is also very valuable for inspecting cards after initial issuance.

- Verification, inspection and validation of EMV card profiles with automatic cross-references and checking against up to date EMV specifications.
- Available with a TechTrex Pinpad with reader option for validation of PIN, smartcard and magnetic track data correlation.
- Automatically validates all card data and certificates for correct format and value.
- Supports VSDC and M/Chip proprietary tags and data requirements.
 - *Validation can be performed to EMV requirements, or the more stringent proprietary requirements of VSDC and M/Chip.*
- Identifies any personalization problems and checks the integrity of any interdependent data, with user friendly on-screen explanations.
- All data is displayed in terms of its individual primitive tags, DOL fields or bit positions, making it extremely easy to view a card's profile.
- User-friendly reports: generate your own report, by simply using the included comprehensive HTML report template.

- Easy to use with no setup or knowledge of complicated script languages required. Suitable even for people unfamiliar with EMV specifications, making it ideal for training and Quality Assurance tasks.

TechTrex PVT Professional enables you to perform EMV transactions with a simulated terminal and the card issuer. PVT Professional interprets and displays all EMV smart card and terminal commands/responses with cross-references to up-to-date EMV specifications. Issuer EMV scripting capability is also included.

- Ideal for EMV training.
- Ability to view all functional level data and interaction between cards and an EMV terminal simulator.
 - *Essential for development and/or testing of EMV smart cards.*
- Default terminal profiles can quickly be setup to reflect the exact specifications of a target terminal, including CA Public keys and supported application list.
- Online issuer simulation is included which supports all published issuer authentication methods (EMV 2000, M/Chip, and VSDC) and issuer EMV scripting. All cryptograms generated by the card may be validated as part of the issuer authentication process.
 - Live cryptogram validation is possible by connecting to the TechTrex **SecurePro™** card production key database / HSM.
 - ***Essential for validation and testing of EMV smart cards from the live personalization process.***
- All offline authentication methods supported (SDA, DDA and CDA).
- Specifically designed for ease of use as well as having a powerful capability in expert problem solving or data analysis situations. Includes easy-to-understand displays for routine operation.

TechTrex PinTrex S300 Pinpad (Included with PVTPro)

TechTrex offers its own branded Pinpad smartcard reader. The PinTrex S300 Pinpad serves as a Smart Card Reader, Magnetic Stripe Reader and secure PIN entry device for validation of smartcard and magnetic track data correlation and also for validation of cardholder PIN number. For customers who purchase PVT Professional, we include the PinTrex S300 as part of the PVT Professional software solution.



1.2.3 Product Support and Training

Product Support

TechTrex provides the best standard support in the industry. TechTrex offers (phone and email) Product Support on a 5 day per week, 18 hours per day basis.

Training

TechTrex recognizes that our customer will require training and that “hands on” training in addition to printed and presentation level training will be the most effective knowledge transfer mechanism. In order to accomplish this, TechTrex recommends that training take place at one of its facilities where assured access to all of the necessary card production machines, software, and expert trainers will be available.

Standard TechTrex product training provides for a comprehensive training program that covers:

- a) System Installation and integration of the SecurePro system into the customer’s site;
- b) System Configuration of the SecurePro system, including the essential steps of configuring the Key management subsystem;
- c) Mock card production, utilizing actual customer card profiles; and
- d) Methods and processes by which to perform system acceptance.

Our experience has shown that the aforementioned approach provides the lowest risk and quickest path to success for our customers. In the event that on-site training is required at the customer’s location, TechTrex can accommodate those requests, but will require a separate training arrangement – for these arrangements, please contact us directly so that we may work with you to craft a training program that will fully satisfy your needs.