REV	EN NO.	SECTION	DESCRIPTION	BY	DATE
A	VAP000001	All	Initial Release	D. Collings	5/8/2001
B	DPP000237	9,13	Removed Proprietary info and Mfg info	D. Collings	7/12/2001
C	DPP000455			D. Collings	11/12/2001
D	DPP000600			D. Collings	10/29/2001
E	DPP000671			D. Collings	2/27/2002
F	DPP001125			D. Collings	8/15/2002
G	DPP001162			D. Collings	9/3/2002
H	DPP001201			D. Collings	9/19/2002
J	DPP0001420		FFIPS 140-2 Revision	D. Collings	1/30/2003
P	DPP001509		See Change History Table	D. Collings	3/20/2003
R	CO02438		See Change History Table	D. Crowe	3/18/2004
S	CO06165		Changes requested by NIST	D. Crowe	11/18/2004
T	CO006645	4.4.1, 6.4	Changes requested by NIST	D. Crowe	12/17/2004

PRODUCT CODE NO. 1A00		**Pitney Bowes**	
APPROVALS			
BY	DATE	TITLE	**CVA Engineering PSD Security Policy**
		PREPARED Dennis Crowe	DATE 12/17/2004
Tom D'Andrea		CHECKED Catherine Morrisey	DATE 12/17/2004
SHEET 1 OF 46 SHEETS		EN NO. DPP001509	DWG NO. VA97004

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1 Introduction

Digital postal payment systems, such as the United States Postal Service's Information-based Indicia Program, rely on secure accounting of postage funds and printing a cryptographic digital postage mark on a mail piece. A Postal Security Device (PSD) provides security services to support the creation of digital postage marks that are securely linked to accounting. A PSD provides two types of data protection: secrecy of Critical Security Parameters (CSPs), such as keys or passwords, and data integrity protection for Funds Relevant Data Items (FRDIs) such as accounting data. CSPs and FRDIs reside in the PSD.

1.1 Scope

This document describes the security policy for the Pitney Bowes Compliant Meter (CoMet) PSD. It is intended to describe the requirements for the secure coprocessor only and not the entire system. This policy applies to the following configurations:

PSD Version	Market	HW	CL	ML	Mailing Machine
1A00 rev. BAA	US	1A8003 rev. AAB	6.04	4.20.01	DM400, 500, 550, 800, 900, 1000
1AEC rev.AAA	Canada	1A8003 rev. AAB	6.04	4.20.01	DM400, 500, 550, 800, 900, 1000
1APC rev. ABC	Canada	1A8003 rev. AAB	6.03	4.20.01	DM230/330

These configurations differ as follows:

- The 1A00 is a USPS IBI-compliant system. It operates on Pitney Bowes high-end mailing machines that feature a Canon printer with which the PSD communicates to securely print indicia.
- The 1AEC is a CPC DIS-compliant system. It operates on Pitney Bowes high-end mailing machines that feature a Canon printer.
- The 1APC is a CPC DIS-compliant system. It operates on Pitney Bowes mid-range mailing machines that feature a Brother Electronics printer, which has a different security mechanism than the Canon printer.
- Keys loaded during configuration are dependent on the key management system’s domain for each country. These keys ensure that the connection to the system infrastructure can only function with the specific infrastructure processes that apply to US (DSA-based) or Canada (ECDSA and Diffie-Helman), as appropriate for the configuration.
- Parameters loaded into the PSD establish indicia parameters and values (such as Canada’s “algorithm ID”), inspection / audit periods, printer security mechanisms, currency attributes, and other country-specific or mailing machine series-specific attributes.

- Control Layer Version 6.04 is the same as version 6.03 except that it corrects some deficiencies for U.S. configurations. Specifically, the PSD incorrectly output zeroes for the indicia serial number and host software version in the US indicia barcode. The configurations for Canada did not require correction; the 1APC version retained 6.03 since its testing was complete, while the subsequent 1AEC configuration adopted the latest version of the Control Layer.

1.2 References

The following documents are referenced by this document, are related to it, or provide background material related to it:

- Data Encryption Standard – FIPS PUB 46-3, October 25, 1999
- Financial Institution Retail Message Authentication – ANSI X9 .19, August 13, 1986
- Digital Signature Standard (DSA) – FIPS PUB 186-2, 2000
- PCIBISAIBIPMS, August 19, 1998
- PKCS #1: RSA Encryption Standard version 1.5, November 1, 1993
- Secure Hash Standard – FIPS PUB 180-1, April 17, 1995
- Security Requirements for Cryptographic Modules – FIPS PUB 140-2, May 25, 2001
- VA97013 MultiChip PSD Hardware Requirements

2 Implementation Architecture

The User Interface Controller (UIC) is a common component for multiple product lines within Pitney Bowes. The hardware is structured to fit the general requirements for a mailing system controller. Different Part Control Numbers (PCN) will be accommodated by downloading different software into the UIC. Similarly, the PSD will be customized in manufacturing to match the specific PCN.

Figure 1 shows a high level schematic of the UIC system with its associated PSD. This is only a partial schematic of the UIC to clarify the interface to the PSD.

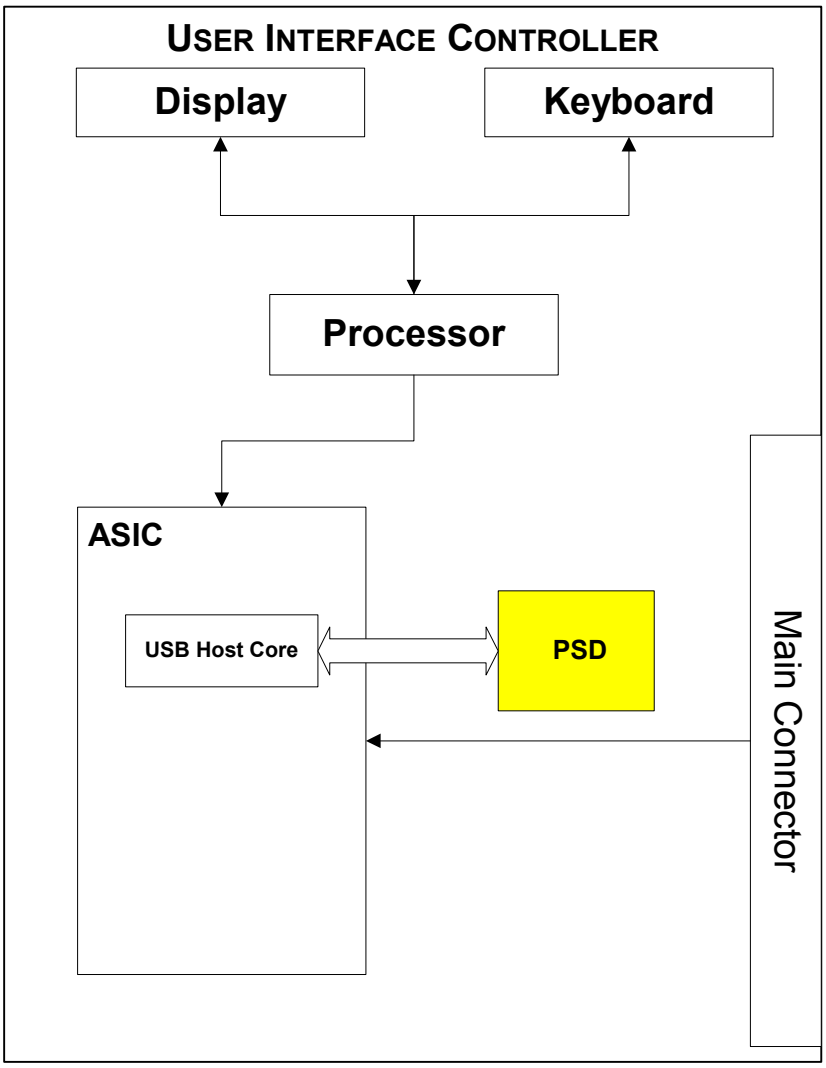


Figure 1 - UIC High Level Schematic

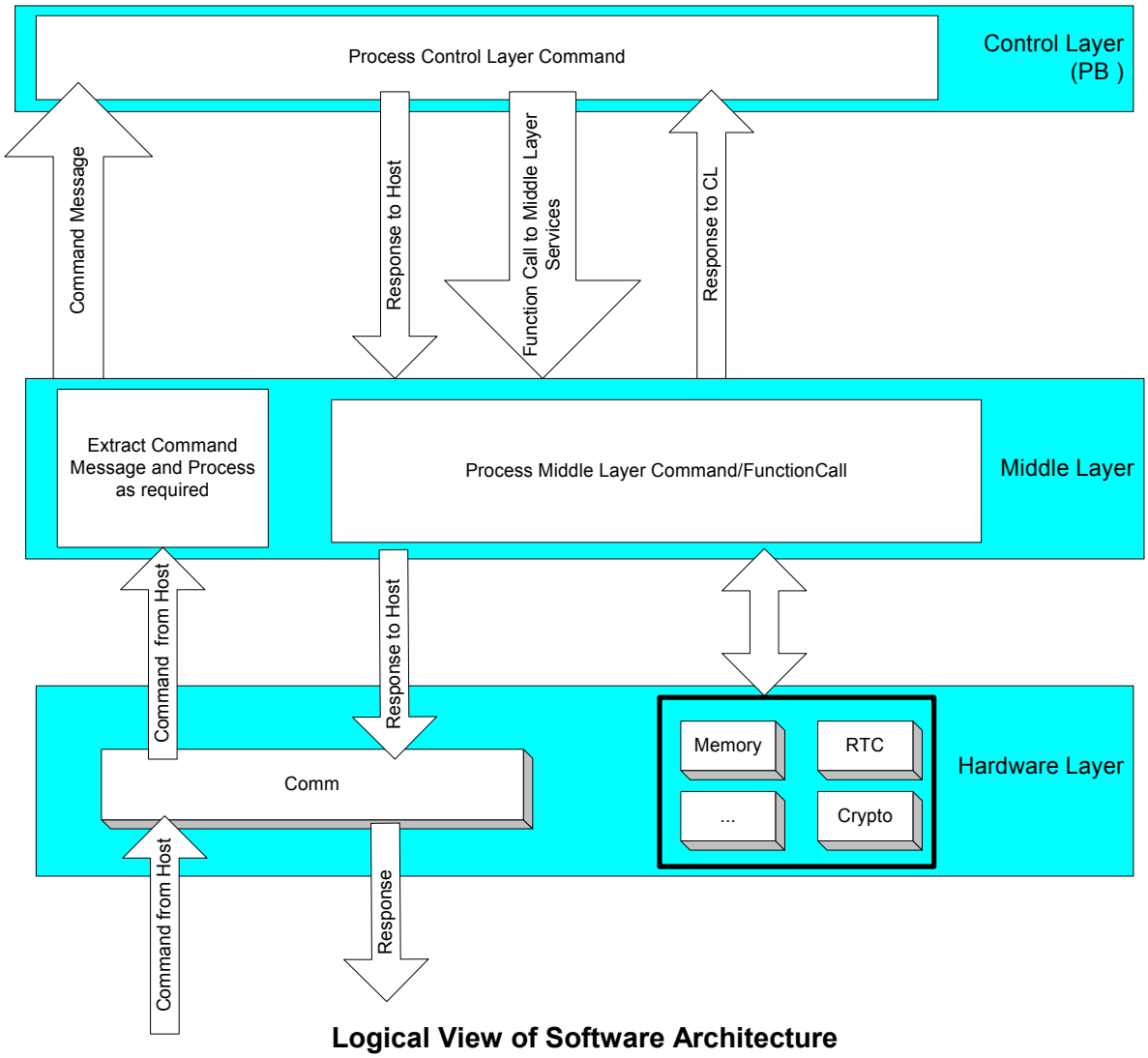
The PSD software is organized into discrete layers as shown in Figure 2 (Logical View of Software Architecture).

The Control Layer communicates with the Middle Layer software which provides low-level functions such as cryptographic, file management, communications, etc. It communicates with the

PSD host and interfaces with other hardware and firmware elements. Generally, the host is the electronic package of a PB meter installed in a mailing machine, which may be in communication with the computer services of the PB Infrastructure Data Center. The Control Layer accesses the nonvolatile memory (NVM) and the real-time clock via the Middle Layer functions. The current interface between the two layers is specified in the PB-Postal Security Device / MYK-82A Interface Control Document, which is part of the contractual relationship between PB and the current subcontractor.

Both layers co-exist on the same ARM processor with a single thread of control.

When the power is applied, the Middle Layer software has control of the processor until it has successfully completed power up checks, after which the Middle Layer passes control to the CL to perform its power up routines. After the CL has successfully initialized, it returns control to the ML, which waits for host messages. Once a message is received, the Middle Layer software/firmware calls the Control Layer firmware to process the message.



Logical View of Software Architecture

Figure 2 - Logical View of Software Architecture

Figure 3 shows a functional block diagram with the tamper barrier indicated. The interface connector is a non-standard USB connection with power supplied in the connector. Details of this interface can be found in 'VA97013 Multichip PSD Hardware Requirements'.

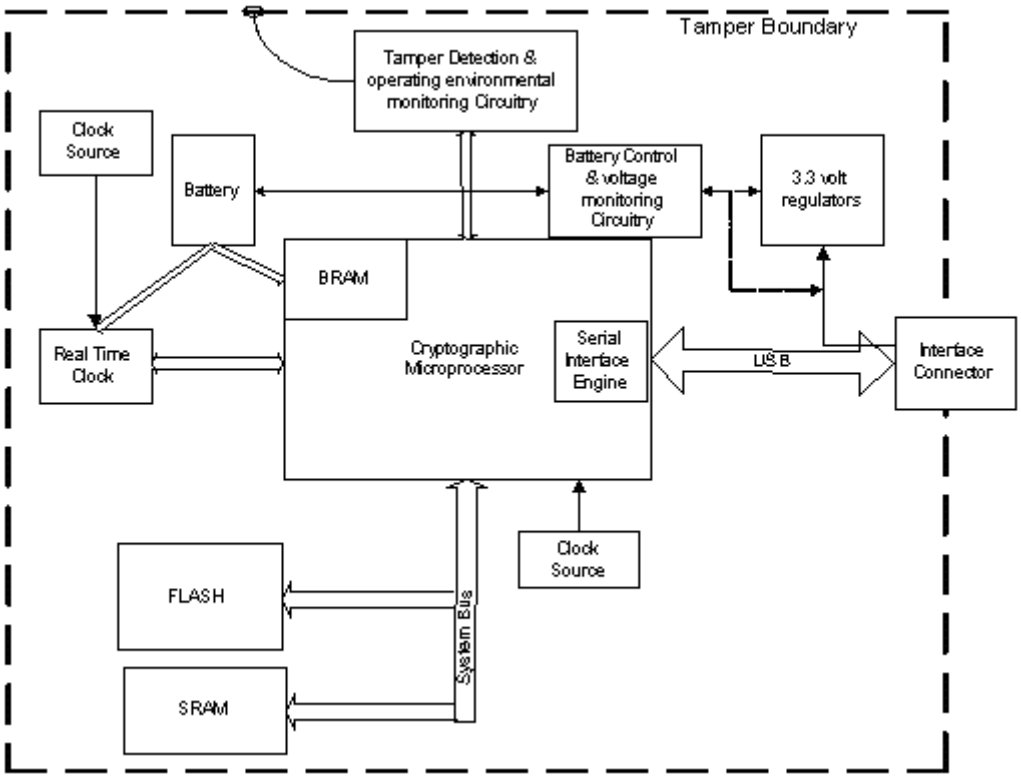


Figure 3 - Block Diagram with Tamper Barrier

Figure 4 shows a photo of the assembled PSD including the connector and representative labeling.

Figure 4 - Photograph of Final Physical Configuration

3 Security Level

The Comet Meter Cryptographic Module consists of a multi-chip stand alone module residing within a tamper resistant enclosure. The module provides a logical USB interface. The cryptographic module meets the overall requirements applicable to Level 3 security of FIPS 140-2.

Table 1 - Security Requirements

Security Requirements Section	Level
Cryptographic Module Specification	3
Module Ports and Interfaces	3
Roles, Services and Authentication	3
Finite State Model	3
Physical Security	3+EFP
Operational Environment	N/A
Cryptographic Key Management	3
Cryptographic Algorithms	3
EMI/ EMC	3
Self Test	3
Design Assurance	3
Mitigation of Other Attacks	N/A

4 Identity Based Operation

There is no login process for an operator for any role in the PSD design. No role or identity is active other than during the processing of a valid authorized transaction.

Each request sent to the PSD that is signed with a particular key which authenticates the entity that owns the key to the PSD. The simplest way to look at it: every time the PSD verifies a signature it is authenticating an entity. Each private key has an associated certificate which is used by the PSD to verify message signatures.

The cryptographic module shall support the following identities:

- Crypto Officer
- PSD Administrator
- Printhead Administrator
- Financial Officer
- Customer

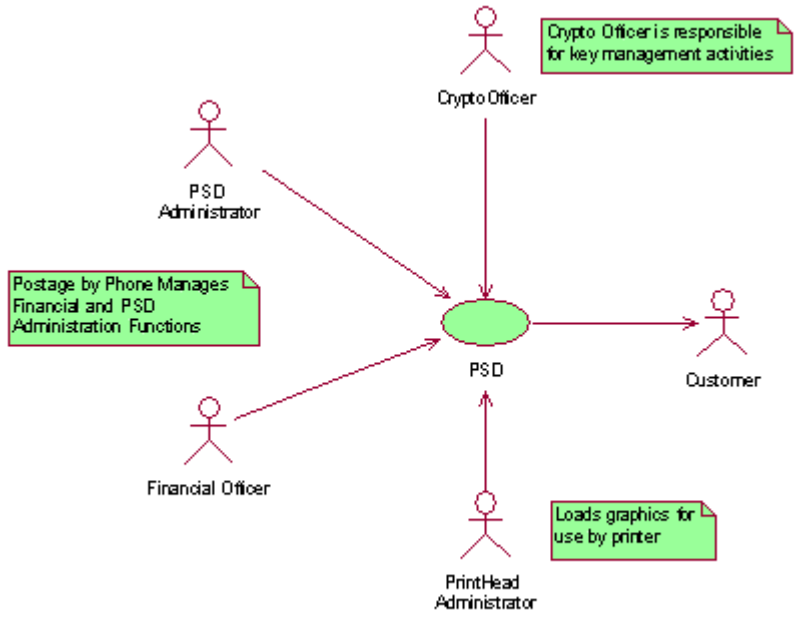


Figure 5 - Recognized Identities

No maintenance identity is accepted by the system.

Each identity is described in detail below.

4.1 Crypto Officer

4.1.1 General Functions

The crypto officer is responsible for the high level key management within the box. The primary functions are to load keys into the PSD, and to authorize the generation and use of an IBI key.

Note: The Middle Layer actually stores and manages the key once the message containing the key has been verified by the Control Layer. From that point on, only the Middle Layer has access to the actual key material.

4.1.2 Acting Individual or Organization

The Key Transaction Processor within Pitney Bowes can load signed key records into any secure box.

The vault manufacturing security coprocessor used by manufacturing can issue the Generate Key and Authorize PSD Key requests.

4.1.3 Services

4.1.3.1 Authorize PSD Key

The Authorize PSD Key message shall cause the PSD to complete the Generate PSD Key transaction. This shall place the PSD in Full Postal state. The Authorize PSD Key command shall instruct the PSD to begin using the new key that was created by the previous Generate PSD Key command. The PB Infrastructure Data Center message with a PSD Key Record shall be included in the transaction. This record shall include the PSD public key and the Certificate ID that was received from the certificate authority. The record shall be signed with the PB Infrastructure Data Center authentication certificate private key. The PSD shall validate the message header and data content and then shall make the new key active. The PSD shall also prepare the Authorize PSD record and shall sign it with the unique PSD Authentication Information Based Indicia (IBI) private key.

4.1.3.2 Delete all Keys & Control Layer

In response to the Host, the PSD shall zeroize all private and secret keys in the system and shall remove the control layer from the system and place the PSD in Transport Mode.

4.1.3.3 Generate Key Exchange Key

This service is PSN configurable to behave in one of the following manners

a. In the United States

The Host can instruct the PSD to generate an RSA public and private key pair, which is the Key Exchange Key. The response message shall contain the public portion of the Key Exchange Key. This will only be used if secret keys are to be loaded.

Note: The US implementation does not load any secret keys.

b. In Canada

The host shall instruct the PSD to establish a triple des secret key in coordination with the Host via a Diffie-Hellman process. This secret key will be used as a one time Key Exchange Key to load a secret key into the PSD. This key has a deterministic life of 30 minutes from generation before it becomes inactive. It is destroyed immediately upon completion of a Load Secret Key transaction.

The Diffie-Hellman process and the Triple Des key being established are both 80 bits in strength.

This process is based on transmission of a parameter set and a ‘public key’ from the host followed by the generation of a ‘private’ key and associated public key and computation

(establishment) of the shared secret key by the PSD. The PSD then transmits its 'public' key back to the host so the host can compute the shared secret Key.

4.1.3.4 Generate PSD Key

The public and private key pair that is the PSD Authentication Key shall be generated by the PSD, when the Host sends this command message. It shall generate either a DSA public/private key set or an ECDSA public/private key set based upon PCN configuration. The message shall include the Signed Key Record (SKR), with parameters to be used. The cryptographic algorithm used by the PSD for IBI is either DSA or ECDSA per configuration data. The Record Type and the Key Name in the SKR shall determine the algorithm to be used. In this state, the PSD shall verify the signature on the incoming message. It shall use the middle layer key pair generation algorithm, GenerateKeyPair. Upon successful completion of the key generation, the key attributes shall be retained, such as:

- Start and end key validity dates
- Key identifier, which is composed of the Revision and key name

The key that is generated cannot be used for debit functions, until authorized by the post office, but it may be used for other operations, for example: Audit processing and self-signing of the response message (e.g., public key); retrieve a public key and sign a response back to the host.

4.1.3.5 Get Certificate Key

The Get Certificate Key shall cause the PSD to output the signed crypto key record that contains the public data included in the specified Certificate key.

4.1.3.6 Get Key Exchange Key

In response to this command, the PSD shall output the signed crypto key record that contains the public data included in the PSD Key Exchange Key. If a key exchange key has not been generated, this service will return an error.

4.1.3.7 Get PSD Certificate

The Host instructs the PSD to send the signed key record that shall contain the public data associated with the PSD Authentication key. This command provides the PSD public key data. The command is used by the print head controller. The middle layer service that is called by the Control Layer software is the Get Public Key service.

4.1.3.8 Get Public Key Data

After the Load Public Key command has been executed, in order to load the public crypto key data into the PSD, the Host shall use this command to retrieve the public key data from the PSD.

4.1.3.9 Load Certificate Key

The Load Certificate Key message shall cause the PSD to pass the certificate key to the middle layer for storage. The incoming signed message shall be verified prior to taking action on the request.

4.1.3.10 Load Public Key

The PSD shall be instructed by the Host to load a public key, which is to be stored in the NVM. In this state, the PSD shall verify the incoming message signature and shall verify that the key that is loaded is signed with the appropriate key. The incoming message shall include the new public key

data for storage, key identifier, and the signature. The middle layer service that is called by the software is the StorePublicKey service.

Upon successful completion of this service, the key attributes shall be retained. These include:

- Start and end key validity dates
- Key identifier, which is composed of the revision and key name

4.1.3.11 Load Secret Key[1]

This command from the Host shall cause the PSD to load the signed key record that contains an encrypted secret key. In this state, the PSD shall verify the signature on the incoming message and shall verify that the key that is being loaded is signed with the appropriate key. The incoming message shall include the encrypted secret key for storage, key identifiers, and the signature. The middle layer service that is called by the embedded program is the StoreSecretKey service.

Upon successful completion of data processing by this service, which included decrypting the secret key with the Key Exchange Key and then re-encrypting it with the Key Encryption Key for storage, the key attributes shall be retained. These include:

- Start and end dates during which the key is valid.
- Key identifier, which is composed of the Revision and the key name

In Canada, the Key Exchange Key and the Canada HMAC Secret Key is loaded using this transaction.

4.1.3.12 Revoke Key

The revoke key message is a signed message that instructs the PSD to remove a key from the key table.

4.1.4 Keys

4.1.4.1 PSD Key

This public-private key pair is generated by the PSD upon request.

a. United States

UNIQUE_PSD_AUTH_IBI_DSA1024_PRIVATE

UNIQUE_PSD_AUTH_IBI_DSA1024_PUBLIC

b. Canada

UNIQUE_PSD_AUTH_IBI_ECDSA_FP160_PUBLIC

UNIQUE_PSD_AUTH_IBI_ECDSA_FP160_PRIVATE

[1] The Load Secret Key is required for various international configurations and is not used in the US Postal Implementation.

4.1.4.2 Root Key

The root key signs the key update key record. The PSD verifies the identity of the crypto officer using the root certificate. This key is used to sign the root and key update key records input into the PSD.

DOMAIN_INF_AUTH_ROOT_DSA1024_PUBLIC

4.1.4.3 Key Update Key

The key update key is used to sign all other certificates. The identity of the crypto officer is verified using the key update key certificate.

DOMAIN_INF_AUTH_KEY_UPDATE_DSA1024_PUBLIC

4.1.4.4 Key Exchange Key

The key exchange key is used by external sources to exchange a key with the PSD

a. United States

UNIQUE_PSD_PRIVACY_KEY_EXCHANGE_RSA1024_PRIVATE

UNIQUE_PSD_PRIVACY_KEY_EXCHANGE_RSA1024_PUBLIC

b. Canada

SESSION_PSD_PRIVACY_KEY_EXCHANGE_DH1024_PRIVATE

SESSION_PSD_PRIVACY_KEY_EXCHANGE_DH1024_PUBLIC

SESSION_PSD_PRIVACY_KEY_EXCHANGE_3DES2_CBC_SECRET

DOMAIN_INF_OPERATION_COMMON_PARAM_DH1024_PARAMETERS

4.1.4.5 Certificate Key

The certificate key is used when key data downloaded to the PSD must be deleted. The identity of the Crypto officer is verified using the certificate Key.

DOMAIN_INF_AUTH_CERTIFICATE_DSA1024_PUBLIC

4.1.4.6 New Key (generic)

The new key is a generic key that is loaded into the PSD and is country or market specific.

For PSD PCNs to be used in Canada, the following key is loaded using Load Secret Key

UNIQUE_PSD_AUTH_INDICIA_DATA_HMAC160_SECRET

In Canada, the digital postage indicium human readable portion is protected by HMAC-SHA-1 message authentication code represented by 5 ASCII printable characters. The message authentication code that provides data origin authentication as well as data integrity. A SHA-1 cryptographic hash function is executed on a the indicum data and the shared secret key to construct the HMAC code.

4.2 PSD Administrator Role

4.2.1 General Information

The PSD Administrator manages non-key data used to set internal parameters and settings in the PSD.

4.2.2 Acting Individual or Organization

The Postage by Phone system and the Manufacturing Systems are the only individuals who act as the PSD Administrator.

4.2.3 Services

4.2.3.1 Disable PSD

The command shall place the PSD in the Disabled state. No indicia shall be generated and no postage value downloads shall be performed.

4.2.3.2 Enable PSD

This command may transition the PSD from the Disabled state to the Serial Number Locked state. It shall be valid only if no other lockout states are set.

4.2.3.3 Reinitialize PSD

Immediately before this command is issued, the Get Challenge command function must have been executed. When the Host instructs the PSD to reinitialize, the file system shall be cleared. Except for the Key encryption key, software and transport crypto keys, all keys shall be cleared. The PSD shall be placed in the Transport Mode by the command. The command will not be accepted if there are any funds in the PSD.

4.2.4 Keys

4.2.4.1 Certificate Key

The certificate key is used when any non-key data downloaded to the PSD must be signed for verification. The identity of the PSD administrator is verified using the certificate Key certificate.

DOMAIN_INF_AUTH_CERTIFICATE_DSA1024_PUBLIC

4.3 Printhead Administrator Role

4.3.1 General Information

The Printhead Administrator is in charge of downloading information used in conjunction with the Printhead such as postage critical and non-critical graphics bit-maps.

Keys are used to verify downloaded data and to sign messages to the printhead. The PSD verifies the signature on the downloaded data using the appropriate key in order to authenticate that the data came from the printhead administrator.

4.3.2 Acting Individual or Organization

The product line server security coprocessor is the only entity authorized to sign graphics data that will be printed.

4.3.3 Services

4.3.3.1 Verify and Sign Hash

The PSD shall be instructed to verify the signature on the cryptographic hash that is in a signed data record and then to re-sign the hash with the PSD key and output a new SDR. The embedded program call is for the VerifySignature service.

After the verification, the crypto hash shall be re-signed with the PSD private key and then sent back to the Host. The middle layer command program call is the SignData service.

4.3.4 Keys

4.3.4.1 PSD Key

This public-private key pair is used to sign verified graphic hash records for transmission to the printhead.

UNIQUE_PSD_AUTH_IBI_DSA1024_PRIVATE

4.3.4.2 Non Postage Critical Graphic Key

This key is used to verify an incoming non postage critical graphic hash.

DOMAIN_INF_AUTH_CONF_NPCG_DSA1024_PUBLIC

4.3.4.3 Postage Critical Graphics Key

This key is used to verify an incoming postage critical graphic hash.

DOMAIN_INF_AUTH_PCG_DSA1024_PUBLIC

4.4 Financial Officer

4.4.1 General Information

Funds transfer into and out of the PSD are the responsibility of the Financial Officer. This corresponds to the “User” role as identified by FIPS 140-2.

4.4.2 Acting Individual or Organization

Postage by Phone is the Financial Officer.

4.4.3 Services

4.4.3.1 Create Postage Value Refund Request

This command requests a return of funds from the PSD to the PbP account.

4.4.3.2 Generate Postage Value Download Request

This command shall initiate a Postage Value Download (PVD) request.

4.4.3.3 Load Postal Configuration Data

For the PSD to load configuration information that is specific for the postal application, it must receive this command. The specific Postal Configuration Data shall be contained in a signed data record (SDR). The data will vary among PCNs. In some configurations, the PSD cannot dispense postage, unless these data items are loaded. Typically, the command will be used immediately prior to the Authorize PSD command.

4.4.3.4 Perform Postage Value Download

To perform a download of postage value (PVD), the Host sends the message to the PSD, which shall verify the signature on the incoming signed data record. The SDR can be an IBI PVD record or it can be an IBI PVD Error record.

4.4.3.5 Perform Postage Value Refund

This command shall be required to complete the postage refunding operation that was started with the Create Postage Value Refund Request command. The PSD shall verify the signature of the included SDR. If the signature and the content of the SDR are valid, then the PSD shall reset the descending register to zero and remain in the lockout state. If the Infrastructure Data Center status orders that the refund be aborted, the PSD shall not reset the descending register to zero and shall exit the lockout state.

4.4.3.6 Process Audit Results

The PCN parameter settings shall cause the PSD to clear inspection lockout or to reset the next inspection due date in response to this command. The Prepare Audit Record command must immediately precede this command in order for the PSD to process the signed data record that is returned from the Pitney Bowes Infrastructure Data Center.

4.4.3.7 Prepare Audit Record

At the time that a PSD is manufactured, the Message Definition File shall be created and written with information that is appropriate for a specific country. The PSD shall use the data in this file to prepare a signed Audit Record, in response to this command from the Host. Typical data included will be the PSD Serial Number, ascending register, descending register, control sum, piece count, software version, configuration revision SMR, error data, PSD date and time (local), PSD PCN and the last inspection date.

4.4.4 Keys

4.4.4.1 PSD Private Key

This key is used to verify PVD and Refund responses

UNIQUE_PSD_AUTH_IBI_DSA1024_PRIVATE

4.4.4.2 PVD Key

The PVD key is used by the infrastructure to sign postage value downloads and audit requests. The identity of the financial officer is verified using the PVD Key certificate.

DOMAIN_INF_AUTH_PVD_DSA1024_PUBLIC

4.5 Customer Role

4.5.1 Acting Individual or Organization

This role performed services that are done on behalf of another role, and require other authorized transactions to occur in conjunction with the service being invoked.

4.5.2 Services

4.5.2.1 Indicium / Debit Services

4.5.2.1.1 Authenticate to PHC

The PSD shall be instructed by the Host to conduct a joint authentication between itself and the Print Head Controller (PHC).

Either of the two following methods will be accepted by the PSD for PHC authentication

1. The input shall be a nonce word and a signed data record (SDR), which shall include the print head ID, type and mailing machine base Product Code Number (PCN). The DOMAIN_INF_AUTH_VENDOR_DSA1024_PUBLIC key is used by the PSD to authenticate the record. This record is signed by the infrastructure and the signed record is installed into the PHC during manufacturing. Verification of the record is done by the PSD.

Or

2. The input shall be the Print Head serial number used as an initial vector in session piece signatures, and a data record, which shall include the print head ID, type and mailing machine base PCN.

4.5.2.1.2 Complete Debit

Completes the update of all information based on the last perform debit request.

4.5.2.1.3 Initialize Printer Session

This instructs the PSD to use the input session seed and generate session keys for the accounting debits that will follow. The PSD shall respond with the SDR for the Session Parameter.

4.5.2.1.4 Non Secure Print Head Id Data

This service is used by the Authenticate to PHC service as part of one of the optional authentication procedures.

4.5.2.1.5 Perform Debit

Based upon the Pre-Debit command, cryptographic functions that were required and that were not computed shall be completed in accordance with the PCN parameter settings. The PSD shall deduct the postage value in the Pre-Debit message from the Descending register and shall update the Ascending Register, Control Sum and Piece Count registers appropriately. These functions shall only be performed in Full Postal state. The indicia record signed with the UNIQUE_PSD_AUTH_IBI_DSA1024_PRIVATE key in the United States or the UNIQUE_PSD_AUTH_IBI_ECDSA_FP160_PRIVATE key in Canada shall be output.

4.5.2.1.6 Pre Debit

Based upon the PCN parameter setting, the invocation of this command shall cause the required cryptographic calculations to be made in preparation for use in the upcoming accounting debit. Typical data included in the command are Postage Value, Mail Date and Rate Category. However, these are variables that are PCN specific. At the time that the PSD is manufactured, these data items are defined in the Message Definition File. This command shall only function in Full Postal state.

4.5.2.2 Miscellaneous Services

4.5.2.2.1 Get Challenge

The Host shall instruct the PSD to output an eight byte nonce (random number), which shall be used in a subsequent command that requires that nonce word for authentication. This is always done in conjunction with another authorized transaction, and is then considered as being done on behalf of any role that requires a nonce value.

4.5.2.2.2 Toggle Out of Service Lockout

This command shall toggle the PSD to enter or exit its Out of Service Lockout state. This is done on behalf of the PSD Administrator to manage the PSD State.

4.5.3 Keys

4.5.3.1 Vendor Key

DOMAIN_INF_AUTH_VENDOR_DSA1024_PUBLIC

4.5.3.2 PSD Key

1. PSD IBI Private Key: This is a DSA or ECDSA private key used to sign postal indicium and inspection certificates produced by the module.
2. PSD IBI Public Key: This is a DSA or ECDSA public key used to authenticate IBIP messages produced by the PSD.

Key Name	Owning Role
UNIQUE_PSD_ AUTH_IBI_ DSA1024_PRIVATE	Financical Officer
UNIQUE_PSD_ AUTH_IBI_ DSA1024_PUBLIC	Financical Officer
UNIQUE_PSD_ AUTH_IBI_ECDSA_FP160_PUBLIC	Financical Officer
UNIQUE_PSD_ AUTH_IBI_ECDSA_FP160_PRIVATE	Financical Officer

4.6 No Role User

4.6.1 General Information

Miscellaneous functions that do not require specific authorization because they are permitted to any role are placed in the no role user category. This role is synonomous to an unauthenticated services role.

4.6.2 Acting Individual or Organization

Any individual or organization can invoke these services and get the expected response.

4.6.3 Services

4.6.3.1 Class Services

4.6.3.1.1 Class Support Request

This message is used to determine whether the postal security device supports a particular class of messages. The General Class Support Request Message provides a more time-efficient means of determining the classes of messages that are supported by the PSD, however this message is more space-efficient.

4.6.3.1.2 General Class Support Request

This message is used to get information from the PSD on all supported Message Classes via a single message.

4.6.3.2 Clock Services

4.6.3.2.1 Get Real Time Clock with Offsets

This command shall cause the PSD to return the value of the real time clock with all of the offsets calculated, including the GMT offset and drift correction.

4.6.3.2.2 Get Real Time Clock Value with No Offsets

This command shall return the PSD real time clock value, with no offsets.

4.6.3.2.3 Get Real Time Clock Offsets

This command shall return the PSD clock offset values.

4.6.3.2.4 Set Clock Drift Correction

The Host shall use this command to set the clock drift correction factor into the PSD. The clock drift may be positive or negative. The factor shall be calculated to the real time clock of the PSD, when the local time is used.

4.6.3.2.5 Set GMT Offset

The user may apply time zone and daylight savings time offsets to produce the Greenwich Mean Time (GMT) offset in the PSD, by using this command from the Host.

4.6.3.3 Diagnostic Services

4.6.3.3.1 Perform Diagnostic Test

The command shall cause the PSD to perform the diagnostic test specified in the message. For example, a command is issued that causes the PSD to perform a cryptographic algorithm test.

4.6.3.3.2 Perform Full Diagnostics

The PSD shall perform its full diagnostic routines when the Host issues this command.

4.6.3.4 File System Services

4.6.3.4.1 Get File Attributes

This message causes the PSD to get and output the attributes from a specified file.

4.6.3.4.2 Read Cyclic File

The message causes the PSD to read and output a specified record from a cyclic file.

4.6.3.4.3 Read Linear File

The message causes the PSD to read and output the next record from a linear file.

4.6.3.4.4 Setup cyclic file for read

This message sets up the parameters for a cyclic file so a specified record can be read.

4.6.3.4.5 Write Cyclic File

This message causes the PSD to write the specified record into a cyclic file.

4.6.3.4.6 Write Linear File

This message causes the PSD to write a record into the end of a linear file.

4.6.3.5 Get Key List

The Get Key List message instructs the PSD to return a list of all active keys stored in the PSD.

4.6.3.6 Modify ACK Timeout Request

This command provides a means of modifying the timeout period, prior to the retransmission of an unacknowledged message.

4.6.3.7 Product Code Number (PCN) Request

This message commands the postal security device to return its PCN.

4.6.3.8 Reboot PSD

This service will cause the current session to be closed, the psd rebooted and a new session initialized

4.6.3.9 Set Unsolicited Message Capability Request

This command can tell the PSD whether or not it can send unsolicited messages.

4.6.3.10 Status Services

4.6.3.10.1 Get PSD Status

Most PSD commands are processed by the PSD when it is in its normal idle state. If the PSD is in a state where a specific command is expected (Process Audit Response, for example), this command is used to return the PSD to its idle state. The status information shall include:

- PSD Application level
- Hardware status
- Current PSD Mode
- Current PSD internal state
- Debit cycle counter

The Control Layer software must have been loaded before this command can be used.

4.6.3.10.2 Get PSD Attributes

The Host requires that the PSD identify itself by its attributes. These may include:

- PSN serial number (Indicia #)
- PSD PCN
- PSD software version
- PSD file system version
- Middle Layer firmware version
- Hardware version
- Comet device serial number (Manufacturing Number)

4.6.3.10.3 Get Middle Layer Attributes

The command shall call the PSD to report the attributes of the Middle Layer. The attributes may include:

- Middle Layer Firmware Version

- Hardware Version
- Comet Device Serial Number

4.6.3.10.4 Get Low Level PSD Status

The Host shall get low level PSD status information with this command. The Control Layer does not have to be loaded for this to be a valid command. The status reported may include:

- Hardware status register
- First time hardware status set
- Last time hardware status set
- Total transport authentication failures
- Successive transport authentication failures
- Control Layer loaded indicator
- Debit cycle counter

4.6.4 Keys

none applicable

5 Modes

The internal state machine in the PSD Control layer relates services into Modes that the service is active within. The modes that are functional in this layer are contained in the following list. The Manufacturing Mode is exactly what it says.

The Serial Number Locked Mode is all of normal operation for the life of the PSD. This mode is invoked by the Service "Authorize PSD Key" as shown in the Finite State Model (FSM). Unless an error lockout is entered the device is always in this mode.

All the other modes are error lockout modes that prevent the PSD from operating until the error is cleared (If permitted). The FSM Documentation shows the transition requirements for each of the error modes back to Serial Number Locked Mode or Manufacturing Mode as permitted.

- Manufacturing Mode
- Manuf Challenge Provided
- Disabled Challenge Provided
- Locked Await Authorize
- Locked Challenge Provided
- Locked Awaiting PVD
- Serial Number Locked Mode (Full Postal)
- Hard Fatal Mode
- Soft Fatal
- Inspect Lockout Mode
- Inspect Waiting PVD
- Key Lockout Mode
- AR Lockout Mode
- Refill Failure Lockout Mode
- Out of Service Mode
- Withdrawal Lockout Mode
- Withdrawal Challenge Provided
- Disabled by Data Center Mode
- End of Life Mode

This list is provided for information value to correlate to the FSM documentation.

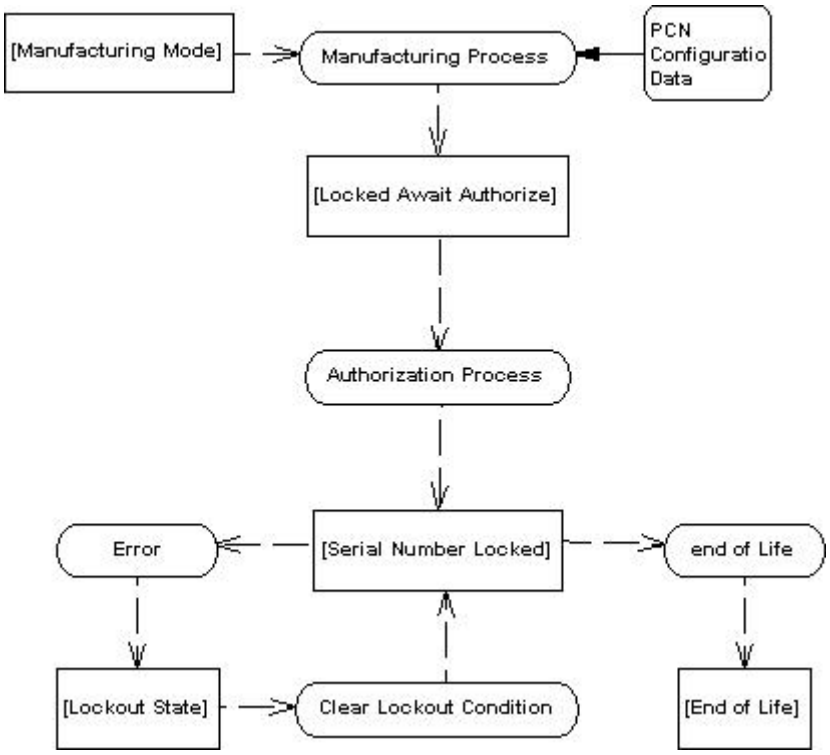


Figure 6 - Simplified State Transition Model

The CM does not exist until the Locked Await Authorize state is reached. From this point on any access that changes state requires authentication to occur.

There are no bypass states in the system.

There are no maintenance states in the system.

There are no safety states in the system.

All time during which the module is not actively processing an individual transaction is an idle state.

Manufacturing and Transport Modes are un-initialized states.

6 Algorithms

The cryptographic module implements the following FIPS approved algorithms in hardware:

- DSA
- ECDSA
- HMAC SHA-1
- pseudo-random number generation
- RSA Signature
- SHA-1
- SkipJack
- TDEA
- TDESMAC

The cryptographic module implements Elliptic Curve DSA (ECDSA) algorithm in mixed hardware and software.

The HMAC algorithm is implemented in software.

No other algorithms are used in the PSD.

6.1 General

The module implements an approved Deterministic RNG (DRNG) per FIPS 186-2. All cryptographic keys generated within the module utilize this DRNG. The module also implements a non-deterministic RNG to seed the approved DRNG.

RSA is used only for key wrapping.

6.2 Hashing Algorithms

SHA-1 is used to hash data for generation of message authentication.

HMAC SHA-1 is used to hash data for generation of message authentication where specifically required in Canadian implementations.

6.3 Encryption /Decryption

OAEP padding is implemented in software for public-key encryption purposes.

Skipjack is used for encrypting and decrypting keys for secure storage

6.4 Signatures & Signature Verification

DSA is implemented in hardware and is used for signing messages and for signature verification purposes.

ECDSA is implemented in software and is used for signing messages and for signature verification purposes.

TDEA is used for message authentication codes (MAC).

6.5 Key Exchange

RSA is implemented in software rather than hardware and is used for encryption and decryption during cryptographic key distribution. It is implemented using the PKCS#1 Ver2.1 message encoding method.

Diffie-Hellman key exchange is used to establish a session key between the PSD and the Infrastructure when CSPs need to be exchanged. The Triple DES session key is used to encrypt the material. The Domain Infrastructure Authentication Certificate public key[2] is used to verify the signature on the payload to ensure authentication of sending entity.

6.6 Strength of Algorithms

Based on # of protected bits in key or signature, the probability is 1 in 2^x tries where x is the number of protected bits.

The algorithms in the PSD provide 80 protected bits or a probability of random success of 1 in 1,208,925,819,614,630,000,000,000 tries.

The system can execute 9.6 transactions per second therefore the probability of a success in 1 minute is 1 in 2,098,829,547,942,060,000,000 tries.

[2] As per MM97010b_master

7 Self-Test

The PSD provides a series of power-on self-tests of the module prior to execution of the first service request.

7.1 MYK82A Internal Self tests

The MYK82A Cryptograph Processor performs internal self tests. These may be invoked by a power on or reset condition, or by the ARM7TDMI processor executing an SWI #0xF00024 instruction (SELFTEST command) under program control.

These tests are performed in ARM7 Supervisor Mode.

7.1.1 SRAM Self test

This test is intended to thoroughly verify correct operation of the MYK82A's internal SRAM.

7.1.2 Multiplier Self test

This test commands the multiplier logic component to perform an A*A (128 x 128 bit) multiply operation, and compares the numerical result with a Known Answer. Results of the SRAM self test are used as the multiplicands, with the Known Answer residing in the SRAM, a copy of the ROM value. In addition to testing the multiplier's #MULT operation, the #SQRFASTMULT logic is run to a known answer. The inclusion of both tests assures the multiplier is fully operational in all modes.

7.1.3 BRAM Self Test

This test is intended to thoroughly verify correct operation of the MYK82A's battery-backed RAM (BRAM). Note that this self test is identical to the SRAM self test except that the contents of BRAM are preserved where SRAM contents are not.

7.1.4 ROM Self-Test

This self test is intended to generate and check a checksum against the contents of the MYK82A's internal Read-Only Memory (ROM).

7.1.5 BRAM Hash Test

This self test performs a hash on the contents of BRAM to verify their authenticity (or that BRAM hasn't yet been programmed, or is corrupt). All except for the final 5 words in the BRAM are hashed using SHA-1. If the 160-bit hash value produced is identical to the final 5 words of BRAM, the test passes. If not, the test fails.

7.1.6 Middle Layer Verification

A DSA signature is used to verify that the Middle Layer is valid.

7.1.7 Control Layer Verification

A hash is generated and compared to a stored value to verify that the Control Layer is valid.

7.2 Cryptographic Function Self Tests

After successful completion of the PSD internal self-tests and prior to execution of the first service request the module shall perform the following additional-tests:

- DES known answer test
- DSS pairwise consistency test
- ECDSA pairwise consistency Test
- HMAC SHA-1 Known Answer Test
- RSA Signature known answer test
- SHA-1-HMAC known answer test
- Skipjack known answer test
- TDES known answer test
- TDESMAC known answer test

8 Security Rules

8.1 General

This section documents the security rules enforced by the cryptographic module to implement the security requirements of this module.

- The CM shall not process more than one request at a time (i.e. single threaded).

  While processing a transaction, prior to returning a response, the PSD will ignore all other inputs to the PSD. No output is performed until the transaction is completed, and the only output is the transaction response.

- The CM shall validate identities using digital signatures to protect authentication data from unauthorized disclosure, modification, or substitution.:

Table 2 - Entity Authentication Table

Identity	Signature	Algorithm	Hash	Bit Strength
Crypto Officer	DSS 1024	DSA	SHA-1	80
PSD Administrator	DSS 1024	DSA	SHA-1	80
Printhead Administrator	DSS 1024	DSA	SHA-1	80
Manufacturing Officer	DSS 1024	DSA	SHA-1	80
Financial Officer	DSS 1024	DSA	SHA-1	80

- All keys generated in the module shall have 80 bits of strength.
- All methods of key generation shall be at least as strong as the key being generated.
- All methods of key establishment shall be at least as strong as the key being generated.
- Signed Digital indicium data shall not be output unless the proper accounting has been performed.
- The CM shall sign digital indicium data using an USPS approved signature method as defined in the IBIP specifications.
- The CM shall not provide a bypass role where plaintext information is just passed through the module.

8.2 Keys

- The cryptographic module (CM) shall not output any secret or private key in plaintext form.
- The CM shall not accept any secret or private key in plaintext form.
- There shall be no seed keys entered into the system.
- There shall be no manual entry of keys into the system.
- ♦ There shall be no entry or output of split keys from the system.

- There shall be no key archiving
- Keys shall be either generated or entered into the system through valid processes. (i.e. Load Secret Key, etc.)
- Only those keys necessary for the domain specified by the PCN shall be loaded during manufacturing or generated during operation.

8.3 Physical Security

- Upon detecting a tamper event, the CM shall execute a zeroize activity that totally eliminates its ability to perform any operation requiring authentication
- Upon detecting a tamper event, the CM shall abort any transaction in process.

9 Items Protected by the module

The module shall protect two types of data items: Funds Relevant Data Items (FRDIs) and Critical Security Parameters (CSPs).

9.1 Critical Security Parameters (CSP)

9.1.1 Definition of CSPs

The module's stored CSPs consist of keys and other information necessary to the management of the security protocols. Secret and private keys are stored within the cryptographic module boundary. The keys are:

Table 3 - Critical Security Parameter Table

Key Name	Owning Role	Short Name
UNIQUE_PSD_PRIVACY_KEY_ENCRYPTION_SKIPJACK_SECRET	Crypto Officer	KUPsdP-KYSJ[3]
NEW_KEY (Generic Triple-DES Key)	Crypto Officer	N/A
The following are only used for USA PCNs		
UNIQUE_PSD_ AUTH_IBI_ DSA1024_PRIVATE	User	P'UPsdA-IBD
UNIQUE_PSD_PRIVACY_KEY_EXCHANGE_RSA1024_PRIVATE	Crypto Officer	P'UPsdP-KER
The following are only used for Canadian PCNs		
UNIQUE_PSD_ AUTH_IBI_ECDSA_FP160_PRIVATE	User	P'UPsdA-IBE1
SESSION_PSD_PRIVACY_KEY_EXCHANGE_DH1024_PRIVATE	Crypto Officer	P'UPsdP-KEDH
SESSION_PSD_PRIVACY_KEY_EXCHANGE_3DES2_CBC_SECRET	Crypto Officer	KSPsdP-KECB
UNIQUE_PSD_AUTH_INDICIA_DATA_HMAC160_SECRET	User	KUPsdA-IDHM

A 'Real Time Clock' is required and must be capable of being set securely. It is being used to manage time-outs and function suspension and should be considered an CSP.

[3] The Key Encryption Key is stored as plaintext in a BRAM and is zeroized in the event of a detected tamper, or by loss of power to the BRAM. Loss of this key invalidates all private and secret keys in the system because they cannot be decrypted from their stored encrypted condition.

GMT Offset is a parameter to determine the relationship between local time and GMT.

Clock Drift Correction is a parameter used to adjust the clock for drift within specified limits.

The PCN is used by manufacturing to determine security protocols for the system, as well as by other systems to determine the correct domain in order to select the correct keys for authorizing specific services.

A special initial vector 'key' is provided by the PHC during Authentication to PHC and is used to derive the secret key chain used to encrypt the indicium records.

9.1.2 Definition of CSP Modes of Access

1. Generate PSD Key: This operation generates and stores a new IBIP key pair for a PSD.
2. Authorize PSD Key approves of use of a newly generated IBIP key pair for a PSD.
3. Verify UNIQUE_PSD_AUTH_IBI_DSA1024_PUBLIC Signature : This operation uses UNIQUE_PSD_AUTH_IBI_DSA1024_PUBLIC Key to verify the identity of the PB security administrator (Secure Configuration or Financial Trusted Coprocessor) requesting a service.
4. Verify DOMAIN_INF_AUTH_PCG_DSA1024_PUBLIC Signature : This operation uses DOMAIN_INF_AUTH_PCG_DSA1024_PUBLIC Key to verify the identity of the PB security administrator (Secure Printhead Trusted Coprocessor) requesting a service.
5. Verify DOMAIN_INF_CONF_NPCG_DSA1024_PUBLIC Signature : This operation uses DOMAIN_INF_CONF_NPCG_DSA1024_PUBLIC Key to verify the identity of the PB security administrator (SSPS Graphics System) requesting a service.
6. Decrypt Unique Comet Confidential Key Exchange Key Encrypted Data: This operation uses the Unique Comet Confidential Key Exchange Private Key to decrypt session initialization parameters from the Comet PHC.
7. Generate Key Exchange Key
8. Generate PSD Key
9. Get Key Exchange Key
10. Get PSD Certificate
11. Get Public Key Data
12. Load Public Key
13. Load Root Key
14. Load Secret Key
15. Verify Key
16. Set Clock Drift Correction
17. Set GMT Offset
18. Set Real Time Clock
19. Get Real Time Clock Offsets
20. Get Real Time Clock Value with No Offsets

21. Get Real Time Clock with Offsets
22. Delete all keys and control layer

In addition, a certificate can be produced by the module to provide evidence that a debit has occurred or to certify the state of the registers contained in the module. The certificate is produced by digitally preparing an output message using the UNIQUE_PSD_AUTH_IBI_DSA1024_PRIVATE Key.

9.2 Funds Relevant Data Items

9.2.1 Definition of FRDIs

FRDIs are data items whose authenticity and integrity are critical to the protection of postage funds, but which are not CSPs and should not be zeroized. In Comet, all FRDIs are stored in nonvolatile memory in the PSD.

9.2.2 FRDIs Stored in the PSD

1. Indicia Serial Number is the identification number registered with the USPS for the meter license.
2. Ascending Register. This register contains the total amount of funds spent over the lifetime of the module.
3. Descending Register: This register contains the amount of funds currently available in the module.
4. Control Sum. This register contains the total amount of funds credited to the module over the lifetime of the module. The Control Sum must equal the sum of the Ascending Register and the Descending Register values.
5. PSD Piece Count: is the number of indicia plus the number of correction indicia dispensed by the PSD.

9.2.3 Definition of FRDI Modes of Access

1. Get PSD Attributes will return a defined set of attributes based on PCN
2. Get PSD Status will return a defined set of attributes based on PCN
3. Load Postal Config Data is required prior to accessing any of the FRDI's.
4. Perform Debit: This operation uses the PSD IBIP private key to sign an IBIP message from the PSD. This will adjust the descending register, ascending register and piece count.
5. Perform Postage Value download. This will adjust the descending register and the control sum.
6. Perform Postage Value Refund. This will adjust the descending register and the control sum.
7. Prepare Audit Record will prepare the IBI audit information as a message.
8. Process Audit Results
9. Reinitialize PSD will zero out all FRDI's

10 Mitigation of Attack Policy

10.1 Other Attacks

No attacks are specifically guarded against.

11 Nomenclature

11.1 Abbreviations

List and expand all abbreviations used in text here.

3DES	Triple Data Encryption Standard
ANSI	American National Standards Institute
CL	Control Layer
CM	Cryptographic Module
CSP	Critical Security Parameter
DEA	Data Encryption algorithm
DES	Data Encryption Standard
DSA	Digital Signature Algorithm
DSS	Digital Signature Standards
ECDSA	Elliptic Curve Digital Signature Algorithm
EFP	Environmental Failure Protection
EFT	Environmental Failure Testing
EMC	Electromagnetic Compatibility
EMI	Electromagnetic interference
FIPS	Federal Information Processing Standards
FRDI	Funds relevant data items
HMAC	A hashing algorithm used for message authentication
IBI	Information Based Indicia
ISO	International Standards Organization
MAC	Message Authentication Codes
ML	Middle Layer
NVM	Nonvolatile Memory
OAEP	Optimal Asymetric Encryption Padding
PB	Pitney Bowes
PbP	Postage by Phone
PCN	Product Code Number
PHC	Print Head Controller
PKCS	Public Key Cryptography Systems
PSD	Postal Security Device
PSN	Postal Serial Number (Indica Serial Number)

PVD	Postage Value download
RSA	Rivest, Shamir, And Aldeman
SDR	Signed Data Record
SHA	Secure Hash Algorithm
SKR	Signed Key Record
TDEA	Triple Data Encryption Algorithm
UIC	User Interface Controller

11.2 Glossary

Diffie-Hellman	A process where two secure facilities may establish a shared secret key using unsecured communications.
Key Establishment	There are three methods for the establishment of a key within the PSD. These are 1. internal generation, 2. load from external source. 3. Diffie-Hellman process.
Key Transaction Processor	The Key Transaction Processor or KTP is a master database system that contains and manages key material in encrypted data records. It is the repository for all Meter related Keys at Pitney Bowes and is the start or end point of a large number of secure transactions involving the distribution of keys.
Secure Configuration Trusted Coprocessor	The secure box used in conjunction with Postage by Phone for configuration management
Secure Financial Trusted Coprocessor	The secure box used in conjunction with Postage by Phone for funds management
Secure Manufacturing Trusted Coprocessor	The secure box used in manufacturing a PSD

12 Tabular Appendices

12.1 Strength of Authentication

Table 4 - Strength of Authentication Table

Authentication Mechanism	Algorithm	Hash	Bit Strength
DSS 1024	DSA	SHA-1	80
Diffie-Hellman 1024	DH1024		80

12.2 Services Authorized for Roles

The following is a complete list of all control layer services and their associated roles and CSP's or Public Keys.

Note: Zeroization in the event of a tamper detection is not considered a service, but is implemented in the hardware. It permanently makes the system unusable as a PSD. In operation, the service 'Reinitialize PSD' erases all FRDI's and places the PSD back into the manufacturing mode

Table 5 - Crypto Officer Services

Service	Role	CSP's and Public Keys
Authorize PSD Key	Crypto Officer	DOMAIN_INF_AUTH_CERTIFICATE_DSA1024_PUBLIC
Delete All Keys and control layer[4]	Crypto Officer	DOMAIN_INF_AUTH_CERTIFICATE_DSA1024_PUBLIC
Generate Key Exchange Key	Crypto Officer	UNIQUE_PSD_PRIVACY_KEY_EXCHANGE_RSA1024_PRIVATE UNIQUE_PSD_PRIVACY_KEY_EXCHANGE_RSA1024_PUBLIC SESSION_PSD_PRIVACY_KEY_EXCHANGE_3DES2_CBC_SECRET SESSION_PSD_PRIVACY_KEY_EXCHANGE_DH1024_PRIVATE SESSION_PSD_PRIVACY_KEY_EXCHANGE_DH1024_PUBLIC DOMAIN_INF_OPERATION_COMMON_PARAM_DH1024_PARAMETERS

- [4] This identifies the key used to authorize the service. The service does not use the keys it destroys, and therefore they are not listed here.

Service	Role	CSP's and Public Keys
Generate PSD Key	Crypto Officer	UNIQUE_PSD_AUTH_IBI_DSA1024_PRIVATE UNIQUE_PSD_AUTH_IBI_DSA1024_PUBLIC UNIQUE_PSD_AUTH_IBI_ECDSA_FP160_PRIVATE UNIQUE_PSD_ AUTH_IBI_ECDSA_FP160_PUBLIC
Get Certificate Key	Crypto Officer	UNIQUE_PSD_PRIVACY_KEY_EXCHANGE_RSA1024_PRIVATE
Get Key Exchange Key[5]	Crypto Officer	UNIQUE_PSD_PRIVACY_KEY_EXCHANGE_RSA1024_PUBLIC
Get PSD Certificate[6]	Crypto Officer	DOMAIN_INF_AUTH_CERTIFICATE_DSA1024_PUBLIC
Get Public Key Data	Crypto Officer	All Public Keys
Load Certificate Key	Crypto Officer	UNIQUE_PSD_PRIVACY_KEY_EXCHANGE_RSA1024_PRIVATE
Load Public Key	Crypto Officer	Any Public Key
Load Secret Key	Crypto Officer	Key Encrypted with (UNIQUE_PSD_PRIVACY_KEY_EXCHANGE_RSA1024_PRIVATE or SESSION_PSD_PRIVACY_KEY_EXCHANGE_3DES2_CBC_SECRET) And any Secret Key Signature is verified with DOMAIN_INF_AUTH_CERTIFICATE_DSA1024_PUBLIC
Revoke Key	Crypto Officer	UNIQUE_PSD_PRIVACY_KEY_EXCHANGE_RSA1024_PRIVATE

[5] The Diffie-Hellman process creates a secret key that cannot be exposed with a service used to get a Public key

[6] There is not an ECDSA version of this key

Table 6 - Financial Officer Services

Service	Role	CSP
Create Postage Value Refund Request	Financial Officer	DOMAIN_INF_AUTH_PVD_DSA1024_PUBLIC
Generate Postage Value Download Request	Financial Officer	DOMAIN_INF_AUTH_PVD_DSA1024_PUBLIC
Load Postal Config Data	Financial Officer	DOMAIN_INF_AUTH_PVD_DSA1024_PUBLIC
Perform Postage Value Download	Financial Officer	DOMAIN_INF_AUTH_PVD_DSA1024_PUBLIC
Perform Postage Value Refund	Financial Officer	DOMAIN_INF_AUTH_PVD_DSA1024_PUBLIC
Process Audit Results	Financial Officer	DOMAIN_INF_AUTH_PVD_DSA1024_PUBLIC
Prepare Audit Record	Financial Officer	UNIQUE_PSD_AUTH_IBI_DSA1024_PRIVATE Or UNIQUE_PSD_ AUTH_IBI_ECDSA_FP160_PRIVATE

Table 7 - Printhead Administrator Services

Service	Role	CSP
Verify and Sign Hash	Printhead Administrator	DOMAIN_INF_AUTH_CONF_NPCG_DSA1024_PUBLIC DOMAIN_INF_AUTH_CONF_PCG_DSA1024_PUBLIC UNIQUE_PSD_AUTH_IBI_DSA1024_PRIVATE

Table 8 - PSD Administrator Services

Service	Role	CSP
Disable PSD	PSD Administrator	DOMAIN_INF_AUTH_CERTIFICATE_DSA1024_PUBLIC
Enable PSD	PSD Administrator	DOMAIN_INF_AUTH_CERTIFICATE_DSA1024_PUBLIC
Reinitialize PSD	PSD Administrator	DOMAIN_INF_AUTH_CERTIFICATE_DSA1024_PUBLIC

Table 9 - Customer Services

Service	Role	CSP
Authenticate to PHC	Customer	DOMAIN_INF_AUTH_VENDOR_DSA1024_PUBLIC UNIQUE_PSD_AUTH_IBI_DSA1024_PRIVATE Or UNIQUE_PSD_ AUTH_IBI_ECDSA_FP160_PRIVATE
Complete Debit	Customer	UNIQUE_PSD_AUTH_IBI_DSA1024_PRIVATE Or UNIQUE_PSD_ AUTH_IBI_ECDSA_FP160_PRIVATE
Get Challenge	Customer	none
Initialize Printer Session	Customer	UNIQUE_PSD_AUTH_IBI_DSA1024_PRIVATE Or UNIQUE_PSD_ AUTH_IBI_ECDSA_FP160_PRIVATE
Perform Debit	Customer	UNIQUE_PSD_AUTH_IBI_DSA1024_PRIVATE or UNIQUE_PSD_AUTH_IBI_ECDSA_FP160_PRIVATE (In Canada only UNIQUE_PSD_AUTH_INDICIA_DATA_HMAC160_SECRET)
Pre Debit	Customer	UNIQUE_PSD_AUTH_IBI_DSA1024_PRIVATE
Non Secure Printhead ID Data	Customer	None
Toggle Service Lockout	Customer	None

Table 10 - No Role User Services

The following services are unauthenticated services.

Service	Role	CSP
Class Support Request	No Role User	None
General Class Support Request	No Role User	None
Get file attributes	No Role User	None
Get Key List	No Role User	none
Get Low Level PSD Status	No Role User	None

Service	Role	CSP
Get Middle Layer Attributes	No Role User	None
Get PSD Attributes	No Role User	None
Get PSD Status	No Role User	None
Get Real Time Clock Offsets	No Role User	None
Get Real Time Clock Value with No Offsets	No Role User	None
Get Real Time Clock with Offsets	No Role User	None
Modify ACK Timeout Request	No Role User	None
PCN Request	No Role User	none
Perform Diagnostic Test	No Role User	None
Perform Full Diagnostics	No Role User	None
Read cyclic file	No Role User	None
Read linear file	No Role User	None
Reboot PSD	No Role User	none
Set Clock Drift Correction	No Role User	None
Set GMT Offset	No Role User	None
Set Unsolicited Msg Capability Request	No Role User	None
Setup cyclic file for read	No Role User	None
Write cyclic file	No Role User	None
Write linear file	No Role User	None

12.3 Inspection/Testing of Physical Security Mechanisms

Table 11 - Physical Inspection Requirements Table

Physical Security Mechanism	Recommended Frequency of Inspection/Test	Inspection/Test Guidance Details
Tamper Barrier	n/a	periodic remote data communications
Battery Power	Continuous	Internal SW

Physical Security Mechanism	Recommended Frequency of Inspection/Test	Inspection/Test Guidance Details
Temperature Sensing	n/a	Proof of Design Test, Manufacturing Sampling
Voltage Sensing	n/a	Proof of Design Test, Manufacturing Sampling

12.4 Mitigation of Other Attacks

Table 12 - Attack Mitigation Table

Other Attacks	Mitigation Mechanism	Specific Limitations

13 Change History

Table 13 - Change History Table

Rev	EN	Section	Description	By	Date
A	VAP000001	All	Initial Release	D. Collings	5/8/2001
B	DPP000237	9,13	Removed Proprietary info and Mfg info	D. Collings	7/12/2001
		5	Added Print Controller Role	D. Collings	7/15/2001
		12	Clarified Printer Session Derived Key Added Key Name Reference Section	D. Collings	10/29/2001
C	DPP000455	4, 6.3	removed references to manufacturing officer	D. Collings	11/12/2001
D	DPP000600		Update per comments	D. Collings	12/10/2001
E	DPP000671	5.3	Change X9.31 to PKCS#1	D Clark	2/27/2002
F	DPP001125	7	Added	D Collings	8/15/2002
		4.1.4.6	New Key definition	D Collings	8/15/2002
G	DPP001162		No change	D Collings	9/3/2002
H	DPP001201	9.1	Changed ‘Digital’ to ‘Data’ in 3DES,DES,DEA,	D. Collings	9/19/2002
		4.1.3.3	Changed ‘public key for RSA encryption’ to ‘public portion of Key Exchange Key’	D. Collings	9/19/2002
		4.1.3.6	Removed ‘crypto’ from sentence	D. Collings	9/19/2002
J	DPP001420		Revised to meet FIPS 140-2 Requirements	D Collings	1/30/2003
K	NR		Clarified usage of HMAC	D Collings	2/24/2003
			Clarified usage of Key Exchange Key service	D Collings	2/24/2003
		12.6	Corrected name of VENDOR_SOFTWARE key	D. Collings	3/7/2003
L	NR	Multiple	Corrected based on review by Infogard	D. Collings	3/14/2003

Rev	EN	Section	Description	By	Date
M	NR	6.5	Replaced root key with certificate key Added footnote ref on Certificate Key in 6.5 Added HMAC key to Debit function in table 9 Added index to document	D. Collings	3/17/2003
N	NR	9.1.1	Added RSA KEK to Table	D Collings	3/18/2003
		4.1.4.4	Added RSA Private Key to USA		
		Several	Changed ECDSA160 to ECDSA_FP160		
P	DPP001509		Per Email from Infogard 3/19.2003	D Collings	3/20/2003
S	CO06165	Several	Updates per request of NIST	D. Crowe	11/18/2004
T	CO06645	4.4.1, 6.4	Updates per request of NIST	D. Crowe	12/17/2004