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payShield® 10K

Console Guide

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Contents

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1 Introduction

This guide contains all the details for the payShield 10K Console Commands. Thales recommends that payShield Manager is used to manage payShield 10K however the Console Commands are still provided as an alternative. The Console Commands can be accessed via the Console connected directly to payShield 10K, or by using the Virtual Console in payShield Manager. When using the Virtual Console please note that several Console Commands are not available.

The Console Commands are listed alphabetically in Section 2 and by function in Section 3 for easy reference.

2 Console Commands – Listed Alphabetically

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4 Configuration Commands

The payShield 10K provides the following console commands to support configuration operations:

Reset to Factory Settings (RESET)

Variant ☑		Key Block ☑
Online ☒	Offline ☒	Secure ☑
Authorization: **Not required**		

Command: **RESET**

Function: Returns the HSM to the state it was in when it was shipped from the factory, so that it can be securely taken out of service – e.g. for return to Thales for repair.
Any configuration changes (including port settings) that the customer has applied will be reversed, and any customer data and logs will be erased.
If the HSM is to be returned (e.g. after it has been repaired), a record of all the settings should be made before using this command such that the settings can be re-applied after the HSM's return.
This command also reports whether the HSM is currently configured as it left the factory.

Authorization:
- Authorization is not required.
- The HSM must be in the secure state.

Inputs:
- Confirmation that Reset is required.

Outputs:
- Whether HSM is currently in its factory default state.
- Confirmation of Reset.

Notes:
- This utility cannot reset firmware or licenses installed on the HSM. Therefore, after use of this facility, the HSM will still have the most recently installed firmware and license – which may be different from the firmware and license when the HSM was shipped from the factory.
- At the end of the reset process, the payShield 10K will automatically perform a restart. If the console does not display correctly after this, the payShield 10K should be restarted manually. Turn the unit off and then back on.

Example 1:

```
Secure> RESET <Return>

Reset HSM to factory settings? [Y/N]: Y <Return>

The unit is currently in its factory default state: NO

Resetting the unit will remove all customer data,
including logs, port settings, keys, etc.  This may cause
the console to stop functioning.

This operation should only be performed if this unit is
being
taken out of normal operation.

Do you want to reset to the factory default settings?
[Y/N]: Y <Return>

You selected Yes; please confirm to Proceed with reset?
[Y/N]: Y <Return>

Return to factory default state complete

The HSM will now reboot automatically. This console is
exiting due to: Terminated
```

Example 2:

```
Secure> RESET <Return>

Reset HSM to factory settings? [Y/N]: Y <Return>
The unit is currently in its factory default state: YES

Resetting the unit will remove all customer data,
including logs, port settings, keys, etc.  This may cause
the console to stop functioning.

This operation should only be performed if this unit is
being
taken out of normal operation.

Do you want to reset to the factory default settings?
[Y/N]: N <Return>

Secure>
```

Upload Software and Licenses (UPLOAD)

Variant ☑		Key Block ☑
Online ☒	Offline ☒	Secure ☑
Authorization: **Not required**		

Command: **UPLOAD**

Function: With this command, you can upload new software and new licenses from the console.

Notes: The software /license must be provided on a suitable USB memory stick inserted into the USB-A socket on the rear of the payShield 10K.

Authorization:
- Authorization is not required.
- The HSM must be in the secure state.

Inputs:
- New software load is available or new license is available.

Outputs:
- The software/license successfully loads.

Errors
- Invalid Entry
- There are no License files available

Example 1:

```
Secure> UPLOAD <Return>

Please select one of the following options:

1) Software update

2) Install new license

Your selection: 1 <Return>

This operation will terminate your session and reboot the

payShield. Do you want to proceed? [Y/N]: Y <Return>

Attached USB Mass storage devices:

Ultra USB 3.0

The following update files are available:

1) ps10k_update_1.pti

2) ps10k_update_2.pti

Your selection (choose 0 to exit): 1 <Return>

The following update will be applied: ps10k_update_1.pti

Continue with update? [Y/N]: Y <Return>

Obtaining update package information , please wait...

***** New HSM software is currently being installed.
*****

***** Please do not remove power from the HSM. *****

***** Validating update package *****

***** Installing update package *****

***** New HSM software has been successfully installed.
*****

***** New HSM Software has been successfully installed.
*****

***** Unit will now reboot automatically. *****

Secure>
```

Example 2:

```
Secure> UPLOAD <Return>

Please select one of the following options:
1) Software update
2) Install new license
Your selection: 2 <Return>

Attached USB Mass storage devices:
Ultra USB 3.0

The following License files are available:
1)      C4665271228Q.licence
Your selection: 1 <Return>

Are you sure you want to install license
C4665271228Q.licence? [Y/N]: Y <Return>

***** New HSM License is currently being installed. *****
***** Please do not remove power from the HSM. *****


***** New HSM License has been successfully installed. *****
```

Example 3

Configure Commands (CONFIGCMDS)

Variant ☑		Key Block ☑
Online ☑	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **CONFIGCMDS**

Function: To view the list of enabled host and console commands, and (if in secure state) to enable or disable host and console commands. All available commands are disabled by default.
Commands are enabled or disabled using the following syntax:
[+ or -] [C or H] [<Command Code>]
+ indicates that the specified command should be enabled.
- indicates that the specified command should be disabled.
C indicates that <Command Code> is a Console command.
H indicates that <Command Code> is a Host command.
<Command Code> is the command code to be enabled or disabled, and may contain the wildcard character '*'. If the first character is '*', then the second character is absent, and this matches all command codes of the specified type. If the second character is '*', then this matches all command codes of the specified type starting with the given first character.

Authorization: The HSM must be in the secure state to enable/disable host and console commands. The current status of enablement of host and console commands can be viewed in any state.

Inputs:
- List of host commands to enable.
- List of console commands to enable.
- List of host commands to disable.
- List of console commands to disable.

Outputs:
- Complete list of enabled host commands.
- Complete list of enabled console commands.

Errors:
- Invalid entry

Notes:
- When a disabled host command is invoked, error code 68 is returned.
- When a disabled console command is invoked, the message "Function undefined or not allowed" is displayed.

Example 1: *This example demonstrates the use of the **CONFIGCMDS** console command to view the list of enabled host and console commands.*

```
Online> CONFIGCMDS <Return>

List of enabled Host commands:
A0 A4 GG GY

List of enabled Console commands:
GC      GS      EC      FK

Online>
```

Example 2: *This example demonstrates the use of the **CONFIGCMDS** console command to enable one console command (DE) and disable one host command (A4).*

```
Secure> CONFIGCMDS <Return>
```

```
List of enabled Host commands:
A0 A4 GG GY
List of enabled Console commands:
GC     GS     EC     FK
Enter command code (e.g. +CDE) or Q to Quit: +CDE
<Return>

List of enabled Host commands:
A0 A4 GG GY
List of enabled Console commands:
GC     GS     EC     FK     DE
Enter command code (e.g. +CDE) or Q to Quit: -HA4
<Return>

List of enabled Host commands:
A0 GG GY
List of enabled Console commands:
GC     GS     EC     FK     DE
Enter command code (e.g. +CDE) or Q to Quit: Q <Return>
Save COMMAND settings to smart card? [Y/N]: N <Return>

Secure>
```

Example 3: *This example demonstrates the use of the **CONFIGCMDS** console command using the wildcard character '*' to disable all non-core host commands, and then enable just those host commands beginning with 'A'.*

```
Secure> CONFIGCMDS <Return>

List of enabled Host commands:
A0 A4 GG GY
List of enabled Console commands:
GC     GS     EC     FK
Enter command code (e.g. +CDE) or Q to Quit: -H* <Return>

List of enabled Host commands:
List of enabled Console commands:
GC     GS     EC     FK     DE
Enter command code (e.g. +CDE) or Q to Quit: +HA*
<Return>

List of enabled Host commands:
A0 A2 A4 A6 A8 AA AC AE AG AS AU AW AY
List of enabled Console commands:
GC     GS     EC     FK     DE
Enter command code (e.g. +CDE) or Q to Quit: Q <Return>
Save COMMAND settings to smart card? [Y/N]: Y <Return>

Insert card and press ENTER: <Return>
COMMAND settings saved to the smartcard.

Secure>
```

Configure PIN Block Formats (CONFIGPB)

Variant ☑	Key Block ☑	
Online ☑	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **CONFIGPB**

Function: To view the list of enabled PIN block formats, and (if in secure state) to enable or disable individual PIN block formats.

Authorization: The HSM must be in the secure state to enable/disable PIN block formats. The current status of PIN Block format enablement can be viewed in any state.

Inputs:
- PIN block format identifier.

Outputs:
- List of enabled PIN block formats.

Errors:
- Invalid entry

Example 1: *This example demonstrates the use of the **CONFIGPB** console command to view the list of enabled PIN block formats.*

```
Online> CONFIGPB <Return>

List of enabled PIN Block formats:
01 - ISO 9564-1 & ANSI X9.8 format 0
05 - ISO 9564-1 format 1
35 - MasterCard Pay Now and Pay Later format
41 - Visa/Amex new PIN only format
42 - Visa/Amex new & old PIN format
47 - ISO 9564-1 & ANSI X9.8 format 3
48 - ISO 9564-1 PIN Block Format 4 (AES)

Online>
```

Example 2**:** *This example demonstrates the use of the **CONFIGPB** console command to enable the use of HSM PIN Block format 03.*

```
Secure> CONFIGPB <Return>

List of enabled PIN Block formats:
01 - ISO 9564-1 & ANSI X9.8 format 0
05 - ISO 9564-1 format 1
35 - MasterCard Pay Now & Pay Later format
41 - Visa/Amex new PIN only format
42 - Visa/Amex new & old PIN format
47 - ISO 9564-1 & ANSI X9.8 format 3
48 - ISO 9564-1 PIN Block Format 4 (AES)

Enter + or - followed by PIN Block format or Q to Quit:
+03 <Return>

List of enabled PIN Block formats:
01 - ISO 9564-1 & ANSI X9.8 format 0
03 - Diebold & IBM ATM format
05 - ISO 9564-1 format 1
35 - MasterCard Pay Now & Pay Later format
41 - Visa/Amex new PIN only format
```

```
42 - Visa/Amex new & old PIN format
47 - ISO 9564-1 & ANSI X9.8 format 3
48 - ISO 9564-1 PIN Block Format 4 (AES)

Enter + or - followed by PIN Block format or Q to Quit: Q
<Return>
Save PIN BLOCK settings to smart card? [Y/N]: Y <Return>

Insert card and press ENTER: <Return>
PIN BLOCK settings saved to the smartcard.

Secure>
```

Configure Security (CS)

Variant ☑	Key Block ☑	
Online ☒	Offline ☒	Secure ☑
Authorization: **Not required**		

Command: **CS**

Function: To set the security configuration of the HSM and some processing parameters. CS converts all lower-case alpha values to upper case for display purposes, except for the Card issuer Password. Operation is menu-driven, as shown in the examples. The security settings can optionally be saved to a smartcard.

Authorization: The HSM must be in the secure state to run this command.

Inputs:

- PIN length [4-12]: a one or two-digit number in the range 4 to 12.
- Echo [oN/ofF]: N or F
- Atalla ZMK variant support [oN/ofF]: N or F
- Transaction key scheme: Racal, Australian or None? [R/A/N]: R or A or N
- User storage key length [S/D/T/V]: S, D, T, or V
- Display general information on payShield Manager Landing page? [Y/N]: Y or N
- Default LMK identifier [0-x]: Integer between 0 and x
- Management LMK identifier [0-x] : Integer between 0 and x
- Whether to erase the installed LMKs to enable the following settings to be changed.
- Select clear PINs? [Y/N]: Y or N
- Enable ZMK translate command? [Y/N]: Y or N
- Enable X9.17 for import? [Y/N]: Y or N
- Enable X9.17 for export? [Y/N]: Y or N
- Solicitation batch size [1-1024]: a one to four-digit number, range 1 to 1024.
- Single/double length ZMKs [S/D]: S or D
- Decimalization table Encrypted/Plaintext [E/P]: E
- Enable Decimalization Table Checks? [Y/N]: Y or N
- PIN encryption algorithm [A/B]: A or B
- Whether to use the default Card Issuer password or to enter a different value (of 8 alphanumeric printable characters).
- Authorized State required when importing DES key under RSA key? [Y/N]: Y or N
- Minimum HMAC verification length in bytes [5-64]: number, range 5-64
- Enable PKCS#11 import and export for HMAC keys? [Y/N]: Y or N
- Enable ANSI X9.17 import and export for HMAC keys? [Y/N]: Y or N
- Enable ZEK/TEK encryption of ASCII data or Binary data or None? [A/B/N]: A or B or N
- Restrict Key Check Values to 6 hex chars? [Y/N]: Y or N
- Enable multiple authorized activities? [Y/N]: Y or N
- Allow persistent authorized activities [Y/N]: Y or N
- Enable support for variable length PIN offset? [Y/N]: Y or N
- Enable weak PIN checking? [Y/N]: Y or N
- Enable PIN Block format 34 as output format for PIN translations to ZPK? [Y/N]: Y or N
- Enable translation of account number for LMK encrypted PINs [Y/N]: Y or N.
- Use HSM clock for date/time validation? [Y/N]: Y or N
- Additional padding to disguise key length? [Y/N] : Y or N
- Key export and import in trusted format only? [Y/N] : Y or N
- Protect MULTOS cipher data checksums? [Y/N] : Y or N
- Enable Key Scheme Tag 'X' (X9.17) for storing keys under LMK? [Y/N] : Y or N
- Enable use of Tokens in PIN Translation? [Y/N]: Y or N

- Enable use of Tokens in PIN Verification? [Y/N]: Y or N
- Allow Error light to be extinguished when viewing Error Log? [Y/N]: Y or N
- Ensure LMK Identifier in command corresponds with host port? [Y/N]: Y or N
- Ignore LMK ID in Key Block Header? [Y/N]: Y or N
- Enable import and export of RSA Private keys? [Y/N]: Y or N
- Prevent Single-DES keys masquerading as double or triple-length key? [Y/N]: Y or N
- Disable Single-DES? [Y/N]: Y or N
- Card/password authorization (local) [C/P]: C or P (Card or Password).
- Restrict PIN block usage for PCI HSM compliance? [Y/N]: Y or N.
- Enforce key type 002 separation for PCI HSM compliance [Y/N]: Y or N.
- Enforce Authorization Time Limit? [Y/N]: Y or N.
- Enforce Multiple Key Components? [Y/N]: Y or N.
- Enforce PCI HSMv3 Key Equivalence for Key Wrapping? [Y/N]: Y or N.
- Enforce minimum key strength of 1024-bits for QH verification? [Y/N]: Y or N.
- Enforce minimum key strength of 2048-bits for RSA? [Y/N]: Y or N.
- Save SECURITY settings to smartcard? [Y/N]: Y or N

Outputs:

- Prompts according to the settings chosen (see examples below).

Errors:

Invalid Entry
Card not formatted to save/retrieve HSM settings.
Attempt with another card? [Y/N]

Notes:

- For software versions which have been PCI HSM certified, in order to be PCI HSM compliant a number of security settings must have specific values as follows:
  - Disable Single-DES? – must be “Y”
  - Card/password authorization (local) – must be "C"
  - Restrict PIN block usage for PCI HSM compliance – must be "Y"
  - Enforce key type 002 separation for PCI HSM compliance –must be "Y"
  - Enforce Authorization Time Limit – must be "Y"
  - Enforce Multiple Key Components – must be "Y"
  - Enforce PCI HSMv3 Key Equivalence for Key Wrapping – must be “Y”
  - Enforce minimum key strength of 1024-bits for RSA signature verification – must be “Y”
  - Enforce minimum key strength of 2048-bits for RSA – must be “Y”
- Once all of these settings are at the PCI HSM compliant value, they cannot be changed unless the RESET command is used.
- If the value of the setting "Enforce key type 002 separation for PCI HSM compliance" is "Y", then:
  - Key Type Table 2 is in effect. If the setting has a value of "N", then the HSM is not being operated in a PCI HSM compliant manner and Key Type Table 1 is in effect.
  - The following Host commands are disabled: AA, AE, FC, FE, FG, HC, KA, OE

Example 1: *Erasing LMKs not selected by the user*

```
Secure> CS <Return>
PIN Length [4-12]: 8 <Return>
Echo [oN/ofF]: N <Return>
Atalla ZMK variant support [oN/ofF]: F <Return>
Transaction Key Scheme: Racal, Australian or None [R/A/N]: N
<Return>
User storage key length [S/D/T/V](SINGLE): <Return>
Display general information on payShield Manager Landing page?
[Y/N]: Y <Return>
Default LMK identifier [0-4](0): <Return>
Management LMK identifier [0-4](0): <Return>

LMKs must be erased before remaining parameters can be set.

Erase LMKs? [Y/N]: N <Return>

Save SECURITY settings to smartcard? [Y/N]: N <Return>
Secure>
```

Example 2: *Settings affecting PCI HSM compliance do not have compliant values. The user wishes to use the default card issuer password.*

```
Secure> CS <Return>

Please make a selection.  The current setting is in parentheses.
Press ENTER to keep the current setting.
PIN length [4-12](4): <Return>
Echo [oN/ofF](ON): <Return>92
Atalla ZMK variant support [oN/ofF](ON): <Return>
Transaction key scheme: Racal, Australian or None? [R/A/N](R):
<Return>
User storage key length [S/D/T/V](SINGLE): <Return>
Display general information on payShield Manager Landing page?
[Y/N]: Y <Return>
Default LMK identifier [0-4](0): <Return>
Management LMK identifier [0-4](0): <Return>

LMKs must be erased before remaining parameters can be set

Erase LMKs? [Y/N]: Y <Return>
Enforce Atalla variant match to Thales key type? [Y/N](YES):
<Return>
Select clear PINs? [Y/N](YES): <Return>
Enable ZMK translate command? [Y/N](YES): <Return>
Enable X9.17 for import? [Y/N](YES): <Return>
Enable X9.17 for export? [Y/N](YES): <Return>
Solicitation batch size [1-1024](5): <Return>

Single/double length ZMKs [S/D](DOUBLE): <Return>
Decimalization table Encrypted/Plaintext [E/P](P): <Return>
Enable Decimalization Table Checks? [Y/N](YES): <Return>

PIN encryption algorithm [A/B](A): <Return>
Use default card issuer password [Y/N](YES): Y <Return>
Authorized State required when importing DES key under RSA key?
[Y/N](YES): <Return>
Minimum HMAC key length in bytes [5-64](10): <Return>
Enable PKCS#11 import and export for HMAC keys [Y/N](YES):
<Return>
Enable ANSI X9.17 import and export for HMAC keys [Y/N](YES):
<Return>
Enable ZEK/TEK encryption of ASCII data or Binary data or None?
[A/B/N] (N): <Return>
Restrict Key Check Values to 6 hex chars [Y/N](YES): <Return>
Enable multiple authorized activities [Y/N](NO): <Return>
Allow persistent authorized activities [Y/N](NO): <Return>
Enable support for variable length PIN offset [Y/N](NO): <Return>
Enable weak PIN checking [Y/N](YES): <Return>
Check new PINs using global list of weak PINs? [Y/N](YES):
<Return>
Check new PINs using local list of weak PINs? [Y/N](YES):
<Return>
Check new PINs using rules? [Y/N](YES): <Return>
Enable PIN Block Format 34 as output format
for PIN Translations to ZPK [Y/N](NO): <Return>
Enable translation of account number for LMK encrypted PINs
[Y/N](NO): <Return>
Use HSM clock for date/time validation? [Y/N](YES): <Return>
Additional padding to disguise key length? [Y/N](NO): <Return>
Key export and import in trusted format only? [Y/N](NO): <Return>
```

```
Protect MULTOS cipher data checksums? [Y/N](YES): <Return>
Enable Key Scheme Tag 'X' (X9.17) for storing keys under LMK?
[Y/N](NO): <Return>
Enable use of Tokens in PIN Translation? [Y/N](NO): <Return>
Enable use of Tokens in PIN Verification? [Y/N](NO): <Return>
Ensure LMK Identifier in command corresponds with host port?
[Y/N](NO):
Ignore LMK ID in Key Block Header? [Y/N](NO):
Enable import and export of RSA Private keys? [Y/N](NO):

The following settings affect PCI HSM compliance:
Prevent single-DES keys masquerading
as double or triple-length key? [Y/N](YES):
The following setting is not PCI HSM compliant:
Disable Single-DES? [Y/N](NO):
Card/password authorization (local) [C/P](C):
Restrict PIN block usage for PCI HSM compliance? [Y/N](YES):
The following setting is not PCI HSM compliant:
Enforce key type 002 separation for PCI HSM compliance?
[Y/N](NO):
Enforce Authorization Time Limit? [Y/N](YES):
The following setting is not PCI HSM compliant:
Enforce Multiple Key Components? [Y/N](NO):
The following setting is not PCI HSM compliant:
Enforce PCI HSMv3 Key Equivalence for Key Wrapping? [Y/N](NO):
The following setting is not PCI HSM compliant:
Enforce minimum key strength of 1024-bits for RSA signature
verification? [Y/N](NO):
The following setting is not PCI HSM compliant:
Enforce minimum key strength of 2048-bits for RSA? [Y/N](NO):
Save SECURITY settings to smartcard? [Y/N]:
Secure>
```

Example 3: *Final setting affecting PCI HSM compliance is about to be set to compliant value. The user is specifying a different card issuer software.*

```
Secure> CS <Return>

Please make a selection.  The current setting is in parentheses.
Press ENTER to keep the current setting.
PIN length [4-12](4): <Return>
Echo [oN/ofF](ON): <Return>
Atalla ZMK variant support [oN/ofF](ON): <Return>
Transaction key scheme: Racal, Australian or None? [R/A/N](R):
<Return>
User storage key length [S/D/T/V](SINGLE): <Return>
Display general information on payShield Manager Landing page?
[Y/N]: Y <Return>
Default LMK identifier [0-4](0): <Return>
Management LMK identifier [0-4](0): <Return>

LMKs must be erased before remaining parameters can be set

Erase LMKs? [Y/N]: Y <Return>
Select clear PINs? [Y/N](YES): <Return>
Enable ZMK translate command? [Y/N](YES): <Return>
Enable X9.17 for import? [Y/N](YES): <Return>
Enable X9.17 for export? [Y/N](YES): <Return>
Solicitation batch size [1-1024](5): <Return>

Single/double length ZMKs [S/D](DOUBLE): <Return>
Decimalization table Encrypted/Plaintext [E/P](P): <Return>
Enable Decimalization Table Checks? [Y/N](YES): <Return>

PIN encryption algorithm [A/B](A): <Return>
Use default card issuer password [Y/N](YES): N <Return>
Enter card issuer password (local):***** <Return>
Password must be 8 characters.
Enter card issuer password (local):******** <Return>
Confirm card issuer password: ******** <Return>
Authorized State required when importing DES key under RSA key?
[Y/N](YES): <Return>
Minimum HMAC key length in bytes [5-64](10): <Return>
Enable PKCS#11 import and export for HMAC keys [Y/N](YES):
<Return>
Enable ANSI X9.17 import and export for HMAC keys [Y/N](YES):
<Return>
Enable ZEK/TEK encryption of ASCII data or Binary data or None?
[A/B/N] (N): <Return>
Restrict Key Check Values to 6 hex chars [Y/N](YES): <Return>
Enable multiple authorized activities [Y/N](NO): <Return>
Allow persistent authorized activities [Y/N](NO): <Return>
Enable support for variable length PIN offset [Y/N](NO): <Return>
Enable weak PIN checking [Y/N](YES): <Return>
Enable PIN Block Format 34 as output format for PIN Translations
to ZPK [Y/N](NO): <Return>
Enable translation of account number for LMK encrypted PINs
[Y/N](YES): <Return>
Use HSM clock for date/time validation? [Y/N](YES): <Return>
Additional padding to disguise key length? [Y/N](NO): <Return>
Key export and import in trusted format only? [Y/N](NO): <Return>
Protect MULTOS cipher data checksums? [Y/N](YES): <Return>
Enable Key Scheme Tag 'X' (X9.17) for storing keys under LMK?
[Y/N](NO): <Return>
```

```
Enable use of Tokens in PIN Translation? [Y/N](NO): <Return>
Enable use of Tokens in PIN Verification? [Y/N](NO): <Return>
Allow Error light to be extinguished when viewing Error Log?
[Y/N](NO): <Return>
Ensure LMK Identifier in command corresponds with host port?
[Y/N](NO): <Return>
Ignore LMK ID in Key Block Header? [Y/N](NO): <Return>
Enable import and export of RSA Private keys? [Y/N](NO): <Return>

The following settings affect PCI HSM compliance - see Console
Reference Manual:
Prevent single-DES keys masquerading as double or triple-length
key? [Y/N](YES): <Return>

Disable Single-DES? [Y/N](YES): <Return>

Card/password authorization (local) [C/P](C): <Return>

The following setting is not PCI HSM compliant:
Restrict PIN block usage for PCI HSM compliance? [Y/N](NO): Y
<Return>

The following setting is not PCI HSM compliant:
Enforce key type 002 separation for PCI HSM compliance?
[Y/N](NO): Y <Return>

Enforce Authorization Time Limit? [Y/N](YES): <Return>

Enforce Multiple Key Components? [Y/N](YES): <Return>

Enforce PCI HSMv3 Key Equivalence for Key Wrapping? [Y/N](YES):
<Return>

Enforce minimum key strength of 1024-bits for RSA signature
verification? [Y/N](YES): <Return>

Enforce minimum key strength of 2048-bits for RSA? [Y/N](YES):
<Return>

These settings will all become PCI HSM compliant.
No further changes will be allowed to these options:
 Prevent single-DES keys masquerading as double or triple-length
key: YES
 Single-DES: DISABLED
 Card/password authorization (local): C
 Restrict PIN block usage for PCI HSM Compliance: YES
 Enforce key type separation for PCI HSM compliance: YES
 Enforce Authorization Time Limit: YES
 Enforce Multiple Key Components: YES
 Enforce PCI HSMv3 Key Equivalence for Key Wrapping: YES
 Enforce minimum key strength of 1024-bits for RSA signature
verification: YES
 Enforce minimum key strength of 2048-bits for RSA: YES

Confirm? [Y/N]: Y <Return>

Save SECURITY settings to smartcard? [Y/N]: Y <Return>
Insert card and press ENTER: <Return>
SECURITY settings saved to the smartcard.

Secure>
```

Example 4: *All settings affecting PCI HSM compliance have compliant values*

```
Secure> CS <Return>

Please make a selection.  The current setting is in parentheses.
Press ENTER to keep the current setting.
PIN length [4-12](4): <Return>
Echo [oN/ofF](ON): <Return>
Atalla ZMK variant support [oN/ofF](ON): <Return>
Transaction key scheme: Racal, Australian or None? [R/A/N](R):
<Return>
User storage key length [S/D/T/V](SINGLE): <Return>
Display general information on payShield Manager Landing page?
[Y/N]: Y <Return>
Default LMK identifier [0-4](0): <Return>
Management LMK identifier [0-4](0): <Return>
LMKs must be erased before remaining parameters can be set

Erase LMKs? [Y/N]: Y <Return>
Select clear PINs? [Y/N](YES): <Return>
Enable ZMK translate command? [Y/N](YES): <Return>
Enable X9.17 for import? [Y/N](YES): <Return>
Enable X9.17 for export? [Y/N](YES): <Return>
Solicitation batch size [1-1024](5): <Return>

Single/double length ZMKs [S/D](DOUBLE): <Return>
Decimalization table Encrypted/Plaintext [E/P](P): <Return>
Enable Decimalization Table Checks? [Y/N](YES): <Return>

PIN encryption algorithm [A/B](A): <Return>
Use default card issuer password [Y/N](YES): Y <Return>
Authorized State required when importing DES key under RSA key?
[Y/N](YES): <Return>
Minimum HMAC key length in bytes [5-64](10): <Return>
Enable PKCS#11 import and export for HMAC keys [Y/N](YES):
<Return>
Enable ANSI X9.17 import and export for HMAC keys [Y/N](YES):
<Return>
Enable ZEK/TEK encryption of ASCII data or Binary data or None?
[A/B/N] (N): <Return>
Restrict Key Check Values to 6 hex chars [Y/N](YES): <Return>
Enable multiple authorized activities [Y/N](NO): <Return>
Allow persistent authorized activities [Y/N](NO): <Return>
Enable support for variable length PIN offset [Y/N](NO): <Return>
Enable weak PIN checking [Y/N](YES): <Return>
Enable PIN Block Format 34 as output format for PIN Translations
to ZPK [Y/N](NO): <Return>
Enable translation of account number for LMK encrypted PINs
[Y/N](YES): <Return>
Use HSM clock for date/time validation? [Y/N](YES): <Return>
Additional padding to disguise key length? [Y/N](NO): <Return>
Key export and import in trusted format only? [Y/N](NO): <Return>
Protect MULTOS cipher data checksums? [Y/N](YES): <Return>
Enable Key Scheme Tag 'X' (X9.17) for storing keys under LMK?
[Y/N](NO): <Return>
Enable use of Tokens in PIN Translation? [Y/N](NO): <Return>
Enable use of Tokens in PIN Verification? [Y/N](NO): <Return>
Allow Error light to be extinguished when viewing Error Log?
[Y/N](NO): <Return>
```

```
Ensure LMK Identifier in command corresponds with host port?
[Y/N](NO): <Return>
Ignore LMK ID in Key Block Header? [Y/N](NO): <Return>
Enable import and export of RSA Private keys? [Y/N](NO): <Return>

The following settings are all PCI HSM compliant and cannot be
changed.
 Prevent single-DES keys masquerading as double or triple-length
key: YES
 Single-DES: DISABLED
 Card/password authorization (local): C
 Restrict PIN block usage for PCI HSM Compliance: YES
 Enforce key type separation for PCI HSM compliance: YES
 Enforce Authorization Time Limit: YES
 Enforce Multiple Key Components: YES
 Enforce PCI HSMv3 Key Equivalence for Key Wrapping: YES
 Enforce minimum key strength of 1024-bits for RSA signature
verification: YES
 Enforce minimum key strength of 2048-bits for RSA: YES
Save SECURITY settings to smartcard? [Y/N]: Y <Return>
Insert card and press ENTER: <Return>
SECURITY settings saved to the smartcard.
Secure>
```

View Security Configuration (QS)

Variant ☑		Key Block ☑
Online ☑	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **QS**

Function: Reports the security configuration of the HSM and some processing parameters, plus the LMK check value.

Authorization: This command does not require any authorization.

Inputs: None.

Outputs:
- See examples below.

Errors: None.

Notes:
- Where the software has been PCI HSM certified, in order to be PCI HSM compliant a number of security settings must have specific values as follows:
  - Disable Single-DES? – must be “Y”
  - Card/password authorization (local) – must be "C"
  - Restrict PIN block usage for PCI HSM compliance – must be "Y"
  - Enforce key type 002 separation for PCI HSM compliance –must be "Y"
  - Enforce Authorization Time Limit – must be "Y"
  - Enforce Multiple Key Components – must be "Y"
  - Enforce PCI HSMv3 Key Equivalence for Key Wrapping – must be “Y”
  - Enforce minimum key strength of 1024-bits for RSA signature verification – must be “Y”
  - Enforce minimum key strength of 2048-bits for RSA – must be “Y”
- Once all of these settings are at the PCI HSM compliant value, they cannot be changed unless the RESET command is used.

Example 1: *Settings affecting PCI HSM compliance do not all have compliant values*

```
Online> QS <Return>

PIN length: 04
Encrypted PIN length: 05
Echo: OFF
Atalla ZMK variant support: OFF
Transaction key support: NONE
User storage key length: SINGLE
Display general information on payShield Manager Landing Page:
NO
Default LMK identifier: 00
Management LMK identifier: 00

Select clear PINs: NO
Enable ZMK translate command: NO
Enable X9.17 for import: NO
Enable X9.17 for export: NO
Solicitation batch size: 1024
ZMK length: DOUBLE
Decimalization tables: ENCRYPTED
Decimalization table checks: ENABLED
PIN encryption algorithm: A

Press "Enter" to view additional security settings... <Return>

Authorized state required when importing DES key under RSA key:
YES
Minimum HMAC length in bytes: 10
Enable PKCS#11 import and export for HMAC keys: NO
Enable ANSI X9.17 import and export for HMAC keys: NO
Enable ZEK/TEK encryption of ASCII data or Binary data or None:
NONE
Restrict key check values to 6 hex chars: YES
Enable multiple authorized activities: YES
Allow persistent authorized activities: NO
Enable variable length PIN offset: NO
Enable weak PIN checking: NO
Enable PIN block Format 34 as output format for PIN
translations to ZPK: NO
Enable translation of account number for LMK encrypted PINs: NO

Use HSM clock for date/time validation: YES
Additional padding to disguise key length: NO
Key export and import in trusted format only: YES
Protect MULTOS cipher data checksums: YES
Enable Key Scheme Tag 'X' (X9.17) for storing keys under LMK:
NO
Enable use of Tokens in PIN Translation: NO
Enable use of Tokens in PIN Verification: NO
Allow Error light to be extinguished when viewing Error Log: NO
Ensure LMK Identifier in command corresponds with host port: NO
Ignore LMK ID in Key Block Header: NO
Enable import and export of RSA Private keys: NO

NOTE: The following settings are not all PCI HSM compliant.
Prevent single-DES keys masquerading as double or triple-length
keys: YES
Single-DES: DISABLED
Card/password authorization (local): C
```

```
Restrict PIN block usage for PCI HSM Compliance: NO
Enforce key type 002 separation for PCI HSM compliance: NO
Enforce Authorization Time Limit: YES
Enforce Multiple Key Components: YES
Enforce PCI HSMv3 Key Equivalence for Key Wrapping: YES
Enforce minimum key strength of 1024-bits for RSA signature
verification: YES
Enforce minimum key strength of 2048-bits for RSA: YES

Online>
```

Example 2: *Settings affecting PCI HSM compliance have compliant values*

```
Online> QS <Return>
PIN length: 04
Encrypted PIN length: 05
Echo: OFF
Atalla ZMK variant support: OFF
Transaction key support: NONE
User storage key length: SINGLE
Display general information on payShield Manager Landing Page:
NO
Default LMK identifier: 00
Management LMK identifier: 00
Select clear PINs: NO
Enable ZMK translate command: NO
Enable X9.17 for import: NO
Enable X9.17 for export: NO
Solicitation batch size: 1024
ZMK length: DOUBLE
Decimalization tables: ENCRYPTED
Decimalization table checks: ENABLED
PIN encryption algorithm: A
Press "Enter" to view additional security settings... <Return>
Authorized state required when importing DES key under RSA key:
YES
Minimum HMAC length in bytes: 10
Enable PKCS#11 import and export for HMAC keys: NO
Enable ANSI X9.17 import and export for HMAC keys: NO
Enable ZEK/TEK encryption of ASCII data or Binary data or None:
NONE
Restrict key check values to 6 hex chars: YES
Enable multiple authorized activities: YES
Allow persistent authorized activities: NO
Enable variable length PIN offset: NO
Enable weak PIN checking: NO
Enable PIN block Format 34 as output format for PIN
translations to ZPK: NO
Enable translation of account number for LMK encrypted PINs: NO
Use HSM clock for date/time validation: YES
Additional padding to disguise key length: NO
Key export and import in trusted format only: YES
Protect MULTOS cipher data checksums: YES
Enable Key Scheme Tag 'X' (X9.17) for storing keys under LMK:
NO
Enable use of Tokens in PIN Translation: NO
Enable use of Tokens in PIN Verification: NO
Allow Error light to be extinguished when viewing Error Log: NO
Ensure LMK Identifier in command corresponds with host port: NO
Ignore LMK ID in Key Block Header: NO
Enable import and export of RSA Private keys: NO
The following settings are all PCI HSM compliant and cannot be
changed:
Prevent single-DES keys masquerading as double or triple-length
keys: YES
Single-DES: DISABLED
Card/password authorization (local): C
Restrict PIN block usage for PCI HSM Compliance: YES
Enforce key type 002 separation for PCI HSM compliance: YES
Enforce Authorization Time Limit: YES
Enforce Multiple Key Components: YES
Enforce PCI HSMv3 Key Equivalence for Key Wrapping: YES
Enforce minimum key strength of 1024-bits for RSA signature
```

```
verification: YES
Enforce minimum key strength of 2048-bits for RSA: YES
Online>
```

Configure Host Port (CH)

Variant ☑	Key Block ☑	
Online ☒	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **CH**

Function: To configure the Host port to emulate a type of data communications equipment and control equipment, i.e., Ethernet or FICON.

The Host port setting can optionally be saved to a smartcard.
The new settings come into effect a few seconds after the command has completed.

Authorization:
- The HSM must be in the offline or secure state to run this command.
- If settings relating to Secure Host Communications (TLS) or Access Control Lists are to be changed, the payShield 10K must be in Secure state.

Inputs:
- The options are menu driven and the inputs vary depending on the communication mode selected. See examples below.
- Inputs specific to the FICON interface have the following definitions:
  - Control Unit Image:
    - Valid Range: 0-255; Default=0
    - This is the actual control unit image defined in the mainframe I/O gens.
  - Unit Address:
    - Valid Range: 0-255; Default=0
    - The unit address for this control unit.
  - Missing Interrupt handler (mih) Minutes
    - Valid Range: 0-60; Default=0
    - This specifies the missing interrupt handler value to be used in the read device characteristics CCW for the mainframe. If set to 0, the mainframe setting is used.

Outputs: None.

Notes:
- To achieve maximum throughput on the HSM, the TCP/IP and FICON interfaces need to be driven with multiple connections (or threads). Optimum performance is normally achieved with 4 - 8 connections (depending on the HSM performance model and the commands being processed), although for FICON on the 1500 cps model the performance improves right up to the maximum of 16 connections. Running with only a single thread can significantly reduce the throughput of the HSM, and means that you will not be able to reach the rated throughput for the machine.
- It is recommended that the Host Ethernet Ports, the Management Ethernet Port, and the Auxiliary Ethernet Port are all on different IP subnets from each other.
- Where dual Ethernet host ports are in use, 2 different IP addresses at the Host computer must be used to drive the 2 ports on the HSM.
- The use of TLS v1.2 is supported on the payShield 10K:
  - TLS traffic can be supported at the same time as non-TLS traffic.
  - The specified number of connections are shared between TLS and non-TLS traffic.

- The HSM can be forced to accept only TLS traffic by setting the *UDP* and *TCP* options to "*N*".

For Ethernet communications (not protected by TLS), a Well-Known Port Address is defined (default value 1500).

- If TLS is enabled, a Well-Known Port Address is also required (default value 2500). This works in the same way as the Well-Known Port Address for non-TLS traffic.

Errors: None.

Example 1: *Ethernet interface*

```
Secure>ch <Return>


Please make a selection.  The current setting is in
parentheses.
Message header length [1-255] (4): <Return>
Disable host connections when no LMKs are installed? [Y/N]
(N): <Return><Return>
Host interface [[E]thernet, [F]icon] (F):E
Enter Well-Known-Port (1500): <Return>
Enter Well-Known-TLS-Port (2500): <Return>
UDP [Y/N] (Y): <Return>
TCP [Y/N] (Y): <Return>
Enable TLS [Y/N] (N): Y <Return>
ACL Enabled [Y/N] (N): Y <Return>
Number of connections [1-64] (5): <Return>
Enter TCP keep alive timeout [1-120 minutes] (120):
<Return>
Number of interfaces [1/2] (1): 2 <Return>

Interface Number 1:
IP Configuration Method? [D]HCP or [S]tatic (DHCP): s
<Return>
Enter IP Address (10.0.0.20): 10.0.0.20 <Return>
Enter subnet mask (255.255.255.0): <Return>
Enter Default Gateway Address (10.0.0.1): <Return>

Enter speed setting for this port:

    SPEED OPTIONS:
0   Autoselect
1   10baseT full-duplex
2   100baseT full-duplex
3   1000baseT full-duplex

Speed setting (0): 3 <Return>

Interface Number 2: <Return>
IP Configuration Method? [D]HCP or [S]tatic (DHCP): s
Enter IP Address (169.254.254.1): 10.0.0.21
Enter subnet mask (255.255.255.0):
Enter Default Gateway Address (169.254.254.1): 10.0.0.1

Enter speed setting for this port:

    SPEED OPTIONS:
0   Autoselect
1   10baseT full-duplex
```

```
2   100baseT full-duplex
3   1000baseT full-duplex

Speed setting (0): 3 <Return>

Save HOST settings to smart card? [Y/N]: n <Return>


Secure>
```

Example 2: *Ethernet interface*

```
Secure>ch <Return>


Please make a selection.  The current setting is in
parentheses.
Message header length [1-255] (4): <Return>
Disable host connections when no LMKs are installed? [Y/N]
(N): <Return>
Host interface [[E]thernet, [F]icon] (E): <Return>
Enter Well-Known-Port (1500): <Return>
Enter Well-Known-TLS-Port (2500): <Return>
UDP [Y/N] (Y): n <Return>
TCP [Y/N] (Y): n <Return>
Enable TLS [Y/N] (Y): y <Return>
ACL Enabled [Y/N] (Y): n <Return>
Number of connections [1-64] (5): 5 <Return>
Enter TCP keep alive timeout [1-120 minutes] (120):
<Return>
Number of interfaces [1/2] (2): 1 <Return>
Interface Number [1/2] (1):
 <Return>
Interface Number 1: <Return>
IP Configuration Method? [D]HCP or [S]tatic (static): d
<Return>
Network Name (S0000000001G-host1): HSM-Host-1 <Return>

Enter speed setting for this port:

    SPEED OPTIONS:
0   Autoselect
1   10baseT full-duplex
2   100baseT full-duplex
3   1000baseT full-duplex

Speed setting (3): <Return>

Save HOST settings to smart card? [Y/N]: n <Return>


Secure>
```

Example 3: *Ethernet Interface.*

```
Secure>ch <Return>

Please make a selection.  The current setting is in
parentheses.
Message header length [1-255] (4): <Return>
Disable host connections when no LMKs are installed? [Y/N]
(N): <Return>
Host interface [[E]thernet, [F]icon] (E): <Return>
Enter Well-Known-Port (1500): <Return>
Enter Well-Known-TLS-Port (2500): <Return>
UDP [Y/N] (N): <Return>
TCP [Y/N] (N): <Return>
Enable TLS [Y/N] (Y): <Return>
ACL Enabled [Y/N] (N): <Return>
Number of connections [1-64] (5): <Return>
Enter TCP keep alive timeout [1-120 minutes] (120):
<Return>
Number of interfaces [1/2] (1): <Return>
Interface Number [1/2] (1): <Return>

Interface Number 1: <Return>
IP Configuration Method?
Network Name (HSM-Host-1): <Return>

Enter speed setting for this port:

    SPEED OPTIONS:
0   Autoselect
1   10baseT full-duplex
2   100baseT full-duplex
3   1000baseT full-duplex

Speed setting (3): <Return>

Save HOST settings to smart card? [Y/N]: n <Return>

Secure>
```

Example 4 *FICON Interface*

```
Secure>ch <Return>
Please make a selection.  The current setting is in parentheses.
Message header length [1-255] (4): <Return>
Disable host connections when no LMKs are installed? [Y/N] (N): <Return>
Host interface [[E]thernet, [F]icon] (E):F <Return>
Control Unit Image [0-255] (5): <Return>
```

```
Unit address [0-255] (5): <Return>
Missing Interrupt Handler (mih) Minutes [0-60] (0): <Return>
Save HOST settings to smart card? [Y/N]: n s<Return>

Secure>
```

View Host Port Configuration (QH)

Variant ☑	Key Block ☑	
Online ☑	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **QH**

Function: To display details of the Host port configuration of the HSM.

Authorization: This command does not require any authorization.

Inputs: None.

Outputs: For all systems:

- The message header length. This is the number of characters at the front of each command from the Host to the HSM (after the STX character). The HSM returns the message header in the response.
- Whether to disable the processing of host commands when no LMKs are installed.
- The protocol used.

For an Ethernet system:

- The Well-Known Port. This is the publicized TCP Port address of the HSM.
- The Well-Known TLS Port. This is the publicized TLS Port address of the HSM.
- Transport method: TCP, UDP, TLS
- Number of TCP connections. Each host interface supports this number of connections.
- The TCP Keep_Alive value: A number in minutes
- Whether ACLs are being used.
- The number of host interfaces configured
- The IP address for each host interface, and how they are derived. This is the IP address of the HSM in the system.
- The Network name of the interface, if configured to DHCP
- Subnet mask for each host interface. This is the subnet mask of the attached TCP/IP network. It is recommended that the Host Ethernet Ports, the Management Ethernet Port, and the Auxiliary Ethernet Port are all on different IP subnets from each other.
- The default gateway IP address
- The MAC Address for the interface
- The port speed for each host interface.

For a FICON system:

- Control Unit Image. This is the actual control unit image defined in the mainframe I/O gens.
- Control Unit Address. The unit address for this control unit.
- Missing Interrupt Handler (mih). The missing interrupt handler value in minutes to be used in the read device characteristics CCW for the mainframe. If set to 0, the mainframe setting is used.

Errors: None.

Example 1:

In this example, Ethernet communications using TCP/IP and TLS are selected – all types of traffic are allowed. The IP addresses are set up as static, manually-entered addresses. Access Control Lists are to be used, and will be set up using the CONFIGACL console command.

```
Online> QH <Return>

Message header length: 04
Disable host connections when no LMKs are installed: No
Protocol: Ethernet
Well-Known-Port: 01500
Well-Known-TLS-Port: 02500
Transport: UDP TCP TLS, 64 connections
TCP Keep_Alive value (minutes): 120 minutes
ACL: Enabled
Number of interfaces : (2)

Interface Number: 1
IP Configuration Method: static
IP address: 192.168.200.36
Subnet mask: 255.255.255.0
Default Gateway: 192.168.200.3
MAC address: 00:d0:fa:04:27:62
Port speed:  1000baseT full-duplex

Interface Number: 2
IP Configuration Method: static
IP address: 192.168.202.110
Subnet mask: 255.255.255.0
Default Gateway: 192.168.202.3
MAC address: 00:d0:fa:04:27:63
Port speed:  1000baseT full-duplex

Online>
```

Example 2:

In this example, Ethernet communications using TCP/IP and TLS are selected - but UDP, and unprotected TCP traffic is not allowed (i.e. all traffic must be TLS protected). The IP address is set up as a dynamic address to be obtained from a DHCP server. Access Control Lists are not being used. Only one host port has been configured.

```
Online> QH <Return>

Message header length: 04
Disable host connections when no LMKs are installed: No
Protocol: Ethernet
Well-Known-Port: 01500
Well-Known-TLS-Port: 02500
Transport: TLS, 64 connections
TCP Keep_Alive value (minutes): 120 minutes
ACL: Disabled
Number of interfaces : (1)

Interface Number: 1
IP Configuration Method: DHCP
Network Name: HSM1-Host-1
IP address: 192.168.200.36
Subnet mask: 255.255.255.0
Default Gateway: 192.168.200.3
MAC address: 00:d0:fa:04:3b:4a
Port speed:  1000baseT full-duplex
```

```
Online>
```

Example 3: *In this example, the host interface has been configured for FICON communications*

```
Online> QH <Return>

Message header length: 04
Disable host connections when no LMKs are installed: No
Protocol: FICON
Control Unit Image: 0
Control Unit Address: 0
Missing Interrupt Handler (mih): 0 minutes

Online>
```

Host Port Access Control List (ACL) Configuration (CONFIGACL)

Variant ☑	Key Block ☑
Online ☒	Offline ☒	Secure ☑
Authorization: **Not required**	

Command: **CONFIGACL**

Function: To display and amend the Access Control Lists (ACLs) for the HSM's host ports. When ACL checking is enabled using the CH console command, traffic from hosts is accepted only where the host's IP address is included in one of the ACL entries set up using this command.

Authorization: This command does not require any authorization.
The HSM must be in Secure state.

Inputs:
- The user can view/add/delete entries. Entries cannot be amended.
- Each of the 2 host ports has its own ACL set.
- Entries can be of the following types:
  - A single IP address
  - An IP address range
  - An IP address mask
- Multiple types of entry can co-exist.
- Multiple entries of each type are allowed.
- The IP addresses in an entry can overlap with IP addresses in other entries.

Outputs:
- Confirmations and errors only.

Errors:
- IP address formats are validated.

Notes:
- This command sets up the IP addresses and ranges that will be used when checking traffic against the ACL, but the use of ACLs must be enabled in the CH console command before the ACLs configured in this command are applied.
- If the CH console command enables ACL checking but no ACL entries have been configured using CONFIGACL, then all host traffic will be blocked.
- ACLs apply only to Ethernet (including TLS) host traffic. They have no effect when FICON host communications are being used.

Example 1: *In this example, only one host interface has been configured in the CH command. There are no existing ACL entries. The user sets up a single address ACL entry, then adds a mask ACL entry, then adds a range ACL entry, and finally deletes the single address ACL entry.*

```
Secure> CONFIGACL <Return>

Access control list for Interface 1:
Single:
        None
Range:
        None
Mask:
        None

Add/Delete/Quit [A/D/Q]: A <Return>

Type - Single/Range/Mask [S/R/M]: S <Return>

IP Address: 10.10.41.10 <Return>

Access control list for Interface 1:
Single:
        1)  10.10.41.10
Range:
        None
Mask:
        None

Add/Delete/Quit [A/D/Q]: A <Return>

Type - Single/Range/Mask [S/R/M]: M <Return>

Base IP Address: 10.10.40.0 <Return>

Mask: 255.255.255.0 <Return>

Access control list for Interface 1:
Single:
        1)  10.10.41.10
Range:
        None
Mask:
        2)  10.10.40.0 to 10.10.40.255
(Mask:255.255.255.0)

Add/Delete/Quit [A/D/Q]: A <Return>

Type - Single/Range/Mask [S/R/M]: R <Return>

From IP Address: 192.168.0.0 <Return>

To IP Address: 192.168.0.92 <Return>

Access control list for Interface 1:
Single:
        1)  10.10.41.10
Range:
        2)  192.168.0.0 to 192.168.0.92
Mask:
        3)  10.10.40.0 to 10.10.40.255
```

```
(Mask:255.255.255.0)

Add/Delete/Quit [A/D/Q]: D <Return>
Entry to delete [1/3]: 1 <Return>

Access control list for Interface 1:
Single:
        None
Range:
        1)  192.168.0.0 to 192.168.0.92
Mask:
        2)  10.10.40.0 to 10.10.40.255
(Mask:255.255.255.0)

Add/Delete/Quit [A/D/Q]: Q <Return>

Secure>
```

Example 2: *In this example, both host interfaces have been configured in the CH command. The user simply views the existing ACL for host interface 2, and then exits.*

```
Secure> CONFIGACL <Return>
Interface 1: 10.10.100.216
Interface 2: 10.10.101.216
Select Interface [1/2]: 2 <Return>
Access control list for Interface 2:
Single:
        1)  10.10.40.22
        2)  10.10.40.23
        3)  10.10.40.23
Range:
        4)  10.10.40.200 to 10.10.40.220
Mask:
        None
WARNING: Duplicate - Single: Entries 2 and 3
Add/Delete/Quit [A/D/Q]: Q <Return>
Secure>
```

Configure Printer Port (CP)

Variant ☑	Key Block ☑	
Online ☒	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **CP**

Function: To select and configure a connection to a printer attached to the HSM via a USB port. The HSM is compatible with most printers via its USB interfaces:
- A serial printer may be connected using a USB-to-serial converter cable available from Thales
- A parallel printer may be connected using a USB-to-parallel converter cable available from Thales

The new settings come into effect immediately after the command has completed.

Authorization: This command does not require any authorization.

Inputs:
- CR/LF order (standard or reversed): Y or N
- Selected printer connection.
- Setup Parameters, dependent on printer type.
- Whether to print a test page.

Outputs:
- Test page.

Errors:
- Failed to print test page

Notes: A printer must be connected to the HSM before the CP command is invoked.

Example 1: *This example demonstrates the configuration of a printer attached to the HSM via a USB-to-serial cable.*

```
Offline> CP <Return>

Reverse the <LF><CR> order? [Y/N]: N <Return>

The following possible printer devices were found in the
system:
   0. No printer
   1. USB-Serial Controller by PrintCo located at Rear
USB Port
Your selection (ENTER for no change): 1 <Return>
You must configure the serial parameters for this device:

   BAUD RATES
1.   1200
2.   2400
3.   4800
4.   9600 (current value)
5.  19200
6.  38400
7.  57600
8. 115200
Device baud rate (ENTER for no change):  8 <Return>

   DATA BITS
1. 5
2. 6
3. 7
4. 8 (current value)
Device data bits (ENTER for no change): <Return>

   STOP BITS
1. 1 (current value)
2. 2
Device stop bits (ENTER for no change): <Return>

   PARITY
1. none (current value)
2.  odd
3. even
Device parity (ENTER for no change): <Return>

  Flow Control
1. none
2. software (current value)
3. hardware
Printer flow_ctl (ENTER for no change): <Return>

  Printer Offline Control
1. none (current value)
2. RTS
3. DTR
Printer offline control (ENTER for no change): <Return>
Timeout [in milliseconds, min=1000, max=86400000]
(12000): <Return>
Delay [in milliseconds, min = 0, max=7200000] (0):
<Return>

Print test page? [Y/N]: Y <Return>
```

```
Offline>
```

Example 2: *This example demonstrates the configuration of a printer attached to the HSM via a USB-to-parallel cable.*

```
Offline> CP <Return>

Reverse the <LF><CR> order? [Y/N]: N <Return>

The following possible printer devices were found in the
system:
No printer
IEEE-1284 Controller by PrintCo located at Rear USB Port
Your selection (ENTER for no change): 1 <Return>
Timeout [in milliseconds, min=1000, max=86400000] (1000):
<Return>
Delay [in milliseconds, min = 0, max=7200000] (0):
<Return>
Print test page? [Y/N]: Y <Return>

Offline>
```

Example 3: *This example demonstrates the configuration of a printer attached to the HSM via a native USB cable.*

```
Offline> CP <Return>

Reverse the <LF><CR> order? [Y/N]: N <Return>

The following possible printer devices were found in the
system:
   0. No printer
   1. USB Printer by PrintCo located at Rear USB Port
Your selection (ENTER for no change): 1 <Return>
Timeout [in milliseconds, min=1000, max=86400000] (1000):
<Return>
Delay [in milliseconds, min = 0, max=7200000] (0):
<Return>
Print test page? [Y/N]: N <Return>

Offline>
```

View Printer Port Configuration (QP)

Variant ☑	Key Block ☑	
Online ☑	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **QP**

Function: To display details of the HSM's printer configuration.

Authorization: This command does not require any authorization.

Inputs:
- Print test page: Y or N

Outputs:
- Reverse the <LF><CR> order: YES or NO.
- Validation of current printer configuration.
- The serial configuration settings (serial printer only).

Errors:
- Failed to print test page

Example 1: *This example demonstrates viewing the configuration of a printer attached to the HSM via a USB-to-serial cable.*

```
Online> QP <Return>

The configured printer, USB-Serial Controller by PrintCo
located at Rear USB Port, has been validated
   BAUD RATE:       38400
   DATA BITS:       8
   STOP BITS:       1
   PARITY:          none
   Flow Control:    XON/XOFF
   Offline Control: none
<LF><CR> order reversed: NO
Timeout:  12000 milliseconds
Delay:    0 milliseconds
Print test page? [Y/N]: N <Return>

Online>
```

Example 2: *This example demonstrates viewing the configuration of a printer attached to the HSM via a USB-to-parallel cable.*

```
Online> QP <Return>

The configured printer, IEEE-1284 Controller by PrintCo
located at Rear USB Port, has been validated.
<LF><CR> order reversed: NO
Timeout:  12000 milliseconds
Delay:    0 milliseconds
Print test page? [Y/N]: N <Return>

Online>
```

Example 3: *This example demonstrates viewing the configuration of a printer attached to the HSM via a native USB cable.*

```
Online> QP <Return>

The configured printer, USB Printer by PrintCo located at
Rear USB Port, has been validated
<LF><CR> order reversed: NO
```

```
Timeout:   1000 milliseconds
Delay:     0 milliseconds
Print test page? [Y/N]: N <Return>

Online>
```

Configure Management Port (CM)

Variant ☑	Key Block ☑	
Online ☒	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **CM**

Function: To configure the Management port, which is an Ethernet port used only for management of the HSM. If connection to the host is via Ethernet then the Ethernet host port is used for that purpose. The Management Ethernet port is used to update the HSM's internal software, updating licensing information, and for enabling management of a HSM via the payShield Manager.

The new settings come into effect a few seconds after the command has completed.

It is recommended that the Host Ethernet Ports, the Management Ethernet Port, and the Auxiliary Ethernet Port are all on different IP subnets from each other.

Authorization: The HSM must be in the offline or secure state to run this command.

Inputs:
- Whether IP address is manually or automatically derived.
  - If manually derived, then the address details must be entered.
  - If using DHCP, then a network name may be entered.
- Ethernet speed setting.
- Enable (local or remote) payShield Manager connection?

Outputs: None.

Errors: None.

Example 1: *In this example, the management port has its IP address set up manually.*

```
Offline> CM <Return>

Management Ethernet Interface:
IP Configuration Method? [D]HCP or [S]tatic (DHCP): S
<Return>
Enter IP address (192.168.100.200): 192.168.200.90
<Return>
Enter subnet mask (255.255.255.0): <Return>
Enter Default Gateway Address (192.168.200.1): <Return>

  Enter speed setting for this port:

      SPEED OPTIONS:
  0   Autoselect
  1   10BaseT half-duplex
  2   10BaseT full-duplex
  3   100BaseTX half-duplex
  4   100BaseTX full-duplex
  5   1000BaseT half-duplex
  6   1000BaseT full-duplex

  Speed setting (4): 6 <Return>


Enable payShield Manager connection:
Enable or Disabled? (E): D <Return>
Changing the IP address, Network name, or method requires
that the Management TLS certificate is regenerated.
```

```
Continuing will cause the
certificate to be regenerated under the Customer Trust
Authority. If you
require an externally signed Management TLS certificate
you will need to regenerate a CSR, have it signed and
imported.
Do you wish to proceed? [Y/N]: Y <Return>

Would you like to apply the changes now? [Y/N]: Y
<Return>

Offline>
```

Example 2: *In this example, the management port has its IP address set up automatically by a DHCP server.*

```
Secure> CM <Return>

Management Ethernet Interface:
IP Configuration Method? [D]HCP or [S]tatic (DHCP):
<Return>
Network Name (B466527122600-mgmt): HSM-Mngmnt <Return>

Enter speed setting for this port:

    SPEED OPTIONS:
0   Autoselect
1   10BaseT half-duplex
2   10BaseT full-duplex
3   100BaseTX half-duplex
4   100BaseTX full-duplex
5   1000BaseT half-duplex
6   1000BaseT full-duplex

Speed setting (0): <Return>

Enable payShield Manager connection:
Enable or Disabled? (E): <Return>

Would you like to apply the changes now? [Y/N]: Y
<Return>

Secure>
```

View Management Port Configuration (QM)

Variant ☑	Key Block ☑	
Online ☑	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **QM**

Function: To display details of the Management port parameters.

Authorization: This command does not require any authorization.

Inputs: None.

Outputs:
- IP configuration method
- Network name (if configuration method is DHCP)
- IP address.
- Subnet mask.
- Default gateway.
- MAC address.
- Ethernet speed setting.
- Enable (local or remote) payShield Manager connection?

Errors: None.

Example 1:

Online> **QM** <Return>

```
Management Ethernet Interface:
IP Configuration Method: static
IP address: 192.168.200.90
Subnet mask: 255.255.255.0
Default Gateway: 192.168.200.1
MAC address: 00:d0:fa:04:27:64
Port speed:  1000baseT full-duplex
payShield Manager connection: Disabled

Online>
```

Example 2: *In this example, the management port has its IP address set up automatically by a DHCP server.*

```
Online> QM <Return>

Management Ethernet Interface:
IP Configuration Method: DHCP
Network Name: HSM-Mngmnt
IP address: 192.168.1.3
Subnet mask: 255.255.255.0
Default Gateway: 192.168.1.1
MAC address: 00:d0:fa:04:27:64
Port speed:  100baseTX full-duplex
payShield Manager connection: Enabled

Online>
```

Configure Auxiliary Port (CA)

Variant ☑	Key Block ☑	
Online ☒	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **CA**

Function: To configure the Auxiliary port, which is an Ethernet port currently used only for transmission of SNMP traffic from the HSM.

The new settings come into effect a few seconds after the command has completed.

It is recommended that the Host Ethernet Ports, the Management Ethernet Port, and the Auxiliary Ethernet Port are all on different IP subnets from each other.

Authorization: The HSM must be in the offline or secure state to run this command.

Inputs:
- Whether IP address is manually or automatically derived.
  - If manually derived, then the address details must be entered.
  - If using DHCP, then a network name may be entered.
- Ethernet speed setting.

Outputs: None.

Errors: None.

Example 1: *In this example, the auxiliary port has its IP address set up manually.*

```
Offline> CA <Return>

Auxiliary Ethernet Interface:
IP Configuration Method? [D]HCP or [S]tatic (DHCP): S
<Return>
Enter IP address (192.168.300.200): 192.168.300.90
<Return>
Enter subnet mask (255.255.255.0): <Return>
Enter Default Gateway Address (192.168.300.1): <Return>

  Enter speed setting for this port:

      SPEED OPTIONS:
  0   Autoselect
  1   10BaseT half-duplex
  2   10BaseT full-duplex
  3   100BaseTX half-duplex
  4   100BaseTX full-duplex
  5   1000BaseT half-duplex
  6   1000BaseT full-duplex

  Speed setting (4): 6 <Return>

Would you like to apply the changes now? [Y/N]: Y
<Return>

Offline>
```

Example 2: *In this example, the auxiliary port has its IP address set up automatically by a DHCP server.*

```
Secure> CA <Return>

Auxiliary Ethernet Interface:
IP Configuration Method? [D]HCP or [S]tatic (DHCP):
<Return>
Network Name (B46652712260-Aux): HSM-Aux <Return>

Enter speed setting for this port:

    SPEED OPTIONS:
0   Autoselect
1   10BaseT half-duplex
2   10BaseT full-duplex
3   100BaseTX half-duplex
4   100BaseTX full-duplex
5   1000BaseT half-duplex
6   1000BaseT full-duplex

Speed setting (0): <Return>

Would you like to apply the changes now? [Y/N]: Y
<Return>

Secure>
```

View Auxiliary Port Configuration (QA)

Variant ☑	Key Block ☑	
Online ☑	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **QA**

Function: To display details of the Auxiliary port parameters.

Authorization: This command does not require any authorization.

Inputs: None.

Outputs:
- IP address.
- Network name, if DHCP configured.
- Subnet mask.
- Default gateway.
- MAC address.
- Ethernet speed setting.

Errors: None.

Example 1:

Online> **QA** <Return>

Auxiliary Ethernet Interface:
IP Configuration Method: static
IP address: 192.168.300.90
Subnet mask: 255.255.255.0
Default Gateway: 192.168.300.1
MAC address: 00:d0:fa:04:43:33
Port speed: Ethernet 1000baseT full-duplex

Online>

Example 2: *In this example, the auxiliary port has its IP address set up automatically by a DHCP server.*

```
Online> QA <Return>

Auxiliary Ethernet Interface:
IP Configuration Method: DHCP
Network Name: HSM-Aux
IP address: 192.168.1.3
Subnet mask: 255.255.255.0
Default Gateway: 192.168.1.1
MAC address: 00:d0:fa:04:43:33
Port speed:  100baseTX full-duplex

Online>
```

Configure Alarms (CL)

Variant ☑	Key Block ☑	
Online ☒	Offline ☒	Secure ☑
Authorization: **Not required**		

Command: **CL**

Function: To enable or disable the motion alarm. The temperature alarm is permanently enabled. The HSM alarm circuitry typically needs to be turned off if the HSM is to be moved. The alarm should be turned on while the HSM is in service or being stored. The alarm setting can optionally be saved to a smartcard.

Authorization: The HSM must be in the secure state to run this command.

Inputs:
- Motion alarm status: Low, Medium, High or Off.
- Save settings to smartcard: Yes or No.

Outputs: None.

Errors:
- Card not formatted to save/retrieve HSM settings.
  Attempt with another card? [Y/N]

Example 1: *In this example, the setting is being made to a **less** secure setting.*

```
Secure> CL <Return>

Please make a selection.  The current setting is in
parentheses.
Motion alarm [Low/Med/High/OFF] (MED): F <Return>
LMKs must be erased before proceeding.
Erase LMKs?? [Y/N]: Y<Return>
Save ALARM settings to smart card? [Y/N]: N <Return>

Secure>
```

Example 2: *In this example, the setting is being made to a **more** secure setting.*

```
Secure> CL <Return>

Please make a selection.  The current setting is in
parentheses.
Motion alarm [Low/Med/High/OFF] (OFF): H <Return>
Save ALARM settings to smart card? [Y/N]: N <Return>

Secure>
```

View Alarm Configuration (QL)

Variant ☑	Key Block ☑	
Online ☑	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **QL**

Function: To display details of the alarm configuration of the HSM.

Authorization: This command does not require any authorization.

Inputs: None.

Outputs:
- The Temperature alarm status.
- The Motion alarm status.

Errors: None.

Example:

```
Online> QL <Return>

Temperature alarm enabled

Motion alarm enabled high sensitivity

Online>
```

View/Change Instantaneous Utilization Period (UTILCFG)

Variant ☑	Key Block ☑	
Online ☑	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **UTILCFG**

Function: To display the current setting of the period over which utilization statistics is to be collected when Instantaneous Utilization Data is requested. This command also allows the setting to be amended (in Offline/Secure states only).

Authorization: The HSM does not require any authorization to run this command.

Inputs: Amended value for Instantaneous Utilization Period. (It is suggested that the period should not be set to less than 10 seconds, as data collected over very short periods will not be indicative of actual activity.)

Outputs: Text messages as in example below.
Note that resetting of the value requires the HSM to be in Offline or Secure state.

Example:

```
Online> UTILCFG <Return>

Measurement period for instantaneous statistics is 60
seconds

Online>

…

Offline> UTILCFG <Return>

Measurement period for instantaneous statistics is 60
seconds

Change? [Y/N]: Y <Return>
Enter new value in seconds (1-60): 10 <Return>

Offline>
```

Suspend/Resume Collection of Utilization Data (UTILENABLE)

Variant ☑	Key Block ☑	
Online ☒	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **UTILENABLE**

Function: To suspend or resume the collection of Utilization Data and the incrementing of the count of seconds over which the data is being collected. This allows data collection to be suspended if, for example, the HSM is taken out of service or temporarily re-purposed. It ensures that cps rates are not diluted by averaging command volumes over the total elapsed time, but only over the time that data is being collected

Authorization: The HSM does not require any authorization to run this command.

Inputs: Whether to change the current state.

Outputs: Text messages as in example below.

Notes: Following a software load, collection of Utilization Data will be suspended. Data collection is automatically suspended while the HSM is not online.

Example:

```
Offline> UTILENABLE <Return>

Utilization statistics gathering is currently turned ON.
Suspend? [Y/N] Y <Return>

Offline> UTILENABLE <Return>

Utilization statistics gathering is currently turned OFF.
Resume? [Y/N] Y <Return>

Offline>
```

Suspend/Resume Collection of Health Check Counts (HEALTHENABLE)

Variant ☑	Key Block ☑	
Online ☒	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **HEALTHENABLE**

Function: To suspend or resume the collection of Health Check counts. This allows data collection to be suspended if, for example, data is not required.

Authorization: The HSM does not require any authorization to run this command.

Inputs: Whether to change the current state.

Outputs: Text messages as in example below.

Notes: Following a software load, collection of Health Check counts will be suspended.

Example:

```
Offline> HEALTHENABLE <Return>

Health check statistics gathering is currently turned
ON.
Suspend? [Y/N] Y <Return>

Offline> HEALTHENABLE <Return>

Health check statistics gathering is currently turned
OFF.
Resume? [Y/N] Y <Return>

Offline>
```

View SNMP Settings (SNMP)

Variant ☑	Key Block ☑	
Online ☑	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **SNMP**

Function: To display the current SNMP settings, and to enable/disable provision of Utilization and Health Check data via SNMP.

Authorization: The HSM does not require any authorization to run this command.

Inputs:
- Whether to Enable/Disable provision of Utilization and Health Check data via SNMP.
- Which Ethernet port to use for SNMP traffic.

Outputs: Text messages as in example below.

Notes: The HSM is delivered with no Users set up.

Example:

```
Secure> SNMP <Return>

V3 Users:
    None

SNMP is currently disabled

Enable? [Y/N]: Y <Return>

 0. Management Port
 1. Auxiliary Port

SNMP port [0-1] (ENTER for no change): 0 <Return>
sysName (Less than 256 characters)(payShield 10K):
<Return>
sysDescr (Less than 256 characters)(Thales e-Security
payShield 10K): <Return>
sysLocation (Less than 256 characters)(USA): <Return>
sysContact (Less than 256 characters)(Thales e-Security
Support): <Return>

Save new MIB-2 system settings? [Y/N]: Y <Return>

SNMP MIB-2 system updated

Secure>
```

Add an SNMP User (SNMPADD)

Variant ☑	Key Block ☑	
Online ☒	Offline ☒	Secure ☑
Authorization: **Not required**		

Command: **SNMPADD**

Function: Add an SNMP User (for SNMP version 3).

Authorization:
- The HSM does not require any authorization to run this command.
- The HSM must be in Secure state.

Inputs:
- The SNMP user name,
- Authentication algorithm,
- Privacy algorithm.

Outputs: Text messages as in example below.

Notes: The HSM is delivered with no Users set up.

Example:

```
Secure> SNMPADD <Return>

Enter user name (Less than 20 characters): SHADES
<Return>
Authentication algorithm [[N]one, [M]D5, [S]HA]: S
<Return>
Enter authentication password (>= 8 and < 20 characters):
Password1 <Return>
Privacy algorithm [[N]one, [D]ES, [A]ES]: A <Return>
Enter privacy password (>= 8 and < 20 characters):
Password2 <Return>
The following entry will be added to the table:
    'createUser shades SHA AES'.
Confirm? [Y/N]: Y <Return>
User added successfully
Enter additional users? [Y/N]: N <Return>
Save and exit? [Y/N]: Y <Return>
SNMP configuration updated

Secure>
```

Delete an SNMP User (SNMPDEL)

Variant ☑		Key Block ☑
Online ☒	Offline ☒	Secure ☑
Authorization: **Not required**		

Command: **SNMPDEL**

Function: Delete an SNMP User.

Authorization:
- The HSM does not require any authorization to run this command.
- The HSM must be in Secure state.

Inputs: The index of the user to be deleted.

Outputs: Text messages as in example below.

Notes: The HSM is delivered with no Users set up.

Example:

```
Secure> SNMPDEL <Return>

SNMP user table:
        0: User=public, Authentication=none, Privacy=none
        1: User=shades, Authentication=SHA, Privacy=DES
        2: User=none, Authentication=none, Privacy=none
        3: User=md5, Authentication=MD5, Privacy=none

Select user to delete [0-3]: 1 <Return>

User 'shades' deleted successfully

Remove additional users? [Y/N]: N <Return>

Save and exit? [Y/N]: Y <Return>

SNMP configuration updated

Secure>
```

Configure SNMP Traps (TRAP)

Variant ☑	Key Block ☑	
Online ☑	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **TRAP**

Function: To display the current SNMP Trap configuration and to enable/disable individual SNMP Traps.

Authorization: The HSM does not require any authorization to run this command.

Inputs: Whether to Enable/Disable individual trap configurations.

Outputs: Text messages as in the example below.

Notes: The HSM is delivered with no SNMP Traps configured.

Example 1:

```
Offline> TRAP <Return>

Trap table is empty, no SNMP traps are configured.

Enable? [Y/N]: Y <Return>

Offline>
```

Example 2:

```
Offline> TRAP <Return>

Entry    IP Address:Port      User name
 1       192.168.100.133:162  User1

Disable? [Y/N]: N <Return>

Offline>
```

Add a new SNMP Trap (TRAPADD)

Variant ☑	Key Block ☑	
Online ☒	Offline ☒	Secure ☑
Authorization: **Not required**		

Command: **TRAPADD**

Function: Add an SNMP Trap.

Authorization:
- Authorization is not required.
- The HSM must be in the Secure state.

Inputs: Trap configuration data & confirmation.

Outputs: Text messages as in example below.

Errors: User table is empty; please add a V3 user first

Failed to add trap destination

Notes: The HSM is delivered with no SNMP traps configured.

Example 1:

```
Secure> TRAPADD <Return>

Enter IP Address: 192.168.100.133 <Return>
Enter Port (162): <Return>
SNMP user table:
        0: User=User1, Authentication=SHA, Privacy=DES

Select user [0-0]: 0 <Return>

The following entry will be added to the table:
        '192.168.100.133:162, User1'.
Confirm? [Y/N]: Y <Return>

Trap destination added successfully

Configure additional traps? [Y/N]: N <Return>

Save and exit? [Y/N]: Y <Return>

SNMP configuration updated

Secure>
```

Delete an SNMP Trap (TRAPDEL)

Variant ☑	Key Block ☑	
Online ☒	Offline ☒	Secure ☑
Authorization: **Not required**		

Command: **TRAPDEL**

Function: Delete an SNMP Trap.

Authorization:
- Authorization is not required.
- The HSM must be in the Secure state.

Inputs: Confirmation of deletion.

Outputs: Text messages as in example below.

Errors: Trap table is empty; nothing to delete
Failed to delete trap destination.

Notes: The HSM is delivered with no SNMP traps configured.

Example:

```
Secure> TRAPDEL <Return>

SNMP Trap table:
    0: Address=192.168.100.133, Port=162, User=User1

Select trap to delete [0-0]: 0 <Return>

Trap destination deleted successfully

Delete additional traps? [Y/N]: N <Return>

Save and exit? [Y/N]: Y <Return>

SNMP configuration updated

Secure>
```

5 Fraud Detection Commands

The payShield 10K provides the following commands to support fraud detection operations:

Configure Fraud Detection (A5)

Variant ☑		Key Block ☑
Online ☑	Offline ☑	Secure ☑
Authorization: **May be required** Activity: **audit.console**		

Command: **A5**

Function: To set the configuration of the HSM fraud detection function.

Authorization: If the Fraud Detection settings are to be edited, the HSM must be:
- in the offline or secure state to run this command, and
- either in the Authorized State, or the activity **audit.console** must be authorized, using the Authorizing Officer cards of the Management LMK.

Inputs:
- Whether and how to respond to Fraud Detection
- Limit on number of PIN verification failures per minute.
- Limit on number of PIN verification failures per hour.
- Limit on number of PIN attacks detected.

Outputs: None.

Errors:
- Not Authorized - the HSM is not authorized to perform this operation.
- Invalid Entry - the value entered is invalid.

Notes:
- If any of the limits set by this command are exceeded, an entry will be made in the Audit Log, and console command A7 must be used to re-enable PIN verification.
- Setting the HSM reaction to Logging only and the limits to zero will result in Fraud Detection not being recorded in the Health Check data. (*The term "Logging" as used in the screen prompt refers to logging in the Health Check data, not in the Audit Log.*)

Example:

```
Offline-AUTH> A5 <Return>

HSM reaction to Exceeding Fraud Limits is : ON

The following limits are set:
PIN verification failures per minute : 100
PIN verification failures per hour   : 1000
PIN Attack Limit                     : 100

HSM reaction to Exceeding Fraud Limits? ([O]n/[L]ogging
only): L <Return>

Note that logging is supported only if enabled via the
HEALTHENABLE console command (or its payShield Manager
equivalent)

Enter limit on PIN verification failures per minute: 200
<Return>
Enter limit on PIN verification failures per hour: 2000
<Return>
Enter PIN Attack Limit: 200 <Return>

Offline-AUTH>
```

Re-enable PIN Verification (A7)

Variant ☑		Key Block ☑
Online ☒	Offline ☑	Secure ☑
Authorization: **Required** Activity: **audit.console**		

Command: **A7**

Function: To reset the configuration of the HSM fraud detection function.

Authorization: The HSM must be in the offline state to run this command. The HSM must be either in the Authorized State, or the activity **audit.console** must be authorized, using the Authorizing Officer cards of the Management LMK.

Inputs: None.

Outputs: None.

Errors:
- Not Authorized - the HSM is not authorized to perform this operation.
- Command only allowed from offline.
- PIN Verification is not currently disabled

Example:

```
Offline-AUTH> A7 <Return>
PIN verification has been re-enabled
Offline-AUTH>
```

6 Diagnostic Commands

The payShield 10K provides the following console commands to support diagnostic operations:

Diagnostic Test (DT)

Variant ☑		Key Block ☑
Online ☑	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **DT**

Function: To perform diagnostic tests.
The DT command tests the following parts of the HSM:
- Battery voltage level
- Various cryptographic algorithms (DES, AES, RSA, SHA-1, etc.)
- Working memory areas
- Power Supplies
- Random Number Generator
- Real-time clock
- Smartcard reader
- Operating temperature
- Operating fan speeds
- Operating voltages

The command also initiates the Health Check Status report.

Authorization: The HSM does not require any authorization for this command.

Inputs: Optional qualifiers to modify scope and detail of output. Options are:

all	run all the commands (default option)
verbose	be verbose in the output
battery	run the battery diagnostics
des	run the DES diagnostics
health	run the health check diagnostics
aes	run the AES KAT
ecdsa	run the ECDSA KAT
md5	run the MD5 KAT
mem	run the memory diagnostics
psu	run the power supply diagnostics
rng	run the random number generator diagnostics
rsa	run the RSA KAT
rtc	run the real-time clock diagnostics
scr	run the smart card reader diagnostics
sha	run the SHA KAT
temp	run the temperature diagnostics
fans	run the fans diagnostics
volt	run the voltage diagnostics

Note that the multiple options can be combined (e.g." dt temp verbose"; "dt volt rsa")
Note that whilst the command code ("dt") is not case sensitive, the options listed above are.

Outputs: Status report on each item.

Errors: None.

Notes:
- The diagnostics are run automatically on a daily basis at the time specified using the ST Console command.

Example 1:

```
Secure>DT <Return>

Battery:          OK
AES:              OK
DES:              OK
ECDSA:            OK
HMAC:             OK
MD5:              OK
Memory:           OK
Power Supply:     OK
RNG:              OK
RSA:              OK
Real-Time Clock: SYNCHRONIZED (system time was synchronized
with the RTC)
SHA:              OK
SCR:              OK
Temperature:      OK
Fans:             OK
Voltages:         OK

Health Check Status

TCP Server:                      Up
UDP Server:                      Up
FICON Server:                    Not Enabled
Local/Remote Manager Server:     Up
Host Ethernet Link 1:            Up
Host Ethernet Link 2:            Up
Host FICON Link:                 Not Enabled
Unit Tampered?:                  No
Fraud limits exceeded?:          No
PIN attack limit exceeded?:      No

Diagnostics complete

Offline>
```

Example 2:

```
Online> DT verbose <Return>

Battery:          OK
    Voltage: 3500 mV
    HSM will enter tamper state if voltage drops below 2500
mV

    Running AES Known Answer Test
    PASSED AES Known Answer Test
AES:              OK

    Running DES Known Answer Test
    PASSED DES Known Answer Test
DES:              OK

    Running ECDSA Known Answer Tests
    PASSED Cryptodev ECDSA Known Answer Tests
    PASSED OpenSSL ECDSA Known Answer Tests
    PASSED OpenSSL ECDHC Known Answer Tests
ECDSA:            OK

    Running MD5 Known Answer Test
    PASSED MD5 Known Answer Test
MD5:              OK

    Running Memory Test
    PASSED Memory Test
Memory:           OK
Power Supply:     OK

    Running RNG self-tests (Attempt: 1)
    PASSED RNG self-tests
RNG:              OK

    Running RSA Known Answer Test
    PASSED RSA Known Answer Test
RSA:              OK
Real-Time Clock: OK
   Current Time: FNov 16 12:09:54 2018


    Running SHA Known Answer Test
    PASSED SHA Known Answer Test
SHA:              OK
SCR:              OK
Temperature:      OK


    MSP       :  33.1C 91.6F          (Min=30.0C 86.0F
Max=35.1C 95.2F)
    MP 1      :  56.2C 133.2F         (Min=46.0C 114.8F
Max=61.6C 142.9F)
    MP 2      :  56.2C 133.2F         (Min=46.3C 115.3F
Max=62.9C 145.2F)
    Crypto    :  41.0C 105.8F         (Min=37.1C 98.8F
Max=42.8C 109.0F)
    Sensor 1  :  43.9C 111.0F         (Min=42.1C 42.1F
Max=46.3C 115.3F)
    Sensor 2  :  38.6C 101.5F         (Min=36.6C 97.9F
Max=40.4C 104.7F)
```

```
    Sensor 3 :  35.2C 95.4F          (Min=33.1C 91.6F
Max=36.6C 36.6F)
Fans:            OK
   Fan 1:             8000 RPM (target: 8000 RPM)
   Fan 2:             7868 RPM (target: 8000 RPM)
Voltages:        OK

    V12          :  11.46   (Min=11.43      Max=11.48)
    V5           :  5.052   (Min=5.032      Max=5.067)
    MP Core      :  1.028   (Min=1.016      Max=1.038)
    Crypto Core  :  1.053   (Min=1.052      Max=1.060)
    Battery      :  3.595   (Min=3.593      Max=3.599)


Health Check Status

TCP Server:                      Up
UDP Server:                      Up
FICON Server:                    Not Enabled
Local/Remote Manager Server:     Up
Host Ethernet Link 1:            Up
Host Ethernet Link 2:            Up
Host FICON Link:                 Not Enabled
Unit Tampered?:                  No
Fraud limits exceeded?:          No
PIN attack limit exceeded?:      No

Diagnostics complete

Online>
```

View Software Revision Number (VR)

Variant ☑		Key Block ☑
Online ☑	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **VR**

Function: To display details of the software release number, revision number and build number.

Authorization: The HSM does not require any authorization to run this command.

Inputs: None.

Outputs: Software revision numbers, serial numbers, license details and FIPS algorithm information.

Errors: None.

Notes: The software revision reported by the VR command will have one of the following forms:

- xxxx-10xx – this indicates that this software has been PCI HSM certified and that the appropriate security settings have been set (e.g. by using the CS Console command) to the required values.
- xxxx-00xx – this indicates that either:
  - this version of software is not PCI HSM certified, or
  - this version of software is PCI HSM certified but one or more of the appropriate security settings have not been set (e.g. by using the CS Console command) to the required values.

Example: *Software which has not been PCI HSM certified. TLS protection of host communications is enabled.*

```
Online>vr


This is a non-Production build! Signed with Development Keys.
Base Release:       FEATURE_HHSM
Revision:           1500-1000
Firmware Version:   1.6.0+DI858
Deployment Version: 1.6.0+DEV858

PCI HSM Compliance:
Refer to the PCI web site (https://www.pcisecuritystandards.org
/approved_companies_providers/approved_pin_transaction_security.php)
for current certification status of this version of payShield 10K software.

Security settings are consistent with the requirements of PCI HSM.

Serial Number:  S0000000001G
Model:          PS10-F

Power supply #1:
   Model number : D1U54P-W-450-12-HA4C
   Serial number: XQ1712Q11221
Power supply #2:
   Model number : D1U54P-W-450-12-HA4C
   Serial number: XQ1712Q11024

Fan #1:
   Serial number: FM0H012000001
Fan #2:
   Serial number: FM0H012000003

Unit info:      Licensed

Host Configuration: Ethernet,FICON,(optional) TLS/SSL
License Issue No:   19
Performance:        2500 cps
Ship Counter:       1
Crypto:             3DES,AES,RSA

Press "Enter" to view additional information...
All Commands Package:
- Enables all host commands

Optional Licenses:
- Legacy Commands
- LMKx20
- Remote payShield Manager
- Visa DSP

Bootstrap Version:                  1.4.64
Sensor Processor Application:       100.15.2
Sensor Processor Boot Version:      1.0.0
CPLD Version:                       1.2.3
PCI HW Rev:                         01


FIPS validated algorithms:
Algorithm                   Name and Version                    FIPS Status
---------                   ----------------                    -----------
DRBG/RNG                    TASP-DRBG v1.0                      Approved
SHA                         TASP-SHA  v1.0                      Approved
HMAC                        TASP-HMAC v1.0                      Approved
TDES                        TASP-TDES v1.0                      Approved
AES                         TASP-AES  v1.0                      Approved
CMAC                        TASP-CMAC v1.0                      Approved
RSA                         TASP-RSA-ACCELERATED  v1.0         Approved
AES                         TASP-AES-ACCELERATED  v1.0         Approved
TDES                        TASP-TDES-ACCELERATED v1.0         Approved


Online>
```

The example above reflects non-PCI compliant settings. A PCI compliant example would reflect the following under the PCI HSM Compliance field:

```
PCI HSM Compliance:
Refer to the PCI web site
(https://www.pcisecuritystandards.org/approved_companies_providers/approved_pin_transaction_security.php) for current
certification status of this version of payShield 10K
software.
Security settings are consistent with the requirements of
PCI HSM.
```

View Available Commands (GETCMDS)

Variant ☑		Key Block ☑
Online ☑	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **GETCMDS**

Function: To display a list of enabled host and console commands. Commands listed in the output are licensed AND enabled. Commands omitted from the output are either not licensed, or not enabled. Console command CONFIGCMDS can be used to enable/disable individual commands.

GETCMDS can optionally generate a hash (message digest) over the set of enabled commands, thus providing a simple mechanism to verify that two (or more) HSMs have the same set of commands enabled.

Note: Some of the commands listed may require additional license options enabled.

Authorization: The HSM does not require any authorization to run this command.

Inputs: [-hl]

Switch	Description
<blank>	Display a list of all host & console commands that are *implemented* AND *licensed* AND *enabled*.
-h	Display a hash of the host & console commands that are *implemented* AND *licensed* AND *enabled*. (The hash is affected by enabling/disabling commands using the CONFIGCMDS console command.)
-l	Display a list of all host & console commands that are *implemented* AND *licensed*. (This list is not affected by enabling/disabling commands using the CONFIGCMDS console command.)

Outputs: A list of available HSM commands (depending on options) or a hash value.

Errors: None.

Example:

```
Online> GETCMDS -h -l <Return>

List of available Host commands:

A0  A2  A4  A6  A8  AA  AC  AE  AG  AI  AK  AM  AO  AQ  AS
AU  AW  AY  B0  B2  B8  BA  BC  BE  BG  BI  BK  BM  BQ  BS
BU  BW  BY  C0  C2  C4  C6  C8  CA  CC  CE  CG  CI  CK  CM
CO  CQ  CS  CU  CW  CY  D0  D2  D4  D6  D8  DA  DC  DE  DG
DI  DK  DM  DO  DQ  DS  DU  DW  DY  E0  E2  E4  E6  E8  EA
EC  EE  EG  EI  EK  EM  EO  EQ  ES  EU  EW  EY  F0  F2  F4
F6  F8  FA  FC  FE  FG  FI  FK  FM  FO  FQ  FS  FU  FW  FY
G0  G2  G4  G6  G8  GA  GC  GE  GG  GI  GK  GM  GO  GQ  GS
GU  GW  GY  H0  H2  H4  H6  H8  HA  HC  HE  HG  HI  HK  HM
HO  HQ  HS  HU  HW  HY  I0  I2  I4  I6  I8  IA  IC  IE  IG
II  IK  IM  IO  IQ  IU  IW  IY  J0  J2  J4  J6  J8  JA  JC
JE  JG  JI  JK  JO  JS  JU  JW  JY  K0  K2  K8  KA  KC  KE
KG  KI  KK  KM  KO  KQ  KS  KU  KW  KY  L0  L2  L4  L6  L8
LA  LC  LE  LG  LI  LK  LM  LO  LQ  LS  LU  LW  LY  M0  M2
M4  M6  M8  MA  MC  ME  MG  MI  MK  MM  MO  MQ  MS  MU  MW
MY  N0  NC  NE  NG  NI  NK  NO  NY  OA  OC  OE  OI  OK  OU
OW  P0  P2  P4  P6  P8  PA  PC  PE  PG  PI  PK  PM  PO  PQ
PS  PU  PW  PY  Q0  Q2  Q4  Q6  Q8  QA  QC  QE  QI  QK  QM
QO  QQ  QS  QU  QW  QY  R2  R4  R6  R8  RA  RC  RE  RG  RI
RK  RM  RO  RQ  RS  RU  RW  RY  SY  T0  T2  T4  T6  TA  U0
U2  U4  U6  U8  V0  V2  V4  V6  V8  W0  W2  W4  W6  W8  X0
X2  X4  X6  X8  XK  XM  XO  XQ  XS  XU  XW  Y0  Y2  Y4  Y6
Y8  Z0  ZA  ZE  ZK  ZM  ZU
List of available Console commands:

A         A5        A6        A7        AUDITLOG          AUDITOPTIONS
C         CA        CH        CK        CL        CLEARERR
CLEARAUDIT          CM        CO        CONFIGACL         CONFIGCMDS
    CONFIGPB
CP        CS        CV        DC        DM        DO
DT        EC        ED        EJECT     ERRLOG    FC
FK        GC        GETCMDS   GETTIME   GK        GS
GT        HEALTHENABLE        HEALTHSTATS         IK        IV        KD
KE        KG        KK        KM        KN        KT
LK        LO        LN        MI        N         NP
NETSTAT   PING      PV        QA        QH        QL
QM        QP        QS        R         RC        RESET
RS        SD        SE        SETTIME   SG        SI
SK        SL        SP        SNMP      SNMPADD   SNMPDEL
SS        ST        SV        T         TD        TRAP
TRAPADD   TRAPDEL   TRACERT   UPLOAD    UTILCFG   UTILENABLE
UTILSTATS           V         VA        VC        VR        VT
XA        XD        XE        XH        XI        XK
XR        XT        XX        XY        XZ        $

Host/Console Command Hash Value:  cf7e8a
```

Show Network Statistics (NETSTAT)

Variant ☑		Key Block ☑
Online ☑	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **NETSTAT**

Function: The HSM records details about network activity on both its Management and Host Ethernet ports for diagnostic and security purposes. As a diagnostic aid, it can provide useful information when configuring the unit. If reviewed periodically, it can also provide evidence of unexpected network activity, which may require further investigation.

The HSM collects information about each 'endpoint' that communicates with it. The information recorded will depend on the particular protocol that was used to send the packet.

Authorization: The HSM does not require any authorization to run this command.

Inputs:

Syntax:

netstat [-vWeenNcCF] [<Af>] –r
netstat {-V|--version|-h|--help}
netstat [-vWnNcaeol] [<Socket> ...]
netstat { [-vWeenNac] -i | [-cWnNe] -M | -s }

Options:

-r, --route	display routing table
-i, --interfaces	display interface table
-g, --groups	display multicast group memberships
-s, --statistics	display networking statistics (like SNMP)
-M, --masquerade	display masqueraded connections
-v, --verbose	be verbose
-W, --wide	don't truncate IP addresses
-n, --numeric	don't resolve names
--numeric-hosts	don't resolve host names
--numeric-ports	don't resolve port names
--numeric-users	don't resolve user names
-N, --symbolic	resolve hardware names
-e, --extend	display other/more information
-p, --programs	display PID/Program name for sockets
-c, --continuous	continuous listing
-l, --listening	display listening server sockets
-a, --all, --listening	display all sockets (default: connected)
-o, --timers	display timers

-F, --fib	display Forwarding Information Base (default)
-C, --cache	display routing cache instead of FIB
-Z, --context	display SELinux security context for sockets

Outputs: Text messages as appropriate.

The reported state can have the following values:

ESTABLISHED
: The socket has an established connection.

SYN_SENT
: The socket is actively attempting to establish a connection.

SYN_RECV
: A connection request has been received from the network.

FIN_WAIT1
: The socket is closed, and the connection is shutting down.

FIN_WAIT2
: Connection is closed, and the socket is waiting for a shutdown from the remote end.

TIME_WAIT
: The socket is waiting after close to handle packets still in the network.

CLOSED
: The socket is not being used.

CLOSE_WAIT
: The remote end has shut down, waiting for the socket to close.

LAST_ACK
: The remote end has shut down, and the socket is closed. Waiting for acknowledgement.

LISTEN
: The socket is listening for incoming connections.

CLOSING
: Both sockets are shut down but we still don't have all our data sent.

UNKNOWN
: The state of the socket is unknown

Example:

```
Offline> NETSTAT <Return>

Available Ethernet Interfaces:
Management Interface : 192.168.220.116
Auxiliary Interface  : 169.254.254.1
Host Interface 1     : 192.168.220.16
Host Interface 2     : 192.168.192.149

Active Internet connections (w/o servers)
Proto Recv-Q Send-Q Local Address       Foreign Address
State
tcp        0    236 192.168.220.116:ssh
193.240.102.135:49921 ESTABLISHED
Active UNIX domain sockets (w/o servers)
Proto RefCnt Flags   Type    State      I-Node   Path
unix  40     [ ]     DGRAM              2925     /dev/log
unix  2      [ ]     DGRAM              1735
unix  2      [ ]     DGRAM              11668
unix  2      [ ]     DGRAM              57209
unix  3      [ ]     STREAM  CONNECTED  143125
/var/ipc/agentx

Offline>
```

Test TCP/IP Network (PING)

Variant ☑	Key Block ☑	
Online ☑	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **PING**

Function: To test the specified network node, and the route to it.

Authorization: The HSM does not require any authorization to run this command.

Inputs:

Syntax:

ping [-q] [-c *count*] [-I *interface*] [-p *pattern*]
[-s *packetsize*] [-t *ttl*] [-w *maxwait*] host

Options:

-c *count* — Stop after sending (and receiving) this many ECHO_RESPONSE packets.

-I *interface* — The interface that PING is to be sent from.

interface Value	HSM Port
h1	Host Port #1
h2	Host Port #2
m	Management Port (default)

-p *pattern* — Fill out the packet with this many "padding" bytes (maximum is 16). You should find this useful for diagnosing data-dependent problems in a network. For example, -p ff causes the sent packet to be filled with ones.

-q — Be quiet: display nothing except for the summary lines at start-up time and when finished.

-s *packetsize* — Send this many data bytes. The default is 56, which translates into 64 ICMP data bytes when combined with the 8 bytes of ICMP header data.

-t *ttl* — Use the specified time-to-live. It represents how many hops the packet can go through before being discarded (when it reaches 0). The default is 255.

-w *maxwait* — Specify a timeout, in seconds, before ping exits regardless of how many packets have been sent or received.

Outputs: Text messages as appropriate.

Example:

```
Offline> PING -I h1 192.168.100.123 <Return>

PING 192.168.100.123 (192.168.100.123): 56 data bytes
64 bytes from 192.168.100.123: seq=0 ttl=32 time=16 ms
64 bytes from 192.168.100.123: seq=1 ttl=32 time=4 ms
64 bytes from 192.168.100.123: seq=2 ttl=32 time=4 ms
64 bytes from 192.168.100.123: seq=3 ttl=32 time=4 ms
64 bytes from 192.168.100.123: seq=4 ttl=32 time=4 ms
64 bytes from 192.168.100.123: seq=5 ttl=32 time=101 ms
64 bytes from 192.168.100.123: seq=6 ttl=32 time=4 ms
64 bytes from 192.168.100.123: seq=7 ttl=32 time=4 ms
64 bytes from 192.168.100.123: seq=8 ttl=32 time=4 ms
64 bytes from 192.168.100.123: seq=9 ttl=32 time=4 ms
```

```
Offline>
```

Trace TCP/IP route (TRACERT)

Variant ☑	Key Block ☑	
Online ☑	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **TRACERT**

Function: To view the path taken from the HSM to the specified address.

Authorization: The HSM does not require any authorization to run this command.

Inputs:

Syntax:

tracert [-dFlInr] [-f *first_ttl*]
[-g *gateway*] [-i *interface*] [-m *max_ttl*] [-p *port*]
[-q *nqueries*] [-s *src_addr*] [-t *tos*] [-w *wait_time*]
host [*packetsize*]

Options:

-d Turn on socket-level debugging.

-F Set the "don't fragment" bit.

-f *first_ttl* Set the initial time-to-live used in the first outgoing probe packet.

-g *gateway* Specify a loose source route gateway (8 maximum).

-I Use ICMP ECHO instead of UDP datagrams.

-i *interface*

interface Value	HSM Port
h1	Host Port #1
h2	Host Port #2
m (default)	Management Port

-l ("el") Display the TTL (time-to-live) value of the returned packet. This is useful for checking for asymmetric routing.

-m *max_ttl* Set the maximum TTL (maximum number of hops) used in outgoing probe packets. The default is 30 hops (the same default as is used for TCP connections).

-n Print hop addresses numerically only. By default, addresses are printed both symbolically and numerically. This option saves a nameserver address-to-name lookup for each gateway found on the path.

-p *port* The base UDP port number to be used in probes (default is 33434). The tracert utility hopes that nothing is listening on UDP ports base to base + nhops -1 at the destination host (so an ICMP PORT_UNREACHABLE message is returned to terminate the route tracing). If something is listening on a port in the default range, you can use this option to pick an unused port range.

-q *nqueries* The number of probes per ttl to *nqueries* (default is three probes).

-r Bypass the normal routing tables and send directly to a host on an attached network. If the host isn't on a directly attached network, an error is returned. You can use this option to "ping" a local host through an

	interface that has no route through it (for example, after the interface was dropped by routed).
-s *src_addr*	The IP address (must be given as an IP number, not a hostname) to be used as the source address in outgoing probe packets. If the host has more than one IP address, you can use this option to force the source address to be something other than the IP address of the interface that the probe packet is sent on. If the IP address you specify isn't one of this machine's interface addresses, an error is returned and nothing is sent.
-t *tos*	The type-of-service (TOS) to be used in probe packets (default is zero). The value must be a decimal integer in the range 0 to 255. You can use this option to see if different TOSs result in different paths. Not all TOS values are legal or meaningful. You should find the values -t 16 (low delay) and -t 8 (high throughput) useful.
-w *wait_time*	The time (in seconds) to wait for a response to a probe (default is 5).
host	The destination hostname or IP number.
packetsize	The probe datagram length (default is 40 bytes).

Outputs: Text messages as appropriate.

Example:

```
Offline> TRACERT  -I h1 –g 10.10.10.1   10.10.11.2
<Return>

traceroute to 10.10.11.2 (10.10.11.2), 64 hops max, 40
byte packets
10.10.10.1 (10.10.10.1)  5.000 ms  7.000 ms  5.000 ms
10.10.11.2 (10.10.11.2)  5.000 ms  6.000 ms  6.000 ms

Offline>
```

View/Reset Utilization Data (UTILSTATS)

Variant ☑	Key Block ☑	
Online ☑	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **UTILSTATS**

Function: To display Utilization Data at the Console. Options to print the data to an HSM-attached printer and to reset accumulated data to zero.

Authorization: The HSM does not require any authorization to run this command.

Notes:
- Utilization statistics are also reset when new software is installed on the HSM.
- The precise meaning of a HSM loading range identified below as, for example, "*10-20%*" is "*from exactly 10% to just under 20%*".
- Statistics are provided irrespective of which host interface the commands are received over.

Inputs:
- Whether to print output to HSM-attached printer
- Whether to reset data

Outputs: Text messages as in example below.

Note that the number of seconds displayed is not necessarily the number of seconds between the start and end times: rather, it is the number of seconds during this period when data collection was enabled using the UTILENABLE command and the HSM was online.

Example:

```
Online> UTILSTATS <Return>

HSM Serial Number:      A4665271570Q

Report Generation Time: 05-Dec-2018 19:42.37
Report Start Time:      04-Dec-2018 09:25.01
Report End Time:        05-Dec-2018 19:42.37
Total number of secs:   123,456

HSM Loading:
0-10%:                  56,789
10-20%:                 24,109
20-30%:                 21,445
30-40%:                 12,382
40-50%:                 3,288
50-60%:                 2,917
60-70%:                 2,123
70-80%:                 403
80-90%:                 0
90-100%:                0
100%:                   0

Press "Enter" to continue... <Return>




Host Command Volumes:
        Cmd Code  Total Transactions  Average CPS
        A0        225                4.79
```

```
        A4          99                  2.11
        A6          342                 7.28
        A8          408                 8.68
        AA          141                 3.00
        AC          135                 2.87
        AE          84                  1.79
        AG          66                  1.40
        AS          18                  0.38
        AU          94                  2.00
        AW          94                  2.00
        AY          94                  2.00
        B0          50                  1.06
        BA          14                  0.30
        BC          34                  0.72
        BE          42                  0.89
        BG          5                   0.11
        BI          11                  0.23
        BK          128                 2.72

Press "Enter" to continue... <Return>

        Cmd Code  Total Transactions  Average TPS
        BM        10                  0.21
        LA        2                   0.04

Instantaneous HSM Load: 17%
Instantaneous Host Command Volumes:
Cmd Code              Total Transactions  Average CPS
BM          10                  0.21
LA          2                   0.04

Send output to printer? [Y/N]: Y <Return>
Reset All Stats? [Y/N]: Y <Return>
All utilization statistics will be reset to 0. Confirm?
[Y/N]: Y <Return>

Online>
```

View/Reset Health Check Counts (HEALTHSTATS)

Variant ☑	Key Block ☑	
Online ☑	Offline ☑	Secure ☑
Authorization: **May be required** Activity: **diagnostics**		

Command: **HEALTHSTATS**

Function: To display Health Check counts at the Console. Options to print the data to a HSM-attached printer and to reset accumulated data to zero.

Authorization: The HSM does not require any authorization to run this command to view the data.
The HSM must be in Offline/Secure Authorized state (or the activity **diagnostics** must be authorized) for the Management LMK to reset the Health Check Counts

Notes:
- Accumulated health check counts are also reset when new software is installed on the HSM.
- If collection of health check data has been suspended at any time, the counts relating to Fraud Detection (i.e. failed PIN verifications and PIN Attacks) will not represent the values of those counts which will be used by the HSM to trigger return of Error 39 or deletion of LMKs.

Inputs:
- Whether to print output to HSM-attached printer
- Whether to reset data (requires Offline/Secure Authorized state).

Outputs: Text messages as in example below.

Example:

```
Offline-AUTH> HEALTHSTATS <Return>

HSM Serial Number:            A4665271570Q

Report Generation Time:        05-Dec-2018 23:22.28
Report Start Time:             01-Dec-2018 01:11.21
Report End Time:               25-Dec-2018 23:22.28
Number of reboots:                                3
Number of tampers:                                1
PIN verification failures/minute limit exceeded: 57
PIN verification failures/hour limit exceeded:    4
PIN Attack Limit exceeded:                        0

Send output to printer? [Y/N]: Y <Return>

Reset All Stats? [Y/N]: Y <Return>
All Utilization statistics will be reset to 0. Confirm?
[Y/N]: Y <Return>

Offline-AUTH>
```

Check the FICON Host Interface

Variant ☑	Key Block ☑	
Online ☒	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **FICONTEST**

Function: To check the operation of the FICON Host interface board (if fitted) and optical transceivers.

Authorization: The HSM does not require any authorization to run this command.

Notes:

- This test is appropriate only to the payShield 10K PS10-F.
- The test can be run using the loopback module provided. This should be connected to the Transceiver connected to payShield 10K. Further details on the loopback module are provided in the payShield 10K Installation and User Guide.
- The test will send 10 packets and report success/failure on each
- The test will check that the following components are installed and operational:
    - HSM main board
    - FICON board and connectors
    - Transceivers and connectors
    - Optical cable
    - FICON software

Inputs:

- None

Outputs: Text messages as in example below.

Example 1: *When this command is entered without parameters, the system displays usage for the command.*

```
Secure>ficonTest -f 0 -l 0 /dev/luminex/lucdrv0 0 0000
              extloop

StartCU() with:
   Identifier:              S0000000001G
   DeviceName:              /dev/luminex/lucdrv0
   Image:                   0
   ControlUnitType:         0000
   ModelNumber:             extloop
   Starting DeviceAddress: 0
   Endig DeviceAddress:     0
   mihMinutes:              0
Set Speed to extloop
Set Speed to extloop
/dev/luminex/lucdrv0 Now Online
/dev/luminex/lucdrv1 Now Online
terminating...
/dev/luminex/lucdrv0 Now Offline
/dev/luminex/lucdrv1 Now Offline
Set Speed to 0
Set Speed to 0
10 packets sent, 10 packets received, 0% loss

Secure>
```

Example 2:

This example uses the output from Example 1, which runs the loopback test:

```
Secure>ficonTest -f 0 -l 0 /dev/luminex/lucdrv0 0 0000
              extloop

StartCU() with:
   Identifier:              S0000000001G
   DeviceName:              /dev/luminex/lucdrv0
   Image:                   0
   ControlUnitType:         0000
   ModelNumber:             extloop
   Starting DeviceAddress: 0
   Endig DeviceAddress:    0
   mihMinutes:              0
Set Speed to extloop
Set Speed to extloop
/dev/luminex/lucdrv0 Now Online
/dev/luminex/lucdrv1 Now Online
terminating...
/dev/luminex/lucdrv0 Now Offline
/dev/luminex/lucdrv1 Now Offline
Set Speed to 0
Set Speed to 0
10 packets sent, 10 packets received, 0% loss


Secure>
```

7 Local Master Keys

7.1 Types of LMKs

A Variant LMK is a set of 20 double- or triple-length TDES keys, with different "pairs" and variants of those "pairs" being used to encrypt different types of keys.

Note that the term "pair" is used regardless of whether the LMK consists of double-length keys, or triple-length keys. The standard LMK format supported in all previous versions of Thales (Racal) HSM firmware consists of 20 double-length TDES keys.

Note that the term "Variant LMK" refers to the fact that variants are applied to the LMK prior to using the LMK; a Variant LMK is not itself a variant of any other key.

A Key Block LMK is either a triple-length TDES key, or a 256-bit AES key, and is used to encrypt keys in a key block format. A Key Block LMK is not compatible with a Variant LMK, and it can only be used to encrypt keys in the key block format.

Note that the term "Key Block LMK" refers to the 'key block' method of encrypting keys; a Key Block LMK is not itself stored in the key block format.

7.2 Multiple LMKs

It is possible to install multiple LMKs within a single HSM. The precise details of the number and type of installed LMKs are controlled via the HSM's license file:

LMKs are stored in a table within the secure memory of the HSM, with each LMK occupying a different “slot” within the table. Each slot has the following attributes:

Attribute	Description
LMK ID	A 2-digit number which uniquely indicates the location of each LMK within the table. All references to LMKs are made by specifying the LMK Identifier.
Key Scheme	• "Variant" for traditional Racal/Thales LMK – key encryption performed using the *variant* method. • "Key Block" for enhanced security – key encryption performed using the *key block* method.
Algorithm	• "3DES (2key)" or "3DES (3key)" is used by Variant LMKs. • "3DES (3key)" or "AES (256-bit)" is used by Key Block LMKs. Other algorithm types may be supported in future software releases.
Status	• "Test" indicates that the LMK is used for testing purposes. • "Live" indicates that the LMK is used for live production purposes.

	When installing LMKs, the HSM will prevent any mixing of Test and Live LMKs within the same slot (i.e. LMK Value and Old/New LMK Value must have the same status).
Comments	User-entered text, which can be used to help identify LMKs.
Authorization	Indicates the authorization status of the HSM for this particular LMK – either a flag (for Authorized State) or a list of authorized activities.
Old/New Status	Flag for each LMK held in Key Change Storage indicating whether they are to be used as an 'old' LMK (loaded via 'LO' command), or a 'new' LMK (loaded via 'LN' command).
LMK Check Value	The check value of the LMK.
Old/New LMK Check Value	The check value of the 'old' or 'new' LMK held in Key Change Storage.

Use the console command VT (View LMK Table) to view the contents of the HSM's LMK table (but not the actual LMK values).

7.3 LMK Commands

The HSM provides the following console commands to support LMK operations:

Generate LMK Component(s) (GK)

Variant ☑	Key Block ☑	
Online ☒	Offline ☒	Secure ☑
Authorization: **Not required**		

Command: **GK**

Function: To generate component(s) of an LMK, and store the component(s) on smartcards.
This command may be used to generate components for the following types of LMKs:
- Double-length (2DES) Variant LMK
- Triple-length (3DES) Variant LMK
- Triple-length (3DES) Key Block LMK
- 256-bit AES Key Block LMK.

When creating a Variant LMK or a 3DES Key Block LMK, this command generates the data for a single LMK component card.

When creating an AES Key Block LMK, this command generates the data for all the required number of LMK component cards.

Authorization: The HSM must be in the secure state to run this command.

Inputs:
- LMK Scheme (Variant or Key Block).
- LMK Algorithm:
  - Double-length (2DES) or triple-length (3DES) if Variant scheme is selected
  - Triple-length (3DES) or AES if Key Block scheme is selected.
- LMK Status (Test or Live).
- For an AES Key Block LMK:
  - Number of components.
  - Number of components required to reconstitute the LMK.

Outputs:
- LMK components written to smartcards.
- LMK component check value.

Errors:
- Card not formatted – use the FC command to format the card.
- Not a LMK card –card is not formatted for LMK or key storage.
- Warning – card not blank. Proceed? [Y/N] – LMK card is not blank.
- Overwrite LMK set? [Y/N] – card already contains an LMK component.
- Smartcard error; command/return: 0003 – invalid PIN is entered.
- Invalid PIN; re-enter – a PIN of less than 4 or greater than 8 is entered.

Notes:
- PINs must be entered within 60 seconds of being requested.
- If the CS setting "Card/Password authorization" is set to "Card", then the HSM will write a random password to the 1st and 2nd LMK component cards. These passwords will be required in order to put the HSM into the Authorized State.

Example 1: (Triple-length Variant LMK)

This example generates a triple-length Variant LMK component set, and writes the components to a smartcard.

```
Secure> GK <Return>
Variant scheme or key block scheme? [V/K]: V <Return>
Enter algorithm type [2=2DES, 3=3DES]: 3 <Return>

Key status? [L/T]: L <Return>
LMK component set [1-9]: 1 <Return>
Insert blank card and enter PIN: ******** <Return>
Writing keys...
Checking keys...
Device write complete, check: ZZZZZZ

Remove the smartcard and store it securely.

Make another copy? [Y/N]: N <Return>
1 copies made.

Repeat the procedure to generate further component sets.

Secure>
```

Example 2: (Double-length Variant LMK)

This example generates a double-length variant LMK component set, and writes the components to a smartcard.

```
Secure> GK <Return>
Variant scheme or key block scheme? [V/K]: V <Return>
Enter algorithm type [2=2DES, 3=3DES]: 2 <Return>

Key status? [L/T]: L <Return>
LMK component set [1-9]: 1 <Return>
Insert blank card and enter PIN: ******** <Return>
Writing keys...
Checking keys...
Device write complete, check: ZZZZZZ

Remove the smartcard and store it securely.

Make another copy? [Y/N]: N <Return>
1 copies made.


Repeat the procedure to generate further component sets.

Secure>
```

Example 3: (Triple-length 3DES Key Block LMK)

This example generates a 3DES key block LMK component, and writes the component to a smartcard.

```
Secure> GK <Return>
Variant scheme or key block scheme? [V/K]: K <Return>
Enter algorithm type [D=DES,A=AES]: D
Key status? [L/T]: L <Return>
LMK component set [1-9]: 1 <Return>
Insert blank card and enter PIN: ******** <Return>
Writing keys...
Checking keys...
Device write complete, check: ZZZZZZ

Remove the smartcard and store it securely.

Make another copy? [Y/N]: N <Return>
1 copies made.

Repeat the procedure to generate further components.

Secure>
```

Example 4: (AES Key Block LMK)

This example generates a set of AES key block LMK components, and writes each component to a smartcard.

```
Secure> GK <Return>
Variant scheme or key block scheme? [V/K]: K <Return>
Enter algorithm type [D=DES,A=AES]: A <Return>
Enter the number of components to generate: [2-9]: 5
<Return>
Enter the number of components required to reconstitute
the LMK: [2-5]: 2 <Return>
Key status? [L/T]: L <Return>

Check value for the LMK: ZZZZZZ

Insert blank card and enter PIN: ******** <Return>
Writing keys...
Checking keys...
Device write complete, check: ZZZZZZ

Remove the smartcard and store it securely.

Insert blank card and enter PIN: ******** <Return>
Writing keys...
Checking keys...
Device write complete, check: ZZZZZZ

Remove the smartcard and store it securely.

The above sequence is repeated to generate each component
card.

Secure>
```

Load LMK (LK)

Variant ☑	Key Block ☑	
Online ☒	Offline ☒	Secure ☑
Authorization: **Not required**		

Command: **LK**

Function: To load LMK components from smartcards.

Authorization: The HSM must be in the secure state to run this command.

Inputs:
- Confirm remote access (if already commissioned for remote access using the payShield Manager)
- LMK Identifier: 2 numeric digits.
- Optional comments
- Smartcards (RLMKs are supported) with LMK components.
- PINs for the Smartcards or passwords. The PIN must be entered within 60 seconds.
- Whether to make this LMK the Default/Management LMK - see Notes below.

Outputs:
- Individual LMK component check value(s).
- Final LMK check value.

Notes:
- For PCI HSM compliance, PINs and smartcards must be used to authenticate the Security Officers.
- Use of this command will always create an entry in the Audit Log.
- If there is not already a Default and/or Management LMK installed (i.e. the LMK IDs identified in the security settings as being the default and management LMKs are empty), you will be asked if you wish to make this new LMK the Default/Management LMK.
- An error is returned if an attempt is made to load an LMK with a single component where:
    - The LMK is not a test LMK, and
    - The security setting to enforce multiple key components has been set to YES.

Errors:
- Invalid LMK identifier - no LMK loaded or entered identifier out of range.
- Load failed check comparison - card is blank.
- Not a LMK card - card is not formatted for LMK or key storage.
- Card not formatted - card is not formatted.
- Smartcard error; command/return: 0003 - invalid PIN is entered.
- Invalid PIN; re-enter - a PIN of less than 5 or greater than 8 digits is entered.
- Invalid key – a standard Thales test key cannot be given live status.
- Incompatible key status – the components have different status ("live" or "test").
- Invalid key - Multiple key components required – an attempt has been made to load an LMK (other than a test LMK) using a single component when the security setting to enforce multiple components has been set to YES.

Example 1: (Double-length Variant LMK)

This example loads a double-length Variant LMK from smartcards and installs it in the HSM. There is already Default and Management LMKs installed.

```
Secure> LK <Return>
Enter LMK id: 00 <Return>
Enter comments: Live LMK for ABC Bank <Return>
LMK in selected location must be erased before
proceeding
Erase LMK? Y <Return>
Load LMK from components or shares
Insert card and press ENTER: <Return>
Enter PIN: ******** <Return>

Check: AAAAAA
Load more components? [Y/N]: Y <Return>

Remove the smartcard. Insert the second and subsequent
smartcards and repeat the loading procedure. When all
components have been loaded and the HSM displays the LMK
Check value, record the check value.

LMK Check: ZZZZZZ
LMK id: 00
LMK key scheme: Variant
LMK algorithm: 3DES (2key)
LMK status: Live
Comments: Live LMK for ABC Bank
Confirm details? [Y/N]: Y <Return>
Use the LO/LN command to load LMKs into key change
storage.
Secure>
```

Example 2: (Triple-length Variant LMK)

This example loads a triple-length Variant LMK from smartcards and installs it in the HSM. There are already Default and Management LMKs installed.

```
Secure> LK <Return>
Enter LMK id: 01 <Return>
Enter comments: Process System One <Return>
LMK in selected location must be erased before
proceeding
Erase LMK? Y <Return>
Load LMK from components or shares
Insert card and press ENTER: <Return>
Enter PIN: ******** <Return>

Check: AAAAAA
Load more components? [Y/N]: Y <Return>

Remove the smartcard. Insert the second and subsequent
smartcards and repeat the loading procedure. When all
components have been loaded and the HSM displays the LMK
Check value, record the check value.

LMK Check: ZZZZZZ
LMK id: 01
LMK key scheme: Variant
```

```
LMK algorithm: 3DES (3key)
LMK status: Live
Comments: Process System One
Confirm details? [Y/N]: Y <Return>
Use the LO/LN command to load LMKs into key change
storage.
Secure>
```

Example 3: (Any LMK type)

In this example, the PIN is not entered within 60 seconds.

```
Secure> LK <Return>
Enter LMK id [0-9]: 0 <Return>
Enter comments: <Return>
Load LMK from components or shares
Insert card and press ENTER: <Return>
Enter PIN:
Terminated
Secure>
```

Example 4: (Double- or triple-length Variant LMK)

In this example, the security setting requiring use of multiple components has been set to YES, but the user has attempted to load a non-Test LMK using only one component.

```
Secure> LK <Return>
Enter LMK id [0-4]: 0 <Return>
Enter comments: <Return>
Load LMK from components or shares
Insert card and press ENTER: <Return>
Enter PIN: ******** <Return>

Check: AAAAAA
Load more components? [Y/N]: N <Return>
LMK Check: ZZZZZZ
Invalid key - Multiple key components required
Secure>
```

Example 5: (3DES Key Block LMK)

This example loads a 3DES key block LMK from smartcards and installs it in the HSM. There is already Default and Management LMKs installed.

```
Secure> LK <Return>
Enter LMK id: 01 <Return>
Enter comments: Live LMK for XYZ Bank <Return>
LMK in selected location must be erased before
proceeding
Erase LMK? Y <Return>
Load LMK from components or shares
Insert card and press ENTER: <Return>
Enter PIN: ******** <Return>

Check: AAAAAA
Load more components? [Y/N]: Y <Return>

Remove the smartcard. Insert the second and subsequent
smartcards and repeat the loading procedure. When all
components have been loaded and the HSM displays the LMK
Check value, record the check value.

LMK Check: ZZZZZZ
LMK id: 01
LMK key scheme: KeyBlock
LMK algorithm: 3DES(3key)
LMK status: Live
Comments: Live LMK for XYZ Bank
Confirm details? [Y/N]: Y <Return>
Use the LO/LN command to load LMKs into key change
storage.
Secure>
```

Example 6: (AES Key Block LMK)

This example loads an AES key block LMK from smartcards and installs it in the HSM. There is already Default and Management LMKs installed.

```
Secure> LK <Return>
Enter LMK id: 02 <Return>
Enter comments: Live LMK for XYZ Bank <Return>
LMK in selected location must be erased before
proceeding
Erase LMK? Y <Return>
Load LMK from components or shares
Insert card and press ENTER: <Return>
PIN: ******** <Return>
Check: AAAAAA

Remove the smartcard. Insert the second and subsequent
smartcards and repeat the loading procedure. When all
components have been loaded and the HSM displays the LMK
Check value, record the check value.

LMK Check: ZZZZZZ
LMK id: 02
LMK key scheme: KeyBlock
LMK algorithm: AES-256
LMK status: Live
Comments: Live LMK for XYZ Bank
Confirm details? [Y/N]: Y <Return>
Use the LO/LN command to load LMKs into key change
storage.
Secure>
```

Example 7: (AES Key Block LMK - no Default or Management LMK already installed.)

This example loads an AES key block LMK from smartcards and installs it in the HSM. There is no Default or Management LMK already installed.

```
Secure> LK <Return>
Enter LMK id: 02 <Return>
Enter comments: Live LMK for XYZ Bank <Return>

Load LMK from components or shares
Insert card and press ENTER: <Return>
Enter PIN: ******** <Return>
Check: AAAAAA

Remove the smartcard. Insert the second and subsequent
smartcards and repeat the loading procedure. When all
components have been loaded and the HSM displays the LMK
Check value, record the check value.

LMK Check: ZZZZZZ
LMK id: 02
LMK key scheme: KeyBlock
LMK algorithm: AES-256
LMK status: Live
Comments: Live LMK for XYZ Bank
Confirm details? [Y/N]: Y <Return>
Use the LO/LN command to load LMKs into key change
storage.
Do you want to make this LMK the default LMK? [Y/N]: Y
<Return>
Do you want to make this LMK the management LMK? [Y/N]:
Y <Return>
Secure>
```

Load 'Old' LMK into Key Change Storage (LO)

Variant ☑	Key Block ☑	
Online ☒	Offline ☒	Secure ☑
Authorization: **Required** Activity: **admin.console**		

Command: **LO**

Function: To load an old LMK component set into Key Change Storage for use in translations from old to new keys. Note that the current LMK must be installed before an "old" LMK can be installed. Also note that it is possible to install a Variant LMK as the "old" LMK, and with a Key Block LMK as the "new" LMK.

Authorization: The HSM must be in the secure state to run this command. Additionally, the HSM must be either in the Authorized State, or the activity **admin.console** must be authorized, using the Authorizing Officer cards of the specified LMK.

Inputs:
- LMK identifier: 2 numeric digits.
- Smartcards (RLMKs are supported) with old LMK components.
- PINs for the Smartcards or passwords. PINs must be entered within 60 seconds of being requested.

Outputs:
- Individual LMK Component check value(s).
- Final LMK key check value.

Errors:
- No LMK loaded – there is no LMK loaded in main memory.
- Invalid LMK identifier – entered identifier out of range
- Key Block LMK not permitted – it is not permitted to load a Key Block LMK into key change storage if a variant LMK is loaded in main memory.
- Load failed check comparison – card is blank.
- Not a LMK card – card is not formatted for LMK or key storage.
- Card not formatted – card is not formatted.
- Smartcard error; command/return: 0003 – invalid PIN is entered.
- Invalid PIN; re-enter – a PIN of less than 4 or greater than 8 is entered.
- Command only allowed from Secure-Authorized – the HSM is not in Secure State, or the HSM is not authorized to perform this operation, or both.
- Invalid key – a standard Thales test key cannot be given live status.
- Incompatible cards – the component cards have different formats.
- Incompatible key status – the components have different status ("live" or "test").
- Invalid key - Multiple key components required – an attempt has been made to load an LMK (other than a Test LMK) using a single component when the security setting to enforce multiple components has been set to YES.

Notes:
- For PCI HSM compliance, PINs and smartcards must be used to authenticate the Security Officers.
- Use of this command will always create an entry in the Audit Log.
- It is not permitted to load a Key Block LMK into the "old" LMK slot of a Variant LMK.
- It is not permitted to load an AES Key Block LMK into the "old" LMK slot of a 3DES Key Block LMK.
- If multiple LMKs are loaded on the HSM, each can have a corresponding old LMK. The ID of the LMK being processed is defined in the command input.

Example 1: (Double-length Variant LMK)

This example loads a double-length Variant LMK from smartcards and installs it as 'old' LMK 00.

```
Secure-AUTH> LO <Return>
Enter LMK id: 00 <Return>
Enter comments: Old LMK for ABC Bank <Return>
Load old LMK from components or shares
Insert card and press ENTER: <Return>
Enter PIN: ******** <Return>
Check: AAAAAA
Load more components? [Y/N]: Y <Return>

Remove the smartcard. Insert the second and subsequent
smartcards and repeat the loading procedure until all old
component sets have been loaded. When all components have
been loaded and the HSM displays the LMK Check value,
ensure that this is the expected value.

LMK Check: ZZZZZZ
LMK id: 00
LMK key scheme: Variant
LMK algorithm: 3DES (2key)
LMK status: Live
Comments: Old LMK for ABC Bank
Confirm details? [Y/N]: Y <Return>
Secure-AUTH>
```

Example 2: (Triple-length Variant LMK)

This example loads a triple-length Variant LMK from smartcards and installs it as 'old' LMK 00.

```
Secure-AUTH> LO <Return>
Enter LMK id: 00 <Return>
Enter comments: Old LMK for Process System One <Return>
Load old LMK from components or shares
Insert card and press ENTER: <Return>
Enter PIN: ******** <Return>
Check: AAAAAA
Load more components? [Y/N]: Y <Return>

Remove the smartcard. Insert the second and subsequent
smartcards and repeat the loading procedure until all old
component sets have been loaded. When all components have
been loaded and the HSM displays the LMK Check value,
ensure that this is the expected value.

LMK Check: ZZZZZZ
LMK id: 00
LMK key scheme: Variant
LMK algorithm: 3DES (3key)
LMK status: Live
Comments: Old LMK for Process System One
Confirm details? [Y/N]: Y <Return>
Secure-AUTH>
```

Example 3: (Double- or triple-length Variant LMK)

This example attempts to load a non-Test LMK using a single component when the security setting to enforce multiple components has been set to YES.

```
Secure-AUTH> LO <Return>
Enter LMK id: 00 <Return>
Enter comments: Old LMK for ABC Bank <Return>
Load old LMK from components or shares
Insert card and press ENTER: <Return>
Enter PIN: ******** <Return>
Check: AAAAAA
Load more components? [Y/N]: N <Return>
Check: AAAAAA
Invalid key - Multiple key components required
Secure-AUTH>
```

Example 4: (3DES Key Block LMK)

This example loads a 3DES key block LMK from smartcards and installs it as 'old' LMK 01.

```
Secure-AUTH> LO <Return>
Enter LMK id: 01 <Return>
Enter comments: Old LMK for XYZ Bank <Return>
Load old LMK from components or shares
Insert card and press ENTER: <Return>
Enter PIN: ******** <Return>
Check: AAAAAA
Load more components? [Y/N]: Y <Return>

Remove the smartcard. Insert the second and subsequent
smartcards and repeat the loading procedure until all old
component sets have been loaded. When all components have
been loaded and the HSM displays the LMK Check value,
```

```
ensure that this is the expected value.


LMK Check: ZZZZZZ
LMK id: 01
LMK key scheme: KeyBlock
LMK algorithm: 3DES (3key)
LMK status: Live
Comments: Old LMK for XYZ Bank
Confirm details? [Y/N]: Y <Return>
Secure-AUTH>
```

Example 5: (AES Key Block LMK)

This example loads an AES key block LMK from smartcards and installs it as 'old' LMK 02.

```
Secure-AUTH> LO <Return>
Enter LMK id: 02 <Return>
Enter comments: Old LMK for XYZ Bank <Return>
Load old LMK from components or shares

Insert card and press ENTER: <Return>
Enter PIN: ******** <Return>
Check: AAAAAA

Remove the smartcard. Insert the second and subsequent
smartcards and repeat the loading procedure until all old
component sets have been loaded. When all components have
been loaded and the HSM displays the LMK Check value,
ensure that this is the expected value.

LMK Check: ZZZZZZ
LMK id: 02
LMK key scheme: KeyBlock
LMK algorithm: AES-256
LMK status: Live
Comments: Old LMK for XYZ Bank
Confirm details? [Y/N]: Y <Return>
Secure-AUTH>
```

Load 'New' LMK into Key Change Storage (LN)

Variant ☑	Key Block ☑	
Online ☒	Offline ☒	Secure ☑
Authorization: **Required** Activity: **admin.console**		

Command: **LN**

Function: To load a new LMK component set into Key Change Storage for use in translations from the current LMK to a "new" LMK. Note that the current LMK must be installed before a "new" LMK can be installed. Also note that it is possible to install a Key Block LMK as the "new" LMK, with a Variant LMK as the current LMK.

Authorization: The HSM must be in the secure state to run this command. Additionally, the HSM must be either in the Authorized State, or the activity **admin.console** must be authorized, using the Authorizing Officer cards of the specified LMK.

Inputs:
- LMK identifier: 2 numeric digits.
- Smartcards (regular HSM or payShield Manager smartcards) with new LMK components.
- PINs for the Smartcards or passwords. PINs must be entered within 60 seconds of being requested.

Outputs:
- Individual LMK Component check value(s).
- Final LMK key check value.

Errors:
- No LMK loaded – there is no LMK loaded in main memory.
- Invalid LMK identifier – entered identifier out of range
- Key Block LMK not permitted – it is not permitted to load a key block LMK into key change storage if a variant LMK is loaded in main memory.
- Load failed check comparison – card is blank.
- Not a LMK card – card is not formatted for LMK or key storage.
- Card not formatted – card is not formatted.
- Smartcard error; command/return: 0003 – invalid PIN is entered.
- Invalid PIN; re-enter – a PIN of less than 4 or greater than 8 is entered.
- Command only allowed from Secure-Authorized – the HSM is not in Secure State, or the HSM is not authorized to perform this operation, or both.
- Invalid key – a standard Thales test key cannot be given live status.
- Incompatible cards – the component cards have different formats.
- Incompatible key status – the components have different status ("live" or "test").
- Invalid key - Multiple key components required – an attempt has been made to load an LMK (other than a Test LMK) using a single component when the security setting to enforce multiple components has been set to YES.

Notes:
- For PCI HSM compliance, PINs and smartcards must be used to authenticate the Security Officers.
- Use of this command will always create an entry in the Audit Log.
- It is not permitted to load a Variant LMK into the "new" LMK slot of a Key Block LMK.
- It is not permitted to load a 3DES Key Block LMK into the "new" LMK slot of an AES Key Block LMK.
- If multiple LMKs are loaded on the HSM, each can have a corresponding 'new' LMK. The ID of the LMK being processed is defined in the command input.

Example 1: (Double-length Variant LMK)

This example loads a double-length Variant LMK from smartcards and installs it as 'new' LMK 00.

```
Secure-AUTH> LN <Return>
Enter LMK id: 00 <Return>
Enter comments: New LMK for ABC Bank <Return>
Load new LMK from components or shares
Insert card and press ENTER: <Return>
Enter PIN: ******** <Return>
Check: AAAAAA
Load more components? [Y/N]: Y <Return>

Remove the smartcard. Insert the second and subsequent
smartcards and repeat the loading procedure until all new
component sets have been loaded. When all components have
been loaded and the HSM displays the LMK Check value,
ensure that this is the expected value.

LMK Check: ZZZZZZ
LMK id: 00
LMK key scheme: Variant
LMK algorithm: 3DES(2key)
LMK status: Live
Comments: New LMK for ABC Bank
Confirm details? [Y/N]: Y <Return>
Secure-AUTH>
```

Example 2: (Triple-length Variant LMK)

This example loads a triple-length Variant LMK from smartcards and installs it as 'new' LMK 00.

```
Secure-AUTH> LN <Return>
Enter LMK id: 00 <Return>
Enter comments: New LMK for Process System One <Return>
Load new LMK from components or shares
Insert card and press ENTER: <Return>
Enter PIN: ******** <Return>
Check: AAAAAA
Load more components? [Y/N]: Y <Return>

Remove the smartcard. Insert the second and subsequent
smartcards and repeat the loading procedure until all new
component sets have been loaded. When all components have
been loaded and the HSM displays the LMK Check value,
ensure that this is the expected value.

LMK Check: ZZZZZZ
LMK id: 00
LMK key scheme: Variant
LMK algorithm: 3DES (3key)
LMK status: Live
Comments: New LMK for Process System One
Confirm details? [Y/N]: Y <Return>
Secure-AUTH>
```

Example 3: (Double- or triple-length Variant LMK)

This example attempts to load a non-Test LMK using a single component when the security setting to enforce multiple components has been set to YES.

```
Secure-AUTH> LN <Return>
Enter LMK id: 00 <Return>
Enter comments: New LMK for ABC Bank <Return>
Load new LMK from components. Or shares
Insert card and press ENTER: <Return>
Enter PIN: ******** <Return>
Check: AAAAAA
Load more components? [Y/N]: N <Return>
Check: AAAAAA
Invalid key - Multiple key components required
Secure-AUTH>
```

Example 4: (3DES Key Block LMK)

This example loads a 3DES key block LMK from smartcards and installs it as 'new' LMK 01.

```
Secure-AUTH> LN <Return>
Enter LMK id: 01 <Return>
Enter comments: New LMK for XYZ Bank <Return>
Load new LMK from components or shares
Insert card and press ENTER: <Return>
Enter PIN: ******** <Return>
Check: AAAAAA
Load more components? [Y/N]: Y <Return>

Remove the smartcard. Insert the second and subsequent
smartcards and repeat the loading procedure until all new
component sets have been loaded. When all components have
been loaded and the HSM displays the LMK Check value,
```

```
ensure that this is the expected value.


LMK Check: ZZZZZZ
LMK id: 01
LMK key scheme: KeyBlock
LMK algorithm: 3DES(3key)
LMK status: Live
Comments: New LMK for XYZ Bank
Confirm details? [Y/N]: Y <Return>
Secure-AUTH>
```

Example 5: (AES Key Block LMK)

This example loads an AES key block LMK from smartcards and installs it as 'new' LMK 02.

```
Secure-AUTH> LN <Return>
Enter LMK id: 02 <Return>
Enter comments: New LMK for XYZ Bank <Return>
Load new LMK from components or shares
Insert card and press ENTER: <Return>
Enter PIN: ******** <Return>
Check: AAAAAA

Remove the smartcard. Insert the second and subsequent
smartcards and repeat the loading procedure until all new
component sets have been loaded. When all components have
been loaded and the HSM displays the LMK Check value,
ensure that this is the expected value.

LMK Check: ZZZZZZ
LMK id: 02
LMK key scheme: KeyBlock
LMK algorithm: AES-256
LMK status: Live
Comments: New LMK for XYZ Bank
Confirm details? [Y/N]: Y <Return>
Secure-AUTH>
```

Verify LMK Store (V)

Variant ☑		Key Block ☑
Online ☑	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **V**

Function: To confirm that the check value is identical to the value that was recorded when the LMK set was installed.
For Variant LMKs, the length of the displayed check value is determined by the CS (Configure Security) setting "Restrict Key Check Value to 6 hex chars".
For Key Block LMKs, the length of the displayed check value is always 6 hex digits.

Authorization: The HSM does not require any authorization to run this command.

Inputs:
- LMK Identifier: 2 numeric digits.

Outputs:
- Master key check value.

Errors:
- Invalid LMK identifier - no LMK loaded or entered identifier out of range.

Example:

```
Online> V <Return>
Enter LMK id: 03 <Return>
Check: ZZZZZZ
Online>
```

Duplicate LMK Component Sets (DC)

Variant ☑		Key Block ☑
Online ☒	Offline ☒	Secure ☑
Authorization: **Not required**		

Command: **DC**

Function: To copy an LMK component onto another smartcard.

Authorization: The HSM must be in the secure state to run this command.

Inputs:
- Smartcard (RLMKs are supported) with LMK component.
- PIN for the smartcard. PINs must be entered within 60 seconds of being requested.

Outputs:
- LMK check value.

Errors:
- Load failed check comparison - card is blank
- Not a LMK card - card is not formatted for LMK or key storage.
- Card not formatted - card is not formatted
- Smartcard error; command/return: 0003 - invalid PIN is entered
- Invalid PIN; re-enter - a PIN of less than 4 or greater than 8 is entered.
- Warning - card not blank. Proceed? [Y/N] - LMK card is not blank
- Overwrite LMK set? [Y/N] - the smartcard already contains an LMK component. It can be overwritten if desired.

Example:

```
Secure> DC <Return>
Insert card to be duplicated and press ENTER: <Return>
Enter PIN: ******** <Return>
Insert blank card and enter PIN: ******** <Return>
Writing keys...
Checking keys...
Device write complete, check: ZZZZZZ
Secure>
```

Delete LMK (DM)

Variant ☑	Key Block ☑	
Online ☒	Offline ☒	Secure ☑
Authorization: **Required** Activity: **admin.console**		

Command: **DM**

Function: To delete a selected LMK and (if loaded) the LMK in the corresponding location in key change storage.

Authorization: The HSM must be in the secure state to run this command. Additionally, the HSM must be either in the Authorized State, or the activity **admin.console** must be authorized, using the Authorizing Officer cards of the specified LMK.

Inputs:
- LMK Identifier: 2 numeric digits.

Outputs:
- Display of relevant entry from LMK table and the key change storage table.

Errors:
- Invalid LMK identifier - no LMK loaded or entered identifier out of range.
- Command only allowed from Secure-Authorized - the HSM is not in Secure State, or the HSM is not authorized to perform this operation, or both.
- LMK id xx is the Default and Management LMK ID – the default and Management LMKs cannot be deleted.

Notes:
- LMKs which are the Default or Management LMK cannot be deleted. The Default and Management LMK must be re-assigned to a new LMK before the desired LMK can be deleted. (The LMK ID of the Management and default LMKs can be viewed by running the QS command.)

Example:

```
Secure-AUTH> DM <Return>
Enter LMK id: 01 <Return>

LMK table entry:
ID Auth     Scheme    Algorithm  Status Check  Comments
01 Yes(1)   KeyBlock  3DES(3key) Test   ZZZZZZ Test LMK
for XYZ Bank

Key change storage table entry:
ID          Scheme    Algorithm  Status Check  Comments
01          Variant   3DES(2key) Test   ZZZZZZ Old test
LMK for XYZ Bank

Confirm LMK deletion [Y/N]: Y <Return>
LMK deleted from main memory and key change storage

Secure>
```

Delete 'Old' or 'New' LMK from Key Change Storage (DO)

Variant ☑		Key Block ☑
Online ☒	Offline ☒	Secure ☑
Authorization: **Not required**		

Command: **DO**

Function: To delete a selected LMK from key change storage. This command may only be used if an LMK is loaded in the corresponding location in main LMK memory.

Authorization: The HSM must be in the secure state to run this command.

Inputs:
- LMK Identifier: 2 numeric digits.

Outputs:
- Display of relevant entry from the key change storage table.

Errors:
- Invalid LMK identifier - no LMK loaded or entered identifier out of range.

Example:

```
Secure> DO <Return>
Enter LMK id: 01 <Return>

Key change storage table entry:
ID    Scheme    Algorithm  Status Check  Comments
01    Variant   3DES(2key) Test   ZZZZZZ Old test LMK for
XYZ Bank

Confirm LMK deletion [Y/N]: Y <Return>
LMK deleted from key change storage

Secure>
```

View LMK Table (VT)

Variant ☑	Key Block ☑	
Online ☑	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **VT**

Function: To display the LMK table and the corresponding table for key change storage.

Authorization: The HSM does not require any authorization to run this command.

Inputs: None.

Outputs:

- Displayed LMK table and key change storage table.
- For each LMK currently installed, the following information is displayed:
  - ID – identifier selected during installation of this LMK.
  - Auth – current authorized status:
    - No – not authorized state/activities not active;
    - Yes – authorized state is active;
    - Yes (nX) – 'n' authorized activities are active (if HSM is configured for multiple authorized activities), with X identifying whether ***H***ost or ***C***onsole commands.
    - (Note that LMKs in key change storage cannot be authorized.)
  - Old/New – Status of key in Key Change Storage
    - Old – key is treated as an 'old' LMK
    - New – key is treated as a 'new' LMK
    - (Note that only LMKs held in Key Change Storage have the Old/New status.)
  - Scheme – The LMK scheme:
    - Variant – indicating a Variant LMK
    - Key Block – indicating a Key Block LMK
  - Algorithm – the LMK algorithm:
    - 3DES (2key) – indicating a double-length TDES Variant LMK
    - 3DES (3key) – indicating a triple-length TDES Variant or triple-length (3DES) Key Block LMK
    - AES-256 – indicating an AES Key Block LMK.
  - Status – the LMK status, selected during generation of the LMK.
    - Live – LMK is a 'live' LMK.
    - Test – LMK is a 'test' LMK.
  - Check – the check value of the LMK.
  - Comments – the comments entered during installation of this LMK.

Errors: None.

Example 1:

The HSM is configured for single authorized state, but has not been authorized:

```
Secure> VT <Return>

LMK table:
ID Authorized  Scheme   Algorithm  Status Check  Comments
00 No          Variant  3DES(2key) Test   268604 test
variant

Key change storage table:No keys loaded in key change
storage

Secure>
```

Example 2:

The HSM is configured for single authorized state, and both host and console commands are authorized for LMK 01:

```
Secure> VT <Return>

LMK table:

ID Authorized  Scheme   Algorithm  Status Check  Comments
00 No          Variant  3DES(2key) Test   268604 test
variant
01 Yes(1H,1C)  Variant  3DES(2key) Test   268604 test
variant
02 Yes(1H,1C)  Variant  3DES(3key) Live   554279
Production 1
Key change storage table:No keys loaded in key change
storage

Secure>
```

Example 3:

The HSM is configured for single authorized state, and only host commands are authorized for LMK 01 (console command authorization has automatically expired after 12 hours):

```
Secure> VT <Return>

LMK table:

ID Authorized  Scheme   Algorithm  Status Check  Comments
00 No          Variant  3DES(2key) Test   268604 test
variant
01 Yes(1H,0C)  KeyBlock AES-256    Live   963272 Mngmnt
LMK
Key change storage table:No keys loaded in key change
storage

Secure>
```

Example 4:

The HSM is configured for multiple authorized activities. Output shows how many host and console commands are authorized for each LMK:

```
Online-AUTH> VT <Return>

LMK table:
ID Authorized  Scheme   Algorithm  Status Check  Comments
00 Yes(0H,1C)  Variant  3DES(3key) Live   726135 test variant
02 Yes(1H,0C)  KeyBlock AES-256    Test   6620CA Mngmnt LMK
Key change storage table:
ID Old/New     Scheme   Algorithm  Status Check  Comments
00 New         KeyBlock 3DES(3key) Live   331873 test variant 2
02 New         KeyBlock AES-256    Test   9D04A0 New mngmnt LMK

Online-AUTH>
```

Generate Test LMK (GT)

Variant ☑	Key Block ☑	
Online ☑	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **GT**

Function: To generate one of the standard Thales Test LMKs, and write the component(s) to smartcard(s).
The payShield 10K supports four different types of LMK:

- 2DES Variant LMK
- 3DES Variant LMK
- 3DES Key Block LMK
- AES Key Block LMK

All three DES-based Test LMKs can be stored on a single smartcard; the AES Test LMK requires two smartcards.

Note: This command simply generates a smart card with the known and documented test LMK stored on it. The command does not generate a new test LMK.

Authorization: The HSM does not require any authorization to run this command.

Inputs:
- Type of Test LMK to be generated.
- Prompts for smartcards to be inserted & PINs to be entered.

Outputs:
- Confirmation of Test LMK components being written to smartcards.
- Prompts to make additional copies.

Errors:
- Card not formatted – use the FC command to format the card.
- Not a LMK card –card is not formatted for LMK or key storage.
- Warning – card not blank. Proceed? [Y/N] – LMK card is not blank.
- Overwrite LMK set? [Y/N] – card already contains an LMK component.
- Invalid selection.
- Invalid PIN.

Example 1:

This example writes the standard 2DES Variant Thales Test LMK to a single smartcard:

```
Online> GT <Return>

Generate Standard Thales Test LMK Set:
  1 - 2DES Variant
  2 - 3DES Variant
  3 - 3DES KeyBlock
  4 - AES KeyBlock
Select Standard Thales Test LMK set to be generated: 1
<Return>
Insert blank card and enter PIN: **** <Return>
Writing keys...
Checking keys...
Device write complete, check: ZZZZZZ

Make another copy? [Y/N]: N <Return>
1 copies made.

Do you want to generate another Standard Thales Test LMK
set [Y/N]: N <Return>

Online>
```

Example 2:

This example writes the two components of the standard AES Key Block Thales Test LMK to two separate smartcards:

```
Online> GT <Return>

Generate Standard Thales Test LMK Set:
  1 - 2DES Variant
  2 - 3DES Variant
  3 - 3DES KeyBlock
  4 - AES KeyBlock
Select Standard Thales Test LMK set to be generated: 4
<Return>
Insert blank card and enter PIN: **** <Return>
Writing keys...
Checking keys...
Device write complete, check: ZZZZZZ
Insert blank card and enter PIN: **** <Return>
Writing keys...
Checking keys...
Device write complete, check: ZZZZZZ

Do you want to generate another Standard Thales Test LMK
set [Y/N]: N <Return>

Online>
```

8 Operational Commands

8.1 Authorization Commands

The payShield 10K needs to be authorized for certain commands to be executed - usually those involving clear text data.

There are two methods of authorizing the HSM – using:

- a single Authorized State;
- multiple Authorized Activities.

*Note: The console command CS (*Configure Security*) setting "Enable multiple authorized activities" determines which method is to be used; by default, multiple Authorized Activities are used.*

If the HSM needs to be placed in Authorized State using the Authorizing Officer cards (or passwords) corresponding to a particular LMK, then the command will only be authorized for that particular LMK identifier. For example, if the "FK" console command ("Form Key from Components") is authorized using the passwords corresponding to the LMK with identifier "00", then only keys encrypted using LMK "00" may be formed using the command.

It is possible to authorize the HSM using multiple Authorizing Officer cards (or passwords), so that the HSM may be simultaneously authorized for different LMKs.

Note: For PCI HSM compliance, PINs and smartcards must be used to authenticate the Security Officers: passwords must not be used.

The payShield 10K provides the following console commands to support the authorization of the HSM:

Enter the Authorized State (A)

Variant ☑	Key Block ☑	
Online ☑	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **A**

Function: To set the HSM into the Authorized State.
The HSM prompts for either Smartcards or Passwords, as applicable, which must correspond to the LMK being authorized.

Authorization: The HSM does not require any authorization to run this command.

Inputs:
- LMK Identifier: 1 or 2 numeric digits.
- PIN (if applicable): 5 to 8 alphanumeric characters. The PIN must be entered within 60 seconds. (4-digit PINs on legacy cards will also be accepted.)
- Either:
  - Smartcards (RLMKs are supported) with authorizing both passwords.
  - Password: 16 alphanumeric characters.

Outputs:
- Text messages as shown in examples.

Notes:
- If the CS setting "Card/Password authorization" is set to "Card", then the passwords required to put the HSM into the Authorized State will be read from smartcards. Note that only the first 2 LMK component cards contain passwords.
- This command is only available when the console command CS (Configure Security) setting "Enable multiple authorized activities [Y/N]" is set to "N".
- For PCI HSM compliance, authentication must use smartcards and PINs, not passwords.
- Use of this command will always cause an entry to be made in the Audit Log.
- Console commands remain authorized for 12 hours (720 minutes).

Errors:
- Invalid LMK identifier - no LMK loaded or entered identifier out of range.
- Card not formatted - card is not formatted.
- Not an LMK card - card is not formatted for LMK or key storage.
- Smartcard error; command/return: 0003 - invalid PIN is entered.
- Invalid PIN; re-enter - a PIN of less than 5 or greater than 8 digits is entered.
- Data invalid; please re-enter - the password is an invalid length.

Example 1: *This example authorizes the HSM using smartcards.*

```
Online> A <Return>
Enter LMK id [0-9]: 00 <Return>
First Officer:
Insert card and enter PIN: ******** <Return>
Second Officer:
Insert card and enter PIN: ******** <Return>
AUTHORIZED
Console authorizations will expire in 720 minutes (12
hours).
Online-AUTH>
```

Example 2: *This example authorizes the HSM using passwords.*

```
Online> A <Return>
Enter LMK id [0-4]: 1 <Return>
First Officer:
```

```
Password: **********  <Return>
Second Officer:
Password: **********  <Return>                    ←
Password too long
Data invalid; please re-enter: **********  <Return>
AUTHORIZED
Console authorizations will expire in 720 minutes (12
hours).

Online-AUTH>
```

Cancel the Authorized State (C)

Variant ☑		Key Block ☑
Online ☑	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **C**

Function: To cancel the Authorized State.
There is an equivalent command available to the host (Host command 'RA')

Authorization: The HSM does not require any authorization to run this command.

Inputs:
- LMK Identifier: 2 numeric digits.

Outputs:
- Text messages as shown in example.

Notes:
- This command is only available when the console command CS (Configure Security) setting "Enable multiple authorized activities [Y/N]" is set to "N".
- Use of this command will always cause an entry to be made in the Audit Log.

Errors:
- Invalid LMK identifier - no LMK loaded or entered identifier out of range.

Example 1:

```
Online-AUTH> C <Return>
Enter LMK id [0-9]: 00 <Return>
NOT AUTHORIZED for LMK id 00
Online>
```

Authorize Activity (A)

Variant ☑		Key Block ☑
Online ☑	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **A**

Function: To authorize the HSM to perform certain specified activities.

In command line mode, the operator specifies which activities are to be authorized.

In menu mode, the operator is prompted to enter the activities.

In both cases, the specified activities are authorized by submitting two Security Officer cards or passwords, which must correspond to the LMK being authorized.

Authorized activities can be made persistent, in which case they are retained even if the power to the HSM is cycled.

Authorization: The HSM does not require any authorization to run this command.

Inputs:

- LMK Identifier: 2 numeric digits
- Activities to be authorized.
- Timeout value: Number of minutes before HSM will revoke chosen authorized activity. Where the security setting *Enforce Authorization Time Limit* has been set to "YES" (i.e. to the PCI HSM compliant value) then console commands can be authorized for a maximum period of 12 hours (720 minutes).
- PIN (if applicable): 5 to 8 alphanumeric characters. The PIN must be entered within 60 seconds of being requested. (4-digit PINs on legacy cards will also be accepted.)
- Either:
    - Smartcards (RLMKs are supported) with authorizing both passwords.
    - Password: 16 alphanumeric characters.
- Use "-h" to display help.

Outputs:

- Text messages as shown in examples.

Syntax:

Syntax: **A** [<*Activity*>] [<*Activity*>] ...

Activity: <*Category*>.[<*Sub-category*>].[<*Interface*>][:<*Timeout*>]

Category = generate|component|genprint|import|export|pin|audit|admin|diag|misc|command

Sub-category (for 'generate|import|export') = key type code, e.g. 001 for ZPK.

Sub-category (for 'pin') = mailer|clear

Interface = host|console

Timeout = value in minutes or 'p' for persistent. (A maximum of 12 hours (720 minutes) is applied to Console commands.}

Names may be shortened but must remain unique.

Errors:

- Invalid LMK identifier - no LMK loaded or entered identifier out of range.
- Card not formatted - card is not formatted.
- Not a LMK card - card is not formatted for LMK or key storage.
- Smartcard error; command/return: 0003 - invalid PIN is entered.
- Invalid PIN; re-enter - a PIN of less than 4 or greater than 8 is entered.
- Data invalid; please re-enter: the password is an invalid length.

Notes:

- If the CS setting "Card/Password authorization" is set to "Card", then the passwords required to put the HSM into the Authorized State will be read from smartcards. Note that only the first 2 LMK component cards contain passwords.
- This command is only available when the console command CS (Configure Security) setting "Enable multiple authorized activities [Y/N]" is set to "Y".
- For PCI HSM compliance, the following security settings must be set:
  - user authentication must be by smartcard and PIN, and not by using passwords.
  - Authorization time limit for Console commands must be enforced.
- Where the security setting *Enforce Authorization Time Limit* has been set to "YES" (i.e. to the PCI HSM compliant value) then console commands can be authorized for a maximum period of 12 hours (720 minutes).
- Use of this command will always cause an entry to be made in the Audit Log.
- Activities are described in terms of four fields: Category, Sub-Category, Interface and Timeout. If the Timeout field is omitted, the activity remains authorized until cancelled either by the console command "C" or the host command "RA".
- Omitting either the Sub-Category and/or the Interface field is equivalent to authorizing multiple activities consisting of all possible combinations of valid values for the missing fields. For clarification:

  pin.mailer

  is equivalent to:

  pin.mailer.host

  pin.mailer.console

  and:

  pin

  is equivalent to:

  pin.clear.console

  pin.clear.host

  pin.mailer.console

  pin.mailer.host
- When authorizing activities, two (or more) activities may overlap, for example:

  pin

  pin.mailer
- There is no requirement to attempt to reduce activities to the minimum set. The list of authorized activities simply consists of all those entered (and authorized) by the user.
- There is one case when it will be necessary to overwrite an existing activity: when only the Timeout field changes. For example, suppose that the following activity is authorized:

  export.001.console:11

  and the user uses the 'A' command to authorize the following activity:

  export.001.console:60

  then this should overwrite the first one (even if the newer activity has a shorter *Timeout* value).

- Note: When omitting the sub-category, but including the interface, there should be two delimiters "." between them:

  Example: export..host allows export of any (valid) key using a host command.
- The option to make an authorization persistent (i.e. to survive across a re-boot of the HSM) is only available for Host commands and where the authorization is also permanent.

Example 1: (Variant or Key Block LMK)

This example authorizes a single activity via the menu.

```
Online> A <Return>
Enter LMK id [0-9]: 0 <Return>
No activities are authorized for LMK id 00.
List of authorizable activities:
generate              genprint component   import
export                pin      audit admin
diagnostic            misc     command
Select category: pin <Return>
clear                 mailer
Select sub-category, or <RETURN> for all: mailer <Return>
host                  console
Select interface, or <RETURN> for all: <Return>
Enter time limit for pin.mailer, or <RETURN> for
permanent: <Return>
Make activity persistent? [Y/N]: N <Return>
Enter additional activities to authorize? [y/N]: N
<Return>

The following activities are pending authorization for
LMK id 00:
pin.mailer

First Officer:
Insert Card for Security Officer and enter the PIN:
******** <Return>
Second Officer:
Insert Card for Security Officer and enter the PIN:
******** <Return>

The following activities are authorized for LMK id 00:
pin.mailer

Online-AUTH>
```

Example 2: (Variant or Key Block LMK)

This example authorizes activities via the command line, with no time limits specified.

```
Online> A gene comp genp i e p au ad di m comm<Return>

Enter LMK id [0-4]: 0 <Return>

Console authorizations will expire in 720 minutes (12
hours).

The following activities are pending authorization for
LMK id 00:

admin..console:720
admin..host
```

```
audit..console:720
audit..host
command..console:720
command..host
component..console:720
component..host
diagnostic..console:720
diagnostic..host
export..console:720
export..host
generate..console:720
generate..host
genprint..console:720
genprint..host
import..console:720
import..host
misc..console:720
misc..host
pin..console:720
pin..host

First officer:
Insert card and enter PIN: ********<Return>

Second officer:
Insert card and enter PIN: ********<Return>

The following activities are authorized for LMK id 00:

admin..console:720  (720 mins remaining)
admin..host
audit..console:720  (720 mins remaining)
audit..host
command..console:720  (720 mins remaining)
command..host
component..console:720  (720 mins remaining)
component..host
diagnostic..console:720  (720 mins remaining)
diagnostic..host
export..console:720  (720 mins remaining)
export..host
generate..console:720  (720 mins remaining)
generate..host
genprint..console:720  (720 mins remaining)
genprint..host
import..console:720  (720 mins remaining)
import..host
misc..console:720  (720 mins remaining)
misc..host
pin..console:720  (720 mins remaining)
pin..host

Online-AUTH>
```

Example 3: (Variant LMK)

This example authorizes three activities additional Example 1 via the menu.

```
Online-AUTH> A <Return>
Enter LMK id [0-9]: 00 <Return>
The following activities are authorized for LMK id 00:
pin.mailer
List of authorizable activities:
generate              genprint component   import
export                pin      audit admin
diagnostic            misc     command
Select category: generate <Return>
000                   100      200   001
002                   400      003   006
008                   009      109   209
309                   409      509   709
00a                   00b      rsa
Select sub-category, or <RETURN> for all: 000 <Return>
host                  console
Select interface, or <RETURN> for all: C <Return>
Enter time limit for generate.000.console, or <RETURN>
for permanent: 60 <Return>

Enter additional activities to authorize? [y/N]: Y
<Return>
List of authorizable activities:
generate              genprint component   import
export                pin      audit admin
diagnostic            misc     command
Select category: export <Return>
000                   100      200   001
002                   400      003   006
008                   009      109   209
309                   409      509   709
00a                   00b      rsa
Select sub-category, or <RETURN> for all: 001 <Return>
host                  console
Select interface, or <RETURN> for all: H <Return>
Enter time limit for export.001.host, or <RETURN> for
permanent: <Return>
Make activity persistent? [Y/N]: n <Return>

Enter additional activities to authorize? [y/N]: Y
<Return>
List of authorizable activities:
generate              genprint component   import
export                pin      audit admin
diagnostic            misc     command
Select category: admin <Return>
host                  console
Select interface, or <RETURN> for all: c <Return>
Enter time limit for admin, or <RETURN> for permanent:
240 <Return>

Enter additional activities to authorize? [y/N]: n
<Return>
The following activities are pending authorization for
LMK id 00:
admin..console:240
export.001.host
generate.000.console:60
```

```
First Officer
Insert Card for Security Officer and enter the PIN: ****
<Return>
Second Officer
Insert Card for Security Officer and enter the PIN: ****
<Return>

The following activities are authorized for LMK id 00:
admin:240 (240 mins remaining)
export.001.host
generate.000.console:60 (60 mins remaining)
pin.mailer

Online-AUTH>
```

Example 4: (Variant LMK)

This example authorizes three activities additional to Example 1 via the command line, including time limits.

```
Online-AUTH> A gene.000.con:60 exp.001.host:p admin:240
<Return>
Enter LMK id [0-19]: 00 <Return>

The following activities are pending authorization for
LMK id 00:

admin:240
export.001.host:persistent
generate.000.console:60

First Officer:
Insert Card for Security Officer and enter the PIN: ****
<Return>
Second Officer:
Insert Card for Security Officer and enter the PIN: ****
<Return>

The following activities are authorized for LMK id 01:

admin:240  (240 mins remaining)
export.001.host:persistent
generate.000.console:60  (60 mins remaining)

Online-AUTH>
```

Example 5: (Variant or Key Block LMK)

This example authorizes a single activity via the command line.

```
Online> A pin.clear <Return>
Enter LMK id [0-9]: 01 <Return>

Console authorizations will expire in 720 minutes (12
hours).

The following activities are pending authorization for
LMK id 01:

pin.clear.console:720
pin.clear.host

First Officer:
Insert Card for Security Officer and enter the PIN: ****
<Return>
```

```
Second Officer:
Insert Card for Security Officer and enter the PIN: ****
<Return>

The following activities are authorized for LMK id 01:

pin.clear.console:720  (720 mins remaining)
pin.clear.host

Online-AUTH>
```

Example 6: (Key Block LMK)

This example authorizes an additional three activities via the menu.

```
Online-AUTH> A <Return>
Enter LMK id [0-9]: 01 <Return>
The following activities are authorized for LMK id 01:
pin.clear
List of authorizable activities:
generate              genprint component   import
export                pin      audit admin
diagnostic            misc     command
Select category: export <Return>
01                    B0 C0    11
12                    13 D0    21
22                    E0 E1    E2
E3                    E4 E5    E6
31                    32 K0    51
52                    M0 M1    M2
M3                    M4 M5    61
62                    63 64    65
P0                    71 72    73
V0                    V1 V2
Select sub-category, or <RETURN> for all: 72 <Return>
host                  console
Select interface, or <RETURN> for all: C <Return>
Enter time limit for export.72.console, or <RETURN> for
permanent: 60 <Return>

Enter additional activities to authorize? [y/N]: Y
<Return>
List of authorizable activities:
generate              genprint component   import
export                pin      audit admin
diagnostic            misc     command
Select category: admin <Return>
host                  console
Select interface, or <RETURN> for all: <Return>
Enter time limit for admin, or <RETURN> for permanent:
240 <Return>

Enter additional activities to authorize? [y/N]: Y
<Return>
List of authorizable activities:
generate              genprint component   import
export                pin      audit admin
diagnostic            misc     command
Select category: misc <Return>
host                  console
Select interface, or <RETURN> for all: c <Return>
```

```
Enter time limit for admin, or <RETURN> for permanent:
<Return>
Make activity persistent? [Y/N]: n <Return>

Enter additional activities to authorize? [y/N]: n
<Return>
The following activities are pending authorization for
LMK id 00:
misc..console
admin:240
export.72.console:60

First Officer
Insert Card for Security Officer and enter the PIN: ****
<Return>
Second Officer
Insert Card for Security Officer and enter the PIN: ****
<Return>

The following activities are authorized for LMK id 01:
misc..console
admin:240 (240 mins remaining)
export.72.console (60 mins remaining)
pin.clear

Online-AUTH>
```

Example 7: (Key Block LMK)

This example authorizes an additional three activities via the command line.

```
Online-AUTH> a exp.001.con:60 admin:240 misc..console
<Return>
Enter LMK id [0-1]: 01 <Return>

Console authorizations will expire in 720 minutes (12
hours).

The following activities are pending authorization for
LMK id 01:

admin:240
export.001.console:60
misc..console:720

First Officer:
Insert Card for Security Officer and enter the PIN: ****
<Return>
Second Officer:
Insert Card for Security Officer and enter the PIN: ****
<Return>

The following activities are authorized for LMK id 01:

admin:240  (228 mins remaining)
export.001.console:60  (60 mins remaining)
export.001.host:persistent
generate.000.console:60  (48 mins remaining)
misc..console:720  (720 mins remaining)
pin.clear.console:720  (712 mins remaining)
pin.clear.host

Online-AUTH>
```

Cancel Authorized Activity (C)

Variant ☑		Key Block ☑
Online ☑	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **C**

Function: To cancel one or more Authorized Activities.

Authorization: The HSM does not require any authorization to run this command.

Inputs:
- LMK Identifier: 2 numeric digits.

Outputs:
- Text messages as shown in examples.

Notes:
- This command is only available when the console command CS (Configure Security) setting "Enable multiple authorized activities [Y/N]" is set to "Y".

Syntax: **C** [<*Activity*>] [<*Activity*>] ...

Activity: <*Category*>[.<*Sub-category*>][.<*Interface*>][:<*Timeout*>]

Category = generate|component|genprint|import|export|pin|audit|admin|diag|misc| command

Sub-category (for 'generate|import|export') = key name, e.g. TPK, MK-AC, etc.

Sub-category (for 'pin') = mailer|clear

Interface = host|console

Timeout = value in minutes or 'p' for persistent

Names may be shortened but must remain unique.

When canceling an authorized activity which includes a timeout, the original value of the timeout should be specified.

Note: When omitting the sub-category, but including the interface, there should be two delimiters "." between them:

Example: export..host allows export of any (valid) key using a host command.

Errors:
- Invalid LMK identifier - no LMK loaded or entered identifier out of range.
- Invalid input.

Notes:
- Use of this command will always cause an entry to be made in the Audit Log.

Example 1: (Variant or Key Block LMK)

This example cancels an existing activity via the menu.

```
Online-AUTH> C <Return>
Enter LMK id [0-9]: 00 <Return>
Cancel pin.mailer? [y/N] Y <Return>
No activities are authorized for LMK id 00.
Online>
```

Note: This example assumes that the activities in the Authorize Activity command Example 1 (above) are active.

Example 2: (Variant or Key Block LMK)

This example cancels an existing activity via the command line.

```
Online-AUTH> C pin.mailer <Return>
Enter LMK id [0-1]: 00 <Return>
No activities are authorized for LMK id 00.
Online>
```

Note: This example assumes that the activities in the Authorize Activity command Example 2 (above) are active.

Example 3: (Variant LMK)

This example cancels an existing activity via the menu.

```
Online-AUTH> C <Return>
Enter LMK id [0-4]: 00 <Return>
Cancel admin:240 (194 mins remaining) ? [y/N] Y <Return>
Cancel export.001.host? [y/N] N <Return>
Cancel generate.000.console:60 (14 mins remaining)?
[y/N] Y <Return>
Cancel pin.mailer? [y/N] N <Return>
The following activities are authorized for LMK id 00:
export.001.host
pin.mailer
Online-AUTH>
```

Note: This example assumes that the activities in the Authorize Activity command Example 3 (above) are active.

Example 4: (Variant LMK)

This example cancels an existing activity via the command line.

```
Online-AUTH> C gene.000.c admin <Return>
Enter LMK id [0-9]: 00 <Return>
The hollowing activities are authorized for LMK id 00.
export.001.host
pin.mailer
Online-AUTH>
```

Note: This example assumes that the activities in the Authorize Activity command Example 4 (above) are active.

Example 5: (Variant or Key Block LMK)

This example cancels an existing activity via the command line.

```
Online-AUTH> C pin.clear <Return>
Enter LMK id [0-9]: 01 <Return>
No activities are authorized for LMK id 01.
Online>
```

Note: This example assumes that the activities in the Authorize Activity command Example 5 (above) are active.

View Authorized Activities (VA)

Variant ☑		Key Block ☑
Online ☑	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **VA**

Function: To view all active authorized activities.

Authorization: The HSM does not require any authorization to run this command.

Inputs:
- LMK identifier: 2 numeric digits.

Outputs:
- List of active authorized activities.

Errors:
- Invalid LMK identifier - no LMK loaded or entered identifier out of range.

Example 1: (Multiple authorized activities enabled)

This example applies when multiple authorized activities has been enabled..

```
Online-AUTH> VA <Return>
Enter LMK id: 00 <Return>
The following activities are authorized for LMK id 00:
admin:240 (228 mins remaining)
export.001.host:persistent
generate.000.console:60 (48 mins remaining)

Online-AUTH>
```

Note: This example assumes the activities in the Authorize Activity command Example 4 (above) were authorized 12 minutes ago.

Example 2: (Multiple authorized activities disabled)

This example applies when multiple authorized activities has not been enabled..

```
Online-AUTH> VA <Return>
Enter LMK id [0-9]: 0 <Return>
LMK id 00 is authorized.
Console authorization expires in 716 minute(s).

Online-AUTH>
```

Note: This example assumes that authorized state was enabled 4 minutes ago.

8.2 Logging Commands

An Error Log and an Audit Log are provided, each with a command to display the log and a command to clear the log. There is also a command to enable the user to set their time zone, so that the correct time is displayed in audit log reports.

The Error log stores fault information for use by Thales support personnel. The error log is used to log unexpected software errors, hardware failures and alarm events. Whenever an error occurs, that error code is stored, along with the time, date and severity level. Additional errors that have the same error code cause the time and date of that code to be updated. In this way, each error type remains in the log (with the most recent time and date) and is not lost. The severity levels are:

- Informative (0) Something abnormal happened, but was not important.
- Recoverable (1) Something abnormal happened, but the unit recovered from it without rebooting or losing data.
- Major (2) Something abnormal happened, but the unit recovered from it but may have lost data/information due to restarting a process or re-initializing hardware. The unit may not function in a full capacity.
- Catastrophic (3) Something abnormal happened, and the unit had to reboot to recover.

Only catastrophic errors cause the HSM to reboot. New errors cause the Fault LED on the front panel to flash.

Whenever the HSM state is altered through power-up, key-lock changes or console commands, the Audit log is updated with the action and the time and date. The Audit log can also be configured to record execution of almost any console or host command. The Audit log records state changes until it is 100% full and for each subsequent state change the earliest (i.e. oldest) record in the log is deleted to make room for the new record. A number of host commands are provided which allow the host computer to extract and archive (print) audit records from the HSM.

Management of the Audit journal is performed from the console using the command 'AUDITOPTIONS', while 'AUDITLOG' is used to retrieve the log and 'CLEARAUDIT' to clear the log. The HSM must be put into the secure-authorized state in order to execute the 'AUDITOPTIONS' and 'CLEARAUDIT' console commands.

Note: Auditing host or console commands may impact HSM performance.

The payShield 10K provides the following console commands to support storage and retrieval of HSM settings:

Display the Error Log (ERRLOG)

Variant ☑		Key Block ☑
Online ☑	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **ERRLOG**

Function: To display the entries in the error log.

Authorization: The HSM does not require any authorization to run this command.

Inputs: None.

Outputs: • A listing of the errors in the error log, or text message: "Error log is empty".

Errors: None.

Notes: In software versions up to v2.1, power supply errors are added to the error log only when the HSM is restarted. From v2.2 onwards, power supply errors are logged as soon as they are detected.

Example 1: *In this example, there are no entries in the error log.*

```
Offline> ERRLOG <Return>
Error log is empty
Offline>
```

Example 2: *In this example, the Security setting "Allow Error light to be extinguished when viewing Error Log?" is set to NO.*

```
Offline> ERRLOG <Return>
Error Log (3 entries)
-------------------------
1: May 01 09:35:00  ERROR (1): Invalid queue size (Severity: 2,
Code = 00000001, Sub-code = 00000002)
2: May 01 09:35:02  ERROR (1): Key3 cannot be specified without
key2 (Severity: 0, Code = 00000004, Sub-code = 00000003)
3: May 06 13:55:00  ERROR: [Power Supply:    FAILED (PSU 2
Failed) ] (Severity: 3, Code = 0x00000001, Sub-Code =
0x0000000E)

Please copy this log to a text file and send it
to your regional Thales E-Security Support center.

Offline>
```

Example 3:

In this example, the Security setting "Allow Error light to be extinguished when viewing Error Log?" is set to YES.

```
Offline> ERRLOG <Return>
Error Log (3 entries)
-------------------------
1: May 01 09:35:00  ERROR (1): Invalid queue size (Severity: 2,
Code = 00000001, Sub-code = 00000002)
2: May 01 09:35:02  ERROR (1): Key3 cannot be specified without
key2 (Severity: 0, Code = 00000004, Sub-code = 00000003)
3: May 06 13:55:00  ERROR: [Power Supply:    FAILED (PSU 2
Failed) ] (Severity: 3, Code = 0x00000001, Sub-Code =
0x0000000E)

Please copy this log to a text file and send it
to your regional Thales E-Security Support center.

Confirm error log has been read and error light should be
extinguished? [Y/N]: Y <Return>

Offline>
```

Example 4:

Entries in the HSM error log have a hash-based integrity check using HMAC. In this example the verification of integrity of the entry failed. A message indicates that an error happened during the verification process and the entry is shown as Unparsed.

```
Offline> ERRLOG <Return>
Error Log (3 entries)
-------------------------
973: May 31 15:17:35 ERROR: [FAN 1 is now present] (Severity:
3, Code = 0x00000003, Sub-Code = 0x00000018)
Error hmac missmatch - Unable to verify text integrity
 974: UNPARSED [[FAN1 is missing, setting FAN??? speed to 16000
RPM] (Severity: 3, Code = 0x00000003, Sub-Code = 0x00000018]
 975: May 31 17:33:14 ERROR: [FAN 1 is now NOT present]
(Severity: 3, Code = 0x00000003, Sub-Code = 0x00000018)

Please copy this log to a text file and send it
to your regional Thales E-Security Support center.

Confirm error log has been read and error light should be
extinguished? [Y/N]: Y <Return>

Offline>
```

Clear the Error Log (CLEARERR)

Variant ☑	Key Block ☑	
Online ☒	Offline ☒	Secure ☑
Authorization: **Not required**		

Command: **CLEARERR**

Function: To clear the entries in the error log.

Authorization: The HSM must be in the secure state to run this command.

Inputs: None.

Outputs:
- A confirmation message.

Errors: None.

Example:
```
Secure> CLEARERR <Return>
Error log Cleared
Secure>
```

Display the Audit Log (AUDITLOG)

Variant ☑	Key Block ☑	
Online ☑	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **AUDITLOG**

Function: To display the entries in the audit log.

Authorization: The HSM does not require any authorization to run this command.

Inputs: None.

Outputs:
- A listing of the entries in the audit log.
  - For authorizations, the period of authorization of Console commands will be indicated by attaching text of the form ":123" (representing 123 minutes) to the identity of the authorized activity.
- The following text messages can be output:
  - Audit Log (in entries)
  - Continue displaying audit log entries? Yes/No/Continuous

Notes:
- Certain items are always recorded in the Audit Log, irrespective of the selections made using AUDITOPTIONS.
  These are:
  - Serial numbers of smartcards used to authenticate users at the HSM or to payShield Manager.
  - Authorization of activities
  - Cancellation of authorization.
  - Key and component entry at the Console or payShield Manager.

  When key and component entry are forcibly logged in this way, the log entry indicates successful completion of the action.
  The user can, as in earlier versions of software, use AUDITOPTIONS to specify that the key and component entry commands are logged: this will normally result in 2 entries in the audit log – one resulting from the AUDITOPTIONS setting indicating that the command was initiated, and the forcible logging indicating the successful completion of the command. If the command does not complete successfully (e.g. because it was cancelled by the user) then there will be no forcible logging, but the entry indicating the command was initiated will still be there if the command was specified in AUDITOPTIONS.
- The Audit Log is now displayed with the most recent entries shown first: up to software version 2.1 the Audit Log was displayed with oldest entries first. This change has been made because, with a maximum length of 50,000 records, it can take a long time to display the complete Audit Log because of the speed limitations of serial connections.

Errors: None.

Example 1:

```
Offline> AUDITLOG <Return>
Audit log is empty
Offline>
```

Example 2:

```
Offline> AUDITLOG <Return>
Audit Log (10 entries)
Counter    Time       Date          Command/Event
------------------------------------------------------------
-----
0000000268  13:55:00  02/Jul/2013  Diagnostic self test
failure: Power
0000000267  16:45:07  01/Jul/2013  Authorized activity
admin..host was cancelled for LMK id 0
0000000266  16:45:05  01/Jul/2013  Authorized activity
admin..console:123 was cancelled
0000000265  15:54:02  01/Jul/2013  Key I/O command BK
executed
0000000264  15:35:55  01/Jul/2013  Activity
component..console:123 was authorized for LMK id 0
0000000263  15:08:48  01/Jul/2013  Smartcard activated:
20025151
0000000262  15:08:48  01/Jul/2013  Smartcard activated:
20025132
0000000261  10:42:32  01/Jul/2013  Host command CA,
response 00
0000000260  10:36:03  01/Jul/2013  Host command CA,
response 69
0000000259  10:34:57  01/Jul/2013  System restarted
0000000258  10:32:48  01/Jul/2013  Keylock turned to
Online
0000000257  10:32:21  01/Jul/2013  Console command CH
0000000256  09:01:56  01/Jul/2013  Diagnostic self tests
passed.

Offline>

After 20 entries are displayed continuously, the
following text is displayed:

Continue displaying audit log entries? [Y/N/C]:
```

Clear the Audit Log (CLEARAUDIT)

Variant ☑	Key Block ☑	
Online ☒	Offline ☒	Secure ☑
Authorization: **Required** Activity: **audit.console**		

Command: **CLEARAUDIT**

Function: To clear the entries in the audit log.

Authorization: The HSM must be in the secure state to run this command. Additionally, the HSM must be either in the Authorized State, or the activity **audit.console** must be authorized, using the Authorizing Officer cards of the Management LMK.

Inputs: None.

Outputs:
- One of the following text messages:
  - Audit Log Cleared
  - Audit Log is empty

Errors:
- Command only allowed from Secure-Authorized - the HSM is not in Secure State, or the HSM is not authorized to perform this operation, or both.

Example 1:

```
Secure-AUTH> CLEARAUDIT <Return>
Warning! The HSM's audit log contains entries that have
not yet been printed.
Please confirm that you wish to delete the entire audit
log. [Y/N]: Y <Return>
Audit Log Cleared

Secure-AUTH>
```

Audit Options (AUDITOPTIONS)

Variant ☑	Key Block ☑	
Online ☒	Offline ☒	Secure ☑
Authorization: **Required** Activity: **audit.console**		

Command: **AUDITOPTIONS**

Function: To configure the HSM's auditing functionality.
The HSM can be configured to monitor and record the following events:
- Execution of individual host command
- Execution of individual console command
- User interactions, including:
  - System restart (e.g. power cycle)
  - State transitions (i.e. Offline, Online, Secure)
  - LMK installation / erasure
  - Authorization activation/cancelling
- The running and result of automatic self tests.
- Error responses to Host commands
- Host connection failures resulting from deployment of Access Control Lists.

Authorization: The HSM must be in the secure state to use this command to change the items to be audited. Additionally, the HSM must be either in the Authorized State, or the activity **audit.console** must be authorized, using the Authorizing Officer cards of the Management LMK.
The current list of items being audited can be viewed in online state.

Inputs:
- Changes to configuration:
- Audited console commands:
  - +CXX to enable auditing of console command XX
  - –CXX to disable auditing of console command XX

  The "?" character can be used as a wildcard when specifying the commands.
- Audited host commands
  - +HXX to enable auditing of host command XX
  - –HXX to disable auditing of host command XX

  The "?" character can be used as a wildcard when specifying the commands.
- Audit Error responses to Host Commands (Y/N)
- Audit user actions (Y/N)
- Audit counter value
- Audit Utilization Data Resets (Y/N)
- Audit Automatic Self testing (Y/N)
- Audit ACL connection failures (Y/N)

Outputs:
- Current & new configuration details:
- List of audited console commands
- List of audited host commands
- List of user actions
- Results of automatic self tests
- Audit counter value

Notes:

- Certain items are always recorded in the Audit Log, irrespective of the selections made using AUDITOPTIONS.
  These are:
  - Serial numbers of smartcards used to authenticate users at the HSM or to payShield Manager.
  - Authorization of activities
  - Cancellation of authorization.
  - Key and component entry at the Console or payShield Manager. This relates to the following Console commands (or HSM equivalents):
    - BK Form a Key from Components
    - CV Generate a Card Verification Value
    - D Form a ZMK from Encrypted Components
    - DE Form a ZMK from Clear Components
    - FK Form Key from Components
    - IK Import a Key
    - IV Import a CVK or PVK
    - LK Load LMK
    - LO Move Old LMKs into Key Change Storage
    - PV Generate a Visa PIN Verification Value

  When key and component entry are forcibly logged in this way, the log entry indicates successful completion of the action.
  The user can, as in earlier versions of software, use AUDITOPTIONS to specify that the key and component entry commands are logged: this will normally result in 2 entries in the audit log – one resulting from the AUDITOPTIONS setting indicating that the command was initiated, and the forcible logging indicating the successful completion of the command. If the command does not complete successfully (e.g. because it was cancelled by the user) then there will be no forcible logging, but the entry indicating the command was initiated will still be there if the command was specified in AUDITOPTIONS.
- **Audit Error Responses to Host Commands**: this setting allows any relevant error responses to Host commands to be logged. In this context, "relevant" means error responses which may indicate situations that require investigation by the payShield 10K Administrators or Security Officers. The use of this setting will therefore not log non-00 error responses which are purely for information or which indicate "business as usual" (e.g. a customer entering an incorrect PIN at a terminal).
- Auditing items (such as heavily used Host commands) which result in a high rate of update to the Audit Log will impact negatively on performance of the HSM.
- After completing the AUDITOPTIONS command, a reboot of the HSM may be required in order to activate the new settings.

Errors:

- Command only allowed from Offline-Authorized - the HSM is not in Offline (or Secure) State, or the HSM is not authorized to perform this operation, or both.
- Invalid Entry - the value entered is invalid.
- Card not formatted to save/retrieve HSM settings - Attempt with another card? [Y/N]

Example:

```
Secure-AUTH>auditoptions

Audit User Actions: YES
Audit Error Responses to Host Commands: YES
Audit utilization data resets: NO
Audit diagnostic self tests: NO
Audit ACL connection failures: NO
Audit Counter Value:
0000000223
List of Audited Console Commands:
List of Audited Host Commands:

Audit User Actions? [Y/N]: y

Audit Error Responses to Host Commands? [Y/N]: n

Audit Utilization Data Resets? [Y/N]: y

Audit Automatic Self Testing? [Y/N]: y

Audit ACL connection failures? [Y/N]: y

Current Audit Counter value is: 0000000223
Enter new value (decimal digits only) or <Return> for no
change:

Modify Audited Command List? [Y/N]: y
Enter command code (e.g. +CDE) or Q to Quit: +CDE
Enter command code (e.g. +CDE) or Q to Quit:
Enter command code (e.g. +CDE) or Q to Quit: q

Audit User Actions: YES
Audit Error Responses to Host Commands: NO
Audit utilization data resets: YES
Audit diagnostic self tests: YES
Audit ACL connection failures: YES
Audit Counter Value:
0000000223
List of Audited Console Commands:
List of Audited Host Commands:

Save Audit Settings to Smartcard? [Y/N]: n
Secure-AUTH>
```

8.3 Time and Date Commands

The SETTIME command is used to set the system time and date used by the payShield 10K for the audit log entries. The user should use this command to adjust the time for the local time zone. The time and date can be queried using the GETTIME command.

The payShield 10K provides the following console commands to support storage and retrieval of HSM settings:

Set the time (SETTIME)

Variant ☑		Key Block ☑
Online ☑	Offline ☑	Secure ☑
Authorization: **Required** Activity: **admin.console**		

Command: **SETTIME**

Function: To set the system time and date used by the HSM.

Authorization: The HSM must be in the secure state to run this command. Additionally, the HSM must be either in the Authorized State, or the activity **admin.console** must be authorized, using the Authorizing Officer cards of the Management LMK.

Inputs:
- The time in hours and minutes.
- The date in year, month and day.

Outputs:
- Text messages, as in the example below.

Errors:
- Command only allowed from Secure-Authorized - the HSM is not in Secure State, or the HSM is not authorized to perform this operation, or both.
- Response invalid. Re-enter - an invalid value has been entered.

Example:

```
Secure-AUTH> SETTIME <Return>
Enter hours [HH](24 hour format): 10 <Return>
Enter minutes [MM]: 08 <Return>
Enter year [YYYY] (2009 or above): 2014 <Return>
Enter month [MM]: 02 <Return>
Enter day [DD]: 12 <Return>
The system time has been modified.
Secure-AUTH>
```

⚠ Setting the date or time back may prevent the payShield Manager from allowing a user to login. Care must be taken when changing the date back such that it is not earlier than the creation date/time of any of the smartcards that will be used to access the HSM.

Query the Time and Date (GETTIME)

Variant ☑	Key Block ☑	
Online ☑	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **GETTIME**

Function: To query the system time and date.

Authorization: The HSM does not require any authorization to run this command.

Inputs: None.

Outputs:
- The year, month and date.
- The time in hours, minutes and seconds.

Errors: None.

Example:
```
Online> GETTIME <Return>
System date and time: Feb 12 10:08:19 2014
Online>
```

Set Time for Automatic Self-Tests (ST)

Variant ☑		Key Block ☑
Online ☒	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **ST**

Function: Reports the time of day when the daily automatic self-tests required for PCI HSM compliance will be run, and allows this time to be changed.

Authorization: The HSM does not require any authorization to run this command.

Inputs: Time of day.

Outputs: None

Errors: None.

Notes:
- The default time for running the diagnostics is 0900.

Example:

```
Secure> ST <Return>

Self test run time is 09:00.

Change? [Y/N]: Y <Return>

Enter hour [HH] (24 hour format): 13 <Return>
Enter minute [MM]: 55 <Return>

Self test run time changed to 13:55.

Secure>
```

8.4 Settings, Storage and Retrieval Commands

Commands are provided to save the payShield 10K's Alarm, Host and Security settings to a smartcard and to restore the settings to the HSM. Besides the dedicated command to Save HSM Settings to Smartcard, the following individual configuration commands have the option to save settings to smartcard:

- CL (Configure Alarms) to save the Alarm configuration.
- CH (Configure Host Port) to save the Host port configuration.
- CS (Configure Security) to save the Security configuration.
- AUDITOPTIONS (Audit Options) to save the Audit configuration.

The payShield 10K provides the following console commands to support storage and retrieval of HSM settings:

Save HSM Settings to a Smartcard (SS)

Variant ☑		Key Block ☑
Online ☑	Offline ☑	Secure ☑
	Authorization: **Required** Activity: **admin.console**	

Command: **SS**

Function: To save the Alarm, Host Port, Security, Audit, Command, and PIN Block settings to a smartcard (RACCs are supported).

Authorization: The HSM must be in the secure state to run this command. Additionally, the HSM must be either in the Authorized State, or the activity **admin.console** must be authorized, using the Authorizing Officer cards of the Management LMK.

Outputs:
- Confirmation messages that Alarm, Host, Security, Audit, Command, and PIN Block settings are saved.

Errors:
- Card not formatted to save/retrieve HSM settings.
  Attempt with another card? [Y/N] - card is not formatted for storing HSM settings.
- Card not formatted. Attempt with another card? [Y/N] - card is not formatted.
- Command only allowed from Secure-Authorized - the HSM is not in Secure State, or the HSM is not authorized to perform this operation, or both.

Example:

```
Secure-AUTH> SS <Return>
Insert card and press ENTER: <Return>
ALARM settings saved to the smartcard.
HOST settings saved to the smartcard.
SECURITY settings saved to the smartcard.
AUDIT settings saved to the smartcard.
COMMAND settings saved to the smart card.
PIN BLOCK settings saved to the smart card.
Secure-AUTH>
```

Retrieve HSM Settings from a Smartcard (RS)

Variant ☑		Key Block ☑
Online ☒	Offline ☒	Secure ☑
	Authorization: **Required** Activity: **admin.console**	

Command: **RS**

Function: To read the Alarm, Host Port, Security, Audit, Command, and PIN Block settings from a smartcard. The user is then prompted to use these to overwrite the existing HSM settings. If the settings on the smartcard were saved using a configuration command (CL, CH, CS and AUDITOPTIONS), then only those settings are overwritten.

Authorization: The HSM must be in the secure state to run this command. Additionally, the HSM must be either in the Authorized State, or the activity **admin.console** must be authorized, using the Authorizing Officer cards of the Management LMK.

Inputs:
- Whether to overwrite each of the groups of saved settings.

Outputs:
- The Alarm, Host, Security, Audit, Command, and PIN Block settings stored on the smartcard are listed.

Errors:
- Card not formatted to save/retrieve HSM settings.
  Attempt with another card? [Y/N] - card is not formatted for storing HSM settings.
- Card not formatted. Attempt with another card? [Y/N] - card is not formatted.
- Command only allowed from Secure-Authorized - the HSM is not in Secure State, or the HSM is not authorized to perform this operation, or both.

Example:

```
Secure-AUTH> RS <Return>
Insert card and press ENTER: <Return>
Temperature Alarm: ON
Motion Alarm: HIGH
Self Test Run Time: 09:00
Overwrite alarm settings with the settings above? [Y/N]: Y
<Return>
ALARM settings retrieved from smartcard

Message header length: 4
Protocol: ETHERNET
Character format: ASCII
UDP active: YES
TCP active: YES
TLS active: YES
Number of TCP connections: 1
Well-Known-Port: 1500
Well-Known-TLS-Port: 2500
Number of host interfaces: 1

Overwrite host settings with the settings above? [Y/N]: n
<Return>

PIN length: 04
Old encrypted PIN length: 05
Echo: OFF
Atalla ZMK variant support: OFF
Transaction key support: AUSTRALIAN
User storage key length: SINGLE
Select clear PINs: NO
Enable ZMK translate command: NO
Enable X9.17 for import: YES
Enable X9.17 for export: YES
Solicitation batch size: 1024
Single-DES: ENABLED
Prevent single-DES keys from masquerading as double or triple-
length keys: NO
ZMK length: DOUBLE
Decimalization tables: PLAINTEXT
Decimalization table checks enabled: YES
PIN encryption algorithm: A
Authorized state required when importing DES key under RSA key:
YES
Minimum HMAC length in bytes: 10
Enable PKCS#11 import and export for HMAC keys: NO
Enable ANSI X9.17 import and export for HMAC keys: NO
Enable ZEK/TEK encryption of ASCII data or Binary data or None:
BINARY
Restrict key check values to 6 hex chars : YES
Enable multiple authorized activities: YES
Enable variable length PIN offset: NO
Enable weak PIN checking: NO
Enable PIN block format 34 as output format for PIN
translations to ZPK: NO
Enable PIN block account number translations: NO
Default LMK identifier: 00
Management LMK identifier: 00
Use HSM clock for date/time validation: YES
Additional padding to disguise key length: NO
Key export and import in trusted format only: NO
Protect MULTOS cipher data checksums: YES
```

```
Enforce Atalla variant match to Thales key type: NO
Card/password authorization: C
Enable use of Tokens in PIN Translation: NO
Enable use of Tokens in PIN Verification: NO
Restrict PIN block usage for PCI Compliance: NO
Enforce key type separation for PCI Compliance: NO
Enforce Authorization Time Limit: YES
Overwrite security settings with the settings above? [Y/N]: Y
<Return>
SECURITY settings retrieved from smartcard.

User Action: ENABLED
Audit Counter: 00000183
24 Audited Mgmt commands
0 Audited Host commands
Audit Host Errors: DISABLED
0 Audited Console commands
Overwrite auditlog settings with the settings above? [Y/N]: n
<Return>

0 Blocked Host commands
0 Blocked Console commands
Overwrite command settings with the settings above? [Y/N]: n
<Return>

Pin Block Format 01: ENABLED
Pin Block Format 02: ENABLED
Pin Block Format 03: ENABLED
Pin Block Format 04: ENABLED
Pin Block Format 05: ENABLED
Pin Block Format 34: ENABLED
Pin Block Format 35: ENABLED
Pin Block Format 41: ENABLED
Pin Block Format 42: ENABLED
Pin Block Format 46: ENABLED
Pin Block Format 47: ENABLED
Pin Block Format 48: ENABLED
Overwrite pin block settings with the settings above? [Y/N]: n
<Return>

Secure-AUTH>
```

8.5 Key Management Commands

The payShield 10K provides the following host commands to support generic key management operations:

Generate Key Component (GC)

Variant ☑	Key Block ☑	
Online ☑	Offline ☑	Secure ☑
Authorization: **Required** Activity: **component.{*key*}.console**		

Command: **GC**

Function: To generate a key component and display it in plain and encrypted forms.

	Variant LMK	Key Block LMK
Authorization:	The HSM must be in the Authorized State, or the activity component.{key}.console must be authorized, where 'key' is the key type code of the key component being generated.	The HSM must be in the Authorized State, or the activity **component.{*key*}.console** must be authorized, where 'key' is the key usage code of the key component being generated.
Inputs:	LMK Identifier: 00-99. Key Length: 1 (single), 2 (double), 3 (triple). Key Type: See the Key Type Table in the Host Programmer's Manual. Key Scheme:	• LMK Identifier: 00-99. • Key Algorithm (if AES LMK): 3DES or AES • Key Length: Single/Double/Triple length DES key or (if AES LMK) 128/192/256-bit AES key. • Key Scheme: • Key Usage: See the Key Usage Table in the *Host Programmer's Manual*. • Mode of Use: See the Mode of Use Table in the *Host Programmer's Manual*. • Component Number: 1-9. • Exportability: See the Exportability Table in the *Host Programmer's Manual*. • Optional Block data.
Outputs:	Clear text key component. Key component encrypted under an appropriate variant of the selected LMK. Component check value.	• Clear text key component. • Key Block containing the component encrypted under the selected LMK. • Component check value.

Notes:

- When generating key components encrypted by a Key Block LMK, the "Component Number" field stored within the component's key block header can be used to help identify individual components. Note, however, that this field is not examined or used by the HSM's FK command when forming a key from these components.

Errors:

- Invalid LMK identifier - no LMK loaded or entered identifier out of range.
- Invalid key type; re-enter - the key type is invalid. See the Key Type Table the *Host Programmer's Manual*.
- Invalid key scheme for key length - the Key Scheme is inappropriate for Key length.
- Invalid key scheme - an invalid key scheme is entered.
- Internal failure 12: function aborted - the contents of LMK storage have been corrupted or erased. Do not continue. Inform the Security Department.
- Various key block field errors – the value entered is invalid, or incompatible with previously entered values.

Example 1: (Variant LMK)

This example generates a double length DES key component in plaintext & encrypted form.

```
Online-AUTH> GC <Return>
Enter LMK id: 00 <Return>
Enter key length [1,2,3]: 2 <Return>
Enter key type: 001 <Return>
Enter key scheme: U <Return>

Clear Component: XXXX XXXX XXXX XXXX XXXX XXXX XXXX
XXXX
Encrypted Component: UYYYY YYYY YYYY YYYY YYYY YYYY
YYYY YYYY
Key check value: ZZZZZZ
Online-AUTH>
```

Example 2: (3DES Key Block LMK)

This example generates a double length DES key component in plaintext & encrypted form.

```
Online-AUTH> GC <Return>
Enter LMK id: 01 <Return>
Enter key length [1,2,3]: 2 <Return>
Enter key scheme: S <Return>
Enter key usage: P0 <Return>
Enter mode of use: N <Return>
Enter component number [1-9]: 2 <Return>
Enter exportability: E <Return>
Enter optional blocks? [Y/N]: N <Return>

Clear component: XXXX XXXX XXXX XXXX XXXX XXXX XXXX
XXXX
Encrypted component: S YYYYYYYY……YYYYYY
Key check value: ZZZZZZ
Online-AUTH>
```

Example 3: (AES Key Block LMK)

This example generates a double length DES key component in plaintext & encrypted form.

```
Online-AUTH> GC <Return>
Enter LMK id: 02 <Return>
Enter algorithm [3DES/AES]: 3 <Return>
Enter key length [1,2,3]: 2 <Return>
```

```
Enter key scheme: S <Return>
Enter key usage: P0 <Return>
Enter mode of use: N <Return>
Enter component number [1-9]: 2 <Return>
Enter exportability: E <Return>
Enter optional blocks? [Y/N]: N <Return>

Clear component: XXXX XXXX XXXX XXXX XXXX XXXX XXXX
XXXX
Encrypted component: S YYYYYYYY……YYYYYY
Key check value: ZZZZZZ
Online-AUTH>
```

Example 4: (AES Key Block LMK)

This example generates a 128-bit AES key component in plaintext & encrypted form.

```
Online-AUTH> GC <Return>
Enter LMK id: 02 <Return>
Enter algorithm [3DES/AES]: A <Return>
Enter key length [128,192,256]: 128 <Return>
Enter key scheme: S <Return>
Enter key usage: K0 <Return>
Enter mode of use: N <Return>
Enter component number [1-9]: 2 <Return>
Enter exportability: E <Return>
Enter optional blocks? [Y/N]: N <Return>

Clear component: XXXX XXXX XXXX XXXX XXXX XXXX XXXX
XXXX
Encrypted component: S YYYYYYYY……YYYYYY
Key check value: ZZZZZZ
Online-AUTH>
```

Convert (KEK) ZMK into a KEKr or KWKs (EA)

Variant ☑	Key Block ☒	
Online ☑	Offline ☑	Secure ☑
Authorization: **Required** Activity: **component.{*key*}.console**		

Command: **EA**

Function: To move a (KEK)ZMK from encryption under LMK Pair 4 – 5 to encryption under LMK Pair 4 – 5 variant 3 or 4.

Notes: This command is used to support the functionality provided for the Australian AS2805 standards.

The payShield must be in Authorized State.

This command supports Variant LMKs only.

Input: KEK (ZMK) encrypted under LMK pair 4 – 5: 32 Hex or 1 Alpha + 32 Hex or 1 Alpha + 48 Hex.

Key Check Value: 6 Hex

KEK type (R/ S) : KEKr or KEKs

Key scheme: Key scheme for encrypting key under LMK.

Output: KEKr or KEKs.

Errors: NOT AUTHORISED – Self explanatory.

KEY PARITY ERROR – The KEK (ZMK) does not have odd parity.

KEY CHECK VALUE FAILURE – The Key Check Value does not match the key.

MASTER KEY PARITY ERROR – The contents of LMK storage have been corrupted or erased. Do not continue – inform the Security Department.

Example:

```
Online-AUTH> EA <Return>
Enter ZMK: U AAAA AAAA AAAA AAAA BBBB BBBB BBBB BBBB <Return>
Enter Key check value: XXXXXX <Return>
Enter KEK type (R/S): R <Return>
Key Scheme: U <Return>
KEKr : U CCCC CCCC CCCC CCCC DDDD DDDD DDDD DDDD
Online-AUTH>
```

Generate Key and Write Components to Smartcard (GS)

Variant ☑	Key Block ☑	
Online ☑	Offline ☑	Secure ☑
Authorization: **Required** Activity: **component.{*key*}.console**		

Command: **GS**

Function: Generates a key in 2 to 3 component and write the components to smartcards.

	Variant LMK	Key Block LMK
Authorization:	The HSM must be in the Authorized State, or the activity **component.{*key*}.console** must be authorized, where 'key' is the key type code of the key being generated.	The HSM must be in the Authorized State, or the activity **component.{*key*}.console** must be authorized, where 'key' is the key usage code of the key being generated.
Inputs:	• LMK Identifier: 00-99. • Key Length: 1 (single), 2 (double), 3 (triple). • Key Type: See the Key Type Table in the *Host Programmer's Manual*. • Key Scheme. • Number of components: 2-3. • Smartcard PINs. PINs must be entered within 60 seconds of being requested.	• LMK Identifier: 00-99. • Key Algorithm (if AES LMK): 3DES or AES • Key Length: Single/Double/Triple length DES key or (if AES LMK) 128/192/256-bit AES key. • Key Scheme. • Number of components: 2-3. • Key Usage: See the Key Usage Table in the *Host Programmer's Manual*. • Mode of Use: See the Mode of Use Table in the *Host Programmer's Manual*. • Key Version Number: 00-99. • Exportability: See the Exportability Table in the *Host Programmer's Manual*. • Optional Block data. • Smartcard PINs. PINs must be entered within 60 seconds of being requested.
Outputs:	• Key encrypted under an appropriate variant of the selected LMK. • Key check value.	• Key Block containing the key encrypted under the selected LMK. • Key check value.

Errors:
- Invalid LMK identifier - no LMK loaded or entered identifier out of range.
- Invalid PIN; re-enter - a PIN of less than 4 or greater than 8 is entered.
- Smartcard error; command/return: 0003 - invalid PIN is entered.
- Warning - card not blank. Proceed? [Y/N] - the smartcard entered is not blank.
- Overwrite key component? [Y/N] - the smartcard already contains a key component. It can be overwritten if desired.
- Device write failed - the component could not be verified.
- Invalid key scheme for key length - the Key scheme is inappropriate for Key length.

- Invalid key type; re-enter - the key type is invalid. See the Key Type Table in the *Host Programmer's Manual*.
- Invalid key scheme - an invalid key scheme is entered.
- Invalid entry - an invalid number of components has been entered.
- Not an LMK card - card is not formatted for LMK or key storage.
- Card not formatted - card is not formatted.
- Command only allowed from Authorized - the HSM is not authorized to perform this operation.
- Internal failure 12: function aborted - the contents of LMK storage have been corrupted or erased. Do not continue. Inform the Security Department.
- Various key block field errors – the value entered is invalid, or incompatible with previously entered values.

Example 1: (Variant LMK)

This example writes two double length DES key components to two smartcards, and encrypts the formed key.

```
Online-AUTH> GS <Return>
Enter LMK id: 00 <Return>
Enter key length [1,2,3]: 1 <Return>
Enter key type: 001 <Return>
Enter key scheme: 0 <Return>
Enter number of components [2-3]: 2 <Return>
Insert card 1 and enter PIN: ******** <Return>
Make additional copies? [Y/N]: N <Return>
Insert card 2 and enter PIN: ******** <Return>
Make additional copies? [Y/N]: N <Return>
Encrypted key: YYYY YYYY YYYY YYYY
Key check value: ZZZZZZ
Online-AUTH>
```

Example 2: (3DES Key Block LMK)

This example generates and writes two double length 3DES key components to two smartcards, and encrypts the formed key.

```
Online-AUTH> GS <Return>
Enter LMK id: 01 <Return>
Enter key length [1,2,3]: 2 <Return>
Enter key scheme: S <Return>
Enter number of components [2-3]: 2 <Return>
Enter key usage: P0 <Return>
Enter mode of use: N <Return>
Enter key version number: 00 <Return>
Enter exportability: E <Return>
Enter optional blocks? [Y/N]: Y <Return>
Enter optional block identifier: 00 <Return>
Enter optional block data: L <Return>
Enter more optional blocks? [Y/N]: N <Return>
Insert card 1 and enter PIN: ******** <Return>
Make additional copies? [Y/N]: N <Return>
Insert card 2 and enter PIN: ******** <Return>
Make additional copies? [Y/N]: N <Return>
Encrypted key: S YYYYYYYY……YYYYYY
Key check value: ZZZZZZ
Online-AUTH>
```

Example 3: (AES Key Block LMK)

This example generates and writes two double length 3DES key components to two smartcards, and encrypts the formed key.

```
Online-AUTH> GS <Return>
Enter LMK id: 02 <Return>
Enter algorithm [3DES/AES]: 3 <Return>
Enter key length [1,2,3]: 2 <Return>
Enter key scheme: S <Return>
Enter number of components [2-3]: 2 <Return>
Enter key usage: P0 <Return>
Enter mode of use: N <Return>
Enter key version number: 00 <Return>
Enter exportability: E <Return>
Enter optional blocks? [Y/N]: Y <Return>
Enter optional block identifier: 00 <Return>
Enter optional block data: L <Return>
Enter more optional blocks? [Y/N]: N <Return>
Insert card 1 and enter PIN: ******** <Return>
Make additional copies? [Y/N]: N <Return>
Insert card 2 and enter PIN: ******** <Return>
Make additional copies? [Y/N]: N <Return>
Encrypted key: S YYYYYYYY……YYYYYY
Key check value: ZZZZZZ
Online-AUTH>
```

Example 4: (AES Key Block LMK)

This example generates and writes two128-bit AES key components to two smartcards, and encrypts the formed key.

```
Online-AUTH> GS <Return>
Enter LMK id: 02 <Return>
Enter algorithm [3DES/AES]: A <Return>
Enter key length [128,192,256]: 128 <Return>
Enter key scheme: S <Return>
Enter number of components [2-3]: 2 <Return>
Enter key usage: P0 <Return>
Enter mode of use: N <Return>
Enter key version number: 00 <Return>
```

```
Enter exportability: E <Return>
Enter optional blocks? [Y/N]: Y <Return>
Enter optional block identifier: 00 <Return>
Enter optional block data: L <Return>
Enter more optional blocks? [Y/N]: N <Return>
Insert card 1 and enter PIN: ******** <Return>
Make additional copies? [Y/N]: N <Return>
Insert card 2 and enter PIN: ******** <Return>
Make additional copies? [Y/N]: N <Return>
Encrypted key: S YYYYYYYY……YYYYYY
Key check value: ZZZZZZ
Online-AUTH>
```

Encrypt Clear Component (EC)

Variant ☑	Key Block ☑	
Online ☑	Offline ☑	Secure ☑
Authorization: **Required** Activity: **component.{*key*}.console**		

Command: **EC**

Function: To encrypt a clear text component and display the result at the console. If the component does not have odd parity, odd parity will be forced before encryption by the selected LMK.

	Variant LMK	Key Block LMK
Authorization:	The HSM must be in the Authorized State, or the activity **component.{*key*}.console** must be authorized, where 'key' is the key type code of the component being encrypted.	The HSM must be in the Authorized State, or the activity **component.{*key*}.console** must be authorized, where 'key' is the key usage code of the component being encrypted.
Inputs:	• LMK Identifier: 00-99. • Key Type: See the Key Type Table in the *Host Programmer's Manual*. • Key Scheme. • Clear Component: 16/32/48 hex digits.	• LMK Identifier: 00-99. • Component Algorithm (if AES LMK): 3DES or AES • Component Length: Single/Double/Triple length DES key or (if AES LMK) 128/192/256-bit AES key. • Key Scheme. • Key Usage: See the Key Usage Table in the *Host Programmer's Manual*. • Mode of Use: See the Mode of Use Table in the *Host Programmer's Manual*. • Component Number: 1-9. • Exportability: See the Exportability Table in the *Host Programmer's Manual*. • Optional Block data. • Clear Component: 16/32/48 hex digits.
Outputs:	• Component encrypted under an appropriate variant of the selected LMK. • Component check value.	• Key Block containing the component encrypted under the selected LMK. • Component check value.

Errors:
- Invalid LMK identifier - no LMK loaded or entered identifier out of range.
- Data invalid; please re-enter - the input data does not contain 16 or 32 or 48 hexadecimal characters. Re-enter the correct number of hexadecimal characters.
- Invalid key type; re-enter - the key type is invalid. See the Key Type Table in the *Host Programmer's Manual*.
- Invalid key scheme - an invalid key scheme is entered.
- Command only allowed from Authorized - the HSM is not authorized to perform this operation.

- Internal failure 12: function aborted - the contents of LMK storage have been corrupted or erased. Do not continue. Inform the Security Department.
- Various key block field errors – the value entered is invalid, or incompatible with previously entered values.

Example 1: (Variant LMK)

This example encrypts a plaintext double length DES key component.

```
Online-AUTH> EC <Return>
Enter LMK id: 00 <Return>
Enter key type: 001 <Return>
Enter key Scheme: U <Return>
Enter component: XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX
<Return>
Encrypted component: U YYYY YYYY YYYY YYYY YYYY YYYY
YYYY YYYY
Key check value: ZZZZZZ
Online-AUTH>
```

Example 2: (3DES Key Block LMK)

This example encrypts a plaintext double length DES key component.

```
Online-AUTH> EC <Return>
Enter LMK id: 01 <Return>
Enter component length [1,2,3]: 2 <Return>
Enter key scheme: S <Return>
Enter key usage: P0 <Return>
Enter mode of use: N <Return>
Enter component number [1-9]: 2 <Return>
Enter exportability: E <Return>
Enter optional blocks? [Y/N]: Y <Return>
Enter optional block identifier: 00 <Return>
Enter optional block data: L <Return>
Enter more optional blocks? [Y/N]: N <Return>
Enter component: XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX
<Return>
Encrypted component: S YYYYYYYY……YYYYYY
Key check value: ZZZZZZ
Online-AUTH>
```

Example 3: (AES Key Block LMK)

This example encrypts a plaintext double length DES key component.

```
Online-AUTH> EC <Return>
Enter LMK id: 02 <Return>
Enter algorithm [3DES/AES]: 3 <Return>
Enter component length [1,2,3]: 2 <Return>
Enter key scheme: S <Return>
Enter key usage: D0 <Return>
Enter mode of use: N <Return>
Enter component number [1-9]: 2 <Return>
Enter exportability: E <Return>
Enter optional blocks? [Y/N]: Y <Return>
Enter optional block identifier: 00 <Return>
Enter optional block data: L <Return>
Enter more optional blocks? [Y/N]: N <Return>
Enter component: XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX
<Return>
Encrypted component: S YYYYYYYY……YYYYYY
Key check value: ZZZZZZ
Online-AUTH>
```

Example 4: (AES Key Block LMK)

This example encrypts a plaintext 128-bit AES key component.

```
Online-AUTH> EC <Return>
Enter LMK id: 02 <Return>
Enter algorithm [3DES/AES]: A <Return>
Enter component length [128,192,256]: 128 <Return>
Enter key scheme: S <Return>
Enter key usage: K0 <Return>
Enter mode of use: N <Return>
Enter component number [1-9]: 2 <Return>
Enter exportability: E <Return>
Enter optional blocks? [Y/N]: Y <Return>
Enter optional block identifier: 00 <Return>
Enter optional block data: L <Return>
Enter more optional blocks? [Y/N]: N <Return>
Enter component: XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX
<Return>
Encrypted component: S YYYYYYYY……YYYYYY
Key check value: ZZZZZZ
Online-AUTH>
```

Form Key from Components (FK)

Variant ☑	Key Block ☑	
Online ☑	Offline ☑	Secure ☑
Authorization: **Required** Activity: **component.{*key*}.console**		

Command: **FK**

Function: To build a key from components. If clear components are used, they will not be checked for parity, but odd parity will be forced on the final key before encryption under the selected LMK.

	Variant LMK	Key Block LMK
Authorization:	The HSM must be in the Authorized State, or the activity **component.{*key*}.console** must be authorized, where 'key' is the key type code of the key being formed.	The HSM must be in the Authorized State, or the activity **component.{*key*}.console** must be authorized, where 'key' is the key usage code of the key being formed.
Inputs:	• LMK Identifier: 00-99. • Key Length: 1 (single), 2 (double), 3 (triple). • Key Type: See the Key Type Table in the *Host Programmer's Manual*. • Key Scheme. Must be U, T, or None/Z. • Component Type: X (xor), H (half), E (encrypted), S (smartcard), T (third). • Number of Components: 1-9 if the security setting "AU Components" has been set to "NO", otherwise 2-9. • Clear Components: 16/32/48 hex digits.	• LMK Identifier: 00-99. • Key Algorithm (if AES LMK): 3DES or AES • Key Length: Single/Double/Triple length DES key or (if AES LMK) 128/192/256-bit AES key. • Key Scheme. • Component Type (for AES keys): X (xor), E (encrypted), S (smartcard), • Component Type (for DES keys): X (xor), E (encrypted), S (smartcard), H (half), T (third). • Number of Components: 1-9 if the security setting "Enforce Multiple Key Components" has been set to "NO", otherwise 2-9. • Key Usage: See the Key Usage Table the *Host Programmer's Manual*. • Mode of Use: See the Mode of Use Table in the *Host Programmer's Manual*. • Key Version Number: 00-99. • Exportability: See the Exportability Table in the *Host Programmer's Manual*. • Optional Block data. • Clear Components: 16/32/48 hex digits.
Outputs:	• Key encrypted under an appropriate variant of the selected LMK. • Key Check Value.	• Key Block containing the component encrypted under the selected LMK. • Key Check Value.

Notes:
- PINs must be entered within 60 seconds of being requested.
- When using key components encrypted by a Key Block LMK, the FK command ignores the "Component Number" field stored within each component key block.

Errors:

- Invalid LMK identifier - no LMK loaded or entered identifier out of range.
- Incompatible header values - the field values are incompatible between components.
- Incompatible key status optional blocks - there is a mismatch between the values contained in one or more key status optional blocks.
- Command only allowed from Authorized - the HSM is not authorized to perform this operation.
- Invalid key scheme - an invalid key scheme is entered.
- Invalid key type; re-enter - the key type is invalid. See the Key Type Table in the *Host Programmer's Manual*.
- Key all zero - the key is invalid.
- Invalid entry - an invalid number of components has been entered.
- Data invalid; please re-enter - the amount of input data is incorrect. Re-enter the correct number of hexadecimal characters.
- Invalid PIN; re-enter - a PIN of less than 4 or greater than 8 is entered.
- Smartcard error; command/return: 0003 - invalid PIN is entered.
- No component card - no key component on the provided smartcard.
- Not a LMK card - card is not formatted for LMK or key storage.
- Card not formatted - card is not formatted.
- Internal failure 12: function aborted - the contents of LMK storage have been corrupted or erased. Do not continue. Inform the Security Department.
- Various key block field errors – the value entered is invalid, or incompatible with previously entered values.

Notes:

- Component type H is not permitted for Triple – DES keys.
- Use of this command will always create an entry in the Audit Log.

Example 1: (Variant LMK)

This example forms a key from plaintext component.

```
Online-AUTH> FK <Return>
Enter LMK id: 00 <Return>
Enter key length[1,2,3]: 2 <Return>
Enter key type: 002 <Return>
Enter key scheme: U <Return>
Component type [X,H,E,S,T]: X <Return>
Enter number of components [1-9]: 2 <Return>

Enter component 1: **** **** **** **** **** **** **** **** <Return>
Component 1 check value: XXXXXX
Continue? [Y/N]: y <Return>

Enter component 2: **** **** **** **** **** **** **** **** <Return>
Component 2 check value: XXXXXX
Continue? [Y/N]: y <Return>

Encrypted key: U YYYY YYYY YYYY YYYY YYYY YYYY YYYY YYYY
Key check value: ZZZZZZ
Online-AUTH>
```

Example 2: (Variant LMK)

This example forms a key from components on a smartcard.

```
Online-AUTH> FK <Return>
Enter LMK id: 00 <Return>
Enter key length[1,2,3]: 2 <Return>
Enter key type: 002 <Return>
Enter key scheme: U <Return>
Component type [X,H,E,S,T]: S <Return>
```

```
Enter number of components (1-9): 2 <Return>

Insert card 1 and enter PIN: ******** <Return>
Component 1 check value: XXXXXX
Continue? [Y/N]: y <Return>

Insert card 2 and enter PIN: ******** <Return>
Component 2 check value: XXXXXX
Continue? [Y/N]: y <Return>

Encrypted key: U YYYY YYYY YYYY YYYY YYYY YYYY YYYY YYYY
Key check value: ZZZZZZ
Online-AUTH>
```

Example 3: (Variant LMK)

This example forms a key from encrypted components.

```
Online-AUTH> FK <Return>
Enter LMK id: 00 <Return>
Enter key length[1,2,3]: 2 <Return>
Enter key type: 002 <Return>
Enter key scheme: U <Return>
Component type [X,H,E,S,T]: E <Return>
Enter number of components (1-9): 2 <Return>

Enter component 1: U XXXX XXXX XXXX XXXX XXXX XXXX XXXX
XXXX <Return>
Component 1 check value: XXXXXX
Continue? [Y/N]: y <Return>

Enter component 2: U XXXX XXXX XXXX XXXX XXXX XXXX XXXX
XXXX <Return>
Component 2 check value: XXXXXX
Continue? [Y/N]: y <Return>

Encrypted key: U YYYY YYYY YYYY YYYY YYYY YYYY YYYY YYYY
Key check value: ZZZZZZ
Online-AUTH>
```

Example 4: (Variant LMK)

The security settings require that multiple components are used to form keys, but the user attempts to form a key from one component.

```
Online-AUTH> FK <Return>
Enter LMK id: 00 <Return>
Enter key length[1,2,3]: 2 <Return>
Enter key type: 002 <Return>
Enter key scheme: U <Return>
Component type [X,H,E,S,T]: E <Return>
Enter number of components (2-9): 1 <Return>

Invalid Entry
Enter number of components (2-9): 2 <Return>

Enter component 1: U XXXX XXXX XXXX XXXX XXXX XXXX XXXX
XXXX <Return>
Component 1 check value: XXXXXX
Continue? [Y/N]: Y <Return>

Enter component 2: U XXXX XXXX XXXX XXXX XXXX XXXX XXXX
XXXX <Return>
Component 2 check value: XXXXXX
Continue? [Y/N]: Y <Return>

Encrypted key: U YYYY YYYY YYYY YYYY YYYY YYYY YYYY YYYY
Key check value: ZZZZZZ
Online-AUTH>
```

Example 5: (3DES Key Block LMK)

This example forms a single length DES key from plaintext components.

```
Online-AUTH> FK <Return>
Enter LMK id: 01 <Return>
Enter key length [1,2,3]: 1 <Return>
Enter key scheme: S <Return>
Component type [X,H,E,S,T]: X <Return>
Enter number of components [1-9]: 2 <Return>
Enter key usage: P0 <Return>
Enter mode of use: N <Return>
Enter key version number: 99 <Return>
Enter exportability: E <Return>
Enter optional blocks? [Y/N]: N <Return>

Enter component 1: **** **** **** **** <Return>
Component 1 check value: XXXXXX
Continue? [Y/N]: Y <Return>

Enter component 2: **** **** **** **** <Return>
Component 2 check value: XXXXXX
Continue? [Y/N]: Y <Return>

Encrypted key: S YYYYYYYY……YYYYYY
Key check value: ZZZZZZ
Online-AUTH>
```

Example 6: (3DES Key Block LMK)

This example forms a double length 3DES key from components on a smartcard.

```
Online-AUTH> FK <Return>
Enter LMK id: 01 <Return>
Enter Key Length[1,2,3]: 2 <Return>
Enter key scheme: S <Return>
Component type [X,H,E,S,T]: S <Return>
Enter number of components (1-9): 2 <Return>

Insert card 1 and enter PIN: ******** <Return>
Component 1 check value: XXXXXX
Continue? [Y/N]: Y <Return>

Insert card 2 and enter PIN: ******** <Return>
Component 2 check value: XXXXXX
Continue? [Y/N]: Y <Return>

Encrypted key: S YYYYYYYY……YYYYYY
Key check value: ZZZZZZ
Online-AUTH>
```

Example 7: (AES Key Block LMK)

This example forms a double length 3DES key from plaintext components.

```
Online-AUTH> FK <Return>
Enter LMK id: 02 <Return>
Enter algorithm [3DES/AES]: 3 <Return>
Enter key length [1,2,3]: 2 <Return>
Enter key scheme: S <Return>
Component type [X,H,E,S,T]: X <Return>
Enter number of components [1-9]: 2 <Return>
Enter key usage: P0 <Return>
Enter mode of use: N <Return>
Enter key version number: 99 <Return>
Enter exportability: E <Return>
```

```
Enter optional blocks? [Y/N]: N <Return>

Enter component 1: **** **** **** **** **** **** ****
**** <Return>
Component 1 check value: XXXXXX
Continue? [Y/N]: y <Return>

Enter component 2: **** **** **** **** **** **** ****
**** <Return>
Component 2 check value: XXXXXX
Continue? [Y/N]: y <Return>

Encrypted key: S YYYYYYYY……YYYYYY
Key check value: ZZZZZZ
Online-AUTH>
```

Example 8: (AES Key Block LMK)

This example forms a 128-bit AES key from components on a smartcard.

```
Online-AUTH> FK <Return>
Enter LMK id: 02 <Return>
Enter algorithm [3DES/AES]: A <Return>
Enter key length [128,192,256]: 128 <Return>
Enter key scheme: S <Return>
Component type [X,E,S]: S <Return>
Enter number of components [1-9]: 2 <Return>
Enter key version number: 00 <Return>
Enter optional blocks? [Y/N]: N <Return>

Insert card 1 and enter PIN: ******** <Return>
Component 1 check value: XXXXXX
Continue? [Y/N]: Y <Return>

Insert card 2 and enter PIN: ******** <Return>
Component 2 check value: XXXXXX
Continue? [Y/N]: Y <Return>

Encrypted key: S YYYYYYYY……YYYYYY
Key check value: ZZZZZZ
Online-AUTH>
```

Example 8: (AES Key Block LMK)

This example forms a 128-bit AES key from encrypted components.

```
Online-AUTH> FK <Return>
Enter LMK id: 02 <Return>
Enter algorithm [3DES/AES]: A <Return>
Enter key length [128,192,256]: 128 <Return>
Enter key scheme: S <Return>
Component type [X,E,S]: E <Return>
Enter number of components [1-9]: 3 <Return>
Enter key version number: 00 <Return>
Enter optional blocks? [Y/N]: Y <Return>
Enter optional block identifier: 03 <Return>
Enter optional block data: 2005:12:21:00 <Return>
Enter more optional blocks? [Y/N]: Y <Return>
Enter optional block identifier: 04 <Return>
Enter optional block data: 2007:12:21:00 <Return>
Enter more optional blocks? [Y/N]: N <Return>

Enter component 1: S XXXXXXXX……XXXXXX <Return>
Component 1 check value: XXXXXX
Continue? [Y/N]: Y <Return>
```

```
Enter component 2: S XXXXXXXX……XXXXXX <Return>
Component 2 check value: XXXXXX
Continue? [Y/N]: y <Return>

Enter component 3: S XXXXXXXX……XXXXXX <Return>
Component 3 check value: XXXXXX
Continue? [Y/N]: y <Return>

Encrypted key: S YYYYYYYY……YYYYYY
Key check value: ZZZZZZ
Online-AUTH>
```

Generate Key (KG)

Variant ☑		Key Block ☑
Online ☑	Offline ☑	Secure ☑
Variant LMK	Authorization: **Determined by KTT(G&E)** Activity: **generate.{*key*}.console** and **export.{*key*}.console**	
Key Block LMK	Authorization: **If export to non-KB.** Activity: **export.{key}.console**	

Command: **KG**

Function: To generate a random key and return it encrypted under the LMK and optionally under a ZMK (for transmission to another party).

	Variant LMK	Key Block LMK
Authorization:	This command examines the 'Generate' flag of the given key type within the Key Type Table to determine the authorization requirement. If the flag is 'A', the HSM must either be in the Authorized State, or the activity **generate.{*key*}.console** must be authorized, where 'key' is the key type code of the key being generated. If the generated key is required to be exported under the ZMK, this command also examines the 'Export' flag of the given key type within the Key Type Table. If the flag is 'A', the HSM must either be in the Authorized State, or the activity **export.{*key*}.console** must be authorized, where 'key' is the key type code of the key being exported.	The authorization requirement for this command depends solely on the type of export being requested: Exported key scheme / Authorization: No export — None 'S' (*Thales Key Block*) — None 'R' (*TR-31 Key Block*) — None 'U', 'T' (*Variant*) — Required 'Z', 'X', 'Y' (*X9.17*) — Required If authorization is required, the HSM must either be in the Authorized State, or the activity **export.{*key*}.console** must be authorized, where 'key' is the key usage code of the key being exported.
Inputs:	• LMK Identifier: 00-99. • Key Length: 1 (single), 2 (double), 3 (triple). • Key Type: See the Key Type Table in the *Host Programmer's Manual*. • Key Scheme (LMK). • Key Scheme (ZMK) (if exporting). • ZMK (if exporting). • Key Block values if exporting to TR-31 format	• LMK Identifier: 00-99. • Key Algorithm (if AES LMK): 3DES or AES • Key Length: Single/Double/Triple length DES key or (if AES LMK) 128/192/256-bit AES key. • Key Scheme (LMK). • Key Scheme (ZMK) (if exporting). • ZMK (if exporting). • Key Usage: See the Key Usage Table in the *Host Programmer's Manual*. • Mode of Use: See the Mode of Use Table in the *Host Programmer's Manual*. • Key Version Number: 00-99.

		• Exportability: See the Exportability Table in the *Host Programmer's Manual*. • Optional Block data. • Exportability of exported key (if exporting).
Outputs:	• Key encrypted under an appropriate variant of the selected LMK. • Key/Key Block encrypted under the ZMK (if exporting). • Key Check Value.	• Key Block containing the key encrypted under the selected LMK. • Key/Key Block encrypted under the ZMK (if exporting). • Key Check Value.

Notes:

For legacy reasons, the export of a ZMK, ZEK or DEK from encryption under a key block LMK to encryption under a ZMK (in variant/X9.17 format) will not be permitted. Specifically, such export of keys with key usage = "K0", "52", "D0", "21" or "22" will be prohibited.

Errors:

- Invalid LMK identifier - no LMK loaded or entered identifier out of range.
- Must be in Authorized State or Activity not authorized - the key type provided requires the HSM to be in Authorized State.
- Data invalid; please re-enter - the encrypted ZMK does not contain the correct characters, or the key check value does not contain 6 hexadecimal characters. Re-enter the correct number of hexadecimal characters.
- Key parity error; please re-enter - the ZMK does not have odd parity on each byte. Re-enter the encrypted ZMK and check for typographic errors.
- Invalid key scheme for key length - the Key scheme is inappropriate for Key length.
- Invalid key scheme - the key scheme is invalid.
- Invalid key type; re-enter - the key type is invalid. See the Key Type Table the *Host Programmer's Manual*.
- Internal failure 12: function aborted - the contents of LMK storage have been corrupted or erased. Do not continue. Inform the Security Department.
- Various key block field errors – the value entered is invalid, or incompatible with previously entered values.

Example 1: (Variant LMK)

This example generates a new double length DES key.

```
Online> KG <Return>
Enter LMK id: 00 <Return>
Enter key length [1,2,3]: 2 <Return>
Enter key type: 002 <Return>
Enter key scheme (LMK): U <Return>
Enter key scheme (ZMK): <Return>
Enter ZMK: <Return>
Key under LMK: U YYYY YYYY YYYY YYYY YYYY YYYY YYYY YYYY
Key Check value: ZZZZZZ
Online>
```

Example 2: (Variant LMK)

This example generates a new double length DES key, and exports it to X9.17 format.

```
Online-AUTH> KG <Return>
Enter LMK id: 00 <Return>
Enter key length [1,2,3]: 2 <Return>
Enter key type: 002 <Return>
Enter key scheme (LMK): U <Return>
Enter key scheme (ZMK): X <Return>
Enter ZMK: U XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX
<Return>
Key under LMK: U YYYY YYYY YYYY YYYY YYYY YYYY YYYY YYYY
Key under ZMK: X YYYY YYYY YYYY YYYY YYYY YYYY YYYY YYYY
Key check value: ZZZZZZ
Online-AUTH>
```

Example 3: (Variant LMK)

This example generates a new double length DES key, and exports it to TR-31 format.

```
Online-AUTH> KG <Return>
Enter LMK id: 00 <Return>
Enter key length [1,2,3]: 2 <Return>
Enter key type: 001 <Return>
Enter key scheme (LMK): U <Return>
Enter key scheme (ZMK): R <Return>
Enter ZMK: U XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX
<Return>
Enter key usage: P0 <Return>
Enter mode of use: N <Return>
Enter key version number: 44 <Return>
Enter exportability: N <Return>
Enter optional blocks? [Y/N]: N <Return>
Key under LMK: U YYYY YYYY YYYY YYYY YYYY YYYY YYYY YYYY
Key under ZMK: R YYYYYYYY……YYYYYY
Key check value: ZZZZZZ
Online-AUTH>
```

Example 4: (3DES Key Block LMK)

This example generates a new double length DES key, and exports it to X9.17 format.

```
Online-AUTH> KG <Return>
Enter LMK id: 01 <Return>
Enter key length [1,2,3]: 2 <Return>
Enter key scheme (LMK): S <Return>
Enter key scheme (ZMK): X <Return>
Enter ZMK: S XXXXXXXX……XXXXXX <Return>
Enter key usage: P0 <Return>
Enter mode of use: N <Return>
Enter key version number: 22 <Return>
Enter exportability: N <Return>
Enter optional blocks? [Y/N]: N <Return>
Key under LMK: S YYYYYYYY……YYYYYY
Key under ZMK: X YYYY YYYY YYYY YYYY YYYY YYYY YYYY YYYY
Key check value: ZZZZZZ
Online-AUTH>
```

Example 5: (3DES Key Block LMK)

This example generates a new double length DES key, and exports it to TR-31 format.

```
Online> KG <Return>
Enter LMK id: 01 <Return>
Enter key length [1,2,3]: 2 <Return>
Enter key scheme (LMK): S <Return>
Enter key scheme (ZMK): R <Return>
Enter ZMK: S XXXXXXXX……XXXXXX <Return>
Enter key usage: 72 <Return>
Enter mode of use: N <Return>
Enter key version number: 33 <Return>
Enter exportability: E <Return>
Enter optional blocks? [Y/N]: Y <Return>
Enter optional block identifier: 03 <Return>
Enter optional block data: 2005:12:21:00 <Return>
Enter more optional blocks? [Y/N]: Y <Return>
Enter optional block identifier: 04 <Return>
Enter optional block data: 2007:12:21:00 <Return>
Enter more optional blocks? [Y/N]: N <Return>
Enter exportability field for exported key block:
<Return>
Key under LMK: S YYYYYYYY……YYYYYY
Key under ZMK: R YYYYYYYY……YYYYYY
Key check value: ZZZZZZ
Online>
```

Example 6: (AES Key Block LMK)

This example generates a new double length DES key.

```
Online-AUTH> KG <Return>
Enter LMK id: 02 <Return>
Enter algorithm [3DES/AES]: 3 <Return>
Enter key length [1,2,3]: 2 <Return>
Enter key scheme (LMK): S <Return>
Enter key scheme (ZMK): <Return>
Enter key usage: P0 <Return>
Enter mode of use: N <Return>
Enter key version number: 00 <Return>
Enter exportability: N <Return>
Enter optional blocks? [Y/N]: N <Return>
Key under LMK: S YYYYYYYY……YYYYYY
Key check value: ZZZZZZ
Online-AUTH>
```

Example 7: (AES Key Block LMK)

This example generates a new 128-bit AES key.

```
Online-AUTH> KG <Return>
Enter LMK id: 02 <Return>
Enter algorithm [3DES/AES]: A <Return>
Enter key length [128,192,256]: 128 <Return>
Enter key scheme (LMK): S <Return>
Enter key scheme (ZMK): <Return>
Enter key usage: K0 <Return>
Enter mode of use: N <Return>
Enter key version number: 00 <Return>
Enter exportability: N <Return>
Enter optional blocks? [Y/N]: N <Return>
Key under LMK: S YYYYYYYY……YYYYYY
Key check value: ZZZZZZ
Online-AUTH>
```

Import Key (IK)

Variant ☑		Key Block ☑
Online ☑	Offline ☑	Secure ☑
Authorization: **Required** Activity: **command.ik.console**		

Command: **IK**

Function: To import a key from encryption under a ZMK to encryption under an LMK. If the key imported does not have odd parity a warning will be issued and odd parity will be forced on the key before encryption under the specified LMK.

Authorization: The HSM must either be in the Authorized State, or the activity **command.ik.console** must be authorized.
For AES LMKs, keys can only be exported in Thales Key Block format.

	Variant LMK	Key Block LMK
Inputs:	• LMK Identifier: 00-99. • Key Type: See the Key Type Table in the *Host Programmer's Manual*. • Key Scheme (LMK). • ZMK to be used to decrypt the key. • Key/Key Block to be imported.	• LMK Identifier: 00-99. • Key Scheme (LMK). • ZMK to be used to decrypt the key. • Key/Key Block to be imported. For import from Variant/X9.17: • Key Usage: See the Key Usage Table in the *payShield 10K Host Programmer's Manual*. • Mode of Use: See the Mode of Use Table in the *payShield 10K Host Programmer's Manual*. • Key Version Number: 00-99. • Exportability: See the Exportability Table in the *payShield 10K Host Programmer's Manual*. • Optional Block data. For import from a key block format: • Modified Key Usage • Optional Block data.
Outputs:	• Key encrypted under an appropriate variant of the selected LMK. • Key Check Value.	• Key Block containing the key encrypted under the selected LMK. • Key Check Value.

Notes:

- For legacy reasons, the import of a ZMK or DEK from encryption under a ZMK (in variant/X9.17 format) to encryption under a key block LMK will not be permitted. Specifically, such import of keys with key usage = "K0", "52", "D0", "21" or "22" will be prohibited.
- Use of this command will always create an entry in the Audit Log.
- If the option "Enforce Atalla variant match to Thales key type" is set to YES in the CS console command, the following matchings between Atalla variant and Thales variant key types will be enforced:

Key Type	Atalla Variant	Thales Variant (*)	Thales Variant (⌀)

TPK ZPK	1 or 01	002 LMK 14-15 001 LMK 06-07	70D LMK 36-37/7 001 LMK 06-07
ZEK	2 or 02	00B LMK 32-33 00A LMK 30-31	00B LMK 32-33 00A LMK 30-31
TAK ZAK CVK	3 or 03	003 LMK 16-17 008 LMK 26-27 402 LMK 14-15/4	003 LMK 16-17 008 LMK 26-27 402 LMK 14-15/4
TMK TPK PVK	4 or 04	002 LMK 14-15 002 LMK 14-15 002 LMK 14-15	80D LMK 36-37/8 70D LMK 36-37/7 002 LMK 14-15
TMK	5 or 05	002 LMK 14-15	80D LMK 36-37/8
BDK type-1	8 or 08	009 LMK 28-29	009 LMK 28-29
MK-AC	9 or 09	109 LMK 28-29/1	109 LMK 28-29/1
MK-SMI	9 or 09	209 LMK 28-29/2	209 LMK 28-29/2
MK-SMC	9 or 09	309 LMK 28-29/3	309 LMK 28-29/3
TEK	26	30B LMK 32-33/3	30B LMK 32-33/3
BDK type-2	30	609 LMK 28-29/6	609 LMK 28-29/6
BDK type-3	8 or 08	809 LMK 28-29/8	809 LMK 28-29/8

* Applies if the security setting "Enforce key type 002 separation for PCI HSM compliance" has the value "N"

ø Applies if the security setting "Enforce key type 002 separation for PCI HSM compliance" has the value "Y"

Errors:

- Invalid LMK identifier - no LMK loaded or entered identifier out of range.
- Must be in Authorized State or Activity not authorized - the key type provided requires the HSM to be in Authorized State.
- Data invalid; please re-enter - the encrypted ZMK does not contain the correct characters, or the key check value does not contain 6 hexadecimal characters. Re-enter the correct number of hexadecimal characters.
- Key parity error; re-enter key - the parity of the ZMK is not odd.
- Warning: key parity corrected - the parity of the key encrypted under the ZMK is not odd.
- Invalid key scheme - the key scheme is invalid.
- Invalid key type; re-enter - the key type is invalid. See the Key Type Table in the *Host Programmer's Manual*.
- Internal failure 12: function aborted - the contents of LMK storage have been corrupted or erased. Do not continue. Inform the Security Department.
- Various key block field errors – the value entered is invalid, or incompatible with previously entered values.

Example 1: (Variant LMK)

This example imports a key from X9.17 format.

```
Online> IK <Return>
Enter LMK id: 00 <Return>
Enter Key type: 002 <Return>
Enter Key Scheme: U <Return>
Enter ZMK: U XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX
<Return>
Enter key: X XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX
<Return>
Encrypted key: U YYYY YYYY YYYY YYYY YYYY YYYY YYYY YYYY
```

```
Key check value: ZZZZZZ
```

Example 2: (Variant LMK)

This example imports a key from TR-31 format.

```
Online> IK <Return>
Enter LMK id: 00 <Return>
Enter key type: 009 <Return>
Enter key scheme (LMK): U <Return>
Enter ZMK: U XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX
<Return>
Enter key: R XXXXXXXX……XXXXXX <Return>
Key under LMK: U YYYY YYYY YYYY YYYY YYYY YYYY YYYY YYYY
Key check value: ZZZZZZ
Online>
```

Example 3: (3DES Key Block LMK)

This example imports a key from X9.17 format.

```
Online-AUTH> IK <Return>
Enter LMK id: 01 <Return>
Enter key scheme (LMK): S <Return>
Enter ZMK: S XXXXXXXX……XXXXXX <Return>
Enter key: X XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX
<Return>
Enter key usage: P0 <Return>
Enter mode of use: N <Return>
Enter key version number: 27 <Return>
Enter exportability: N <Return>
Enter optional blocks? [Y/N]: N <Return>
Key under LMK: S YYYYYYYY……YYYYYY
Key check value: ZZZZZZ
Online-AUTH>
```

Example 4: (3DES Key Block LMK)

This example imports a key from TR-31 format. Note that a new (more restrictive) value for the imported key block's Key Usage field is entered during the import process.

```
Online> IK <Return>
Enter LMK id: 01 <Return>
Enter key scheme (LMK): S <Return>
Enter ZMK: S XXXXXXXX……XXXXXX <Return>
Enter key: R XXXXXXXX……XXXXXX <Return>
Enter modified key usage: 72 <Return>
Enter optional blocks? [Y/N]: Y <Return>
Enter optional block identifier: 03 <Return>
Enter optional block data: 2005:12:21:00 <Return>
Enter more optional blocks? [Y/N]: Y <Return>
Enter optional block identifier: 04 <Return>
Enter optional block data: 2007:12:21:00 <Return>
Enter more optional blocks? [Y/N]: N <Return>
Key under LMK: S YYYYYYYY……YYYYYY
Key check value: ZZZZZZ
Online>
```

Example 5: (3DES or AES Key Block LMK)

This example imports a key from Thales Key Block format.

```
Online> IK <Return>
Enter LMK id: 01 <Return>
Enter key scheme (LMK): S <Return>
Enter ZMK: S XXXXXXXX……XXXXXX <Return>
Enter key: S XXXXXXXX……XXXXXX <Return>
Key under LMK: S YYYYYYYY……YYYYYY
Key check value: ZZZZZZ
Online>
```

Export Key (KE)

Variant ☑		Key Block ☑
Online ☑	Offline ☑	Secure ☑
Variant LMK	Authorization: **Determined by KTT(E)** Activity: **export.{*key*}.console**	
Key Block LMK	Authorization: **If export to non-KB.** Activity: **export.{key}.console**	

Command: **KE**

Function: To translate a key from encryption under the specified LMK to encryption under a ZMK.

	Variant LMK	Key Block LMK
Authorization:	This command examines the 'Export' flag of the given key type within the **Key Type Table** to determine whether authorization is required. If required, the HSM must either be in the Authorized State, or the activity **export.{*key*}.console** must be authorized, where 'key' is the key type code of the key being exported.	The authorization requirement for this command depends on the type of export being requested: Exported key scheme / Authorization: 'S' (*Thales Key Block*) – None 'R' (*TR-31 Key Block*) – None 'U', 'T' (*Variant*) – Required 'Z', 'X', 'Y' (*X9.17*) – Required If authorization is required, the HSM must either be in the Authorized State, or the activity **export.{*key*}.console** must be authorized, where 'key' is the key usage code of the key being exported. For AES LMKs, keys can only be exported in Thales Key Block format.
Inputs:	• LMK Identifier: 00-99. • Key Type: See the Key Type Table in the *Host Programmer's Manual*. • Key Scheme (ZMK). • ZMK to be used to encrypt the key. • Key to be exported. For export to Thales Key Block & TR-31: • Key Usage: See the Key Usage Table in the *Host Programmer's Manual*. • Mode of Use: See the Mode of Use Table the *payShield 10K Host Programmer's Manual*.	• LMK Identifier: 00-99. • Key Scheme (ZMK). • ZMK to be used to encrypt the key. • Key to be exported. For export to key block format: • Exportability of exported key.

	• Key Version Number: 00-99. • Exportability: See the Exportability Table in the *payShield 10K Host Programmer's Manual*. • Optional Block data. *Note export from a Variant LMK to Thales Key Block is not permitted.*	
Outputs:	• Key/Key Block encrypted under the ZMK. • Key Check Value.	• Key/Key Block encrypted under the ZMK. • Key Check Value.

Notes: For legacy reasons, the export of a ZMK, ZEK or DEK from encryption under a key block LMK to encryption under a ZMK (in variant/X9.17 format) will not be permitted. Specifically, such export of keys with key usage = "K0", "52", "D0", "21" or "22" will be prohibited.

Errors:

- Invalid LMK identifier - no LMK loaded or entered identifier out of range.
- Must be in Authorized State or Activity not authorized - the key type provided requires the HSM to be in Authorized State.
- Data invalid; please re-enter - the encrypted ZMK or key does not contain 16 or 32 hex or 1 alpha + 32 hex or 1 alpha + 48 hex. Re-enter the correct number of hexadecimal characters.
- Key parity error; re-enter key - the ZMK or key does not have odd parity on each byte. Re-enter the key and check for typographic errors.
- Invalid key scheme - the key scheme is invalid.
- Invalid key type; re-enter - the key type is invalid. See the Key Type Table the *payShield 10K Host Programmer's Manual*.
- Internal failure 12: function aborted - the contents of LMK storage have been corrupted or erased. Do not continue. Inform the Security Department.
- Various key block field errors – the value entered is invalid, or incompatible with previously entered values.

Example 1: (Variant LMK)

This example exports a key to X9.17 format.

```
Online-AUTH> KE <Return>
Enter Key type: 002 <Return>
Enter Key Scheme: X <Return>
Enter ZMK: U XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX
<Return>
Enter key: U XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX
<Return>
Key under ZMK: X YYYY YYYY YYYY YYYY YYYY YYYY YYYY YYYY
Key check value: ZZZZZZ
Online-AUTH>
```

Example 2: (Variant LMK)

This example exports a key to TR-31 format.

```
Online-AUTH> KE <Return>
Enter LMK id: 00 <Return>
Enter key type: 001 <Return>
Enter key scheme (ZMK): R <Return>
Enter ZMK: U XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX
<Return>
Enter key: U XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX
<Return>
Enter key usage: P0 <Return>
Enter mode of use: N <Return>
Enter key version number: 44 <Return>
Enter exportability: N <Return>
Enter optional blocks? [Y/N]: N <Return>
Key under ZMK: R YYYYYYYY……YYYYYY
Key check value: ZZZZZZ
Online-AUTH>
```

Example 3: (3DES Key Block LMK)

This example exports a key to X9.17 format.

```
Online-AUTH> KE <Return>
Enter LMK id: 01 <Return>
Enter key scheme (ZMK): X <Return>
Enter ZMK: S XXXXXXXX……XXXXXX <Return>
Enter key: S XXXXXXXX……XXXXXX <Return>
Key under ZMK: X YYYY YYYY YYYY YYYY YYYY YYYY YYYY YYYY
Key check value: ZZZZZZ
Online-AUTH>
```

Example 4: (3DES Key Block LMK)

This example exports a key to TR-31 format.

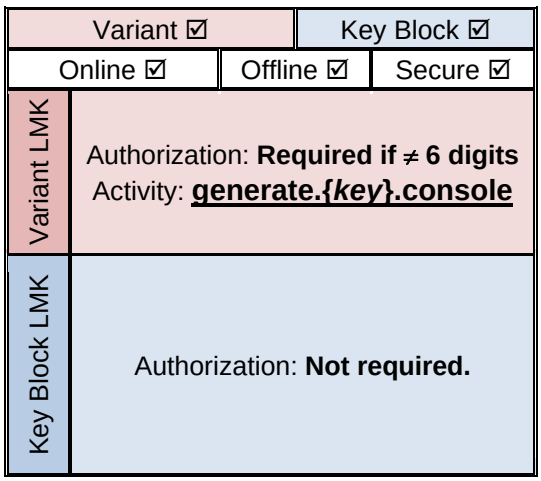
```
Online> KE <Return>
Enter LMK id: 01 <Return>
Enter key scheme (ZMK): R <Return>
Enter ZMK: S XXXXXXXX……XXXXXX <Return>
Enter key: S XXXXXXXX……XXXXXX <Return>
Enter exportability field for exported key block:
<Return>
Key under ZMK: R YYYYYYYY……YYYYYY
Key check value: ZZZZZZ
Online>
```

Example 5: (3DES or AES Key Block LMK)

This example exports a key to Thales Key Block format.

```
Online> KE <Return>
Enter LMK id: 01 <Return>
Enter key scheme (ZMK): S <Return>
Enter ZMK: S XXXXXXXX……XXXXXX <Return>
Enter key: S XXXXXXXX……XXXXXX <Return>
Enter exportability field for exported key block:
<Return>
Key under ZMK: S YYYYYYYY……YYYYYY
Key check value: ZZZZZZ
Online>
```

Generate a Check Value (CK)



Command: **CK**

Function: To generate a key check value (KCV) for a key encrypted under a specified LMK.

	Variant LMK	Key Block LMK
Authorization:	This command only requires authorization when calculating either 8 or 16 digit Key Check Values. If required, the HSM must either be in the Authorized State, or the activity **generate.{*key*}.console** must be authorized, where 'key' is the key type of the key being used. Regardless of the authorization requirement, this command examines the 'Generate' flag of the given key type within the **Key Type Table** to determine whether the check value can be calculated.	The HSM does not require any authorization to run this command. Note: Key Check Values of key blocks are always 6-digits in length.
Inputs:	• LMK Identifier: 00-99. • Key Type: See the Key Type Table in the *Host Programmer's Manual*. • Key Length: 1 (single), 2 (double), 3 (triple). • Key.	• LMK Identifier: 00-99. • Key.
Outputs:	• Key Check Value.	• Key Check Value.

Errors:

- Invalid LMK identifier - no LMK loaded or entered identifier out of range.
- Incompatible LMK schemes - the LMK schemes are different.
- Data invalid; please re-enter - incorrect number of characters.
- Key parity error; re-enter key - the entered key does not have odd parity on each byte. Re-enter the complete line (key and Key-Type code) and check for typographic errors.
- Invalid key type; re-enter - the key type is invalid. See the Key Type Table in the *payShield 10K Host Programmer's Manual*.
- Internal failure 12: function aborted - the contents of LMK storage have been corrupted or erased. Do not continue. Inform the Security Department.
- Various key block field errors – the value entered is invalid, or incompatible with previously entered values.

Example 1: (Variant LMK)

This example generates a check value of a key.

```
Online-AUTH> CK <Return>
Enter LMK id: 00 <Return>
Enter key type code: 001 <Return>
Enter key length flag [S/D/T]: D <Return>
Enter encrypted key: XXXX XXXX XXXX XXXX XXXX XXXX XXXX
XXXX <Return>
Key check value: ZZZZ ZZZZ ZZZZ ZZZZ
Online-AUTH>
```

Example 2: (Key Block LMK)

This example generates a check value of a key.

```
Online> CK <Return>
Enter LMK id: 01 <Return>
Enter key block: S XXXXXXXXXXXXXXX……XXXXXXXXX <Return>
Key check value: ZZZZZZ
Online>
```

Set KMC Sequence Number (A6)

Variant ☑	Key Block ☒	
Online ☒	Offline ☑	Secure ☑
Authorization: **Required** Activity: **misc.console**		

Command: **A6**

Function: To set the value of the KMC sequence number held within the HSM protected memory.

Note: This command is provided for the MasterCard OBKM functionality.

Authorization: The HSM must be in the Offline state to run this command. Additionally, the HSM must be either in the Authorized State, or the activity misc.console must be authorized.

Inputs: New sequence number value.

Outputs: None.

Errors: Not Authorized - The HSM is not in Authorized State
Not Offline – The HSM must be offline to run this command
Invalid Entry – The value entered is invalid (Counter can have any value between 00000000 and FFFFFFFF).

Example:

```
Offline-AUTH> A6 <Return>
Current KMC sequence number is: 00000000 000000F3
Enter new value or <Enter> for no change: 2BAF <Return>
Current KMC sequence number is: 00000000 00002BAF
Offline-AUTH>
```

8.6 Payment System Commands

The payShield 10K provides the following console commands to support some of the card payment systems host commands.

Generate a Card Verification Value (CV)

Variant ☑		Key Block ☑
Online ☑	Offline ☑	Secure ☑
Authorization: **Required** Activity: **misc.console**		

Command: **CV**

Function: To generate a VISA CVV or MasterCard CVC.

Authorization: The HSM must be either in the Authorized State, or the activity **misc.console** must be authorized, using the Authorizing Officer cards of the relevant LMK.

Inputs:
- LMK identifier: indicates the LMK to use when decrypting the supplied CVK(s).
- Encrypted CVK
- Primary account number (PAN) for the card: up to 19 decimal digits.
- Card Expiry date: 4 decimal digits.
- Service code: 3 decimal digits.

Outputs:
- Card Verification Value: 3 decimal digits.

Errors:
- Invalid LMK identifier - no LMK loaded or entered identifier out of range.
- Command only allowed from Authorized - the HSM is not authorized to perform this operation.
- Data invalid; please re-enter - possibly incorrect key length. Could also be incorrect PAN, card expiry date, or service code length or non-decimal PAN, card expiry date or service code.
- Key parity error; please re-enter - the parity of the key entered is not odd.
- Internal failure 12: function aborted - the contents of LMK storage have been corrupted or erased. Do not continue. Inform the Security Department.
- Various key block field errors – the value entered is invalid, or incompatible with previously entered values.

Notes: Use of this command will always create an entry in the Audit Log.

Example 1: (Variant LMK)

This example generates a CVV using a CVK pair encrypted in variant format.

```
Online-AUTH> CV <Return>
Enter LMK id: 00 <Return>
Enter key A: XXXX XXXX XXXX XXXX <Return>
Enter key B: XXXX XXXX XXXX XXXX <Return>
Enter PAN: 1234567812345678 <Return>
Enter expiry date: 0694 <Return>
Enter service code: 123 <Return>
CVV: 321
Online-AUTH>
```

Example 2: (Variant LMK)

This example generates a CVV using a double length CVK in variant format.

```
Online-AUTH> CV <Return>
Enter LMK id: 00 <Return>
Enter key A: U XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX
<Return>
Enter PAN: 1234567812345678 <Return>
Enter expiry date: 0694 <Return>
Enter service code: 123 <Return>
CVV: 321
Online-AUTH>
```

Example 3: (Key Block LMK)

This example generates a CVV using a CVK in key block format.

```
Online-AUTH> CV <Return>
Enter LMK id: 01 <Return>
Enter key block: S XXXXXXXX……XXXXXX <Return>
Enter PAN: 1234567812345678 <Return>
Enter expiry date: 0694 <Return>
Enter service code: 123 <Return>
CVV: 321
Online-AUTH>
```

Generate a VISA PIN Verification Value (PV)

Variant ☑		Key Block ☑
Online ☑	Offline ☑	Secure ☑
Authorization: **Required** Activity: **misc.console**		

Command: **PV**

Function: To generate a VISA PIN Verification Value (PVV).

Authorization: The HSM must be either in the Authorized State, or the activity **misc.console** must be authorized, using the Authorizing Officer cards of the relevant LMK.

Inputs:
- LMK identifier: indicates the LMK to use when decrypting the supplied PVK(s).
- Encrypted PVK.
- The PVV data block comprising:
  - The 11 right-most digits of the account number (excluding check digit): 11 decimal digits.
  - The PIN verification key indicator (PVKI): 1 decimal digit.
  - The 4 left-most digits of the clear PIN: 4 decimal digits.

Outputs:
- The PIN Verification Value (PVV): 4 decimal digits.

Errors:
- Invalid LMK identifier - no LMK loaded or entered identifier out of range.
- Command only allowed from Authorized - the HSM is not authorized to perform this operation.
- Data invalid; please re-enter - the PVK A, PVK B or the PVV data block field is not 16 characters long. Re-enter the correct number of characters.
- Key parity error; please re-enter - the PVK A or PVK B does not have odd parity on each byte. Re-enter the encrypted PVK A or PVK B and check for typographic errors.
- Internal failure 12: function aborted - the contents of LMK storage have been corrupted or erased. Do not continue. Inform the Security Department.
- Various key block field errors – the value entered is invalid, or incompatible with previously entered values.

Notes:
- The completion of this activity will always be entered in the audit log irrespective of the AUDITOPTIONS settings,

Example 1: (Variant LMK)

This example generates a PVV using a PVK pair in variant format.

```
Online-AUTH> PV <Return>
Enter LMK id: 00 <Return>
Enter key A: XXXX XXXX XXXX XXXX <Return>
Enter key B: XXXX XXXX XXXX XXXX <Return>
Enter PVV data block: XXXXXXXXXXX N NNNN <Return>
PVV: NNNN
Online-AUTH>
```

Example 2: (Variant LMK)

This example generates a PVV using a double length PVK in variant format.

```
Online-AUTH> PV <Return>
Enter LMK id: 00 <Return>
Enter key A: U XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX
<Return>
Enter PVV data block: XXXXXXXXXXX N NNNN <Return>
PVV: NNNN
Online-AUTH>
```

Example 3: (Key Block LMK)

This example generates a PVV using a PVK in key block format.

```
Online-AUTH> PV <Return>
Enter LMK id: 01 <Return>
Enter key block: S XXXXXXXX……XXXXXX <Return>
Enter PVV data block: XXXXXXXXXXX N NNNN <Return>
PVV: NNNN
Online-AUTH>
```

Load the Diebold Table (R)

Variant ☑	Key Block ☑	
Online ☑	Offline ☒	Secure ☒
Authorization: **Required** Activity: **misc.console**		

Command: **R**

Function: To load the Diebold table into user storage in the HSM.

Authorization: The HSM must be online and must be either in the Authorized State, or the activity **misc.console** must be authorized, using the Authorizing Officer cards of the relevant LMK.

Inputs:
- LMK identifier: indicates the LMK to use when encrypting the supplied values.
- Location in user storage at which to store the Diebold table. See notes below.

Outputs:
- The 512-character encrypted table: 16 lines of 32 hexadecimal characters each.

Errors:
- Invalid LMK identifier - no LMK loaded or entered identifier out of range.
- Command only allowed from Online-Authorized - the HSM is not online, or the HSM is not authorized to perform this operation, or both.
- Invalid index - the specified location in user storage is out of range. Enter a valid value.
- Data invalid; please re-enter - the entered index is not 3 hexadecimal characters long, or a table entry is not 16 hexadecimal characters long. Re-enter the correct number of hexadecimal characters.
- Invalid table: duplicate or missing values - some of the data entered is not a valid entry for a Diebold table. Check the table and re-enter the data, checking for typographic errors.
- Internal failure 12: function aborted - the contents of LMK storage have been corrupted or erased. Do not continue. Inform the Security Department.

Notes:
- Encryption of the Diebold Table:
  - If the security setting "Enforce key type 002 separation for PCI HSM compliance" has the value "N", the Diebold table is encrypted using LMK pair 14-15 variant 0.
  - If the security setting "Enforce key type 002 separation for PCI HSM compliance" has the value "Y", the Diebold table is encrypted using LMK pair 36-37 variant 6.
- User Storage is structured in different ways depending on whether the security setting "User storage key length" has a fixed length value (setting = S(ingle), D(ouble), T(riple)) or is variable (setting = V(ariable)).
  - If the length is fixed, the Diebold table is stored as 32 contiguous blocks of 16 characters. The index for the first block must be in the range 000-FE0.
  - If the length is variable, the Diebold table is stored as a single block of 512 characters. Because this needs to use one of the larger slots capable of handling blocks larger than 100 bytes, the index must be in the range 000-07F.

  See the *payShield 10K Host Programmer's Manual* for further information.
- If the security setting "Enforce key type 002 separation for PCI HSM compliance" is changed, the Diebold Table must be re-entered by using this command. Therefore, it is important that the cleartext version of the table is retained.

Example: *The security setting "User storage key length" has a fixed length value.*

```
Online-AUTH> R <Return>
Enter LMK id: 00 <Return>
Enter index (000 - FE0): XXX <Return>
Now enter table, 16 hex digits/line
Line 01: XXXX XXXX XXXX XXXX <Return>
XXXX XXXX XXXX XXXX OK? [Y/N] Y <Return>
Line 02:
…
…
Line 32: XXXX XXXX XXXX XXXX <Return>
XXXX XXXX XXXX XXXX OK? [Y/N] Y <Return>

XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX
XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX
…
…
XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX
XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX (16 lines of
encrypted table are displayed)
Online-AUTH>
```

Note: The result of the "R" command gives no indication as to the LMK scheme or LMK identifier used in the command. When this value is used with other (host) commands, the user must ensure that the correct LMK is specified in the command.

Encrypt Decimalization Table (ED)

Variant ☑	Key Block ☑	
Online ☑	Offline ☑	Secure ☑
Authorization: **Required** Activity: **misc.console**		

Command: **ED**

Function: To encrypt a 16 digit decimalization table for use with host commands using IBM 3624 PIN Generation & Verification.

Authorization: The HSM must be either in the Authorized State, or the activity **misc.console** must be authorized, using the Authorizing Officer cards of the relevant LMK.

Inputs:
- LMK identifier: indicates the LMK to use when encrypting the decimalization table.
- Decimalization table. 16 decimal digits that specify the mapping between hexadecimal & decimal numbers.
- The HSM by default checks that the decimalization table contains at least 8 different digits, with no digit repeated more than 4 times. This feature may be disabled using the Configure Security parameter "Enable decimalization table check". Disabling of this feature is not recommended.

Outputs:
- Encrypted decimalization table:
  - 16 Hex characters when using a Variant LMK or a 3DES Key Block LMK.
  - 32 Hex characters when using an AES LMK.

Errors:
- Invalid LMK identifier - no LMK loaded or entered identifier out of range.
- Not Authorized - the HSM is not authorized to perform this operation.
- Decimalization table invalid - the decimalization table is not all decimal or does not contain at least 8 different digits with no digit repeated more than 4 times.
- Master Key Parity Error - the contents of the HSM storage have been corrupted or erased. Do not continue. Inform the security department.

Example: (Variant or 3DES Key Block LMK) *This example encrypts a decimalization table using a Variant LMK (same applies with 3DES Key Block LMK).*

```
Online-AUTH> ED <Return>
Enter LMK id: 00 <Return>
Enter decimalization table: 0123456789012345 <Return>
Encrypted decimalization table: XXXX XXXX XXXX XXXX
Online-AUTH>
```

Example: (AES Key Block LMK) *This example encrypts a decimalization table using an AES LMK.*

```
Online-AUTH> ED <Return>
Enter LMK id: 00 <Return>
Enter decimalization table: 0123456789012345 <Return>
Encrypted decimalization table: XXXX XXXX XXXX XXXX XXXX
XXXX XXXX XXXX
Online-AUTH>
```

Note: The result of the "ED" command gives no indication as to the LMK scheme or LMK identifier used in the command. When this value is used with other (host) commands, the user must ensure that the correct LMK is specified in the command.

Translate Decimalization Table (TD)

Variant ☑	Key Block ☑	
Online ☑	Offline ☑	Secure ☑
Authorization: **Required** Activity: **misc.console**		

Command: **TD**

Function: To translate an encrypted decimalization table from Encryption under an old LMK to encryption under the corresponding new LMK.

Authorization: The HSM must be either in the Authorized State, or the activity **misc.console** must be authorized, using the Authorizing Officer cards of the relevant LMK.

Inputs:
- LMK identifier: indicates the LMK to use when translating the decimalization table.
- Encrypted Decimalization table. This is the result of encrypting a decimalization table using the ED command. The size of the encrypted decimalization table depends on the LMK used to encrypt it: for DES-based Variant and 3DES Key Block LMKs, the size is 16 hex digits. For AES Key Block LMKs, the size is 32 hex digits.
- The HSM by default checks that the decimalization table contains at least 8 different digits, with no digit repeated more than 4 times. This feature may be disabled using the Configure Security parameter "Enable decimalization table check". Disabling of this feature is not recommended.

Outputs:
- Encrypted decimalization table:
  - 16 Hex characters when using a Variant LMK or a 3DES Key Block LMK.
  - 32 Hex characters when using an AES LMK.

Errors:
- Invalid LMK identifier - no LMK loaded or entered identifier out of range.
- `Not Authorized -` the HSM is not authorized to perform this operation.
- `Decimalization Table Invalid -` decimalization table not all decimal or does not contain at least 8 different digits with no digit repeated more than 4 times.
- Master Key Parity Error - the contents of the HSM storage have been corrupted or erased. Do not continue. Inform the security department.
- No LMK in Key Change Storage - Key Change storage is empty.

Example:
(Variant or 3DES Key Block LMK)

```
Online-AUTH> TD <Return>
Enter LMK id: 00 <Return>
Enter decimalization table encrypted under old LMK :
XXXXXXXXXXXXXXXX <Return>
Decimalization table encrypted under new LMK       :
YYYYYYYYYYYYYYYY
Online-AUTH>
```

Example:
(AES Key Block LMK)

```
Online-AUTH> TD <Return>
Enter LMK id: 00 <Return>
Enter decimalization table encrypted under old LMK :
XXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXX <Return>
Decimalization table encrypted under new LMK       :
YYYYYYYYYYYYYYYY YYYYYYYYYYYYYYYY
Online-AUTH>
```

Note: The result of the "TD" command gives no indication as to the LMK scheme or LMK identifier used in the command. When this value is used with other (host) commands, the user must ensure that the correct LMK is specified in the command.

Generate a MAC on an IPB (MI)

Variant ☑	Key Block ☑	
Online ☑	Offline ☑	Secure ☑
Authorization: **Required** Activity: **misc.console**		

Command: **MI**

Function: To generate a MAC on the Cryptogram component of a CAP IPB.

Authorization: The HSM must be either in the Authorized State, or the activity **misc.console** must be authorized, using the Authorizing Officer cards of the relevant LMK.

Inputs:
- LMK identifier: indicates the LMK to use when generating the MAC.
- 8 byte IPB represented as 16 hex ASCII characters.

Outputs:
- 4 byte MAC over the plaintext IPB input data.

Errors:
- Invalid LMK identifier - no LMK loaded or entered identifier out of range.
- Command only allowed from Authorized - the HSM is not authorized to perform this operation.
- IPB is not 8 bytes. Please re-enter - the validation of the IPB failed.
- Warning: Less than 16 '1'bits in IPB - the IPB contains less than 16 '1' bits.

Example:

```
Online-AUTH> MI <Return>
Enter LMK id: 00 <Return>
Enter IPB: FFFFFFFF00000000 <Return>
                          MAC: FB1A 3C1A
Online-AUTH>
```

Note: The result of the "MI" command gives no indication as to the LMK scheme or LMK identifier used in the command. When this value is used with other (host) commands, the user must ensure that the correct LMK is specified in the command.

8.7 Smartcard Commands

The payShield 10K provides the following console commands to support HSM smartcards. Please note that some of these commands are designed to operate only with the legacy HSM smartcards while other may support both the legacy and new smartcards used in the payShield Manager.

Note: DO NOT REPEATEDLY ENTER INVALID PINS. A LEGACY SMARTCARD "LOCKS" AFTER EIGHT SUCCESSIVE INVALID PINS HAVE BEEN ENTERED. LEGACY SMARTCARDS CAN BE "UNLOCKED" BY REFORMATTING, WHICH DELETES THE ENTIRE CONTENTS OF THE CARD. NEW SMARTCARDS USED BY THE PAYSHIELD MANAGER LOCK AFTER FIVE SUCCESSIVE INVALID PINS HAVE BEEN ENTERED. THEY MAY BE UNLOCKED BY RECOMMISSIOING THEM.

Format an HSM Smartcard (FC)

Variant ☑	Key Block ☑	
Online ☑	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **FC**

Function: To format an HSM smartcard for use by the HSM.
Different formats are used for LMK storage and saving HSM settings.
payShield Manager cards do not need to be formatted.

Authorization: The HSM does not require any authorization to run this command.

Inputs:
- (LMK cards): Smartcard PIN: 5 to 8 alphanumeric characters.
- Date: 6 numeric character format DDMMYY.
- Time: 6 numeric characters; format hhmmss.
- Issuer ID: maximum 35 alphanumeric characters.
- User ID: maximum 35 alphanumeric characters.

Outputs:
- Text messages:
  - Insert card and press ENTER.
  - Format card for HSM settings/LMKs? [H/L]
  - Enter new PIN for smartcard.
  - Re-enter new PIN.
  - Enter format code.
  - Enter date.
  - Enter time.
  - Enter Issuer ID.
  - Enter User ID.
  - Format complete.
  - Card already formatted, continue? [Y/N].

Note:
- This command only operates with legacy HSM smartcards.

Errors:
- Invalid PIN; re-enter - the PIN entered is fewer than 5 or greater than 8 digits.
- PINs did not agree - the new PINs entered for the card did not match each other.
- Invalid input. Entry must be in numeric format - non numeric value is entered for time or date.

Example 1:

```
Online> FC <Return>
Insert card and press ENTER: <Return>
Card already formatted, continue? [Y/N]: Y <Return>
Format card for HSM settings/LMKs? [H/L]: L <Return>
Erasing card
Formatting card . . .
Enter new PIN for Smartcard: ******* <Return>
Re-enter new PIN: ******* <Return>
Enter time [hhmmss]: 153540 <Return>
Enter date [ddmmyy]: 261093 <Return>
Enter User ID: Joe Small <Return>
Enter Issuer ID: Big Bank plc <Return>
Format complete
Online>
```

Example 2:

```
Online> FC <Return>
Insert card and press ENTER: <Return>
Card already formatted, continue? [Y/N]: Y <Return>
Format card for HSM settings/LMKs? [H/L]: H <Return>
                      Erasing card
                      Formatting card . . .
Format complete
Online>
```

Create an Authorizing Officer Smartcard (CO)

Variant ☑		Key Block ☑
Online ☒	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **CO**

Function: To copy the Password for an Authorizing Officer to another smartcard (RLMKs are supported) so that it can be used to set the HSM into the Authorized State. Note that only LMK component cards 1 and 2 contain the Password.

Authorization: The HSM must be in the offline or secure state to run this command.

Inputs:
- Smartcard PIN: 5 to 8 alphanumeric characters. PINs must be entered within 60 seconds of being requested.

Outputs:
- Text messages:

  Insert Card for Component Set 1 or 2 and enter the PIN.

  Insert Card for Authorizing Officer and enter the PIN.

  Copy Complete.

Errors:
- `Card not formatted` – card not formatted
- `Not a LMK card` – card is not formatted for LMK or key storage.
- `Smartcard error; command/return: 0003` – an invalid PIN was entered.
- `Invalid PIN; re-enter` – PIN is fewer than 5 or greater than 8 digits.
- Card not blank - copy failed.

Example:

```
Offline> CO <Return>
Insert Card for Component Set 1 or 2 and enter PIN:
******** <Return>
Insert Card for Authorizing Officer and enter PIN:
******** <Return>
Copy complete.
Offline>
```

Verify the Contents of a Smartcard (VC)

Variant ☑	Key Block ☑	
Online ☑	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **VC**

Function: To verify the key component or share held on a smartcard. The HSM reads the key component from the smartcard, computes the check value, compares this with the check value stored on the card and displays the result.

Authorization: The HSM does not require any authorization to run this command.

Inputs:
- Smartcard PIN: 5 to 8 alphanumeric characters. PINs must be entered within 60 seconds of being requested.

Outputs:
- Component Set check value:
  - For Variant LMKs, the length of the displayed check value is determined by the CS (Configure Security) setting "Restrict Key Check Value to 6 hex chars".
  - For Key Block LMKs, the length of the displayed check value is always 6 hex digits.
- Comparison: Pass or Fail.
- Text messages:
  - Check:
  - Compare with card:

Errors:
- `Card not formatted` – card not formatted
- `Not a LMK card` – card is not formatted for LMK or key storage.
- `Smartcard error; command/return: 0003` – an invalid PIN was entered.
- Invalid PIN; re-enter - PIN is fewer than 5 or greater than 8 digits.

Example:

```
Online> VC <Return>
Insert card and enter PIN: ******** <Return>

Scheme: Variant
Check: 012345.
Compare with card: Pass.
Online>
```

If a smartcard is defective or cannot be successfully verified, replace it. Copy a verified smartcard (from the same set of components) onto a replacement.

Note: DISPOSE OF THE FAULTY SMARTCARD IN A SECURE MANNER.

Change a Smartcard PIN (NP)

Variant ☑	Key Block ☑	
Online ☑	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **NP**

Function: To select a new PIN for a smartcard (RACCs and RLMKs are supported) without changing any of the other details stored on the card.
The old PIN must be submitted before a change is effected and the new PIN must be supplied correctly at two consecutive prompts.

Authorization: The HSM does not require any authorization to run this command.

Inputs:
- Smartcard PIN: 5 to 8 alphanumeric characters. PINs must be entered within 60 seconds of being requested.

Outputs:
- Text messages:
  - Insert Card and press ENTER.
  - Enter current PIN.
  - Enter new PIN for smartcard.
  - Re-enter new PIN.
  - PIN change completed.

Errors:
- `Card not formatted` – card not formatted
- `Not a LMK card` – card is not formatted for LMK or key storage.
- `Smartcard error; command/return: 0003` – an invalid PIN was entered.
- Invalid PIN; re-enter - PIN is fewer than 5 or greater than 8 digits.
- PINs did not agree - the new PINs entered for the smartcard did not match.

Example:

```
Online> NP <Return>
Insert card and press ENTER: <Return>
Enter current PIN: **** <Return>
Enter new PIN for smartcard: **** <Return>
Re-enter new PIN: **** <Return>
PINs did not agree
Enter new PIN for smartcard: **** <Return>
Re-enter new PIN: **** <Return>
PIN change completed
Online>
```

Read Unidentifiable Smartcard Details (RC)

Variant ☑		Key Block ☑
Online ☑	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **RC**

Function: To read otherwise unidentifiable smartcards (RACCs and RLMKs supported).

Authorization: The HSM does not require any authorization to run this command.

Inputs: None.

Outputs:
- Text messages:
  - Insert Card and press ENTER when ready.
  - This card is formatted for saving and retrieving HSM settings.
  - Version, as stored on card: decimal integer.
  - Date, as stored on card; format: YY/MM/DD.
  - Time, as stored on card; format: hh:mm:ss.
  - User ID, as stored on card; free format alphanumeric.
  - Issuer ID, as stored on card; free format alphanumeric.
  - Data Zone Size, as stored on card: decimal integer.
  - Max Data Free, as stored on card: decimal integer.

Errors:
- `Card not formatted` – card not formatted
- Not a LMK card - card is not formatted for LMK or key storage.

Example 1:
```
Online> RC <Return>
Insert card and press ENTER: <Return>
Format version: 0001
Issue time: 11:53:00
Issue date: 93/10/25
User ID: Bill Weasel
Issuer ID: Big Bank plc
User-data zone size: 0000
Free: 0392
Online>
```

Example 2:
```
Online> RC <Return>
Insert card and press ENTER: <Return>
This card is formatted for saving and retrieving HSM
settings.
Online>
```

Eject a Smartcard (EJECT)

Variant ☑	Key Block ☑	
Online ☑	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **EJECT**

Function: To eject the smartcard from the smartcard reader.

Authorization: The HSM does not require any authorization to run this command.

Inputs: None.

Outputs: None.

Errors: None.

Example:
```
Online> EJECT <Return>
Online>
```

8.8 DES Calculator Commands

The payShield 10K provides the following console commands to support the encryption and decryption of data with a given plaintext single, double or triple-length DES key:

Single-Length Key Calculator (N)

Variant ☑	Key Block ☑	
Online ☑	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **N**

Function: To encrypt and decrypt the given data block with the given single-length key.

Authorization: The HSM does not require any authorization to run this command.

Inputs:
- Key (no parity required): 16 hexadecimal characters.
- Data block: 16 hexadecimal characters.

Outputs:
- The data encrypted with the key.
- The data decrypted with the key.

Errors:
- Data invalid; please re-enter - the entered data does not comprise 16 hexadecimal characters. Re-enter the correct number of hexadecimal characters.

Example:

```
Online> N <Return>
Enter key: XXXX XXXX XXXX XXXX <Return>
Enter data: XXXX XXXX XXXX XXXX <Return>
Encrypted: YYYY YYYY YYYY YYYY
Decrypted: YYYY YYYY YYYY YYYY
Online>
```

Double-Length Key Calculator ($)

Variant ☑	Key Block ☑	
Online ☑	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **$**

Function: To encrypt and decrypt the given data block with the given double-length key.

Authorization: The HSM does not require any authorization to run this command.

Inputs:
- The double-length key (odd parity is required): 32 hexadecimal characters.
- Data block: 16 hexadecimal characters.

Outputs:
- The data encrypted with the key.
- The data decrypted with the key.

Errors:
- Data invalid; please re-enter - the entered data does not comprise 32 hexadecimal characters. Re-enter the correct number of hexadecimal characters.

Example:

```
Offline> $ <Return>
Enter key: XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX
<Return>
Enter data: XXXX XXXX XXXX XXXX <Return>
Encrypted: YYYY YYYY YYYY YYYY
Decrypted: YYYY YYYY YYYY YYYY
Offline>
```

Triple-Length Key Calculator (T)

Variant ☑	Key Block ☑	
Online ☑	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **T**

Function: To encrypt and decrypt the given data block with the given triple-length key.

Authorization: The HSM does not require any authorization to run this command.

Inputs:
- The triple-length key (odd parity is required): 48 hexadecimal characters.
- Data block: 16 hexadecimal characters.

Outputs:
- The data encrypted with the key.
- The data decrypted with the key.

Errors:
- Data invalid; please re-enter - Re-enter the correct number of hexadecimal characters.

Example:

```
Offline> T <Return>
Enter key: XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX
XXXX XXXX XXXX <Return>
Single, Double, or Triple length data? (S,D,T): S
<Return>
Enter data: XXXX XXXX XXXX XXXX <Return>
Encrypted: YYYY YYYY YYYY YYYY
Decrypted: YYYY YYYY YYYY YYYY
Offline>
```

9 payShield Manager Commands

This section describes the commands used to configure the HSM for use with the payShield Manager.

Note that the HSM's private key, the certified public key and the Domain Authority self-signed public key certificate are recovered by use of the HSM Master Key (HRK) if a tamper attempt has occurred.

Add a RACC to the whitelist (XA)

Variant ☑		Key Block ☑
Online ☒	Offline ☒	Secure ☑
Authorization: **Not required**		

Command: **XA**

Function: To add a RACC to the whitelist on the HSM.

Authorization: The HSM must be in Secure state to run this command.

Inputs:
- None

Outputs:
- None

Example 1**:**

```
Secure> XA <Return>

Insert payShield Manager Smartcard and press ENTER:
<Return>
Enter PIN:  ****** <Return>

Do you want to add card XYZ123 to the whitelist? Y
<Return>

Card XYZ123 added to whitelist.

Secure>
```

Decommission the HSM (XD)

Variant ☑	Key Block ☑	
Online ☒	Offline ☒	Secure ☑
Authorization: **Not required**		

Command: **XD**

Function: To decommission the HSM by deleting the payShield Managers keys and groups.

Authorization: The HSM must be in Secure state to run this command.

Inputs:
- None

Outputs:
- None

Example 1**:**

```
Secure> XD <Return>

Do you want to erase the payShield Manager's keys and
groups? [Y/N]: Y <Return>

Secure>
```

Remove RACC from the whitelist (XE)

Variant ☑	Key Block ☑	
Online ☒	Offline ☒	Secure ☑
Authorization: **Not required**		

Command: **XE**

Function: To remove an RACC from the whitelist.

Authorization: The HSM must be in Secure state to run this command.

Inputs:
- None

Outputs:
- None

Example 1**:**

```
Secure> XE <Return>

Choice    ID            Type
   1      ABC321        restricted
   2      XYZ123        restricted
Which RACC do you want to remove? 1 <Return>

Card ABC321 removed from whitelist

Secure>
```

Commission the HSM (XH)

Variant ☑	Key Block ☑	
Online ☒	Offline ☒	Secure ☑
Authorization: **Not required**		

Command: **XH**

Function: To commission the HSM

Authorization: The HSM must be in Secure state to run this command.

Inputs:
- None

Outputs:
- None

Example 1**:**

```
Secure> XH <Return>

Please have all Customer Trust Authority (CTA) payShield
Manager smartcards available
Insert first CTA payShield Manager Smartcard and press
ENTER: <Return>
Enter PIN:  ****** <Return>
Insert CTA payShield Manager Smartcard 2 of 3 and press
ENTER: <Return>
Enter PIN:  ****** <Return>
Insert CTA payShield Manager Smartcard 3 of 3 and press
ENTER: <Return>
Enter PIN:  ****** <Return>

Starting the commissioning of the HSM process...
Please insert left key card and press ENTER: <Return>
Enter PIN:  ****** <Return>
Please insert right key card and press ENTER: <Return>
Enter PIN:  ****** <Return>

Successfully commissioned HSM

Secure>
```

Generate Customer Trust Authority (XI)

Variant ☑		Key Block ☑
Online ☒	Offline ☒	Secure ☑
Authorization: **Not required**		

Command: **XI**

Function: Generates the Customer Trust Authority and stores them on smartcards.

Authorization: The HSM must be in Secure state to run this command.

Inputs:
- Country
- State
- Locality
- Organization
- Organizational Unit
- Common Name
- Email
- Number of private shares
- Number of shares needed to recover private key

Outputs:
- None

Example 1:

```
Secure> XI <Return>

Please enter the certificate Subject information:
     Country Name (2 letter code) [US]: US <Return>
     State or Province Name (full name) []: Florida
<Return>
     Locality Name (eg, city) []: Plantation <Return>
     Organization Name (eg, company) []: Thales <Return>
     Organizational Unit Name (eg, section) []:
Production <Return>
     Common Name (e.g. server FQDN or YOUR name) [CTA]:
CTA <Return>
     Email Address []: info@thalesgroup.com <Return>

Enter number of Customer Trust Authority private key
shares [3-9]: 3 <Return>
Enter number of shares to recover the Customer Trust
Authority private key [3-3]: 3 <Return>

   Issued to: CTA, Issued by: CTA
   Validity : Jan  9 10:28:49 2015 GMT to Jan  3 10:28:49
2040 GMT
   Unique ID: EE3CB7CE8343B464CC04278188CF7EB3 - 3DE05514
(Root)

Insert payShield Manager Smartcard 1 of 3 and press
ENTER: <Return>
Enter new PIN for smartcard:  ****** <Return>
Re-enter new PIN:  ****** <Return>
Working....
CTA share written to smartcard.

Insert payShield Manager Smartcard 2 of 3 and press
ENTER: <Return>
Enter new PIN for smartcard:  ****** <Return>
Re-enter new PIN:  ****** <Return>
Working....
CTA share written to smartcard.
```

```
Insert payShield Manager Smartcard 3 of 3 and press
ENTER: <Return>
Enter new PIN for smartcard:  ****** <Return>
Re-enter new PIN:  ****** <Return>
Working....
CTA share written to smartcard.

Successfully generated a Customer Trust Authority
Secure>
```

Make an RACC left or right key (XK)

Variant ☑	Key Block ☑	
Online ☒	Offline ☒	Secure ☑
Authorization: **Not required**		

Command: **XK**

Function: Defines a RACC as either a left or right key in the whitelist on the HSM.

Authorization: The HSM must be in Secure state to run this command.

Inputs: Left or Right (card type)

Outputs:
- None

Example 1**:**

```
Secure> XK <Return>

Insert payShield Manager Smartcard and press ENTER:
<Return>
Enter PIN:  ****** <Return>
Do you want to make ABC321 a [L]eft or [R]ight key? L
<Return>

Card ABC321 is now a left key.

Secure>
```

Commission a smartcard (XR)

Variant ☑	Key Block ☑	
Online ☒	Offline ☒	Secure ☑
Authorization: **Not required**		

Command: **XR**

Function: To commission a smartcard.

Authorization: The HSM must be in Secure state to run this command.

Inputs:
- None

Outputs:
- None

Example 1**:**

```
Secure> XR <Return>

Please have all Customer Trust Authority (CTA) payShield
Manager smartcards available
Insert first CTA payShield Manager Smartcard and press
ENTER: <Return>
Enter PIN:  ******
Insert CTA payShield Manager Smartcard 2 of 3 and press
ENTER: <Return>
Enter PIN:  ******
Insert CTA payShield Manager Smartcard 3 of 3 and press
ENTER: <Return>
Enter PIN:  ******
Enforce a PIN change on first use? [Y/N]: N <Return>
Insert a payShield Manager Smartcard to be commissioned
and press ENTER: <Return>
Enter new PIN for smartcard:  ****** <Return>
Re-enter new PIN:  ****** <Return>
Do you wish to add the smartcard A3 to the HSM whitelist
[Y/N]: Y <Return>
Assign smartcard as a Left or Right Key RACC? [L/R/N]: N
<Return>
Would you like to commission another card? [Y/N]: N
<Return>

Secure>
```

Transfer existing LMK to RLMK (XT)

Variant ☑		Key Block ☑
Online ☒	Offline ☒	Secure ☑
Authorization: **Not required**		

Command: **XT**

Function: To transfer an existing HSM LMK stored on legacy smartcards to payShield Manager RLMK cards for use through the payShield Manager.

In order to transfer a Variant LMK you will be required to fully reassemble the LMK (bring all the components together). Then, the fully formed Variant LMK is split among shares onto the pre-commissioned payShield Manager RLMK cards.

For Key Block LMKs, they are not stored as components on non-payShield Manager smart cards, but as shares. However, you must bring a quorum of share holders together, reconstitute the LMK, and then split it among shares onto the pre-commissioned payShield Manager RLMK cards.

Authorization: The HSM must be in Secure state to run this command.

Inputs:
- Number of shares to split LMK into
- Number of Components required to reconstitute LMK

Outputs:
- None

Example 1:

```
Secure> XT <Return>

Please have all the local LMK components and enough
commissioned RACCs to receive the LMK ready.

Insert card and press ENTER: <Return>
Enter PIN: ***** <Return>

Check: 268604
Load more components? [Y/N]: N <Return>

LMK Check:      268604
LMK key scheme: Variant
LMK algorithm:  3DES(2key)
LMK status:     Test

Is this the LMK you wish to transfer? [Y/N]: Y <Return>

Enter the number of shares to split the LMK into: [2-9]:
2 <Return>
The number of shares required to reconstitute the LMK:
[2-2]: 2 <Return>

Insert a commissioned card 1 of 2 and press ENTER:
<Return>
Enter PIN:  ****** <Return>

Card Check: E0CBF4
LMK share written to smartcard.

Insert a commissioned card 2 of 2 and press ENTER:
<Return>
Enter PIN:  ****** <Return>
```

```
Card Check: E0CBF4
LMK share written to smartcard.
Want to test the reassembly of the LMK? Y <Return>

Please have all the RLMK shares ready
Insert RLMK card and press ENTER: <Return>
Enter PIN:  ****** <Return>
LMK share 1 read (1 of 2) Card Check: E0CBF4
Insert RLMK card and press ENTER: <Return>
Enter PIN:  ****** <Return>
LMK share 2 read (2 of 2) Card Check: E0CBF4

LMK Check 268604

Secure>
```

Decommission a smartcard (XX)

Variant ☑		Key Block ☑
Online ☑	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **XX**

Function: To decommission a payShield Manager smartcard.

Authorization: The HSM may be in any state to run this command.

Inputs:
- None

Outputs:
- None

Example 1**:**

```
Secure> XX <Return>

Please insert card to decommission and press ENTER:
<Return>
Warning: Resetting a payShield Manager Smartcard to its
original state
will erase all key material from the card.

Are you sure? [Y/N]: Y <Return>

payShield Manager Smartcard successfully decommissioned
Would you like to decommission another card? [Y/N]: N
<Return>

Secure>
```

HSM commissioning status (XY)

Variant ☑	Key Block ☑	
Online ☑	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **XY**

Function: To show the state of the HSM Management commissioning and whitelist.

Authorization: The HSM may be in any state to run this command.

Inputs:
- None

Outputs:
- Thales Trust installed
- Customer Trust Authority installed
- HSM Public Key installed
- Is HRK password user defined
- Is HRK available for use
- Authorized RACCs

Example 1**:**

Note: The following contains sample output, e.g., Issue to: *TES LC.*

```
Online>xy

Thales Trust installed                : Yes
     1 - Issued to: A4665000000A, Issued by: Development
Factory TTA
         Validity : Sep 26 15:35:30 2018 GMT to Sep 20
15:35:30 2043 GMT
         Unique ID: B655F28FD784A9C2A5169FF4F4DD41EA -
D61B5F4A

Customer Trust Authority Installed      : Yes
     2 - Issued to: TES LC, Issued by: TES LC
         Validity : Oct  5 13:11:12 2018 GMT to Sep 29
13:11:12 2043 GMT
         Unique ID: 9FEACF2E361A2BADA0E2E9238D121E1D -
27871B3A (Root)


HSM Public Key Certificate Installed : Yes
     3 - Issued to: A4665000000A, Issued by: TES LC
         Validity : Oct 30 16:01:34 2018 GMT to Oct 24
16:01:34 2043 GMT
         Unique ID: ABA92BB246260EFF838BD06062331E54 -
27871B3A


Is HRK passphrase user defined       : Yes

Is HRK available for use             : Yes

Authorized RACCs                     : 4
   Serial Number               Certificate
Number           RACC Type
   7307001132072979      BF9BBAA7525818AA       Left
   7307001145072979      392FDA0DD7B25CBA      Left
   7307001152072979      DBD139588ED7A17C       Right
   7307001265072979      223386DBE9391015         Right

Online>
```

Duplicate CTA share (XZ)

Variant ☑	Key Block ☑	
Online ☒	Offline ☒	Secure ☑
Authorization: **Not required**		

Command: **XZ**

Function: To duplicate a CTA share smartcard.

Authorization: The HSM must be in Secure state to run this command.

Inputs:
- None

Outputs:
- None

Example 1:

```
Secure> XZ <Return>

Insert a CTA share payShield Manager Smartcard to be
duplicated:
Enter PIN:  ****** <Return>
Working...
Please insert a commissioned payShield Manager smartcard
and press ENTER: <Return>
Enter PIN:  ****** <Return>
Working...
CTA share written to smartcard.

Secure>
```

10 Secure Host Communications

This section describes the commands used to configure a payShield 10K such that the host connection is protected using TLS (known as Secure Host Communications).

The Certificate Requests and Certificates may be stored on / loaded from a regular USB memory stick.

The required format for the USB memory stick is FAT32. The Operating System used in the payShield 10K supports most types of USB memory sticks, but may not have the drivers for some of the newer types. If difficulties are experienced when trying to read from or write to a USB device, an alternative memory stick should be used.

The HSM's certificate signing request (CSR) structure is compliant with PKCS#10. The client must use the same key type as is included in the HSM's CSR.

The HSM uses certificate formats compliant with X.509.

The payShield 10K provides the following console commands to manage the HSM's private key, the certified public key and the CA self-signed public key certificate to support secure host communications:

The HRK enables the recovery of the HSM's private key, the certified public key and the CA self-signed public key certificate used for payShield Manager.

Generate Certificate Signing Request (SG)

Variant ☑	Key Block ☑	
Online ☒	Offline ☒	Secure ☑
Authorization: **Not required**		

Command: **SG**

Function: To generate the HSM's public/private key pair for use with secure host communications, and extract the public key in the form of a Certificate Signing Request (".CSR").
The private key is stored in tamper protected memory. It is backed up internally using the HSM Master Key (HRK) – see command SK for details.

Authorization: The HSM must be in the secure state to run this command.

Inputs:
- Certificate fields (Country, State, Locality, Org Name, Org Unit Name, Common Name, E-mail Address).
- Key Type (RSA, ECDSA)
- Filename when saving to USB memory stick

Outputs:
- Prompts, as above
- Key generation message
- Prompt to save to USB memory stick
- Certificate Signing Request

Errors:
- File exists – replace?

Notes:
- The HRK must be installed (using the SK console command) prior to using this command.
- The exported file will automatically have the extension ".CSR".
- The size of RSA keys used is 2048-bits.
- The size of ECDSA keys used is either 256-bits, 384-bits or 521-bits (user selectable).
- The client must use the same RSA/ECDSA key type as is included in the HSM's CSR.
- A maximum certificate chain length of 6 is supported.
- The required format for the USB memory stick is FAT32. The Operating System used in the payShield 10K supports most types of USB memory stick, but may not have the drivers for some of the newer types. If difficulties are experienced when trying to read from or write to a USB device, an alternative memory stick should be used.

Example 1: *This example demonstrates the use of the **SG** console command to generate a 521-bit ECDSA public/private key pair and output a certificate signing request.*

```
Secure> SG <Return>
Please enter the Subject Information for the Certificate Request:

   Country Name (2 letter code) []: UK <Return>
   State or Province Name (full name) []: Greater London <Return>
   Locality Name (eg, city) []: London <Return>
   Organization Name (eg, company) []: Bank XYZ <Return>
   Organizational Unit Name (eg, section) []: Operations <Return>
   Common Name (e.g. server FQDN or YOUR name) []: HSM-0001
<Return>
   Email Address []: bill@bankxyz.com <Return>

Select key type:
  1 - RSA
  2 - ECDSA P-256
  3 - ECDSA P-384
  4 - ECDSA P-521
Type [4]: 4 <Return>

Generating key pair ......................+++
.......+++
DONE

Do you wish to save to a file [Y/N]: Y <Return>
Enter filename: HSM-0001 <Return>
-----BEGIN CERTIFICATE REQUEST-----
MIIC2TCCAcECAQAwgZMxCzAJBgNVBAYTAlVLMRcwFQYDVQQIEw5HcmVhdGVyIExv
bmRvbjEPMA0GA1UEBxMGTG9uZG9uMREwDwYDVQQKEwhCYW5rIFhZWjETMBEGA1UE
CxMKT3BlcmF0aW9uczERMA8GA1UEAxMISFNNLTAwMDIxHzAdBgkqhkiG9w0BCQEW
EGJpbGxAYmFua3h5ei5jb20wggEiMA0GCSqGSIb3DQEBAQUAA4IBDwAwggEKAoIB
AQC+JhIisca5k7l5YIRNcDcq/QMb3jHzhQIbME4O9zDhTtmINFM7YrvZ6N2Sy1TU
za1cPf9JKR2X5D3ukaICtkTwxArj1WRnU2UnINTYeO0RWeBaouxO4ijSvzx5mCCg
RtcSQDK748+0xgWlZezkKkv+akOh4vYPdiOKx47wiS7UAENBaQI14C5cbnj6JMLe
f3hmzQzzu3vACAIDbuQXZ5A7w7ecGLSLahjEyx1H7PXpLnul2lPRlBcemVdqHi8f
dfXTAKE1RrKSrvU22sOn6uQLGFRTseIuC4tFvtZNJRHAtqCYpabV4vrBmNQDaw8W
p2FFu+e71ybqsLY0R5xt7ZABAgMBAAGgADANBgkqhkiG9w0BAQUFAAOCAQEAvVzS
iy5gJkAjUdqaBjr5MUoAXvk15fEg6gO+SV39X3mSsQklQdoHwFSNgOUWYHkTKPvN
vZnCxMlUK2nBhlu2Xz44yC/U7+E7FsaQz2nXrNx/gF3SY/a/ODA+Y9iSERIpwRCM
9CKapYONeBHqK/NIcgTOZ3SMsC9JXsvtxPyQ7vmbu4a/JpMantWfcLCA+z6i+S+H
WavGnPVGt9ERD5Cij7B6qSbbrkn+xoJARIGsXhbVQmdSxR8I8HUAQDYV+2VJo3bA
ct9ubVjaw2SSiQZp9xB7BOJjk/NQrTk5gG3BkDI/Ukp9A9s7YoW1oMY8YdIg/YRo
Y+LI5trvXN73V2X0Ow==
-----END CERTIFICATE REQUEST-----


Secure>
```

Example 2: *This example demonstrates the use of the **SG** console command to generate a 2048-bit RSA public/private key pair and output a certificate signing request.*

```
Secure> SG <Return>
Please enter the Subject Information for the Certificate Request:

   Country Name (2 letter code) []: UK <Return>
   State or Province Name (full name) []: Greater London <Return>
   Locality Name (eg, city) []: London <Return>
   Organization Name (eg, company) []: Bank XYZ <Return>
   Organizational Unit Name (eg, section) []: Operations <Return>
   Common Name (e.g. server FQDN or YOUR name) []: HSM-0002
<Return>
   Email Address []: bill@bankxyz.com <Return>

Select key type:
  1 - RSA
  2 - ECDSA P-256
  3 - ECDSA P-384
  4 - ECDSA P-521
Type [4]: 1 <Return>

Generating key pair ......................+++
.......+++
DONE

Do you wish to save to a file [Y/N]: Y <Return>
Enter filename: HSM-0002 <Return>
-----BEGIN CERTIFICATE REQUEST-----
MIIC2TCCAcECAQAwgZMxCzAJBgNVBAYTAlVLMRcwFQYDVQQIEw5HcmVhdGVyIExv
bmRvbjEPMA0GA1UEBxMGTG9uZG9uMREwDwYDVQQKEwhCYW5rIFhZWjETMBEGA1UE
CxMKT3BlcmF0aW9uczERMA8GA1UEAxMISFNNLTAwMDIxHzAdBgkqhkiG9w0BCQEW
EGJpbGxAYmFua3h5ei5jb20wggEiMA0GCSqGSIb3DQEBAQUAA4IBDwAwggEKAoIB
AQDBJAjJVtpE2Covk13BpZCACN6hUoQeLRv62+M3Lioa/ckvrIDaFxRTmlBGAof/
nZR3uRXSRz5oo3MX+fG4QXuLCGujFPHUfdnJRFIGnxoxkrrXn5OyxtokLwdE3HrK
VgKeUPQvDluZVXCbFJ1rGGaBk6bRQCfb7hBI7gcba6NfLIPms/bXYgy5hKUbkf+N
rMGtKAHz70E7BRMyY95GFo6nDne579rUi8RDxC4vqIJgkaXbuv4evYxlliTsQ69O
wr0iRSygYHSYzA8TVcwJ1pNTO1Jeg2xJ8r4axs0r5IKxxpD2PDAv4DdyQ0TsZkTB
QfSxPnlD4sTeQW5s42Y0B02ZAgMBAAGgADANBgkqhkiG9w0BAQUFAAOCAQEAJqPX
alHvtQKsfxgzTn2nWiw/v/9v8Qs11MIRJ5/Y3x+fdRSSK55uwPmRIRlCYdM0xQ4C
tSW3jWUiB1P0a3XxC5O4cWfbXJSxWkoSiN6V5gZrCI9W1z05xAuJZtjdVcFbUvVI
pPw3LXXS2CxAsAbgtz3QG+MIdyiicE5vUN2kKxhhZaC8Ev3tpy2Uue8XGy1sDybu
8qx5I5tMUSAsYx4M956gJEL0Mt9k8phIhsbKz5IKDDEwuyurJlYoOqkVVZeuBKZu
YKJKdOtwzzuUesEcGQfbAleBR0ntezm0irWJRaCXEyg0e5DF0FfWGIE08ojx4dvh
w3mX71ZX4RGchVEsYQ==
-----END CERTIFICATE REQUEST-----


Secure>
```

Import Certificate (SI)

Variant ☑	Key Block ☑	
Online ☒	Offline ☒	Secure ☑
Authorization: **Not required**		

Command: **SI**

Function: To import a certificate for storage inside the HSM for use with secure host communications.
The certificate may be one of the following:
- HSM certificate
- Client certificate
- Sub-CA certificate (for either HSM or client)
- Root-CA certificate (for either HSM or client)

Authorization: The HSM must be in the secure state to run this command.

Inputs:
- File selection
- Prompt for import of additional certificates

Outputs:
- Prompts, as above
- Filenames of certificates on USB memory stick
- Summary of imported certificate (Issued to/by, Validity, ID)
- Chain of Trust statement (for an HSM certificate)

Notes:
- The HSM's public/private key pair must be installed (using the SG console command) prior to using this command.
- The file(s) to be imported must have the extension ".CRT".
- A maximum certificate chain length of 6 is supported.
- The required format for the USB memory stick is FAT32. The Operating System used in the payShield 10K supports most types of USB memory stick, but may not have the drivers for some of the newer types. If difficulties are experienced when trying to read from or write to a USB device, an alternative memory stick should be used.

Example 1: *This example demonstrates the use of the **SI** console command to import the root CA certificate (that signed the HSM's certificate) into the HSM.*

```
Secure> SI <Return>

Select File
   1 - HSM-0001.crt
   2 - BankXYZRootCA.crt
   3 - Client.crt
   4 - ClientRootCA.crt
File: 2 <Return>

Imported Trusted CA Certificate
         Issued to: Bank XYZ, Issued by: Bank XYZ
         Validity : May 9 10:59:22 2013 GMT to May 7 10:59:22
2023 GMT
         Unique ID: 9C8FC713FAA31010 - AC03FAD5 (Root)

Do you wish to import another certificate? N <Return>

Secure>
```

Example 2:

*This example demonstrates the use of the **SI** console command to import the HSM's (now signed) certificate back into the HSM.*

(Note that the root CA certificate has already been installed (see Example 1), and so the HSM indicates that the "Chain of Trust" is complete.

```
Secure> SI <Return>

Select File
   1 - HSM-0001.crt
   2 - BankXYZRootCA.crt
   3 - Client.crt
   4 - ClientRootCA.crt
File: 1 <Return>

Imported CA-signed HSM Certificate
         Issued to: HSM-0001, Issued by: Bank XYZ
         Validity : May 21 15:05:51 2013 GMT to May 21 15:05:51
2014 GMT
         Unique ID: 2050 - AC03FAD5

Chain of Trust validated
         Bank XYZ (Root)

Do you wish to import another certificate? N <Return>

Secure>
```

Export HSM Certificate's Chain of Trust (SE)

Variant ☑	Key Block ☑	
Online ☒	Offline ☒	Secure ☑
Authorization: **Not required**		

Command: **SE**

Function: To export the HSM certificate's chain of trust (i.e. the chain of certificates required to authenticate the HSM's certificate, up to and including the root CA certificate).

Authorization: The HSM must be in the secure state to run this command.

Inputs: Filename when saving to USB memory stick

Outputs: Prompts, as above
Prompt to save to USB memory stick
Certificate Chain of Trust is displayed at the console, and (if requested) saved to the USB memory stick

Errors: File exists – replace?

Notes: The HSM's public/private key pair must be installed (using the SG console command) prior to using this command.
The exported file will automatically have the extension ".CRT".
A maximum certificate chain length of 6 is supported.
The required format for the USB memory stick is FAT32. The Operating System used in the payShield 10K supports most types of USB memory stick, but may not have the drivers for some of the newer types. If difficulties are experienced when trying to read from or write to a USB device, an alternative memory stick should be used.

Example 1: *This example demonstrates the use of the **SE** console command to export the HSM certificate's chain of trust (in this case, just the root CA certificate) to a USB memory stick.*

```
Secure> SE <Return>

Do you wish to save to a file [Y/N]: Y <Return>
Enter filename: BankXYZRootCA <Return>

Bank XYZ

-----BEGIN CERTIFICATE-----
MIID+TCCAuGgAwIBAgIJAJyPxxP6oxAQMA0GCSqGSIb3DQEBBQUAMIGyMQswCQYD
VQQGEwJVSzEYMBYGA1UECBMPQnVja2luZ2hhbXNoaXJlMRUwEwYDVQQHEwxMb25n
IENyZW5kb24xDzANBgNVBAoTBlRoYWxlczEMMAoGA1UECxMDUE1HMR4wHAYDVQQD
ExVwYXlTaGllbGQgQ2VydGlmaWNhdGUxMzAxBgkqhkiG9w0BCQEWJGphbWVzLnRv
cmp1c3NlbkB0aGFsZXMtZXNlY3VyaXR5LmNvbTAeFw0xMzA1MDkxMDU5MjJaFw0y
MzA1MDcxMDU5MjJaMIGyMQswCQYDVQQGEwJVSzEYMBYGA1UECBMPQnVja2luZ2hh
bXNoaXJlMRUwEwYDVQQHEwxMb25nIENyZW5kb24xDzANBgNVBAoTBlRoYWxlczEM
MAoGA1UECxMDUE1HMR4wHAYDVQQDExVwYXlTaGllbGQgQ2VydGlmaWNhdGUxMzAx
BgkqhkiG9w0BCQEWJGphbWVzLnRvcmp1c3NlbkB0aGFsZXMtZXNlY3VyaXR5LmNv
bTCCASIwDQYJKoZIhvcNAQEBBQADggEPADCCAQoCggEBANTFR+dFeafMZsMwgeOK
vWxjmaUOP6z5mK+qeD4wYvNP5cv1GVqKoMFTNkJL+jeBSyo39IR0T4AoalroUb6F
yi76nmv0VVqFgPWIS92bRBozGp8dZU09aJQGCuOIjEvKuUtddWrpp0ClFEnTXXsx
LpfjTal5vSl+D9lazkMiFxdi7OUQyf6CiVuoch7bq0A4nmcjSlPyE/b3FpJn6zul
S+/DvRo4N4wJBHkZftAyPHZUYaV84perRG4CRbirFUfpRH1kVC+P6Gal/KMKWlzE
kKJOIxZqtaU973/AD4CV2QZtMurFC9m9p84uOW2SinMeKEdolVTFgVo+h3KjFHM/
yVsCAwEAAaMQMA4wDAYDVR0TBAUwAwEB/zANBgkqhkiG9w0BAQUFAAOCAQEAoHEN
1QyqWSTXkhtAnu+F3gy/Qs/wYLszaYYlBUSQasjN866SzRC/jVtYT6UYabvOke5B
9Z4KNsICkRtmgdYpic0kjK40RjUdw4QZu4jC+EM4eY8HTa7fSaH1nxrkPAEUwNKZ
o3Re+3jQeIx6gi5rnLf/FZ1cEP1fySh0hzuSo2xSIY/hwUWhlZJYZKBu3wzfHG1d
GB7D4xU4jUTvkKJQDuCHUdSrf+cMstN9dkrhYNNw49L9tYrD0ZzlPM3rVXD28uAL
Wt+CPOtsjIixNRl8vZmEVJDWJaRibCcfrTeDBs4O3hmAgx/Mdv5FX/NSjhZZO15m
X4FkYiQv2CJb7J/vAw==
-----END CERTIFICATE-----

Secure>
```

View Installed Certificate(s) (SV)

Variant ☑	Key Block ☑	
Online ☑	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **SV**

Function: To view the list of currently installed certificates (for use with secure host communications). Individual certificates can be displayed in full.

Authorization: The HSM can be in any state to run this command.

Inputs:
- Certificate to be displayed in full.

Outputs:
- The HSM's public/private key pair must be installed (using the SG console command) prior to using this command.
- Prompts, as above
- List of currently installed certificates.
- Status of HSM's private key – installed or not installed
- HSM Certificate installed – maximum of 1 certificate
- Client Certificate(s) installed – maximum of 10 certificates
- CA Certificate(s) installed – maximum of 10 certificates
- Chain of trust validity – for the HSM's certificate chain
- Contents of selected certificate.
- A maximum certificate chain length of 6 is supported.

Example 1: *This example demonstrates the use of the **SV** console command to view the list of currently installed certificates, and to display the contents of the HSM's certificate.*

```
Secure> SV <Return>

HSM Private Key installed: Yes

HSM Certificate installed:
     1 - Issued to: HSM-0002, Issued by: Bank XYZ
         Validity : May 21 15:05:51 2013 GMT to May 21 15:05:51
2014 GMT
         Unique ID: 2050 - AC03FAD5

Client certificate(s) installed:
     2 - Issued to: APP-0001, Issued by: Applications
         Validity : May  7 09:37:18 2013 GMT to May  7 09:37:18
2014 GMT
         Unique ID: 2016 - D221289A

CA Certificate(s) installed:
     3 - Issued to: Applications, Issued by: Applications
         Validity : May  7 09:24:10 2013 GMT to May  5 09:24:10
2023 GMT
         Unique ID: C14FF9DE78FB441A - D221289A (Root)

     4 - Issued to: Bank XYZ, Issued by: Bank XYZ
         Validity : May  9 10:59:22 2013 GMT to May  7 10:59:22
2023 GMT
         Unique ID: 9C8FC713FAA31010 - AC03FAD5 (Root)

Chain of Trust validated:
         Bank XYZ (Root)

Select an item to view: 1 <Return>

Certificate:
    Data:
        Version: 3 (0x2)
        Serial Number: 8273 (0x2051)
    Signature Algorithm: sha1WithRSAEncryption
        Issuer: C=UK, ST=Greater London, L=London, O=Bank XYZ,
OU=RootCA, CN=Bank XYZ/emailAddress=root@bankxyz.com
        Validity
            Not Before: May 21 15:05:51 2013 GMT
            Not After : May 21 15:05:51 2014 GMT
        Subject: C=UK, ST=Greater London, O=Bank XYZ,
OU=Operations, CN=HSM-0002/emailAddress=bill@bankxyz.com
        Subject Public Key Info:
            Public Key Algorithm: rsaEncryption
                Public-Key: (2048 bit)
                Modulus:
                    00:aa:31:e6:90:46:fe:e9:26:8b:93:39:5a:8c:be:
                    …
                    3d:39:2b:d7:06:47:04:6a:54:d2:12:4e:ac:9a:a3:
                    5b:49
                Exponent: 65537 (0x10001)
        X509v3 extensions:
            X509v3 Basic Constraints:
                CA:FALSE
            X509v3 Key Usage:
```

```
                Digital Signature, Non Repudiation, Key
Encipherment
    Signature Algorithm: sha1WithRSAEncryption
         b8:e9:e9:8f:2e:f9:50:93:a1:8b:8d:0b:e5:fd:ef:6f:6c:05:
         …
         59:0d:df:85:b7:48:c6:02:d9:16:f9:80:e5:c9:c2:69:7f:06:
         2b:ba:18:9f

Do you wish to view another certificate? N <Return>

Online>
```

Delete Installed Certificate(s) (SD)

Variant ☑	Key Block ☑	
Online ☒	Offline ☒	Secure ☑
Authorization: **Not required**		

Command: **SD**

Function: To delete a currently installed certificate (for use with secure host communications).

Authorization: The HSM must be in the secure state to run this command.

Inputs:
- Certificate to be deleted.

Outputs:
- Prompts, as above
- List of currently installed certificates.
- Status of HSM's private key – installed or not installed
- HSM Certificate installed – maximum of 1 certificate
- Client Certificate(s) installed – maximum of 10 certificates
- CA Certificate(s) installed – maximum of 10 certificates
- Chain of trust validity – for the HSM's certificate chain
- Prompt to delete another certificate

Example 1: *This example demonstrates the use of the **SD** console command to remove a client certificate from the HSM.*

```
Secure> SD <Return>
HSM Private Key installed: Yes

HSM Certificate installed:
     1 - Issued to: HSM-0002, Issued by: Bank XYZ
         Validity : May 21 15:05:51 2013 GMT to May 21
15:05:51 2014 GMT
         Unique ID: 2050 - AC03FAD5

Client certificate(s) installed:
     2 - Issued to: APP-0001, Issued by: Applications
         Validity : May  7 09:37:18 2013 GMT to May  7
09:37:18 2014 GMT
         Unique ID: 2016 - D221289A

CA Certificate(s) installed:
     3 - Issued to: Applications, Issued by: Applications
         Validity : May  7 09:24:10 2013 GMT to May  5
09:24:10 2023 GMT
         Unique ID: C14FF9DE78FB441A - D221289A (Root)

     4 - Issued to: Bank XYZ, Issued by: Bank XYZ
         Validity : May  9 10:59:22 2013 GMT to May  7
10:59:22 2023 GMT
         Unique ID: 9C8FC713FAA31010 - AC03FAD5 (Root)

Chain of Trust validated:
         Bank XYZ (Root)

     5 - HSM Private Key

Select an item to delete (6 for ALL): 2 <Return>
Do you wish to delete another certificate? N <Return>
Secure>
```

Generate HRK (SK)

Variant ☑		Key Block ☑
Online ☒	Offline ☒	Secure ☑
Authorization: **Not required**		

Command: **SK**

Function: To generate a new HSM Recovery Key (HRK). Once installed, the HRK will be used to back-up secret key material inside the HSM into persistent memory (a process known as key synchronization).
The following secret key material is backed-up in this process:

- Secure Host Communications key material:
  - HSM's private key
- Remote Management key material:
  - HSM's private key
  - HSM's public key certificate
  - CA public key certificate

Authorization: The HSM must be in the secure state to run this command.

Inputs:
- Passphrases 1 & 2 (each entered twice for verification).

Outputs:
- Prompts, as above.
- Passphrase rules.
- Creating HRK message.
- Key synchronization message.

Notes:
- The HRK replaces the RMK (used in previous versions of software).

Example 1: *This example demonstrates the use of the **SK** console command to generate an HRK.*

```
Secure> SK <Return>

**** NOTE ****
Passphrase rules as follows:
1 - Must be between 8 and 30 characters long.
2 - Can contain spaces
3 - Must be comprised of (at a minimum):
   2 digits
   2 uppercase characters
   2 lowercase characters
   2 symbols (e.g. !/?.#:')

   Enter administrator 1 passphrase: ********************
Re-enter administrator 1 passphrase: ********************

   Enter administrator 2 passphrase: **************
Re-enter administrator 2 passphrase: **************

Creating HRK. Please, wait ... DONE

HRK generated successfully

Key synchronization complete
Secure>
```

Change HRK Passphrase (SP)

Variant ☑	Key Block ☑	
Online ☒	Offline ☒	Secure ☑
Authorization: **Not required**		

Command: **SP**

Function: To change one of the passphrases associated with the HRK.

Authorization: The HSM must be in the secure state to run this command.

Inputs:
- Existing passphrase 1 or 2.
- New passphrase 1 or 2 (entered twice for verification).

Outputs:
- Prompts, as above.
- Passphrase rules.
- Creating HRK message.
- Key synchronization message.

Notes:
- The HRK replaces the RMK (used in previous versions of software).

Example 1: *This example demonstrates the use of the **SP** console command change administrator #1's HRK passphrase.*

```
Secure> SP <Return>

**** NOTE ****
Passphrase rules as follows:
1 - Must be between 8 and 30 characters long.
2 - Can contain spaces
3 - Must be comprised of (at a minimum):
   2 digits
   2 uppercase characters
   2 lowercase characters
   2 symbols (e.g. !/?.#:')
4 - Cannot use the same passphrase that was used within
the past 10 previous attempts

Select administrator password to change [1,2]: 1
   Enter administrator 1 current passphrase:
********************
   Enter administrator 1 new passphrase: ************
Re-enter administrator 1 new passphrase: ************


Changing passphrases. Please, wait ... DONE

HRK generated successfully

Secure>
```

Restore HRK (SL)

Variant ☑	Key Block ☑	
Online ☒	Offline ☒	Secure ☑
Authorization: **Not required**		

Command: **SL**

Function: To restore the HRK (and also the secret key material backed-up by the HRK) in the event of erasure of tamper protected memory.

Authorization: The HSM must be in the secure state to run this command.

Inputs:
- Passphrases 1 & 2.

Outputs:
- Prompts, as above.
- Restoring HRK message.
- Key synchronization message.

Errors:
- HRK already loaded.

Notes:
- The HRK replaces the RMK (used in previous versions of software).

Example 1: *This example demonstrates the use of the **SL** console command to generate an HRK.*

```
Secure> SL <Return>

Enter administrator 1 passphrase: ********************
Enter administrator 2 passphrase: **************

Recovering HRK. Please, wait ... DONE

HRK recovered successfully

Key synchronization complete

Secure>
```

11 KMD Support Commands

This section describes the set of console commands that facilitate the operation of the Thales Key Management. Please note the Key Management Device (KMD) is now end of sale and has been replaced by the Trusted Management Device (TMD).

Generate KTK Components (KM)

Variant ☐	Key Block ☐	
Online ☒	Offline ☒	Secure ☑
Authorization: **Not required**		

Command: **KM**

Function: To generate the components of a KMD Transport Key (KTK), and store the components on smartcards.

Authorization: None

Inputs:
- Number of components to generate
- Prompt for smartcards & PINs to be entered

Outputs:
- Check value of smartcards
- Check value of new KTK

Example 1: *This example demonstrates the use of the **KM** console command to generate two KTK components on smartcards.*

```
Secure> KM <Return>

Enter number of components [2-3]: 2 <Return>
Insert blank card and enter PIN: ****** <Return>
    Writing keys...
    Checking keys...
Device write complete, check: ZZZZZZ

Make another copy? [Y/N]: N <Return>

    1 copies made
Insert blank card and enter PIN: ****** <Return>
    Writing keys...
    Checking keys...
Device write complete, check: ZZZZZZ

Make another copy? [Y/N]: N <Return>

    1 copies made

KTK Check Value: ZZZZZZ

Secure>
```

Install KTK (KN)

Variant ☐	Key Block ☐	
Online ☒	Offline ☒	Secure ☑
Authorization: **Not required**		

Command: **KN**

Function: To install a KMD Transport Key (KTK) into the HSM.

Authorization: None

Inputs:
- KTK Identifier: 2 numeric digits
- Number of components to use
- Prompt for smartcards & PINs to be entered

Outputs:
- Check value of smartcards
- Check value of new KTK

Example 1: *This example demonstrates the use of the **KN** console command to install a KTK in KTK Id 01, using two smartcards.*

```
Secure> KN <Return>
Enter KTK id [00-19]: 01 <Return>
Enter comments: KTK for KMD in secure room <Return>
KTK in selected location must be erased before
proceeding.
Erase KTK? [Y/N]: Y <Return>

Load KTK in components
Insert card and enter PIN: ****** <Return>
Check: ZZZZZZ
Load more components? [Y/N]: Y <Return>

Insert card and enter PIN: ****** <Return>
Check: ZZZZZZ
Load more components? [Y/N]: N <Return>

KTK check: ZZZZZZ
KTK id: 01
KTK key scheme: Variant
KTK algorithm: AES-256
Comments: KTK for KMD in secure room

Confirm details? [Y/N]: Y <Return>

Secure>
```

View KTK Table (KT)

Variant ☐	Key Block ☐	
Online ☑	Offline ☑	Secure ☑
Authorization: **Not required**		

Command: **KT**

Function: To display the KTK table.

Authorization: None

Inputs:
- None

Outputs:
- List of installed KTKs

Example 1: *This example demonstrates the use of the **KT** console command to display the list of all KTKs currently installed in the HSM.*

```
Online> KT <Return>

KTK table:
ID Scheme   Algorithm   Check   Comments
01 Variant  3DES(2key)  292489  KTK for KMD in secure
room
03 Variant  3DES(2key)  549235  KTK for 2nd KMD

Online>
```

Import Key encrypted under KTK (KK)

Variant ☑	Key Block ☑	
Online ☑	Offline ☑	Secure ☑
Authorization: **Required** Activity: **command.kk.console**		

Command: **KK**

Function: To translate a key from encryption under a KTK to encryption under an LMK.

Authorization: The HSM must either be in the Authorized State, or the activity **command.kk.console** must be authorized.

Inputs:
- LMK Identifier
- Key Type Code
- Key Scheme (LMK)
- KTK Identifier
- Key encrypted under KTK

Outputs:
- Key encrypted under LMK

Example 1: *This example demonstrates the use of the **KK** console command to import a double-length DES ZMK (key type 000) from encryption under KTK Id 01 to encryption under LMK Id 02.*

```
Online-AUTH> KK <Return>

Enter LMK id: 02 <Return>
Enter Key type: 000 <Return>
Enter Key Scheme (LMK): U <Return>

Enter KTK id: 01 <Return>
Enter key: U XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX
<Return>

LMK encrypted key: U YYYY YYYY YYYY YYYY YYYY YYYY YYYY
YYYY
Key check value: ZZZZZZ

Online-AUTH>
```

Delete KTK (KD)

Variant ☐	Key Block ☐	
Online ☒	Offline ☒	Secure ☑
Authorization: **Not required**		

Command: **KD**

Function: To delete a selected KTK from the HSM.

Authorization: None

Inputs:
- KTK Identifier

Outputs:
- Display of relevant entry from KTK table.

Example 1: *This example demonstrates the use of the **KD** console command to delete a previously installed KTK (KTK Id 01) from the HSM.*

```
Secure> KD <Return>
Enter KTK id: 01 <Return>

KTK table entry:
ID Scheme   Algorithm   Check   Comments
01 Variant  3DES(2key)  292489  KTK for KMD in secure
room

Confirm KTK deletion [Y/N]: Y <Return>
KTK deleted from main memory

Secure>
```

Appendix A: Error Responses Excluded from Audit Log

If the option to Audit Error Responses to Host Commands is selected using AUDITOPTIONS, those errors which may require attention by the HSM Administrators or Security Officers are logged. The following non-00 error responses are not included in the Audit Log:

	Not Audited if error response is:		
Cmnd	01	02	43
A6	X		
BC	X		
BE	X		
BK		X	
BY	X		
CG	X		
CK	X	X	
CM	X		
CO	X		
CQ	X		
CU	X		
DA	X	X	
DC	X		
DE		X	
DU	X	X	
EA	X	X	
EC	X		
EE		X	
EG	X		
EI			X
F0	X		
F2	X		
FA	X		
FU	X		
G2	X		
G4	X		
GO	X		

Cmnd	Not Audited if error response is:		
	01	02	43
GQ	X		
GS	X		
GU	X		
J0			X
K2	X		
KE			X
KO			X
P0	X		
PG	X		
PY	X		
QQ	X		
QS	X		
QU	X		
QW	X		
XM	X		
XK	X		
ZU	X		

Appendix B: Technical Support Contacts

Our team of knowledgeable and friendly support staff are available to help. If your product is under warranty or you hold a support contract with Thales, do not hesitate to contact us using the link below. For more information, consult our standard Terms and Conditions for Warranty and Support.

https://supportportal.thalesgroup.com/csm

THALES

Contact us

For all office locations and contact information, please visit
cpl.thalesgroup.com/contact-us

> cpl.thalesgroup.com <