

# Cherry Trail/Braswell Platform System Tools for Intel<sup>®</sup> Trusted Execution Engine (Intel<sup>®</sup> TXE) and Intel<sup>®</sup> Integrated Sensor Solution Firmware

User Guide

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## Revision History

Document Number	Revision Number	Description	Date
550215	0.5	Initial release.	July 2014
550215	0.7	<ul style="list-style-type: none"> <li>• Milestone release.</li> <li>• Updated tool screenshot from latest tool kit.</li> <li>• Removed Intel AT.</li> <li>• Updated command line option for FITc/FPT/TXEManuf/TXEInfo/FWUpdLcl section.</li> <li>• Added details on SVN usage and update command line example of manifest creation.</li> </ul>	November 2014
550215	0.8	<ul style="list-style-type: none"> <li>• Updated <a href="#">section 3.4.24</a> for FITc changes, ISS sensor calibration and configuration should be modified by PDT editor from now on.</li> <li>• Updated <a href="#">Table 18</a> to add –ISH option of TXEInfo tool.</li> <li>• Updated calibration tool command line usage and examples.</li> <li>• Updated Manifest Generation Tool section with ISS support for FLAMInGo.exe.</li> </ul>	December 2014
550215	1.0	<ul style="list-style-type: none"> <li>• Added detailed description of –ISH option in <a href="#">Table 16</a>.</li> <li>• Updated <a href="#">Section 2.5</a> Operating System Support Matrix.</li> <li>• Used consistent naming rule for Flash Descriptor Security Override strap to avoid customer confusion.</li> </ul>	March 2015
550215	1.2	<ul style="list-style-type: none"> <li>• Added –PROVHDCP and –READHDCP command in FPT section <a href="#">Table 10</a>.</li> <li>• Added value lists supported by CHT/BSW platform for TXEInfo – feat command.</li> </ul>	September 2015

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# 1 Introduction

This document is intended to describe the tools that are used in the platform design, manufacturing, testing, and validation process.

## 1.1 Terminology

Acronym/Term	Definition
3PDS	3rd Party Data Storage
AC	Alternating Current
Agent	Software that runs on a client PC with OS running
API	Application Programming Interface
ASCII	American Standard Code for Information Interchange
BBBS	BIOS Boot Block Size
BIN	Binary file
BIOS	Basic Input Output System
BIOS-FW	Basic Input Output System Firmware
BIST	Built In Self Test
CCM	Client Control Mode (Host Based Setup and Configuration)
CLI	Command Line Interface
CHT	Cherry Trail
CPU	Central Processing Unit
CRB	Customer Reference Board
DHCP	Dynamic Host Configuration Protocol
DIMM	Dual In-line Memory Module
DLL	Dynamic Link Library
DNS	Domain Naming System
EC	Embedded Controller
EEPROM	Electrically Erasable Programmable Read Only Memory
EFI	Extensible Firmware Interface
EHCI	Enhanced Host Controller Interface
EID	Endpoint ID
End User	The person who uses the computer (either Desktop or Mobile or Tablet). In corporate, the user usually does not have administrator privileges.
EOP	End Of Post





Acronym/Term	Definition
FCIM	Full Clock Integrated Mode
FCSS	Flex Clock Source Select
FDI	Flexible Display Interface
FITC	Flash Image Tool
FLOCKDN	Flash Configuration Lock-Down
FMBA	Flash Master Base Address
FOV	Fixed Offset Variable
FPT	Flash Programming Tool
FPTW	Flash Programming Tool Window
FQDN	Fully Qualified Domain Name
FRBA	Flash Region Base Address
FW	Firmware
FWUpdate	Firmware Update
G3	A system state of Mechanical Off where all power is disconnected from the system. A G3 power state does not necessarily indicate that RTC power is removed.
GPIO	General Purpose Input/output
GUI	Graphical User Interface
GUID	Globally Unique Identifier
HECI (deprecated)	Host Embedded Controller Interface
Host or Host CPU	The processor running the operating system. This is different than the security engine controller running the Intel® Trusted Execution Engine (Intel® TXE) FW.
Host Service/ Application	An application running on the host CPU
HostIF	Host Interface
HTTP	HyperText Transfer Protocol
HW	Hardware
IBEN	Input Buffer Enable
IBV	Independent BIOS Vendor
ID	Identification
IDER	Integrated Drive Electronics Redirection
INF	An information file (.inf) used by Microsoft operating systems that support the Plug and Play feature. When installing a driver, this file provides the OS with the necessary information about driver filenames, driver components, and supported hardware.
Intel® Trusted Execution Engine (Intel® TXE)	Intel® Trusted Execution Engine. The embedded processor residing in the Silicon.



Acronym/Term	Definition
Intel® ISS	Intel® Integrated Sensor Solution. In the Silicon as well.
PDT	Platform Descriptor Table
Intel® AT	Intel® Anti-Theft Technology
Intel® DAL	Intel® Dynamic Application Loader (Intel® DAL)
Intel® Trusted Execution Engine Interface (Intel® TXEI)	Intel® Trusted Execution Environment Interface
Intel® TXEI driver	Intel® Trusted Execution Engine (Intel® TXE) host driver that runs on the host and interfaces between ISV Agent and the Intel® Trusted Execution Engine (Intel® TXE) HW.
Intel TXEINFO	Intel® Trusted Execution Engine (Intel® TXE) Setting Checker Tool
Intel TXEInfoWin	Windows* version of Intel TXEINFO
Intel TXEManuf	Intel TXEManuf validates Intel® Trusted Execution Engine (Intel® TXE) functionality on the manufacturing line
TXEManufWin	Windows* version of Intel TXEManuf
FWUPDLCL	Firmware Update Local Tool
ISV	Independent Software Vendor
IT User	Information Technology User. Typically very technical and uses a management console to ensure multiple PCs on a network function.
JEDECID	Joint Electronic Device Engineering Councils ID. Standard Manufacturer's Identification Code that is assigned, maintained and updated by the JEDEC office
JTAG	Joint Test Action Group
KVM	Keyboard, Video, Mouse
LAN	Local Area Network
LED	Light Emitting Diode
LMS	Local Management Service. An SW application which runs on the host machine and provides a secured communication between the ISV agent and the Intel® Management Engine Firmware.
LPC	Low Pin Count Bus
MO	Intel® Trusted Execution Engine (Intel® TXE) power state where all HW power planes are activated. Host power state is S0.
M-Off	No power is applied to the security engine processor subsystem. Intel® Trusted Execution Engine (Intel® TXE) is shut down.
MAC address	Media Access Control address
NM	Number of Masters
NVAR	Named Variable
NVM	Non-Volatile Memory
NVRAM	Non-Volatile Random Access Memory



Acronym/Term	Definition
OCKEN	Output Clock Enable
ODM	Original Device Manufacturer
OEM	Original Equipment Manufacturer
OEM ID	Original Equipment Manufacturer Identification
OOB	Out Of Band
OOB interface.	Out Of Band interface. An SOAP/XML interface over secure or non-secure TCP protocol.
OS	Operating System
OS Hibernate	OS state where the OS state is saved on the hard drive.
OS not Functional	The Host OS is considered non-functional in Sx power state in any one of the following cases when the system is in S0 power state: OS is hung After PCI reset OS watch dog expires OS is not present
OVR	Override
PAVP	Protected Video and Audio Path
PC	Personal Computer
PCI	Peripheral Component Interconnect
PCIe*	Peripheral Component Interconnect Express
PDR	Platform Descriptor Region
PHY	Physical Layer
PID	Provisioning ID
PKI	Public Key Infrastructure
PM	Power Management
PRTC	Protected Real Time Clock
PSK	Pre-Shared Key
RCS	Remote Connectivity Service
RCFG	Remote Configuration
RNG	Random Number Generator
ROM	Read Only Memory
RPAS	Remote Connectivity Service
RSA	A public key encryption method
RTC	Real Time Clock
S0	A system state where power is applied to all HW devices and the system is running normally.



Acronym/Term	Definition
S1, S2, S3	A system state where the host CPU is not running but power is connected to the memory system (memory is in self-refresh).
S4	A system state, where the host CPU and memory are not active.
S5	A system state where all power to the host system is off but the power cord is still connected.
SDK	Software Development Kit
SEBP	Single Ended Buffer Parameters
SHA	Secure Hash Algorithm
SMB	Small Medium Business mode
SMBus	System Management Bus
Snooze mode	Intel® Trusted Execution Engine (Intel® TXE) activities are mostly suspended to save power. Intel® Trusted Execution Engine (Intel® TXE) monitors HW activities and can restore its activities depending on the HW event.
SOAP	Simple Object Access Protocol
SOL	Serial over LAN
SPI	Serial Peripheral Interface
SPI Flash	Serial Peripheral Interface Flash
Standby	OS state where the OS state is saved in memory and resumed from the memory when the mouse/keyboard is clicked.
Sx	All S states which are different than S0
SW	Software
System States	Operating System power states such as S0, S1, S2, S3, S4, and S5.
TCP/IP	Transmission Control Protocol/Internet Protocol
TLS	Transport Layer Security
UI	User Interface
UIM	User Identifiable Mark
UMA	Unified Memory Access
Un-configured state	The state of the Intel® Trusted Execution Engine (Intel® TXE) FW when it leaves the OEM factory. At this stage the Intel® Trusted Execution Engine (Intel® TXE) FW is not functional and must be configured.
UNS	User Notification Services
UPDPARAM	Update Parameter Tool
USB	Universal Serial Bus
USBr	Universal Serial Bus Redirection
UUID	Universally Unique IDentifier
VE	Virtualization Engine
VLAN	Virtual Local Area Network
VSCC	Vendor Specific Component Capabilities



Acronym/Term	Definition
Windows* PE	Windows* Preinstallation Environment
WIP	Work in Progress
WLAN	Wireless Local Area Network
XML	Extensible Markup Language. Intel® AMT's XML-based protocol has 3 parts: <ul style="list-style-type: none"> <li>• An envelope that defines a framework for describing what is in a message and how to process it.</li> <li>• A set of encoding rules for expressing instances of application-defined data types.</li> <li>• A convention for representing remote procedure calls and responses.</li> </ul>
ZTC	Zero Touch Configuration
IPC	Inter-Process Communication, which is hardware block used for communication between SeC and the host.
FPF	Field Programmable Fuses
IBB	Initial Boot Block
SB	Secure Boot
ADB	Android* Debug Bridge

## 1.2 Reference Documents

Document	Document Number/Location
Cherry Trail FW Bring Up Guide	FW kit
Intel® Atom™ Z8000 Processor Series - External Design Specification (EDS) (Volume 1 of 2)	539071
Intel® Atom™ Z8000 Processor Series - External Design Specification (EDS) (Volume 2 of 2)	543698
Intel® Atom™ Z8000 Processor Series SPI Flash Programming Guide	FW kit 540557
Intel® Atom™ Z8000 Processor Series (Volume 1 of 2) - BIOS Writers Guide	540142
Intel® Atom™ Z8000 Processor Series (Volume 2 of 2) - BIOS Writers Guide	540143
Cherry Trail and Braswell SoC Intel® Trusted Execution Engine (Intel® TXE) - BIOS Writer's Guide	545425
Cherry Trail T4 Platform - Design Guide	537901
Cherry Trail T3 Platform – Design Guide	540558

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## 2 Preface

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This document covers the system tools used for creating, modifying, and writing binary image files, manufacturing testing, Intel® Trusted Execution Engine (Intel® TXE) setting information gathering, and Intel® Trusted Execution Engine (Intel® TXE) FW updating.

The tools are located in **Kit directory\Tools**. For information on other tools, refer corresponding tool user guide in the other directories in the FW release.

The system tools described in this document are platform specific in following ways:

- **Cherry Trail/Braswell Platform** – All tools in the Cherry Trail/Braswell FW release kit are designed for Cherry Trail/Braswell platforms only. These tools do not work properly on any other legacy platforms (Cedar Trail, Oak Trail) and previous SoC based platform (Medfield, Clover Trail and Bay Trail). Tools designed for other platforms also do not work properly on the Cherry Trail platform.
- **Intel® Trusted Execution Engine (Intel® TXE) Firmware SKU** – A common set of tools are provided for the following
  - **Intel® Trusted Execution Engine (Intel® TXE) FW SKUs:** Tablet, Entry Level Netbook and Desktop SKU.

**Note:** The system tools including FITc, FPT, TXEInfo and TXEManuf should be used for SPI image development and manufacturing purpose only. OEMs and ODMs who using those tools need to ensure follow all legal agreements and never release or expose those tools to end user. Contact local Intel field representative, for further question regarding legal or license agreement.

### 2.1 Intel® Trusted Execution Engine (Intel® TXE) System Tools Changes

Intel developed the following system tools enhancements for Intel® Trusted Execution Engine (Intel® TXE) platforms:

- Firmware status of each tool changes from Intel® Trusted Execution Engine (Intel® TXE).
- FITC support ISS firmware and sensor SKU/Interrupt/Calibration configuration.
- One image for both FITC and FW update.
- FPT Support ISS manufacturing line configuration setting including Active SSKU, ISS enable/disable and calibration file flashing.
- TXEInfo support ISS FW version, status and setting display.
- Intel TXEMANUF option changes, supporting –ISS option for ISS FW aliveness tests, sensor calibration, sensor connectivity and Sensor BIST.
- Add Multiple Operation System support for broader enablement.

**Note:** More details are available in the corresponding tool documentation.



## 2.2 Image Editing Tools

The following tools create and write flash images:

### **FITC:**

Combines the Descriptor, BIOS, PDR, Intel® Trusted Execution Engine (Intel® TXE) and ISS FW binaries into one image.

Configures softstraps and NVARs for Intel® Trusted Execution Engine (Intel® TXE) and ISS FW settings that can be programmed by a flash programming device or the FPT Tool.

### **FPT:**

Programs the flash memory of individual regions or the entire flash device.

Modifies some Intel® Trusted Execution Engine (Intel® TXE) and ISS settings (FOV) after Intel® Trusted Execution Engine (Intel® TXE) and ISS is flashed on the flash part.

Programming FPF file, Widevine keybox and sensor calibration data.

### **FWUpdate:**

Updates the Intel® Trusted Execution Engine (Intel® TXE), ISS FW code region and calibration file on a flash device that has already been programmed with a complete SPI image.

**Note:** The firmware update tool provided by Intel only works on the platforms that support this feature.

## 2.3 Manufacturing Line Validation Tools

The manufacturing line validation tools (Intel TXEMANUF) allow the Intel® Trusted Execution Engine (Intel® TXE) functionality to be tested immediately after the SoC is generated. These tools are designed to be able to run quickly. They can run on simple operating systems, such as UEFI shell. The Windows\* versions are written to run on Windows\* 8.1 and Windows\* PE. Android\* version required to be pushed onto device via ADB interface. These tools are mostly run on the manufacturing line to do manufacturing testing.

## 2.4 Intel® Trusted Execution Engine (Intel® TXE) Setting Checker Tool

The Intel® Trusted Execution Engine (Intel® TXE) setting checker tool (Intel TXEINFO) retrieves and displays information about some of the Intel® Trusted Execution Engine (Intel® TXE)/ISS FW settings, the Intel® Trusted Execution Engine (Intel® TXE)/ISS FW version, and the FW capability on the platform. Widevine keybox provision status and sensor status also be retrieved from this tool.



## 2.5 Operating System Support

Table 1. OS Support for Tools

Intel® Trusted Execution Engine (Intel® TXE) and Manufacturing Tools	UEFI Shell 32/64 bit	Windows* PE 3.x/4.0/5.x 32/64 bit (Based on Windows* 8.1)	Windows* 8.1 32/64 bit	Windows* 7 32/64 bit	Android* 32/64bit (Kitkat/Lollipop)
FITC			x	x	
FPT	x	x	x		x
FWUPDATE	x	x	x		x
FWUPDATE UEFI library	x				
TXEMANUF	x	x	x		x
TXEINFO	x	x	x		x
Manifest Generation Tool			x	x	
Calibration Tool			x		x

**NOTES:**

1. Android\* based tools have to be pushed onto device via ADB and set to executable before running.
2. Maximum EFI environment variable size supported by BIOS and TXE manufacturing tools is 136KB (0x22000). Anything beyond this specification is neither supported nor validated. It is recommended to stay below this limit to avoid unexpected EFI and manufacturing tools behavior.
3. Customer should use OS version for each tools. In other word, 32 bits tool should not be used on 64 bits OS as it's not POR and vice versa.

## 2.6 Generic System Requirements

The installation of the following services is required by integration validation tools that run locally on the system under test with the Intel® Trusted Execution Engine:

- Intel® Trusted Execution Engine Interface (Intel® TXEI) driver.

Refer description of each tool for exact requirements.



Table 2. Tools Summary

Tool Name	Feature Tested	Runs on Intel® Trusted Execution Engine (Intel® TXE) Device
TXEManuf	Connectivity between Intel® Trusted Execution Engine (Intel® TXE) Devices.	X
TXEInfo	Firmware Aliveness – outputs certain Intel® Trusted Execution Engine (Intel® TXE) parameters.	X
FPT	Programs the image onto the flash memory.	X
FWUpdate	Updates the FW code while maintaining the previously set values.	X

### 2.6.1 UEFI Tools

EFI system tools will not run without disabling "UEFI Security Boot" in the BIOS setup menu. If attempting to do so result in the error "Certificate Verification Failed" error message. Otherwise OEM has to sign any EFI utility with OEM key which is not recommended for manufacturing tool segment for security concern.

Figure 1. Certificate Verification Failed Error



### 2.6.2 Manufacturing Tools Requirement

There are some manufacturing requirements Intel strongly recommended our customer have to follow to prevent unexpected failure returned from Intel Manufacturing Tool kit and test case.

- On the manufacturing flow, SPI write protection should only be enabled after all TXE manufacturing flow has done including FOV update, TXEManuf, FPF programming and FPT –closemnf.
- In repair flow, SPI write protection should be able to be temporarily disabled during the operation of TXE repair, testing, refurbish.

### 2.6.3 Android\* Tools

In order to use Intel TXE System tools locally on SUT (System Under Test), must push the tools using ADB (Android\* Debug Bridge) to a directory and set to executable that can be accessed using Terminal Emulator or using ADB itself.



Obtain ADB and fastboot tool from Intel VIP or MCP (comes as part of the Phone Flash Tool installation, which is not part of the Intel TXE FW Kit currently). There are Linux\* and Windows\* versions of the tool. Usage of this tool will be the same with respect to Intel® Trusted Execution Engine (Intel® TXE) System tools.

Command line example to ADB push tool to device and change permission in AOS:

ADB Push:

```
C:\adb push C:\CHT_FW_KIT\Flash_Programming_Tool\Android\TXEInfo  
/data/local
```

Change permission and command line example:

```
C:\adb shell chmod 777 /data/local/TXEInfo  
C:\adb shell TXEInfo -verbose
```

## 2.7 Error Return

Tools always return 0/1 for the error level (0 = success, 1 = error). A detail error code is displayed on the screen and stored on an error.log file in the same directory as the tools. (Refer Tool Detail Error Codes for a list of these error codes).

## 2.8 Usage of Double-Quote Character (")

The EFI version of the tools handle multi-word argument is different than the Windows\* version. If there is a single argument that consists of multiple words delimited by spaces, the argument needs to be entered as following:

- `FPT.exe -r "^" this is an example"`.
- The command shell used to invoke the tools in EFI and Windows\* has a built-in CLI.
- The command shell was intended to be used for invoking applications as well as running in batch mode and performing basic system and file operations. For this reason, the CLI has special characters that perform additional processing upon command.
- The double-quote is the only character which needs special consideration as input. The various quoting mechanisms are the backslash escape character (/), single-quotes ('), and double-quotes ("). A common issue encountered with this is the need to have a double-quote as part of the input string rather than using a double-quote to define the beginning and end of a string with spaces.
- For example, the user may want these words – one two – to be entered as a single string for a vector instead of dividing it into two strings ("one", "two"). In that case, the entry – including the space between the words – must begin and end with double-quotes ("one two") to define this as a single string.
- When double-quotes are used in this way in the CLI, they define the string to be passed to a vector, but are NOT included as part of the vector. The issue encountered with this is how to have the double-quote character included as part of the vector as well as bypassed during the initial processing of the string by the CLI. This can be resolved by preceding the double-quote character with a backslash (\).
- For example, if the user wants these words to be input – input"string – the command line is: `input\"string`.



## 2.9 PMX Driver Limitation

Several Windows\* tools (Intel TXEINFO, Intel TXEMANUF, and FPT) use the PMX library to get access to the PCI device. Only one tool can get access to the PMX library at a time because of library limitation. Therefore, running multiple tools to get access to PMX library will result in an error (failure to load driver).

The PMX driver is not designed to work with the latest Windows\* driver model (it does not conform to the new driver's API architecture).

In Windows\* 7 and higher, the verifier sits in kernel mode, performing continual checks or making calls to selected driver APIs with simulations of well-known driver related issues.

**Warning:** Running the PMX driver with the Windows\* 7 and higher driver verifier turned on causes the OS to crash. Do not include PMX as part of the verifier driver list if the user is running Windows\* 7 and higher with the driver verifier turned on.

§

### 3 Intel® Flash Image Tool

The Flash Image tool (**FITC.exe**) creates and configures a complete SPI image file for Cherry Trail platforms in the following way:

1. FITC creates and allows configuration of the Flash Descriptor Region, which contains configuration information for platform hardware and FW.
2. FITC assembles the following into a single SPI flash image:
  - Binary files of the following regions:
    - Basic Input Output System (BIOS)
    - Intel® Trusted Execution Engine (Intel® TXE)
    - Intel® ISS
    - Platform Descriptor Region (PDR)
    - The Flash Descriptor Region created by FITC
3. The user can manipulate the completed SPI image via a GUI and change the various SoC parameters to match the target hardware. Various configurations can be saved to independent files, so the user does not have to recreate a new image each time.

FITC supports a set of command line parameters that can be used to build an image from the CLI or from a makefile. When a previously stored configuration is used to define the image layout, the user does not have to interact with the GUI.

**Note:** FITC just generates a complete SPI image file; it does not program the flash device. This complete SPI image must be programmed into the flash with FPT, any third-party flash burning tool, or some other flash burner device.

#### 3.1 System Requirements

FITC runs on Windows\* 7 and Windows\* 8/8.1. The tool does not have to run on an Intel® Trusted Execution Engine (Intel® TXE)-enabled system with Cherry Trail SoC mounted.

#### 3.2 Flash Image Details

A flash image is composed of four regions. The locations of these regions are referred to in terms of where they can be found within the total memory of the flash.

Figure 2. SPI Flash Image Regions

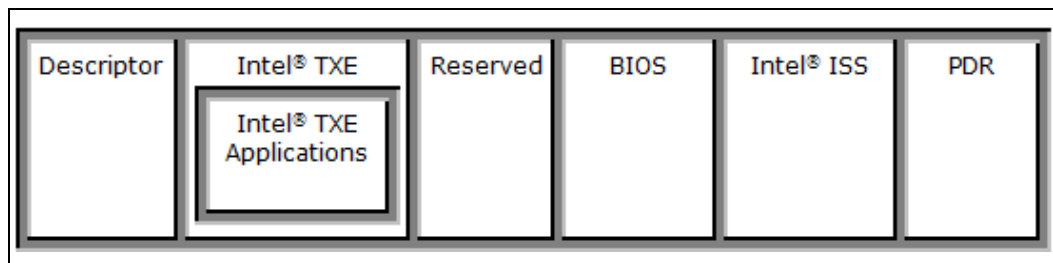




Table 3. Flash Image Regions – Description

Region	Description
Descriptor	<p>This region contains information such as the space allocated for each region of the flash image, read-write permissions for each region, and a space which can be used for vendor-specific data. It takes up a fixed amount of space at the beginning of the flash memory.</p> <p><b>NOTE:</b> This region MUST be locked before the serial flash device is shipped to end users. Refer <a href="#">section 3.4.11</a> below for more information. Failure to lock the Descriptor Region leaves the Intel® Trusted Execution Engine (Intel® TXE) device vulnerable to security attacks.</p>
Intel® Trusted Execution Engine (Intel® TXE)	<p>This region contains code and configuration data for Intel® Trusted Execution Engine (Intel® TXE) applications, such as Intel® Platform Trust Technology (Intel® PTT). It takes up a variable amount of space at the end of the Descriptor.</p> <p>Intel ISS configuration data is located in the Intel® Trusted Execution Engine (Intel® TXE) data region (NVAR)</p>
Intel® ISS	Contains code for Intel® ISS firmware and OEM ISS code.
Reserved	This region is reserved for future use.
BIOS	This region contains code and configuration data for the entire computer.
PDR	This region lets system manufacturers describe custom features for the platform. (this region is optional for cost reduction program which using 2MB or 4MB SPI flash as main storage)

### 3.2.1 Flash Space Allocation

Space allocation for each region is determined as follows:

1. Each region can be assigned a fixed amount of space. If a region is not assigned a fixed amount of space, it occupies only as much space as it requires.
2. If there is still space left in the flash after allocating space to all of the regions, the Intel® Trusted Execution Engine (Intel® TXE) /ISS region expands to fill the remaining space.
3. If there is leftover space and Intel® Trusted Execution Engine (Intel® TXE) /ISS region is not implemented, the BIOS region expands to occupy the remaining space.
4. If only the Descriptor region is implemented, it expands to occupy the entire flash.

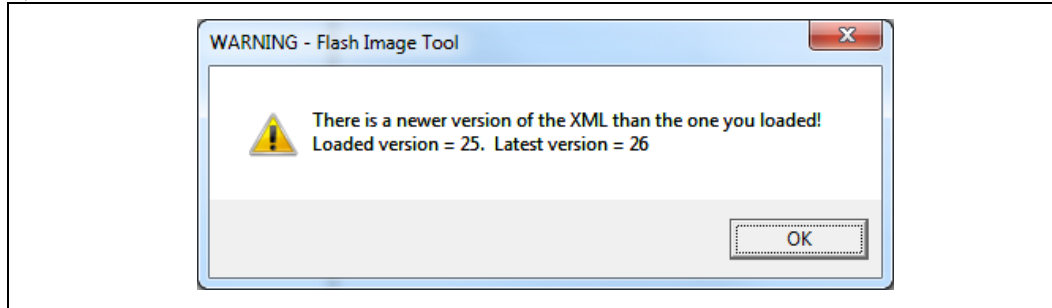
## 3.3 Required Files

The FITC main executable is fitc.exe. The following files must be in the same directory as fitc.exe:

- fitctmpl.xml
- newfiletmpl.xml
- vsccommn.bin
- fitc.ini

FITC does not run correctly if any of the .xml and .bin files listed above are missing. FITC creates a blank **fitc.ini** file if there is no **fitc.ini** file in the folder.

**Note:** When using a 'Newfiletmp.xml' from previous kit releases FITc will display a message to the user that the file being used is older than the version FITc expecting (Refer following example).



After the user selects the **OK** radio button, FITc automatically updates the 'Newfiletmp.xml' with any missing / new or changed variables and pre-populates those variables with the firmware defaults. Once this is completed the user can then re-save this new 'Newfiletmp.xml' back to retain the updates made by FITc.

## 3.4 FITC

Refer following for further information:

- General configuration information – Refer the FW Bring Up Guide from the appropriate Intel® Trusted Execution Engine (Intel® TXE) FW kit.
- Detailed information on how to configure SoC Soft Straps and VSCC information – Refer Cherry Trail SoC SPI programming guide from the appropriate Intel® Trusted Execution Engine (Intel® TXE) FW kit.

### 3.4.1 Configuration Files

The flash image can be configured in many different ways, depending on the target hardware and the required FW options. FITC lets the user change this configuration in a graphical manner (via the GUI). Each configuration can be saved to an XML file. These XML files can be loaded at a later time and used to build subsequent flash images. Note that the newfiletmp.xml under FITC folder is just a template which should not be loaded without any modifications.

### 3.4.2 Creating New Configuration

FITC provides a default configuration file that the user can use to build a new image. This default configuration file can be loaded by clicking **File > New**.

### 3.4.3 Opening an Existing Configuration

To open an existing configuration file:

1. Go to **File > Open**. The **Open File** dialog appears.



2. Select the XML file to load.
3. Click **Open**.

**Note:** The user can also open a file by dragging and dropping a configuration file into the main window of the application.

### 3.4.4 Saving a Configuration

To save the current configuration in an XML file:

1. Go to **File > Save** or **> Save As**. The Save File dialog appears if the configuration has not been given a name or if **File > Save As** was chosen.
2. Select the path and enter the file name for the configuration.
3. Click **Save**.

### 3.4.5 Environment Variables

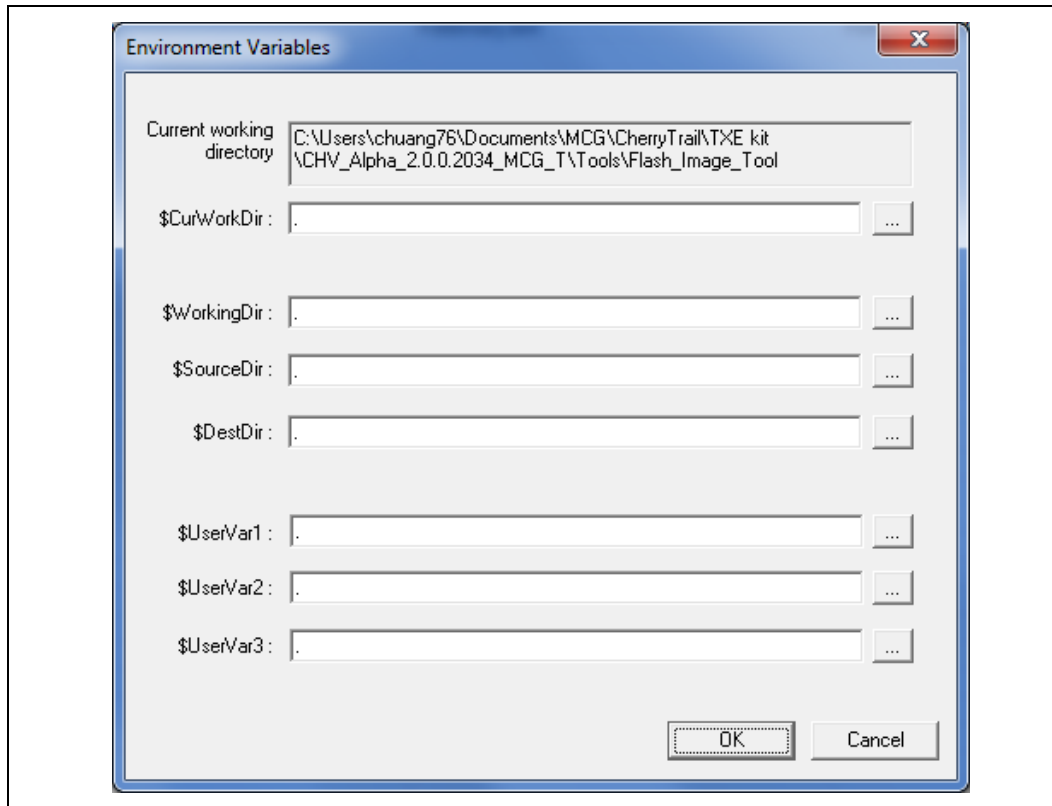
A set of environment variables is provided to make the image configuration files more portable. The configuration is not tied to a particular root directory structure because all of the paths in the configuration are relative to environment variables. The user can set the environment variables appropriate for the platform being used, or override the variables with command line options.


It is recommended that the environment variables be the first thing that the user sets when working with a new configuration. This ensures that FITC can properly substitute environment variables into paths to keep them relative. Doing this also speeds up configuration because many of the **Open File** dialogs default to particular environment variable paths.

To modify the environment variables:

1. Go to **Build > Environment Variables**. A dialog appears displaying the current working directory on top, followed by the current values of all the environment variables:
  - \$CurWorkDir – the current FITc working directory.
  - \$WorkingDir – the directory where the log file is kept and where the components of an image are stored when an image is decomposed.
  - \$SourceDir – the directory that contains the base image binary files from which a complete flash image is prepared. Usually these base image binary files are obtained from Intel® VIP Tech Zone on the Web, a BIOS programming resource, or another source.
  - \$DestDir – the directory in which the final combined image is saved, as well as all intermediate files generated during the build.
  - \$UserVar1-3 – used when the above variables are not populated.

Figure 3. Environment Variables Dialog



2. Click  button next to an environment variable and select the directory where that variable's files will be stored; the name and relative path of that directory appears in the field next to the variable's name.
3. Repeat Step 2 until the directories of all relevant environment variables are defined.
4. Click **OK**.

**Note:** The environment variables are saved in the application's INI file, not the XML configuration file. This allows the configuration files to be portable across different computers and directory structures.

### 3.4.6 Build Settings

FITC lets the user set several options that control how the image is built. The options that can be modified are described in [Table 4](#).

To modify the build setting:

1. Go to **Build > Build Settings**. A dialog box appears showing the current build settings.
2. Modify the relevant settings in the **Build Settings** dialog.
3. Click **OK**. The modified build settings are saved in the XML configuration file.

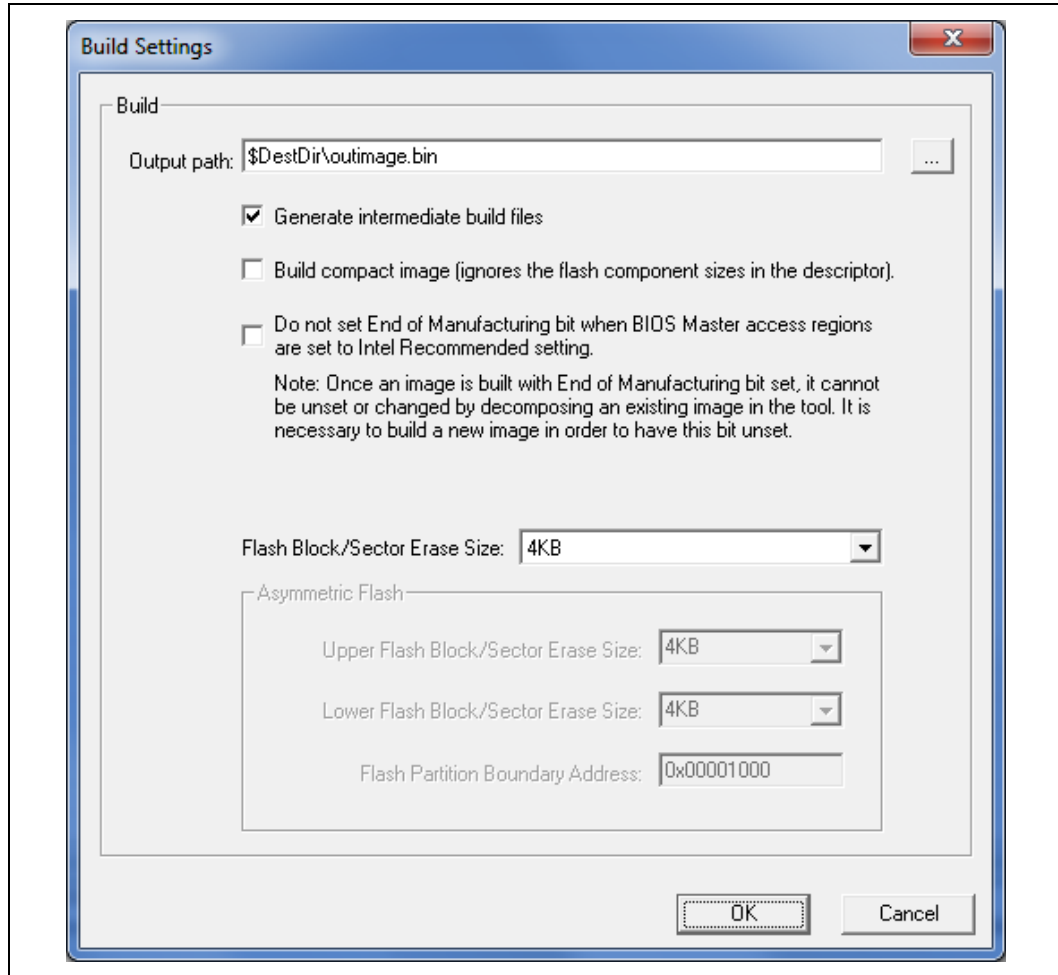




Table 4. Build Settings Dialog Options

Option	Description
Output path	The path and filename where the final image should be saved after it is built. <b>NOTE:</b> Using the \$DestDir environment variable makes the configuration more portable.)
Generate intermediate build files	Causes the application to generate separate (intermediate) binary files for each region, in addition to the final image file (Refer <a href="#">Figure 3</a> ). These files are located in the specified output folder's INT subfolder. These image files can be programmed individually with the FPT.
Build Compact Image	Creates the smallest flash image possible. (By default, the application uses the flash component sizes in the Descriptor to determine the image length.)
Do not set End of Manufacturing bit ...	When descriptor permissions are set to production values, do not select the <b>Do not set End of Manufacturing bit</b> box unless not closing End of Manufacturing is explicitly desired. Intel strongly recommends that the Global Lock Bit/End of Manufacturing bit be set on all production platforms.
Flash Block/Sector Erase Size	All regions in the flash conform to the <b>4KB sector erase size</b> . It is critical that this option is set correctly to ensure that the flash regions can be properly updated at runtime.
Asymmetric Flash	Allows the user specify a different sector erase size for the upper and lower flash block. <b>Only 4KB erase is supported for Intel® Trusted Execution Engine (Intel® TXE) FW</b> . This option also lets user modify the flash partition boundary address.

Figure 4. Build Settings Dialog



End of manufacturing bit is simply a byte in the image. This is not an NVAR, or FOV. In previous generation, when creating an image, the user can set the Intel® TXE manufacturing done bit (Global Lock bit) automatically based on BIOS being set to production Master Access section. However, in order to allow some customers not to set it, we show this checkbox. This checkbox only does something if:

- Intel® Trusted Execution Engine (Intel® TXE) manufacturing done bit is not set, BIOS is not set to production → FITc will not set Intel® Trusted Execution Engine (Intel® TXE) manufacturing done bit – independent of this checkbox.
- Intel® Trusted Execution Engine (Intel® TXE) manufacturing done bit is not set, BIOS is set to production, checkbox is unchecked → FITc will set Intel® Trusted Execution Engine (Intel® TXE) manufacturing done bit.
- Intel® Trusted Execution Engine (Intel® TXE) manufacturing done bit is not set, BIOS is set to production, checkbox is checked → FITc will not set Intel® Trusted Execution Engine (Intel® TXE) manufacturing done bit.
- Intel® Trusted Execution Engine (Intel® TXE) manufacturing done bit set → will stay set.



A dumped image is never reflected in this checkbox – it does not show the actual value of Intel® Trusted Execution Engine (Intel® TXE) manufacturing done bit. It shows what should be done in the next build. But if Intel® Trusted Execution Engine (Intel® TXE) manufacturing done bit is set, this checkbox will never uncheck it.

### 3.4.7 Selecting Platform SKU

The ability to select Platform SKU allows the user configure "Full Featured Engineering samples" to test how the firmware behaves like the production Intel® Atom™ Processor, with the following reservations:

- Certain features only work with particular SoC SKUs and FW kits.
- SKU Manager Selection has no effect on the Production SoC chip.

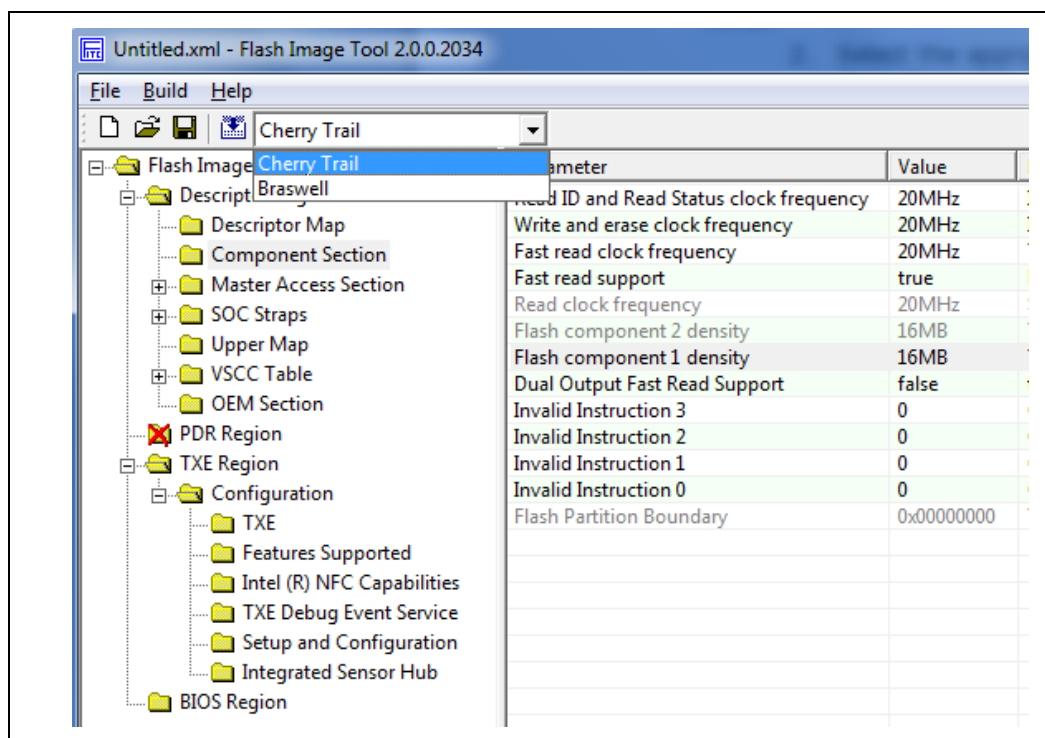
To select a Platform SKU:

1. Load the Intel® Trusted Execution Engine (Intel® TXE) region.

**Note:** Loading the Intel® Trusted Execution Engine (Intel® TXE) region first ensures that the proper FW settings are loaded into FITC.

2. Select the appropriate platform type for the specific SoC from the SKU Manager drop-down list.

Figure 5. Selected SKU Platform in FITC



### 3.4.8 Modifying Flash Descriptor Region

The FDR contains information about the flash image and the target hardware. This region contains the read/write values. It is important for this region to be configured correctly or the target computer may not function as expected. This region also needs to be configured correctly in order to ensure that the system is secure.

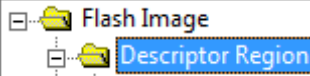
### 3.4.9 Descriptor Region Length

The Descriptor Region Length parameter sets the size of the Descriptor region.

To set the value of the Descriptor Region Length parameter:

1. Select **Descriptor Region** in the left pane. The **Descriptor Region Length** parameter appears in the right pane.
2. Double-click the **Descriptor Region Length** parameter. The **Descriptor Region Length** dialog appears.
3. Enter any non-zero value into the dialog to set the length of the region and click **OK**.

Figure 6. Descriptor Region Length Parameter

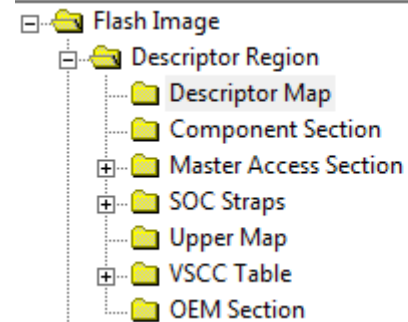
	<table> <tr> <th>Parameter</th><th>Value</th></tr> <tr> <td>Descriptor region length</td><td>0x00000000</td></tr> </table>	Parameter	Value	Descriptor region length	0x00000000
Parameter	Value				
Descriptor region length	0x00000000				

### 3.4.10 Setting Number and Size of Flash Components

To set the number of flash components:

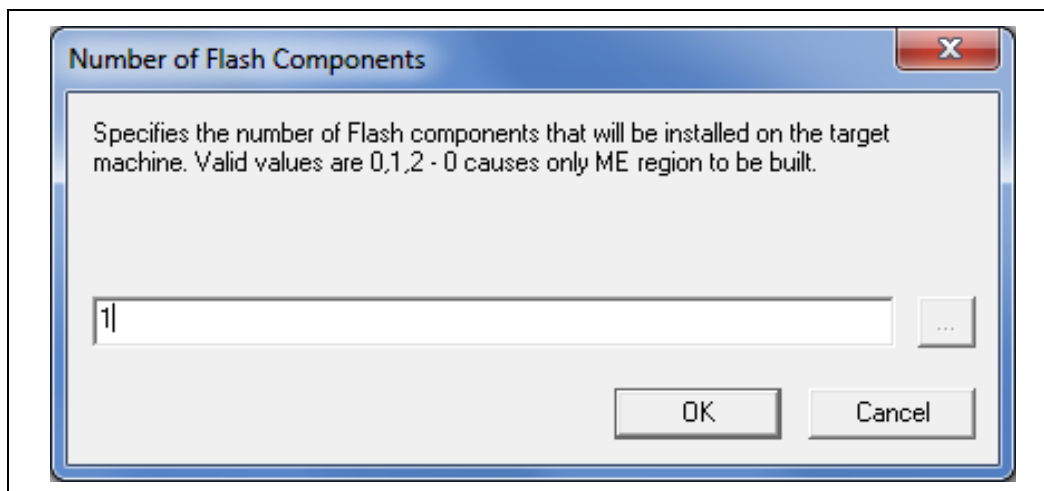
1. Expand the **Descriptor Region** node of the tree in the left pane.
2. Select **Descriptor Map** (Refer [Figure 7](#)). All the parameters in the Descriptor Map section are listed in the right pane.

Figure 7. Descriptor Region > Descriptor Map Parameters

	<table> <tr> <th>Parameter</th><th>Value</th></tr> <tr> <td>Region base address</td><td>0x04</td></tr> <tr> <td><b>Number of Flash Components</b></td><td><b>1</b></td></tr> <tr> <td>Component Base Address</td><td>0x03</td></tr> <tr> <td>Number of SOC straps</td><td>14</td></tr> <tr> <td>SOC straps base address</td><td>0x10</td></tr> <tr> <td>Number of Masters</td><td>2</td></tr> <tr> <td>Master base address</td><td>0x06</td></tr> <tr> <td>Number of CPU Strap Length</td><td>0</td></tr> <tr> <td>PROC straps base address</td><td>0x20</td></tr> </table>	Parameter	Value	Region base address	0x04	<b>Number of Flash Components</b>	<b>1</b>	Component Base Address	0x03	Number of SOC straps	14	SOC straps base address	0x10	Number of Masters	2	Master base address	0x06	Number of CPU Strap Length	0	PROC straps base address	0x20
Parameter	Value																				
Region base address	0x04																				
<b>Number of Flash Components</b>	<b>1</b>																				
Component Base Address	0x03																				
Number of SOC straps	14																				
SOC straps base address	0x10																				
Number of Masters	2																				
Master base address	0x06																				
Number of CPU Strap Length	0																				
PROC straps base address	0x20																				

3. Double-click **Number of Flash Components** in the right pane (Refer [Figure 8](#)). The Flash Components dialog appears.
4. Enter the number of flash components (valid values are 0, 1 or 2).
5. Click **OK**. The parameter is updated.

Figure 8. Flash Components Dialog



To set the size of each flash component:

1. Expand **Descriptor Region** node in the left pane and select **Component Section**. The Component Section parameters appear in the right pane.
2. In the **Flash component 1 density** and **Flash component 2 density** parameters specify the size of each flash component.
3. Double-click one of these parameters. A dialog appears.
4. Select the correct component size from the dialog's drop-down list and click **OK**. The parameter is updated.
5. Repeat steps 2-3 for the other parameter.

**Note:** The size of the second flash component is only editable if the number of flash components is set to 2.

Figure 9. Descriptor Region &gt; Component Section Parameters

Parameter	Value	Help Text
Read ID and Read Status clock frequency	20MHz	If more that one Flash component exists, this field must be the lowest c...
Write and erase clock frequency	20MHz	If more that one Flash component exists, this field must be the lowest c...
Fast read clock frequency	20MHz	This field is undefined if the Fast Read Support is set to false.
Fast read support	true	Enables/disables Fast Read support.
Read clock frequency	20MHz	Sets the Flash read frequency
Flash component 2 density	8MB	This field identifies the size of the 2nd Flash component.
Flash component 1 density	8MB	This field identifies the size of the 1st Flash component.
Dual Output Fast Read Support	false	false: Not Supported. true: Dual Output Fast Read instruction is issued in...
Invalid Instruction 3	0	Op-code for an invalid instruction that the Flash Controller should prote...
Invalid Instruction 2	0	Op-code for an invalid instruction that the Flash Controller should prote...
Invalid Instruction 1	0	Op-code for an invalid instruction that the Flash Controller should prote...
Invalid Instruction 0	0	Op-code for an invalid instruction that the Flash Controller should prote...
Flash Partition Boundary	0x00000000	The FPBA build settings are configurable in Build -> Build Settings.

### 3.4.11 Region Access Control

Regions of the flash can be protected from read or write access by setting a protection parameter in the Descriptor Region. The Descriptor Region must be locked before Intel® Trusted Execution Engine (Intel® TXE) devices are shipped. If the Descriptor Region is not locked, the Intel® Trusted Execution Engine (Intel® TXE) device is



vulnerable to security attacks. The level of read/write access provided is at the discretion of the OEM/ODM. A cross-reference of access settings is shown below.

**Table 5. Region Access Control Table**

		Regions that can be accessed			
		PDR	Intel® Trusted Execution Engine (Intel® TXE)	BIOS	Descriptor
Region to Grant Access	Intel® Trusted Execution Engine (Intel® TXE)	None/Read/Write	Intel® Trusted Execution Engine (Intel® TXE) can always read from and write to Intel® Trusted Execution Engine (Intel® TXE) Region	None/Read/Write	None/Read/Write
	BIOS	None/Read/Write	None/Read/Write	BIOS can always read from and write to BIOS Region	None/Read/Write

There are three parameters in the Descriptor that specify access for each chipset. The bit structure of these parameters is shown in the following table:

Key:

- 0 – Denied access
- 1 – Allowed access
- NC – bit may be either 0 or 1 since it is unused.

**Table 6. CPU/BIOS Access**

Read Access								
	Unused			PDR	Severed	Intel® Trusted Execution Engine (Intel® TXE)	BIOS	Desc
Bit Number	7	6	5	4	3	2	1	0
Bit Value	X	X	X	0/1	0/1	0/1	NC	0/1



Write Access								
	Unused			PDR	Severed	Intel® Trusted Execution Engine (Intel® TXE)	BIOS	Desc
Bit Number	7	6	5	4	3	2	1	0
Bit Value	X	X	X	0/1	0/1	0/1	NC	0/1

**Example:**

If the CPU/BIOS needs read access to the Intel® Trusted Execution Engine (Intel® TXE) and write access to Intel® Trusted Execution Engine (Intel® TXE), then the bits are set to:

- Read Access – 0b 0000 1110 (0x 0E in hexadecimal)
- Write Access – 0b 0000 0110 (0x 06 in hexadecimal)

To set these access values in FITC:

1. Select **Descriptor Region > Master Access > CPU/BIOS** in the left pane. The access parameters are listed in the right pane (Refer [Figure 10](#)).
2. Double-click each parameter and set its access value in one of the following ways:
  - To generate an image for debug purposes or to leave the SPI region open: Select 0xFF for both read and write access in all three sections.
  - To generate a production image with BIOS access to the PDR region: Select read access 0x0B and write access 0x0A.

**Note:** These settings should only be used if the PDR region is implemented.

- To lock the SPI in the image creation phase: Select the recommended setting for production (e.g., select 0x0D for Intel® Trusted Execution Engine (Intel® TXE) read access and 0x0C for Intel® Trusted Execution Engine (Intel® TXE) write access).

**Note:** If all Read/Write Master access settings for Intel® Trusted Execution Engine (Intel® TXE) are set to production platform values, then the Intel® Trusted Execution Engine (Intel® TXE) manufacturing mode done (Global Lock) bit is automatically set. If the Intel® Trusted Execution Engine (Intel® TXE) manufacturing mode done (Global Lock) bit is set, the FOV mechanism is not available.

**Figure 10. Descriptor Region > Master Access Section**

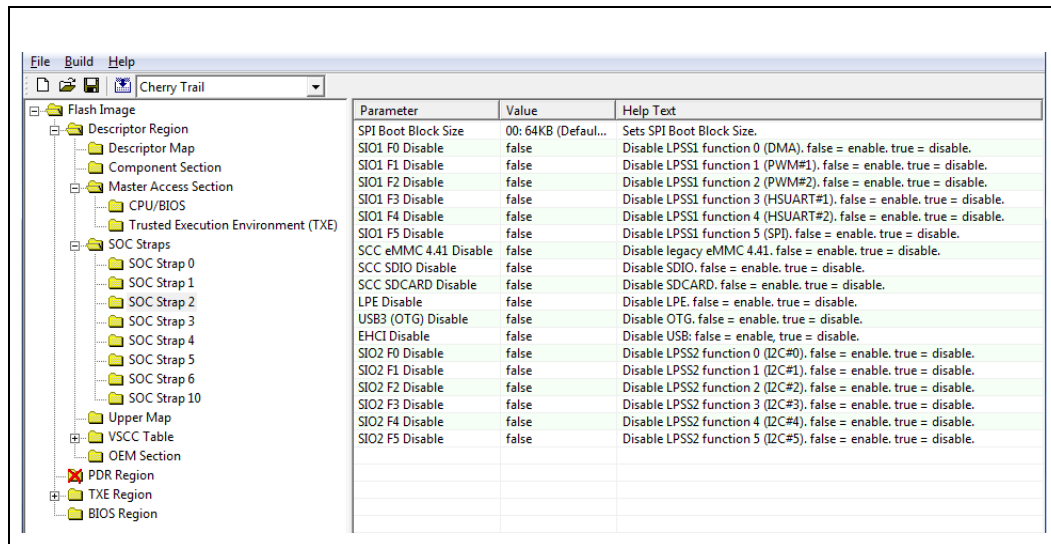
Flash Image			Parameter	Value	Help Text
Descriptor Region			PCI Bus ID	0	
Descriptor Map			PCI Device ID	0	
Component Section			PCI Function ID	0	
Master Access Section			Read Access	0xFF	0xFF = Debug/Manufacturing, 0x0B = Produ
CPU/BIOS			Write Access	0xFF	0xFF = Debug/Manufacturing, 0x0A = Produ
Trusted Execution Environment (TXE)					

### 3.4.12 SoC Straps

These sections contain configuration options for the SoC. The number of Soft Strap sections and their functionality differ based on the target SoC. Improper settings could lead to undesirable behavior from the target platform.

**Note:** The SoC is different for each SKU which means only relevant strap shows up for modification for certain SKU. (Refer [Figure 10](#) and for more information on how to set them correctly, refer the FW BringUp Guide or the Cherry Trail SoC SPI programming guide).

Figure 11. SoC Straps



### 3.4.13 VSCC Table

This section is used to store information to setup flash access for Intel® Trusted Execution Engine (Intel® TXE). This does not have any effect on the usage of the FPT. **If the information in this section is incorrect, Intel® Trusted Execution Engine (Intel® TXE) FW may not communicate with the flash device.** The information provided is dependent on the flash device used on the system. (For more information, refer the Cherry Trail SoC SPI Programming Guide).

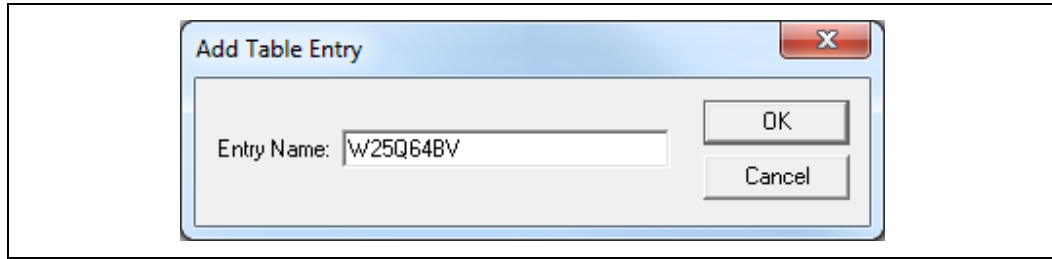
### 3.4.14 Adding New Table

To add a new table:

1. Right-click **Descriptor Region > VSCC table**.
2. Select **Add Table Entry** from the pop-up menu. The **Add Table Entry** dialog appears.



Figure 12. Add VSCC Table Entry Dialog



3. Enter a name into the **Entry Name** field.

**Note:** To avoid confusion it is recommended that each table entry name be unique. There is no checking mechanism in FITC to prevent table entries that have the same name and no error message is displayed in such cases.

4. Click **OK**, the new table is listed in the left pane under **VSCC Table** and user can enter into it the values for the flash device. (Refer [Figure 13](#)), which shows the parameters of a new VSCC table).

**Note:** The VSCC register value will be automatically populated by FITC using the vscccommn.bin file the appropriate information for the Vendor and Device ID.

**Note:** If the descriptor region is being built manually the user will need to reference the VSCC table information for the parts being supported from the manufacturers' serial flash data sheet. The Cherry Trail SoC SPI Programming Guide should be used to calculate the VSCC values.

Figure 13. Sample VSCC Table Entry

Parameter	Value	Help Text
Vendor ID	0xEF	The vendor specific byte of the JEDEC ID.
Device ID 0	0x60	The first device specific byte of the JEDEC ID.
Device ID 1	0x17	The second device specific byte of the JEDEC ID.
Right-Click folder to delete this table entry		To delete this VSCC table entry right-click the folder.

### 3.4.15 Removing an Existing VSCC Table

To remove an existing table:

1. Right-click the name of the table in the left pane that the user wants to remove.
2. Choose **Remove Table Entry**. The table and all of the information will be removed.

### 3.4.16 Modifying Intel® Trusted Execution Engine (Intel® TXE) Region

The Intel® Trusted Execution Engine (Intel® TXE) region contains all of the FW data for the Intel® Trusted Execution Engine (Intel® TXE) (including the Intel® Trusted Execution Engine (Intel® TXE) FW Kernel and Intel® NFC capabilities).



### 3.4.17 Setting Intel® Trusted Execution Engine (Intel® TXE) Region Binary File

To select Intel® Trusted Execution Engine (Intel® TXE) region binary file:

1. Select Intel® Trusted Execution Engine (Intel® TXE) Region tree node.
2. Double-click the **TXE Binary Input file** in the list. A dialog appears that lets the user select the Intel® Trusted Execution Engine (Intel® TXE) file to be used.
3. Click **OK** to update the parameter. When the flash image is built, the content of this file is copied into the Intel® Trusted Execution Engine (Intel® TXE) Region.

### 3.4.18 Configuration

The Configuration parameters are visible and editable only after a valid Intel® Trusted Execution Engine (Intel® TXE) FW image has been loaded.

If any of the parameters do not have the Intel-recommended value, the offending row is highlighted yellow but no errors are reported. The highlighted yellow is designed to draw attention to these values to ensure these parameters are set correctly.

### 3.4.19 Intel® Trusted Execution Engine (Intel® TXE) Section

This section describes Intel® Trusted Execution Engine (Intel® TXE) FW Kernel parameters. (Refer FW Bringup guide for general information and Appendix for more details.)

The Intel® Trusted Execution Engine (Intel® TXE) section lets the user define the system features. The parameter values can be found in the **Help Text** next to the parameter value as shown in [Figure 14](#).

Figure 14. Intel® Trusted Execution Engine (Intel® TXE) Section

Parameter	Value
FW Update OEM ID	00000000-0000-0000-0000-000000000000
Host TXE Region Flash Protection Override	true
OEM Tag	0x00000000
Hide FW Update Control	false
FPF Mirroring File	
CEK Configuration	

### 3.4.20 Features Supported

The Features Supported section determines which features are supported by the system. If a system does not meet the minimum hardware requirements, no error message is given when programming the image. (Refer FW Bringup guide for general information for re details.)

These options control the availability and visibility of FW features.



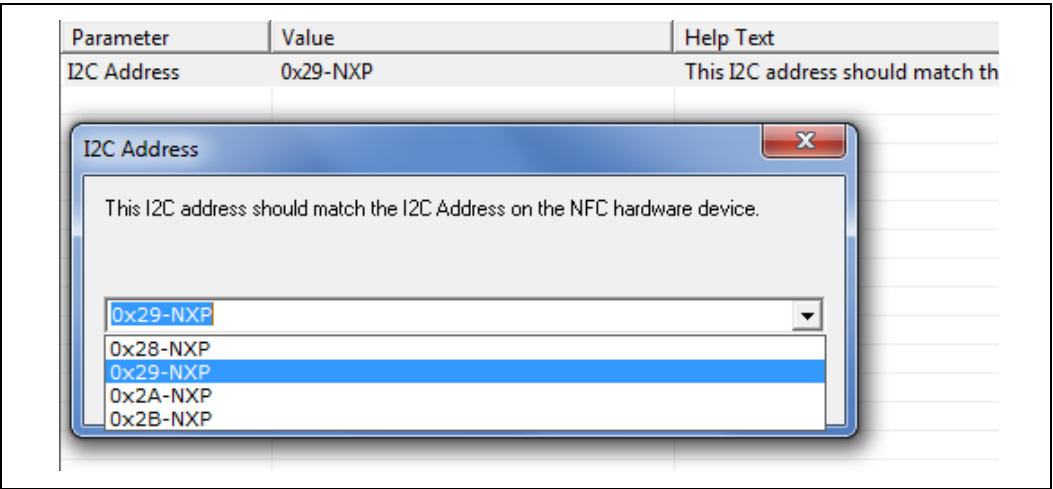
In cases where a specific feature is configurable in the UEFI BIOS, permanently disabling it through the **Features Supported** section hides/disables that feature in UEFI BIOS.

The ability to change certain options is SKU-dependent and – depending on the SKU selected – some of default values will be disabled and cannot be changed.

3.4.21 Intel® NFC Capabilities

This section allows the end user to either enable or disable Near Field Communication which connects to TXE via I2C bus. I2C/SMBus salve address of Intel® NFC devices also can be configured with different value. This address may vary from one Intel® NFC module vendor to another. Make sure to know the SMBUS address used by Intel® NFC HW module.

Figure 15. Intel NFC Capabilities



3.4.22 TXE Debug Event Service

The TXE Debug Event Service section allows the end user to specify the configuration settings of TXE Debug error and event filters. (Refer FW Bringup guide for general information).

Figure 16. TXE Debug Event Services

Parameter	Value	Help Text
Error Filter	Critical	Set the error filter
Logging Interface	Flash	Set the logging interface to the interface to be used.
Buffer Size	2	Set the buffer size.
MDES State with Va...	true	true = Enable, false = Disable
Event Filters	Click To Edit	Click To Edit

### 3.4.23 Setup and Configuration Section

The Setup and Configuration section allows the end user to specify the configuration settings. (Refer FW Bringup guide for general information and Appendix E for more details).

Figure 17. Setup and Configuration Section

Parameter	Value	Help Text
ODM ID used by Intel (R) Services	0x00000000	ID generated by or i
System Integrator ID used by Intel (R) Services	0x00000000	ID generated by or i
Reserved ID used by Intel (R) Services	0x00000000	Reserved ID may be
Permit Period Timer Resolution	Days	This setting determ

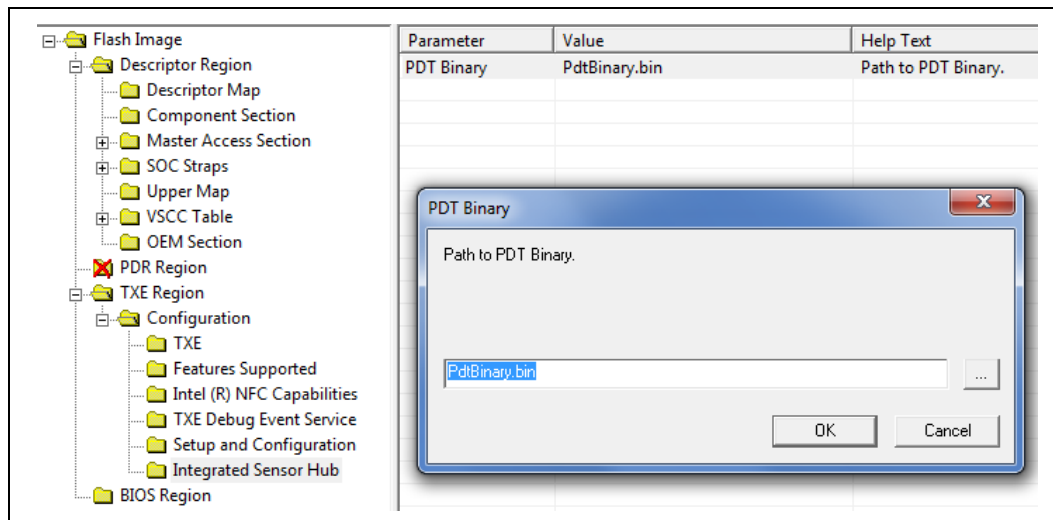
### 3.4.24 Setting Intel® Integrated Sensor Solution

PDT binary contains sensor lists and configuration and calibration data file which can be generated and modified from PDT editor of Intel® ISS FDK kit. To select binary file for Intel® ISS firmware:

4. Select Intel® Integrated Sensor Solution node.
5. Double-click the **PDT Binary** in the list. A dialog appears that lets the user select the PDT binary file to be used.

Click **OK** to update the path to PDT Binary. When the flash image is built, the content of this file is copied into the Intel® Trusted Execution Engine (Intel® TXE) Region for Intel® ISS to use as need.

Figure 18. Integrated Sensor Solution



### 3.4.25 Modifying PDR Region

The PDR Region contains various configuration parameters that let the user customize the computer's behavior.

Figure 19. PDR Region Options

Parameter	Value
PDR region length	0x00000000
PDR binary input file	

### 3.4.26 Setting PDR Region Length Option

The PDR Region length option should not be altered. A value of 0x00000000 indicates that the PDR Region will be auto-sized by FITC tool based on PDR binary input file.

### 3.4.27 Setting PDR Region Binary File

To select the PDR region binary file:

1. Select **PDR Region** in the left pane; the PDR Region parameters are listed in the right pane.
2. Double-click the **PDR binary input file** parameter. A dialog appears that lets the user specify which PDR file to use.
3. Click **OK** to update the parameter. When the flash image is built, the contents of this file is copied into the BIOS region.

### 3.4.28 Enabling/Disabling PDR Region

The PDR Region can be excluded from the flash image by disabling it in FITC.

To disable the PDR Region:

1. Right-click **PDR Region** in the left pane.
2. Select **Disable Region** from the pop-up menu. When the flash image is built, there is no PDR Region in it.

**Note:** This region is disabled by default.

To enable the PDR Region:

1. Right-click **PDR Region** in the left pane.
2. Select **Enable Region** from the pop-up menu.

### 3.4.29 Modifying BIOS Region

The BIOS Region contains the BIOS code run by the host processor. This is done so that if the flash descriptor becomes corrupt for any reason, the SoC defaults to legacy mode and looks for the reset at the end of the flash memory. By placing the BIOS Region at the end there is a chance the system will still boot. It is also important to note that the BIOS binary file is aligned with the end of the BIOS Region so that the

reset vector is in the correct place. This means that if the binary file is smaller than the BIOS Region, the region is padded at the beginning instead of at the end.

Figure 20. BIOS Region Parameters

Parameter	Value
BIOS region length	0x00000000
BIOS binary input file	

### 3.4.30 Setting BIOS Region Length Parameter

The value of the BIOS Region length parameter should not be altered. A value of 0x00000000 indicates that the BIOS Region will be auto-sized by FITC tool based on BIOS binary input file.

### 3.4.31 Setting BIOS Region Binary File

To select the BIOS region binary file:

1. Select **BIOS Region** in the left pane; the BIOS Region parameters are listed in the right pane.
2. Double-click **BIOS binary input file** parameter. A dialog appears that lets the user specify which BIOS file to use.
3. Click **OK** to update the parameter. When the flash image is built, the contents of this file are copied into the BIOS region.

### 3.4.32 Enabling/Disabling BIOS Region

The BIOS Region can be excluded from the flash image by disabling it in FITC.

To disable BIOS Region:

1. Right-click **BIOS Region** in the left pane.
2. Select **Disable Region** from the pop-up menu. When the flash image is built, there is no BIOS Region in it.

To enable BIOS Region:

1. Right-click **BIOS Region** in the left pane.
2. Select **Enable Region** from the pop-up menu.

### 3.4.33 Building Flash Image

The flash image can be built with the FITC GUI interface.

To build a flash image with the currently loaded configuration:

- Go to **Build > Build Image**.
- OR –
- Specify an XML file with the /b option in the command line.

FITC uses an XML configuration file and the corresponding binary files to build the SPI flash image. The following is produced when an image is built:

- Binary file representing the image
- Text file detailing the various regions in the image
- Optional set of intermediate files (Refer [Section 3.4.6](#)).
- Multiple binary files containing the image broken up according to the flash component sizes

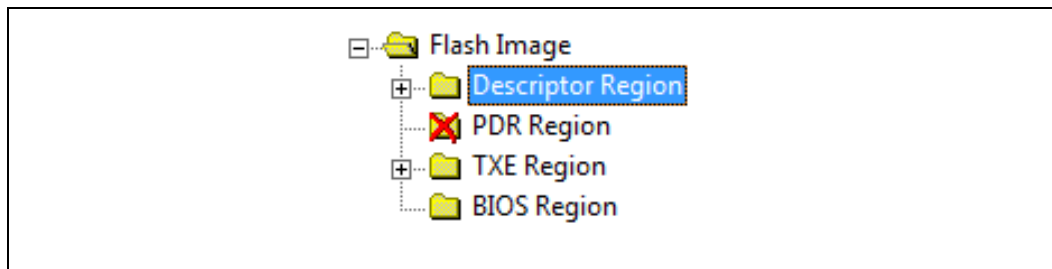
**Note:** These files are only created if two flash components are specified.

The individual binary files can be used to manually program independent flash devices using a flash programmer. However, the user should select the single larger binary file when using FPT.

### 3.4.34 Change Region Order on SPI Device

The order and placement of the regions in the full SPI image created by FITC can be altered. The location of each region is determined by the order of the PDR, TXE and BIOS regions as they are displayed in left pane of the FITC window.

Figure 21. Region Order



Each region is added to the full SPI image in the order in which they appear in the list. The order of the regions in the full SPI image created from the regions listed in Figure 23 in order immediately after the Descriptor Region:

1. TXE Region
2. BIOS Region

This can be useful when programming a system with two SPI devices. It is possible to change the order of the PDR, TXE and BIOS regions by clicking and dragging the region to the required location. [Figure 23](#) shows that the Intel® Trusted Execution Engine (Intel® TXE) is placed on the first SPI device and the BIOS Region is placed on the second SPI device. The length of each region and the order determines if that region is on the first or second SPI device.

### 3.4.35 Decomposing an Existing Flash Image

FITC is capable of taking an existing flash image and decomposing it in order to create the corresponding configuration. This configuration can be edited in the GUI like any other configuration (refer below). A new image can be built from this configuration that is almost identical to the original, except for the changes made to it.



To decompose an image:

1. Go to **File > Open**.
2. Change the file type filter to the appropriate file type.
3. Select the required file and click **Open**. The image is automatically decomposed, the GUI is updated to reflect the new configuration, and a folder is created with each of the regions in a separate binary file.

**Note:** It is also possible to decompose an image by simply dragging and dropping the file into the main window. When decomposing an image, there are some NVARs will not be able to be decomposed by FITC. FITC will use Intel default value instead. User might want to check the log file to find out which NVARs were not parsed.

**Note:** FITC will decompose only Cherry Trail SoC TXE firmware images. FITC will read the TXE region firmware version from the binary to determine if the image is a SoC image. If the image is not a SoC image an error should be displayed to the user and the image should not be decomposed.

### 3.4.36 Command Line Interface

FITC supports command line options.

**To view all of the supported options:** Run the application with the `-?` option.

The command line syntax for FITC is:

```
FITC [/h] [/?][/b] [/o <file>] [/platform <value>] [/txe <file>]
      [/bios <file>] [/pdr <file>] [/w <path>] [/s <path>] [/d <path>]
      [/u1 <value>] [/u2 <value>] [/u3 <value>] [/i <enable|disable>]
      [/flashcount <1|2>] [/flashsize1 <size>] [/flashsize2 <size>]
      [/save <file>] [/fpf <file>] [XML or BIN file]
```

**Table 7. FITC Command Line Options**

Option	Description
-h	Display Help
-?	Displays the command line options.
-b	Automatically builds the flash image. The GUI does not appear if this flag is specified. This option causes the program to run in auto-build mode. If there is an error, a valid message is displayed and the image is not built. If a BIN file is included in the command line, this option decomposes it.
-o <file>	Path and filename where the image is saved. This command overrides the output file path in the XML file.
-txe <file>	Overrides the binary source file for the Intel® Trusted Execution Engine (Intel® TXE) Region with the specified binary file.
-bios <file>	Overrides the binary source file for the BIOS Region with the specified binary file.
-pdr <file>	Overrides the binary source file for the PDR Region with the specified binary file.





Option	Description
-w <path>	Overrides the working directory environment variable \$WorkingDir. It is recommended that the user set these environmental variables first. (Suggested values can be found in the OEM Bringup Guide.)
-s <path>	Overrides the source file directory environment variable \$SourceDir. It is recommended that the user set these environmental variables before starting a project.
-d <path>	Overrides the destination directory environment variable \$DestDir. It is recommended that the user set these environmental variables before starting a project.
-u1 <value>	Overrides the \$UserVar1 environment variable with the value specified. Can be any value required.
-u2 <value>	Overrides the \$UserVar2 environment variable with the value specified. Can be any value required.
-u3 <value>	Overrides the \$UserVar3 environment variable with the value specified. Can be any value required.
-i <enable disable>	Enables or disables intermediate file generation.
-flashcount <0, 1 or 2>	Overrides the number of flash components in the Descriptor Region. If this value is zero, only the Intel® Trusted Execution Engine (Intel® TXE) Region is built.
-flashsize1 <0, 1, 2, 3, 4 or 5>	Overrides the size of the first flash component with the size of the option selected as follows: 0 = 512KB 1 = 1MB 2 = 2MB 3 = 4MB 4 = 8MB 5 = 16MB.
-flashsize2 <0, 1, 2, 3, 4 or 5>	Overrides the size of the first flash component with the size of the option selected as follows: 0 = 512KB 1 = 1MB 2 = 2MB 3 = 4MB 4 = 8MB 5 = 16MB.
-save	Saves the XML file.
-fpf <file>	Overrides the FPF Mirroring NVAR using input FPF Mirroring file with file path point to the FPF mirroring file. FITC will take in the FPF mirroring file convert the contents of the FPF mirroring file into the format required for the FPF Mirroring NVAR before setting these values. Then decompose the FPF Mirror NVAR and write the contents to an FPF Mirroring File. This file shall be saved at the same path as the TXE region. If decompose fails an error shall be displayed to the user.  <b>NOTE:</b> FITC will warn the user if they attempt add a file to this NVAR on production-fw images. Pre-production images should not have a warning.



Option	Description
<XML File>	Used when generating a flash image file. A sample xml file is provided along with the FITC. When an xml file is used with the /b option, the flash image file is built automatically.
<BIN File>	Decomposes the BIN file. The individual regions are separated and placed in a folder with the same name as the BIN file.

### 3.4.37 Example – Decomposing an Image and Extracting Parameters

The NVARS variables and the current value parameters of an image can be viewed by dragging and dropping the image into the main window, which then displays the current values of the image's parameters.

An image's parameters can also be extracted by entering the following commands into the command line:

```
Fitc.exe output.bin /b
```

This command would create a folder named "output". The folder contains the individual region binaries (Descriptor, Intel® Trusted Execution Engine (Intel® TXE), and BIOS) and the Map file.

The xml file contains the current Intel® Trusted Execution Engine (Intel® TXE) parameters.

The Map file contains the start, end, and length of each region.

### 3.4.38 More Examples of FITC CLI

**Note:** If using paths defined in the KIT, be sure to put "" around the path as the spaces cause issues.

Build image with assigned BIOS and TXE binary:

```
fitc.exe /b /bios "..\..\..\Image Components\BIOS\BIOS.ROM" /txe  
"..\..\..\Image Components\Firmware\CHT_TXE_PreProduction.BIN" <file.bin  
or file.xml>
```

Take an existing image and put in a new BIOS binary:

```
fitc.exe /b /bios "..\..\..\Image Components\BIOS\BIOS.ROM" <file.bin or  
file.xml>
```

Take an existing image and put in a different Intel® Trusted Execution Engine (Intel® TXE) region:

```
fitc.exe /b /txe "..\..\..\Image  
Components\Firmware\CHT_TXE_PreProduction.BIN" <file.bin or file.xml>
```

§



## 4 Intel® Flash Programming Tool

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The Flash Programming Tool (FPT) is used to program a complete SPI image into the SPI flash device(s).

FPT can program each region individually or it can program all of the regions with a single command. The user can also use FPT to perform various functions such as:

- View the contents of the flash on the screen.
- Write the contents of the flash to a log file.
- Perform a binary file to flash comparison.
- Write to a specific address block.
- Program fixed offset variables.
- FPF programming and lock.

**Note:** For proper function in a multi-SPI configuration the Block Erase, Block Erase Command and Chip Erase must all match.

### 4.1 System Requirements

The EFI version of FPT (**fpt.efi**) runs on an EFI environment.

The Windows\* version (**fptw.exe**) requires administrator privileges to run under Windows\* OS. The user needs to use the **Run as Administrator** option to open the CLI in Windows\* 32 bit OS.

The Windows\* 64 bit version (**fpt64w.exe**) is designed for running in native 64 bit OS environment which does not have 32 bit compatible mode available for example Windows\* PE 64.

The Android\* version (FPT) requires root privileges to run under Android\* OS using ADB shell. FPT and fparts.txt should be push onto SUT and same path before performing.

FPT requires that the platform is bootable (i.e. working BIOS) and an operating system to run on. It is designed to deliver a custom image to a computer that is already able to boot and is not a means to get a blank system up and running. FPT must be run on the system with the flash memory to be programmed.

One possible workflow for using FPT is:

1. A pre-programmed flash with a bootable BIOS image is plugged into a new computer.
2. The computer boots.
3. FPT is run and a new BIOS/Intel® Trusted Execution Engine (Intel® TXE) image is written to flash.
4. The computer powers down.

5. The computer powers up, boots, and is able to access its Intel® Trusted Execution Engine (Intel® TXE) capabilities as well as any new custom BIOS features.

## 4.2 Flash Image Details

A flash image is composed of up to five regions. The locations of these regions are referred to in terms of where they can be found within the overall layout of the flash memory.

Figure 22. Flash Image Regions

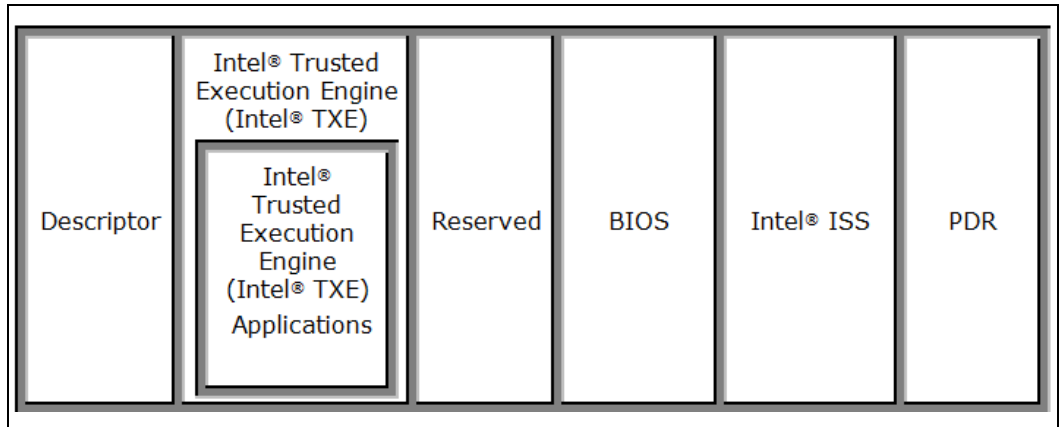
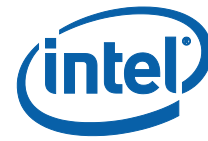


Table 8. Flash Image Regions – Description

Component	Description
Descriptor	Region that takes up a fixed amount of space at the beginning of the flash memory. Contains information such as: Space allocated for each region of the flash image. Read/write permissions for each region. A space that can be used for vendor-specific data.
Intel® Trusted Execution Engine (Intel® TXE)	Contains code and configuration data for Intel® Trusted Execution Engine (Intel® TXE) applications, such as Intel® Platform Trust Technology (Intel® PTT) technology. Intel ISS configuration data is located in the Intel TXE data region (NVAR)
Intel® ISS	Contains code for Intel® ISS firmware and OEM ISS code.
Reserved	This region is reserved for future use.
BIOS	Contains code and configuration data for the entire platform.
PDR	Region that allows system manufacturers to define custom features for the platform.

## 4.3 Microsoft Windows\* Required Files

The Microsoft Windows\* version of FPT executable is **fptw.exe**. The following files must be in the same directory as **fptw.exe**:



- **fparts.txt** – contains a comma-separated list of attributes for supported flash devices. The text in the file explains each field. An additional entry may be required in this file to describe the flash part which is on the target system. Examine the target board before adding the appropriate attribute values. The supplied file is already populated with default values for SPI devices used with Intel CRBs.
- **fptw.exe** – the executable used to program the final image file into the flash.
- **pmxdll.dll**
- **idrvdll.dll**
- For tools to work under the Windows\* PE environment, you must manually load the driver with the .inf file in the Intel® Trusted Execution Engine Interface (Intel® TXEI) driver installation files. Once you locate the .inf file you must use the Windows\* PE cmd `drvload ipc.inf` to load it into the running system each time Windows\* PE reboots. Failure to do so causes errors for some features.

**Table 9. FPT Windows\* OS Requirements**

FPT version	Target OS	Support Drivers
FPTW.EXE	Windows* 32 / 64 bit w/WOW64	idrvdll.dll, pmxdll.dll
FPTW64.EXE	Windows* Native 64 bit	idrvdll32e.dll, pmxdll32e.dll

**Note:** In the Windows\* environment for operations involving global reset you should add a pause or delay when running FPTW using a batch or script file.

## 4.4 EFI Required Files

The EFI version of the FPT executable is **fpt.efi**. The following files must be in the same directory as **fpt.efi**:

- **fparts.txt** – contains a comma-separated list of attributes for supported flash devices. The text in the file explains each field. An additional entry may be required in this file to describe the flash part which is on the target system. Examine the target board before adding the appropriate attribute values. The supplied file is already populated with default values for SPI devices used with Intel CRBs.
- **fpt.efi** – the executable used to program the final image file into the flash.

## 4.5 Programming Flash Device

Once the Intel® Trusted Execution Engine (Intel® TXE) is programmed, it runs at all times. Intel® Trusted Execution Engine (Intel® TXE) is capable of writing to the SPI flash device at any time as need.

### 4.5.1 Stopping Intel® Trusted Execution Engine (Intel® TXE) SPI Operations

FPT will automatically halt Intel® Trusted Execution Engine (Intel® TXE) SPI access prior to erasing or writing data in the TXE region. Customers do not have use either of



the following steps listed below when updating platforms unless the descriptor has been locked.

Intel® Trusted Execution Engine (Intel® TXE) SPI Operations can be stopped in the following ways:

- Assert GPIO\_SUS[5] pin low (Flash Descriptor Security Override Strap) on the rising edge of PMC\_PWROK during power transition. (Refer Cherry Trail Platform Design Guide for more detail and implementation recommendation)
- Send the HMRFP0 TXEI message from BIOS to Intel® Trusted Execution Engine (Intel® TXE) (Refer Intel® TXE BIOS Writer's Guide for more detail and implementation recommendation)

**Note:** When updating the entire Intel® Trusted Execution Engine (Intel® TXE) region using the FPT tool, FPT will automatically stop Intel TXE before programming. No action is required in this case.

## 4.6 Usage

The EFI, Windows\* and Android\* versions of the FPT can run with command line options.

To view all of the supported commands: Run the application with the -? option.

The commands in EFI and Windows\* versions have the same syntax. The command line syntax for fpt.efi, fptw.exe and fptw64.exe is:

```
FPTw.exe [-H|?] [-VER] [-EXP] [-VERBOSE] [-Y] [-P] [-LIST] [-I]
          [-F] [-ERASE] [-VERIFY] [-D] [-DESC] [-BIOS] [-TXE] [-PDR]
          [-C] [-B] [-E] [-REWRITE] [-ADDRESS|A] [-LENGTH|L] [-FOVS]
          [-CFGGEN] [-U] [-O] [-IN] [-N] [-ID] [-V] [-LOCK] [-DUMPLOCK]
          [-PSKFILE] [-CLOSEMNF] [-GRESET] [-PAGE] [-SPIBAR] [-R] [-VARS]
          [-COMMIT] [-COMPARE] [-HASHED] [-PROVKB] [-READKB] [-WRITEFPF]
          [-READFPF] [-READFPFATTRIB] [-COMPAREFPF] [-FPFS] [-WRITEGLOBAL]
          [-READGLOBAL] [-GETFPFLOCKSTAT] [-WRITEFPFBATCH] [-
          COMPAREFPFBATCH]
          [-PROVHDCP] [-READHDCP]
```

**Table 10. Command Line Options for fpt.efi, fptw.exe and fptw64.exe**

Option	Description
-H -?	Displays the list of command line options supported by FPT tool.
-VER	Shows the version of the tools.
-EXP	Shows examples of how to use the tools.



Option	Description
-VERBOSE [<file>]	Displays the tool's debug information or stores it in a log file.
-Y	Bypasses Prompt. FPT does not prompt user for input. This confirmation will automatically be answered with "y".
-P <file>	Flash parts file. Specifies the alternate flash definition file which contains the flash parts description that FPT has to read. By default, FPT reads the flash parts definitions from <b>fparts.txt</b> .
-LIST	Supported Flash Parts. Displays all supported flash parts. This option reads the contents of the flash parts definition file and displays the contents on the screen.
-I	Info. Displays information about the image currently used in the flash.
-F <file> <NOVERIFY>	Flash. Programs a binary file into an SPI flash. The user needs to specify the binary file to be flashed. FPT reads the binary, erases the flash, and then programs the binary into the flash. After a successful flash, FPT verifies that the SPI flash matches the provided image. Without specifying the length with -L option, FPT will use the total SPI size instead of an image size.  The NOVERIFY sub-option <i>*must*</i> follow the file name. This will allow flashing the SPI without verifying the programming was done correctly. The user will be prompted before proceeding unless '-y' is used.
-ERASE:	Block Erase. Erases all the blocks in a flash. This option does not use the chip erase command but instead erases the SPI flash block by block. This option can be used with a specific region argument to erase that region. This option cannot be used with the -f, -b, -c, -d or -verify options.
-VERIFY <file>:	Verify. Compares a binary to the SPI flash. The image file name has to be passed as a command line argument if this flag is specified.
-D <file> :	Dump. Reads the SPI flash and dumps the flash contents to a file or to the screen using the STDOUT option. The flash device must be written in 4KB sections. The total size of the flash device must also be in increments of 4KB.
-DESC:	Read/Write Descriptor region. Specifies that the Descriptor region is to be read, written, or verified. The start address is the beginning of the region.
-BIOS:	Read/Write BIOS region. Specifies that the BIOS region is to be read, written, or verified. Start address is the beginning of the region.
-TXE:	Read/Write Intel® Trusted Execution Engine (Intel® TXE) region. Specifies that the Intel® Trusted Execution Engine (Intel® TXE) region is to be read, written, or verified. The start address is the beginning of the region.
-PDR:	Read/Write PDR region. Specifies that the PDR region is to be read, written, or verified. The start address is the beginning of the region.
-C:	Chip erase. Erases the contents of SPI flash device(s). This function does NOT erase block by block.
-B:	Blank Check. Checks whether the SPI flash is erased. If the SPI flash is not empty, the application halts as soon as contents are detected. The tool reports the address at which data was found.
-E:	Skip Erase. Does not erase blocks before writing. This option skips the erase operation before writing and should be used if the part being flashed is a blank SPI flash device.



Option	Description
-REWRITE	Rewrite the SPI flash with file data even if flash is identical
-A<value>, -ADDRESS <value>	Write/Read Address. Specifies the start address at which a read, verify, or write operation must be performed. The user needs to provide an address. This option is not used when providing a region since the region dictates the start address.
-L <value>, LENGTH <value>	Write/Read Length. Specifies the length of data to be read, written, or verified. The user needs to provide the length. This option is not used when providing a region since the region/file length determines this.
-FOVS:	Supported Fixed Offset Variables. Displays all supported FOVs supported by FPT. This option displays names and IDs of supported FOVs.
-CFGGEN	FOV Input file generation option. This creates a file which can be used to update the FOVs. If no file name is specified the default name "FPT.CFG" will be used.
-U:	Update. Updates the FOVs in the flash. The user can update the multiple FOVs by specifying their names and values in the parameter file. The parameter file must be in an INI file format (the same format generated by the -cfggen command). The -in <file> option is used to specify the input file.
-O <file>	Output File. The file used by FPT to output FOV information.
-IN <file>	Input File. The file used by FPT for FOV input. This option flag must be followed by a text file (i.e., <code>fpt -u -in FPT.cfg</code> ). The tool updates the FOVs contained in the text file with the values provided in the input file. User can also use FPT -cfggen to generate this file.
-N <value>	Name. Specifies the name of the FOV that the user wants to update in the image file or flash. The name flag must be used with Value (-v).
-ID <value>	ID. The names of certain FOVs are quite lengthy. This option lets the user update the FOV by providing its unique identification number instead of its name. The ID for each FOV is specified in the configuration file.
-V <value>	Value. Specifies the value for the FOV variable. The name of variable is specified in the Name flag. The Value flag must follow the Name flag.
-LOCK:	Region Lock. Sets the SPI flash region access to the Intel recommended values.
-DUMPLOCK <PDR>:	Dump Lock Settings. Displays the current lock settings on the screen. The lock settings are read from the descriptor region.
-PSKFILE <file>	PID/PPS/Password pair file. Specifies the input file that contains the one or more PID/PPS/Password key value pairs. This option is used to update the PID, PPS, and Password FOVs whose values are read from the input file. This option only support version 1 FiletypeHeader UUID.





Option	Description
-CLOSEMNF <NO> <PDR>:	<p>End of Manufacturing. This option is executed at the end of manufacturing phase. This option does the following:</p> <p>Sets the Intel® Trusted Execution Engine (Intel® TXE) manufacturing mode done bit (Global Lock bit).</p> <p>Verifies that the Intel® Trusted Execution Engine (Intel® TXE) manufacturing mode done bit (Global Lock bit) is set.</p> <p>Sets the master region access permission in the Descriptor region to its Intel-recommended value.</p> <p>Verifies that flash regions are locked.</p> <p>If the image was properly set before running this option, FPT skips all of the above and reports PASS. If anything was changed, FPT automatically forces a global reset through the CF9GR mechanism. The user can use the no reset option to bypass the reset. If nothing was changed, based on the current setting, the tool reports PASS without any reset.</p> <p>The "NO" addition will prevent the system from doing a global reset following a successful update of the Intel® Trusted Execution Engine (Intel® TXE) Manufacturing Mode Done, the Region Access permissions, or both.</p> <p>The "PDR" addition will allow CPU\BIOS Read and Write access to the PDR region of flash.</p> <p><b>NOTE:</b> Running FPT -closemnf also sets the default value for any unprovisioning process. Run FPT -closemnf first if the user wants to test any unprovisioning related process. In order to allow FPT to perform a global reset, BIOS should not lock CF9GR when Intel® Trusted Execution Engine (Intel® TXE) is in manufacturing mode. This step is highly recommended to the manufacturing process. Without doing proper end of manufacturing process would lead to ship platform with potential security/privacy risk.</p>
-GRESET <NO> :	<p>Global Reset. FPT performs a global reset. On mobile platforms this includes driving GPIO30 low. Mobile platforms require a SUS Well power-down acknowledge-driven low before the global reset occurs or the platform may not boot up from the reset.</p> <p>The "NO" afterwards disables the driving of GPIO30 for mobile SKUs.</p>
-PAGE	Pauses the screen when a page of text has been reached. Hit any key to continue.
-SPIBAR:	Display SPI BAR. FPT uses this option to display the SPI BAR.
-R <name>	NVAR Read. FPT uses this option to read a variable stored as a NVAR in the FW. The value of the variable is displayed. By default, all non-secure variables are displayed in clear-text and secure NVAR will be displayed in HASH. The -hashed option can be used to display the hash of a value instead of the clear-text value.
-VARS:	Display Supported Variables. FPT uses this option to display all variables supported for the -R and -COMPARE commands.
-COMMIT:	Commit. FPT uses this option to commit FOVs changes to NVAR and cause relevant reset accordingly. If no pending variable changes are present, Intel® Trusted Execution Engine (Intel® TXE) does not reset and the tool displays the status of the commit operation.



Option	Description
-COMPARE <file>	NVAR Compare. FPT uses this option to compare a NVAR with the expected value filled in a text file. The compare entry should have the following format: "<name>" = <value>  <b>NOTE:</b> <value> should have the form "xx ", where xx is a hexadecimal value. Each byte must be separated by a space and start with the least significant followed by the next significant byte.
-HASHED:	Hash Variable Output. FPT uses this option to distinguish whether the displayed output is hashed by the FW. For variables that can only be returned in hashed form this option has no effect – the data displayed is hashed regardless.
-PROVKB <file>	Provision Widevine* Google* DRM using KeyBox file.
-READKB	Display Widevine keybox device ID.
-WRITEFPF	Writes as a value to an FPF if not locked.
-READFPF	Reads the FPF value – register or Fuses depending on if the fuses have been committed or not.
-READFPFATTRIB	Display the attributes for the selected FPF.
-COMPAREFPF	Compares the stored FPF register against the expected value, provided on the command line, prior to committing.
-FPFS	Display the list of FPFs.
-WRITEGLOBAL	Writes the Global Valid Fuse.
-READGLOBAL	Reads the Global Valid Fuse.
-GETFPFLOCKSTAT <name>	Display the lock status of the specified FPF.
-WRITEFPFBATCH <f> [NoVerify]	Writes the FPF fuses from a file.
-COMPAREFPFBATCH <f> [NoVerify]	Compare the FPF fuses from a file to the actual fuses or FPF mirroring.
-PROVHDCP <file> <file>	Provide HDCP Rx keying material to firmware.
-READHDCP	Display HDCP Rx provisioning status.

Table 11. FPT - closemfn Behavior

Condition before FPT - closemfn			Condition after FPT -closemfn			Other FPT Action	
TXE Mfg Done Bit Set	Flash Access Set to Intel Rec Values	TXE Mfg Mode	TXE Mfg Done Bit Set	Flash Access Set to Intel Rec Values?	TXE Mfg Mode	FPT Return Value <sup>1</sup>	Global Reset
No	No	Enabled	Yes	Yes	Disabled	0	Yes
No	Yes	Enabled	No	Yes	Enabled	1	No
Yes	No	Enabled	Yes	Yes	Disabled	0	Yes



Yes	Yes	Disabled	Yes	Yes	Disabled	0	No
<sup>1</sup> Return value 0 indicates successful completion. In the second case, FPT –closemfn returns 1 (= error) because it is unable to set the TXE Mfg Done bit, because flash permissions are already set to Intel recommended values (host cannot access TXE Region).							

## 4.7 Programming Fixed Offset Variables

FPT can program the fixed offset variables and change the default values of the parameters. The modified parameters are used by the Intel® Trusted Execution Engine (Intel® TXE) FW after a global reset (Intel® Trusted Execution Engine (Intel® TXE) + HOST reset) or upon returning from a G3 state. The fixed offset variables can be continuously changed until the Intel® Trusted Execution Engine (Intel® TXE) manufacturing mode done (formerly Global Lock bit) bit is set to 0x01. The parameters can **NOT** be modified after this bit is set. To modify the default settings for the parameters, the entire flash device must be re-programmed.

The variables can be modified individually or all at once via a text file.

**Table 12. Fixed Offset Variables Options**

Option	Description
fptw.exe –FOVs	Displays a list of the supported variables.
fptw.exe –cfggen	Creates an empty text file that lets the user update multiple fixed offset variables. The variables have the following format in the text file: <Parameter name> = <Value>
fptw.exe –U –IN <Text file>	Updates the fixed offset variables with the values as they are entered in the text file.
fptw.exe –U –n <name> -v <value>	Update certain variable with assigned value.
fptw.exe -commit	Commit updated FOVs to SPI flash.

Refer [Fixed Offset Variables](#) for a description of all the Fixed Offset Variable parameters.

**Table 13. Intel Recommend Access Settings**

	Intel® Trusted Execution Engine (Intel® TXE)	BIOS
Read	0b 0000 1101 = 0x0d	0b 0000 0011 = 0x0B
		0b 0001 1011 = 0x1B – BIOS access to PDR
Write	0b 0000 1100 = 0x0c	0b 0000 0010 = 0x0A
		0b 0001 1010 = 0x1A – BIOS access to PDR



## 4.8 Fparts.txt File

The **fparts.txt** file contains a list of all flash devices that are supported by FPT. The flash devices listed in this file must contain a 4KB erase block size. If the flash device is not listed, the user will receive the following error:

Intel® Flash Programming Tool. Version: x.x.x.xxxx

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Platform: "Intel® Atom Zxxxx"

Error 75: "fparts.txt" file not found.

If the device is not located in **fparts.txt**, the user is expected to provide information about the device, inserting the values into **fparts.txt** in same format as is used for the rest of the devices. Detailed information on how to derive the values in **fparts.txt** is found in the Cherry Trail Platform SoC SPI Programming Guide. The device must have a **4KB erase sector** and the total size of the SPI Flash device must be a multiple of 4KB. The values are listed in columns in the following order:

- Display name
- Device ID (2 or 3 bytes)
- Device Size (in bits)
- Block Erase Size (in bytes - 256, 4K, 64K)
- Block Erase Command
- Write Granularity (1 or 64)
- Unused
- Chip Erase Command.

## 4.9 FPF

Field Programmable Fuses (FPF) is implemented as 4 banks of one time programmable area inside Cherry Trail SoC. Objective of FPF is to let OEMs choose platform configuration before shipping their platform to end users. Default FPF value in one time programmable area inside virgin SoC will be all zero. It can be programmed once by OEM/ODM at their factory once then configuration is final and platform is ready to be ship and sold. Main usages of FPF are listed in following:

- Enabled/Disable TXE Features (ex: Secure Boot, Intel® Platform Trust Technology (Intel® PTT))
- Store Hash of OEM public key used for signing BIOS, so on.

FPF is recommended to be programmed end of manufacturing step, all fuse banks would be locked once Global Valid fuse set to 1 at end of manufacturing as well for security and manufacturing flow perspective. All FPF fuse will be read only after Global Valid fuse set and after post manufacturing stage. Global Valid fuse can be referred as OEM-end of manufacturing for access control purpose and OEM manufacturing flow support. This is the responsibility of the OEM/ODM to program the Global Valid fuse (1 bit) after all the OEM manufacturing FPF fuse files were programmed correctly.



If the objective is to test enable/disable features, use FPF mirroring in SPI flash and then no need to program the real fuse itself. This will prevent wasting platform due to manual mistakes or wrong Fuse configuration. If the objective is to test the FPF itself, test using SPI image stitching with FPF mirroring by FITC tool first and program the real FPF using FPT once the test pass.

- Tool for programming FPF: FPT (Flash Programming Tool).
- Tool for SPI image creation with FPF mirroring: FITC.
- FPF mirroring/configuration file is input to both FPT and FITC.

#### 4.9.1 FPF Programming

To support FPF programming on Cherry Trail SoC, FPT implemented new set of commands listed in following table:

**Table 14. FPT Command for FPF Access**

Command Example	Usage and Purpose
-WRITEFPF <name> -V <value>	Writes as a value to an FPF if not locked.
-READFPF <name>	Reads the FPF value – register or Fuses depending on if the fuses have been committed or not.
-READFPFATTRIB <name>	Display the attributes for the selected FPF.
-COMPAREFPF <name> -V <value>	Compares the stored FPF register against the expected value, provided on the command line, prior to committing.
-FPFS	Display the list of FPFs
-WRITEGLOBAL	Writes the Global Valid Fuse.
-READGLOBAL	Reads the Global Valid Fuse.
-GETFPFLOCKSTAT <name>	Display the lock status of the specified FPF
-WRITEFPFBATCH<f> [NoVerify]	Writes the FPF fuses from a file.
-COMPAREFPFBATCH<f> [NoVerify]	Compare the FPF fuses from a file to the actual fuses or FPF mirroring.

There is a batch process programming command within FPT for FPF programming to allow the OEM to use a FPF configuration file with all FPFs that are desired to be programmed, the value that is needed, and a lock status.

The format of FPF configuration file is shown in the following figure:

[illegible]

Edit this file to give non-default values to FPF fuses using the FPF flash mirror. Each line in this file describes a fuse file in the following pattern:

- **ID:** Fuse file ID.
- **Value:** Desired value of fuse file in hex digits, must be byte-aligned (For single bit file, should be 00 or 01).

FUSE\_FILE\_OEM\_KEY\_HASH\_1:87c558E1FBBA60F7A87E58372D7CCC3BBB704DDB8E2144907C88FA1465A86FEA

```
{0x87,0xc5,0x58,0xE1,0xFB,0xBA,0x60,0xF7,0xA8,0x7E,0x58,0x37,0x2D,0x7C,0xCC,
0x3B,0xBB,0x70,0x4D,0xDB,0x8E,0x21,0x44,0x90,0x7C,0x88,0xFA,0x14,0x65,0xA8,
0x6F,0xEA}
```

FUSE\_FILE\_ALT\_BIOS\_LIMIT:1FFF

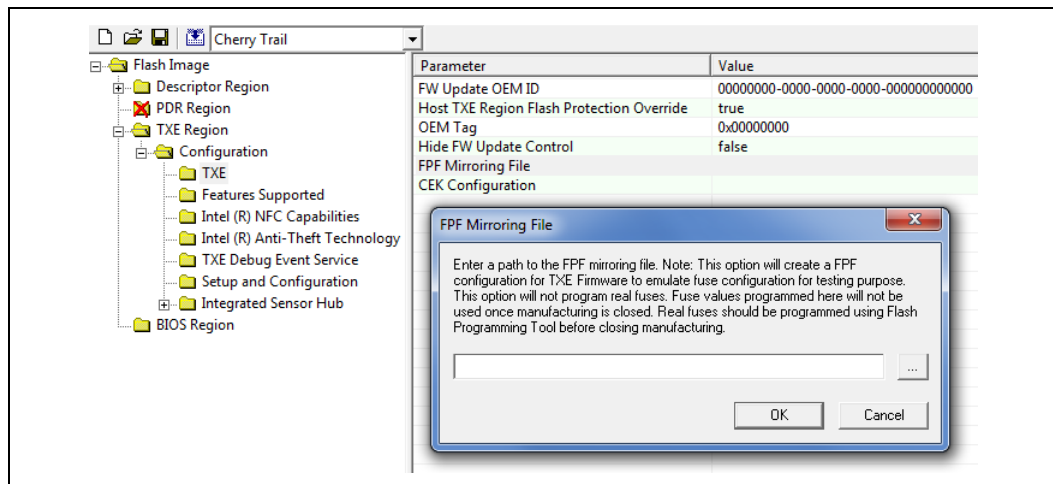
### 4.9.2 FPF Mirroring

It is used to mirror the Field Programmable Fuse (FPF) setting in the TXE firmware. The following is a guideline for FPF mirroring: (Refer Intel® Trusted Execution Engine (Intel® TXE) Firmware Manufacturing Recommendation for more detail).

- FITC uses the FPF configuration file to create an NVAR with the fuse configuration into production SPI image.
- TXE FW uses this NVAR and simulates the FPF settings after SPI image programming and platform boot.
- FPF mirroring enables testing FPF configuration without programming the fuse.
- Allows OEMs to test and finalize the FPF configuration they want to use prior to production.
- Actual fuses should be programmed at manufacturing line with FPT and same FPF configuration file which have been verified before.
- The production SPI image for product will ship to end user should not have FPF mirroring present, as main purpose of FPF mirroring is for early validation in production phase but not for mass production.
- Global Valid fuse should be programmed at end of manufacturing process.

**Note:** FITC does not update the FPF mirroring NVAR if the user decomposes an existing SPI image, modifies the text file and rebuilds the image. In order to use new or updated FPF mirroring NVAR, the user actually needs to browse to the FPF mirror file setting field from TXE region and reload new or updated text file to read in new values. FPF mirroring will not be updated or removed if you just open an image that already contains the FPF mirror NVAR and delete it from the file dialog box.

Figure 24. Dialog Box for FPF Mirroring File Insertion



## 4.10 Examples

The following examples illustrate the usage of the EFI versions of the tool (fpt.efi and fptw.exe respectively). The Windows\* version of the tool (Fptw.exe) behaves in the same manner apart from running in a Windows\* environment.



#### 4.10.1 Complete SPI Flash Device with Binary File

```
C:\ fptw.exe -f spi.bin
```

```
EFI:
```

```
>fpt.efi -f spi.bin or fs0:\>fpt.efi -f spi.bin
```

```
-----
```

```
Intel (R) Flash Programming Tool. Version: x.x.x.xxxx
```

```
Copyright (c) 2007-2014, Intel Corporation. All rights reserved.
```

```
Platform: "Intel(R) Atom Zxxxx"
```

```
Reading HSFSTS register... Flash Descriptor: Valid
```

```
--- Flash Devices Found ---
```

```
AT26DF321 ID:0x1F4700 Size: 4096KB (32768Kb)
```

```
AT26DF321 ID:0x1F4700 Size: 4096KB (32768Kb)
```

```
Warning: There are some addresses that are not defined in any regions.
```

```
Read/Write/Erase operations are not possible on those addresses.
```

```
PDR Region does not exist.
```

```
- Erasing Flash Block [0x800000] - 100% complete.
```

```
- Programming Flash [0x800000] 8192KB of 8192KB - 100% complete.
```

```
- Verifying Flash [0x800000] 8192KB of 8192KB - 100% complete.
```

```
RESULT: The data is identical.
```

```
FPT Operation Passed
```

```
This command writes the data in the spi.bin file into a whole SPI flash from address 0x0.
```

#### 4.10.2 Program Specific Region

```
fptw.exe -f bios.rom -BIOS
```

```
EFI:
```

```
fpt.efi -f bios.rom -BIOS
```





-----

Intel (R) Flash Programming Tool. Version: x.x.x.xxxx

Copyright (c) 2007-2014, Intel Corporation. All rights reserved.

Platform: Intel(R) Atom Zxxxx

Reading HSFSTS register... Flash Descriptor: Valid

--- Flash Devices Found ---

W25Q64BV ID:0xEF4017 Size: 8192KB (65536Kb)

- Erasing Flash Block [0x800000]... - 100% complete.

- Programming Flash [0x800000]2560KB or 2560KB - 100% complete.

- Verifying Flash [0x800000]2560KB or 2560KB - 100% complete.

RESULT: The Data is identical.

FPT Operation Passed

This command writes the data in **bios.rom** into the BIOS region of the SPI flash and verifies that the operation ran successfully.

### 4.10.3 Program SPI Flash from Specific Address

Windows\*:

fptw.exe -F image.bin -A 0x100 -L 0x800

EFI:

fpt.efi -F image.bin -A 0x100 -L 0x800

This command loads 0x800 of the binary file **image.bin** starting at address 0x0100. The starting address and the length need to be a multiple of 4KB.

### 4.10.4 Dump Full Image

fptw.exe -d imagedump.bin

EFI:

fpt.efi -d imagedump.bin

-----

Intel (R) Flash Programming Tool. Version: x.x.x.xxxx

Copyright (c) 2007-2014, Intel Corporation. All rights reserved.

Platform: Intel(R) Atom Zxxxx

Reading HSFSTS register... Flash Descriptor: Valid

--- Flash Devices Found ---

W25Q64BV ID:0xEF4017 Size: 8192KB (65536Kb)

- Reading Flash [0x00800000]... 8192KB of 8192KB - 100% complete.

Writing flash contents to file "imagedump.bin"...

Memory Dump Complete

FPT Operation Passed



This command writes the contents of all regions to the file **imagedump.bin**.

#### 4.10.5 Dump Specific Region

```
fptw.exe -d descdump.bin -desc
```

EFI:

```
fpt.efi -d descdump.bin -desc
```

-----

Intel (R) Flash Programming Tool. Version: x.x.x.xxxx

Copyright (c) 2007-2014, Intel Corporation. All rights reserved.

Platform: Intel(R) Atom Zxxxx

Reading HSFSTS register... Flash Descriptor: Valid

--- Flash Devices Found ---

W25Q64BV ID:0xEF4017 Size: 8192KB (65536Kb)

- Reading Flash [0x000040]... 4KB of 4KB - 100% complete.

Writing flash contents to file "descdump.bin"...

Memory Dump Complete

FPT Operation Passed

This command writes the content of the Descriptor region to the file **descdump.bin**.

#### 4.10.6 Display SPI Information

```
fptw.exe -I
```

-----

Intel (R) Flash Programming Tool. Version: x.x.x.xxxx

Copyright (c) 2007-2014, Intel Corporation. All rights reserved.

Platform: Intel(R) Atom Zxxxx

Reading HSFSTS register... Flash Descriptor: Valid

--- Flash Devices Found ---

AT26DF321 ID:0x1F4700 Size: 4096KB (32768Kb)

AT26DF321 ID:0x1F4700 Size: 4096KB (32768Kb)

--- Flash Image Information --

Signature: VALID

Number of Flash Components: 2

Component 1 - 4096KB (32768Kb)

Component 2 - 4096KB (32768Kb)

Regions:

Descriptor - Base: 0x000000, Limit: 0x000FFF

BIOS - Base: 0x600000, Limit: 0x7FFFFFFF

TXE - Base: 0x003000, Limit: 0x5FFFFFFF

PDR - Not present

Master Region Access:

CPU/BIOS - ID: 0x0000, Read: 0xFF, Write: 0xFF

TXE - ID: 0x0000, Read: 0xFF, Write: 0xFF



Used Space: 8192KB, Actual Space: 8192KB

FPT Operation Passed

This command displays information about the flash devices present in the computer. The base address refers to the start location of that region and the limit address refers to the end of the region. If the flash device is not specified in **fparts.txt**, FPT returns the error message "There is no supported SPI flash device installed".

#### 4.10.7 Verify Image with Errors

```
fptw.exe -verify outimage.bin
```

EFI:

```
fpt.efi -verify outimage.bin
```

```
-----
Intel(R) Flash Programming Tool. Version:  x.x.x.xxxx
Copyright (c) 2007-2014, Intel Corporation. All rights reserved.
Platform: Intel(R) Atom Zxxxx
Reading HSFSTS register... Flash Descriptor: Valid
--- Flash Devices Found ---
      W25Q64BV      ID:0xEF4017      Size: 8192KB (65536Kb)
RESULT: Data does not match!
[0x00000000] Expected 0x5A, Found: 0x5A
[0x00000001] Expected 0xA5, Found: 0xA5
Total mismatches found in 64 byte block: 2
Error 204: Data verify mismatch found at address 0x000
```

This command compares the Intel® Trusted Execution Engine (Intel® TXE) region programmed on the flash with the specified FW image file **outimage.bin**. If the **-y** option is not used; the user is notified that the file is smaller than the binary image. This is due to extra padding that is added during the program process. The padding can be ignored when performing a comparison. The **-y** option proceeds with the comparison without warning.

#### 4.10.8 Verify Image Successfully

```
fptw.exe -verify outimage.bin
```

EFI:

```
fpt.efi -verify outimage.bin
```

```
-----
Intel (R) Flash Programming Tool. Version:  x.x.x.xxxx
Copyright (c) 2007-2014, Intel Corporation. All rights reserved.

Platform: Intel(R) Atom Zxxxx
Reading HSFSTS register... Flash Descriptor: Valid

      --- Flash Devices Found ---
      AT26DF321 ID:0x1F4700      Size: 4096KB (32768Kb)
      AT26DF321 ID:0x1F4700      Size: 4096KB (32768Kb)

- Verifying Flash [0x800000] 8192KB of 8192KB - 100% complete.
RESULT: The data is identical.
```



FPT Operation Passed

This command compares **image.bin** with the contents of the flash. Comparing an image should be done immediately after programming the flash device. Verifying the contents of the flash device after a system reset results in a mismatch because Intel® Trusted Execution Engine (Intel® TXE) changes some data in the flash after a reset.

#### 4.10.9 Get Intel® Trusted Execution Engine (Intel® TXE) Settings

fptw.exe -r "Power Package 1".

```
-----
Intel (R) Flash Programming Tool. Version:  x.x.x.xxxx
Copyright (c) 2007-2014, Intel Corporation. All rights reserved.
Platform: Intel(R) Cherry Trail Platform
Reading HSFSTS register... Flash Descriptor: Valid
--- Flash Devices Found ---
      W25Q64BV      ID:0xEF4017      Size: 8192KB (65536Kb)
Variable: "Power Package 1"
Value: True / 01
Retrieve Operation: Successful
```

**Note:** Only -r (get command) supports the -hashed optional command argument. When -hashed is used, variable value will be returned in hashed format, otherwise it will be returned in clear txt. There are a few exceptions in the case of PID and PPS, their value will be always returned in hashed format regardless -hashed is used or not. This is primarily because of security concern.

#### 4.10.10 Compare Intel® Trusted Execution Engine (Intel® TXE) Settings

FPT -verbose -compare vars.txt compares variables with suggested values in vars.txt, and report result on the screen. Vars.txt can have the following data with verbose information: FPT -VARS can be used to get the VAR list for the platform and get the value/format from FITC advanced mode. There are settings in the ME which are stored encrypted. Users will not be able to compare them using clear text values. Use FPT -R option to read the hash value of those settings and use them as baseline for the expected value.

```
"OEMSKURule" = EF DC EE 0F
"OEM_TAG" = 78 56 34 12
"Debug Si Features" = 00 00 00 00
"Prod Si Features" = 00 00 00 00
"TXEI TXE Region Unlockable" = True
"Sub System Vendor ID" = 00 00
"FW Update OEM ID" = 12345678-AABB-CCDD-EEFF-55AA11223344
"PROC_MISSING" = No onboard glue logic
"PAVP Permanently Disabled?" = No
"Intel(R) Anti-Theft Technology Permanently Disabled?" = No
"BIOS Reflash Capable" = False
"Boot into BIOS Setup Capable" = False
"Pause during BIOS Boot Capable" = False
"Host Based Setup and Configuration" = True
"Allow Unsigned Assert Stolen" = False
"Intel(R) Anti-Theft BIOS Recovery Timer" = Disabled
```



"ODM ID used by Intel(R) Service" = <hashed value>

#### 4.10.11 FOV Configuration File Generation (-cfggen)

It creates an input file which can be used to update multiple (any or all) FOV's. The file includes all the current FOV's. When creating the file, it extracts the fixed offset variables from flash.

**Note:** The file generated will change every time the list of FOV's changes.

fptw.exe -cfggen [ -o <Output Text File> ][ options ]

< none >	Creates an input file which can be modified to update multiple FOVs. If no output file name is provided, the default "FPT.cfg" file will be created.
-o <Output File Name>	The desired name of the file generated. If none is provided the default, fpt.cfg, will be used.
-p < file name >	Alternate SPI Flash Parts list file.
-page	Pauses at screen / page / window boundaries. Hit any key to continue.
-Verbose [<file name>]	Displays more information.
-y	Will not pause to user input to continue

Example FPT.CFG output:

```
;
; Flash Programming Tool FOV Programming File
;
; Any entry that is not included, or does not have a value
; following the label will not be updated.
;
; Comments can be added by using a ';' as the first entry
; on the line.
;
; For further explanation of the required inputs see the
; System Tools User Guide.doc
;
; Any entries, FOVs that are displayed with values
; indicates that the FOV has already been given a value,
; but has not yet been committed. Entries without values
; indicates that the FOV has not been written, at least
; since the system reset or use of the '-commit' command.
;
OEMSKURule =
    PAVP =
    OEM_TAG =
    ODM_ID =
    SystemIntegratorId =
    ReservedId =
```

§



## 5 Intel® TXEManuf

---

Intel TXEManuf validates Intel® Trusted Execution Engine (Intel® TXE) functionality on the manufacturing line. It does not check for LAN functionality as it assumes that all Intel® Trusted Execution Engine (Intel® TXE) components on the test board have been validated by their respective vendors. It does verify that these components have been assembled together correctly.

The Windows\* version of Intel TXEManuf (Intel TXEMANUFWIN) requires administrator privileges to run under Windows\* OS. The user needs to use the **Run as Administrator** option to open the CLI in Windows\* 8 64/32 bit, Windows\* 8 SoC.

Intel TXEManuf validates all components and flows that need to be tested according to the FW installed on the platform to ensure the functionality of Intel® Trusted Execution Engine (Intel® TXE) applications: BIOS-FW, Flash, SMBus. This tool is meant to be run on the manufacturing line.

### 5.1 Windows\* PE Requirements

For tools to work under the Windows\* PE environment, you must manually load the driver with the .inf file in the Intel® Trusted Execution Engine Interface (Intel® TXEI) driver installation files. Once you locate the .inf file you must use the Windows\* PE cmd `drvload ipc.inf` to load it into the running system each time Windows\* PE reboots. Failure to do so causes errors for some features.

### 5.2 How to use Intel TXEMANUF

Intel TXEMANUF checks the FW SKU and runs the proper tests accordingly unless an option to select tests is specified.

Intel TXEMANUF is intelligent enough to know if it should run the test or report a result. If there is no test result available for an Intel® Trusted Execution Engine (Intel® TXE) enabled platform, TXEMANUF calls the test. Otherwise, it reports the result or the failure message from the previous test.

Intel TXEMANUF tools report the result or cause a reboot. If there is a reboot, Intel TXEMANUF should be run again. **VSCC.COMN.bin** is required to verify the VSCC entry on the platform. This file must be in same folder as the TXEMANUF executable or TXEMANUF reports an error. **ISHLib.dll** is required to verify ISS self test and functionality on the platform. This file must be in same folder as the TXEMANUF executable or TXEMANUF reports an error.

### 5.3 Usage

The UEFI version of the tool can be operated using the same syntax as the Windows\* version. The Windows\* version of the tool can be executed by:



TXEManufWin.exe [-EXP] [-H|?] [-VER] [-S0] [-F] [-TEST]  
 [-EOL] [-CFGGEN] [-VERBOSE] [-PAGE] [-NONFC]  
 [NFC] [-NOISH] [-ISH]

**Table 15. Tool Options**

Option	Description
No option	<p>There are differences depending on the firmware SKU type the system is running on:</p> <p>If BIST test result is not displayed after BIST test is done, the tool needs to be run again (with or without any BIST related argument combinations) to retrieve the result, once test result is displayed, it will be cleared.</p> <p>Tool is capable of remembering whether/what tests (including host based tests) have been run from previous invocation. Host based tests will be run for all cases (whether it's retrieving test result or run the actual BIST). Currently there is one host based tests which is VSCC Table validation check.</p> <p>When using –verbose, TXEManuf displays the list of all the tests that have been run and retrieved.</p>
-EXP	Shows examples of how to use the tools.
-H or -?	Displays the help screen.
-VER	Shows the version of the tools.
-S0	The same as No option, except that there is no power reset/hibernation performed at the end of the BIST test. The test result is reported back right after the test is done and cleared.
-F <filename>	Load customer defined .cfg file.
-TEST <level>	Run full test.
-EOL <Var Config> -F <filename>	<p>This option runs several checks for the use of OEMs to ensure that all settings and configurations have been made according to Intel requirements before the system leaves the manufacturing process. The check can be configured by the customer to select which test items to run and their expected value (only applicable for Variable Values, FW Version, and BIOS Version). The sub option config or var is optional. Using –EOL without a sub option is equivalent to the –EOL config.</p> <p>When –f flag is used along with a file name, the tool will load the file as the configuration file, instead of using TXEManuf.cfg.</p>
-CFGGEN <filename>	<p>Use this option along with a filename to generate a default configuration file. This file (with or without modification) can be used for the –EOL option. Rename it <b>TXEManuf.cfg</b> before using it. It is highly recommended to use this option to generate a new <b>TXEManuf.cfg</b> with an up-to-date variable names list before using the Intel TXEManuf End-Of-Line check feature.</p>
-VERBOSE <file>	Displays the debug information of the tool or stores it in a log file.
–PAGE	When it takes more than one screen to display all the information, this option lets the user pause the display and then press any key to continue on to the next screen.
-NONFC	Skip NFC Test in full/runtime tests.



Option	Description
-NFC	Force NFC Test in full/runtime tests.
-NOISH	Skip ISS tests.
-ISH <command> <options>	Triggers the ISS test. Where command include: -h ?: help information -Test <Level>: execute selftest -EXP: valid command line example Where options include: -page : enable paging output -verbose: enable verbose output  Test level varies (0,1,2,3) Level 0 - ISS FW aliveness test. Level 1 - Level 0 test + connectivity test. Level 2 - Level 1 test + calibration test. Level 3 - Level 2 + Sensor BIT for each sensor that supports build-in selftest. If a sensor does not have a BIST support and the requested level is 3 the FW shall run level 0 to 2 test instead and return a warning that this sensor does not support self test if applicable.

### 5.3.1 Host Based Tests

TXE/BIOS VSCC validation, Intel TXEManuf verifies that flash SPI ID on the system is described in VSCC table. If found, VSCC entry for relevant SPI part should match the known good values that pre-populated in the file.

Intel® Trusted Execution Engine (Intel® TXE) state check, Intel TXEManuf verifies Intel® Trusted Execution Engine (Intel® TXE) is in normal state. This is done by checking the value of 4 fields (initialization state, mode of operation, current operation state, and error state) in FW status register1. If any of these fields indicates Intel® Trusted Execution Engine (Intel® TXE) is in abnormal state, Intel TXEManuf will report error without running BIST test.

### 5.3.2 ISS Manufacturing Tests

On the top of TXE related test, TXEManuf is recommended tool for production testing of ISS firmware provided by Intel.

It support ISS firmware aliveness tests, Algorithm sanity check, sensor connectivity, and 2nd level diagnostic which is Sensor part BIST.

Unless option specify otherwise, TXEManuf detect which is installed, detected which firmware features are enabled and runs only the appropriate tests.

With TXEManuf -h, you will refer all the options for ISS.



Figure 25. TXEManuf for ISS

```

Usage: -ISH [-command] [-options]
where command includes:
-h!?      : Help information
-Test <Level> : Execute self test
-EXP      : Valid command line example

where options include:
-Page     : Enable paging output
-Verbose  : Enable verbose output

```

Table 16. ISS Tests List

Option	Description
-ISH	Runs only the ISS tests. (without the other TXEManuf tests) From ISS perspective, this is equivalent to -ISH Test 1
-ISH EXP	Prints an example for usage of ISS TXEManuf command line
-ISH Test <Level>	<p>Run a specific ISS Test, Level is an integer parameter:  Level 0 = Test basic aliveness.  Level 1 = Level 0 + Basic connectivity to each sensor  Level 2 = Level 1 + Calibration check for sensor that must have calibration.  Level 3 = Level 2 + Sensor BIST for each sensor that support BIST.</p> <p><b>NOTE:</b> This is vendor specific and may not be supported.  If devices do not support BIST, the ISS firmware shall run Level 0-2 test only.</p> <p><b>NOTE:</b>  Level 0 - Aliveness only</p> <ul style="list-style-type: none"> <li>· Not check anything in the HW.</li> <li>· Check only sensors dependency by SW</li> <li>· Every virtual sensor knows that he depends on physical or other virtual sensors so this test check that all mandatory sensors that it depends on are configured in HDT.</li> </ul> <p>Level 1 – Connectivity</p> <ul style="list-style-type: none"> <li>· HW Checking against the physical sensors</li> <li>· the udriver working physically with the sensor by running self-test function to basically verify connection to expected behavior</li> </ul> <p>Level2 – Calibration</p> <ul style="list-style-type: none"> <li>· Every physical sensor required calibration data</li> <li>· This test check that every sensor that require calibration data has its own calibration data (configured in SDT tables)</li> <li>· The test performed by checking that calibration data length in PDT &gt; 0</li> </ul> <p>Level3 – Self test by Sensor</p> <ul style="list-style-type: none"> <li>· Advanced test for physical sensor that can be implemented by udriver. This test depends on the udriver self-test implementation.</li> </ul>
-Page	Enable paging output when option includes it.



Option	Description
-Verbose	Enable verbose output when option includes it.

## 5.4 Intel TXEMANUF –EOL Check

TXEMANUF –EOL check is introduced in the Cherry Trail SoC Family platform to give customers the ability to check Intel® Trusted Execution Engine (Intel® TXE)-related configuration before shipping. There are two sets of tests that can be run: variable check and configuration check. Variable check is very similar as FPT –compare option.

### 5.4.1 TXEMANUF.cfg File

The **TXEMANUF.cfg** file includes all the test configurations for TXEMANUF –EOL check. It needs to be at the same folder that TXEMANUF is run. If there is no **TXEMANUF.cfg** file on that folder, TXEMANUF –EOL config runs the Intel recommended default check only.

Here is an example of the **TXEMANUF.cfg** file:

```
// The end-of-line checks are broken into two categories. One is
// Variable Check, and the other is Configuration Check. If either
// of these check fails, by default TXEManuf will report error and
// continue on to the next check. If a user doesn't wish to continue
// when an error is found, ErrAction field can be used. Please see
// the examples here for detailed explanation:
//
//     SubTestName="TXE VSCC check", ErrAction="ErrorStop"
//
// If the above test fails, TXEManuf will report error and stop. There
// are total of three different error actions user can choose from:
//
// ErrorContinue - report error and continue on to the next check
// ErrorStop - report error and stop any check after the current one
// WarnContinue - report warning and continue on to the next check
//
// To add comment or take out a specific test, leave // at the start
// of a line. This file is processed by TXEManuf line by line as text
// file. Duplication of the same sub-tests are allowed, but TXEManuf
// will always perform the last test to the first test from the file.

// All string comparisons given in this file are case insensitive
// compare. There might be multiple field name/value pairs in one
// entry, but each field needs to be specified in the following
// format where <field name> can be replaced by SubTestName, ReqVal
// or ErrAction, <field value> can be replaced by any string including
// dash and/or spaces surrounded by double quotation marks, or hex-
// decimal number(s) that not surrounded by double quotation marks.
// In case of numeric value, each value (without 0x prefix) needs to
// be specified in byte and eliminated by spaces if there are multiple
// bytes. No line Wrapping is supported:
//
//     <field name>=<field value>", such as ReqVal=" ", or
//     <field name>=<numeric value>, such as ReqVal=78, or
//     <field name>=<numeric value>, such as ReqVal=01 0A 0F FE 7B CD
```



```

////////////////////////////////////
////
// Intel recommends default end-of-line checks includes the following
// list. If a user chooses to use his/her own version of TXEManuf.cfg
// to skip or modify the error action of these checks as WarnContinue,
// TXEManuf will report failure with warnings when these checks are
// skipped,
// or have errors. It's suggested that a user should perform these
// Intel(R)
// recommended check on all type of SKUs.

SubTestName="EOP status check"
SubTestName="TXE VSCC check"
SubTestName="BIOS VSCC check"
SubTestName="TXE Manufacturing Mode status"
SubTestName="Flash Region Access Permissions"
SubTestName="CF9GR lock check"
SubTestName="FPF Global Valid bit check"
// SubTestName="Security Descriptor Override (SDO) check"
// SubTestName="Validate Keybox Provisioning"

////////////////////////////////////
////
// The following Configuration Check requires a user to enter an expected
// value after ReqVal=, otherwise the lines without ReqVal field values
// will
// be ignored.
//
// Please note that GBE version check will be skipped if Intel Gbe region
// is not present in SPI image.
//
// TXE FW version is a string as <major ver>.<minor ver>.<hotfix
// ver>.<build num>
// GBE version is a string as <major ver>.<minor ver>.<revision ver>
// BIOS version is string that vendor specific
////////////////////////////////////
////

// SubTestName="TXE FW version", ReqVal=
// SubTestName="BIOS version", ReqVal=
// SubTestName="OEM Public Key Hash FPF", ReqVal=
// SubTestName="Perform Secure Boot FPF", ReqVal=
// SubTestName="Key Manifest ID FPF", ReqVal=
// SubTestName="PTT FPF", ReqVal=
// SubTestName="Alternative BIOS Limit FPF", ReqVal=
// SubTestName="OEM Unique Device ID FPF", ReqVal=

////////////////////////////////////
// Variable Check - user needs to put an expected value after ReqVal,
// otherwise the lines without ReqVal field values will be ignored
//
// There are variables that stored in encrypted format. When comparing
// with these variables, ReqVal can only specified as numeric values
// (in encrypted form) in byte order as mentioned above. ReqVal needs
// to be surrounded by double quotation marks if they are string input.
//
// To get an up-to-dated TXEManuf.cfg with a complete variable names
// list,
// please run TXEManuf -cfggen <filename>. Please note that variables
// that have # need to be replace by a number. Here defines the number:

```



```
//
// Note: The '#' for hash variables should be replaced with an entry
//       index.
//       The valid range is 0 to 22.
//
// !!! Please be sure to disable sending EOP or leave platform in ME
// !!! manufacturing mode to run this test, otherwise TXEManuf will
// !!! report failure because this feature is only available in factory
// !!! mode environment.
////////////////////////////////////

// SubTestName="Allow Unsigned Assert Stolen", ReqVal=
// SubTestName="FeatureShipState", ReqVal=
// SubTestName="Flash Protection Override Policy Hard", ReqVal=
// SubTestName="Flash Protection Override Policy Soft", ReqVal=
// SubTestName="FW Update OEM ID", ReqVal=
// SubTestName="Intel (R) Anti-Theft BIOS Recovery Timer", ReqVal=
// SubTestName="Intel (R) Anti-Theft Technology Permanently Disabled?",
ReqVal=
// SubTestName="Intel (R) Dynamic Application Loader Permanently
Disabled?", ReqVal=
// SubTestName="Near Field Communication Enabled", ReqVal=
// SubTestName="Near Field Communication I2C Address", ReqVal=
// SubTestName="ODM ID used by Intel (R) Services", ReqVal=
// SubTestName="OEM_TAG", ReqVal=
// SubTestName="OEMSKURule", ReqVal=
// SubTestName="PAVP Permanently Disabled?", ReqVal=
// SubTestName="Permit Period Timer Resolution", ReqVal=
// SubTestName="Reserved ID used by Intel (R) Services", ReqVal=
// SubTestName="System Integrator ID used by Intel (R) Services", ReqVal=
// SubTestName="TXEI TXE Region Unlockable", ReqVal=
```

Lines which start with // are comments. They are also used to inform users of the available test group names and the names of specific checks that are included in each test that Intel TXEManuf recognizes.

**To select, which test items to run:** Create a line that begins with SubTestName="<specific sub test name>".

Here are some other examples that explain how to use this feature:

- To run an Intel TXE version check defined under "Platform Configuration Checkings", a valid Intel TXE version should be equal to string 2.0.0.1008:

```
SubTestName="TXE version", ReqVal="2.0.0.1008"
```

**Note:** When running Widevine manufacturing flow, uncomment SubTestName "Validate Keybox Provisioning" from proper EOL testing.

## 5.4.2 TXEMANUF –EOL Variable Check

**TXEMANUF –EOL var** check is designed to check the Intel® Trusted Execution Engine (Intel® TXE) settings on the platform before shipping. To minimize the security risk in exposing this in an end-user environment, this test is only available in Intel® Trusted Execution Engine (Intel® TXE) manufacturing mode or No EOP Message Sent.



**Note:** -EOL var check. The system must be in Intel® Trusted Execution Engine (Intel® TXE) manufacturing mode when -EOL var check is run or No EOP Message Sent.

### 5.4.3 TXEMANUF –EOL Config Check

**TXEMANUF –EOL Config** check is designed to check the Intel® Trusted Execution Engine (Intel® TXE)-related configuration before shipping. Running Intel-recommended tests before shipping is highly recommended.

**Table 17. TXEMANUF - EOL Config Tests**

Test	Expected Configuration
EOP status check	Enabled
Intel® Trusted Execution Engine (Intel® TXE) VSCC check	Set according to the Intel-recommended value.
BIOS VSCC check	Set according to the Intel-recommended value.
Intel® Trusted Execution Engine (Intel® TXE) Manufacturing Mode status	Disabled
Flash Region Access Permissions	Set according to the Intel-recommended value.
CF9GR lock check	Locked
FPF Global Valid bit check	Set
Flash Descriptor Security Override (FDSO) check (GPIO_SUS[5])	Disabled
Validate Keybox Provisioning	Not Provisioned (only Provisioned for Android* platform)
<b>NOTE:</b> –EOL Config check. If the system is in Intel® Trusted Execution Engine (Intel® TXE) manufacturing mode when –EOL Config check is run there will be an error report or No EOP Message Sent.	

### 5.4.4 Output/Result

The following test results can be displayed at the end-of-line checking:

- Pass – all tests passed.
- Pass with warning – all tests passed except the tests that were modified by the customer to give a warning on failure. (This modification does not apply to Intel-recommended tests.
- Fail with warning - all tests passed except some Intel-recommended tests that were modified by the customer to give a warning on failure.
- Fail - any customer-defined error occurred in the test.



## 5.5 Examples

### 5.5.1 TXEMANUF Running on a Full Image with Some BIST Failures Intel® Trusted Execution Engine (Intel® TXE) FW Platform

```
TXEMANUF -verbose
```

```
Intel(R) TXEManuf Version: 2.0.0.1003
Copyright(C) 2007 - 2014, Intel Corporation. All rights reserved.
```

```
FW Status Register1: 0x1F0000D5
FW Status Register2: 0x60000000
```

CurrentState:	Normal
ManufacturingMode:	Enabled
TXEMemoryInvalid:	Valid
OperationalState:	Power Gated
InitComplete:	Initializing
BUPLoadState:	Success
ErrorCode:	No Error
ModeOfOperation:	Normal
Phase:	HOSTCOMM Module

```
Get FWU info command...done
```

```
Get FWU version command...done
```

```
Get FWU feature state command...done
```

```
Get TXE FWU platform type command...done
```

```
Get TXE FWU feature capability command...done
Feature enablement is 0xA0101060
gFeatureAvailability value is 0x1
Intel(R) TXEI device is found to be disabled
```

```
Request Intel(R) TXE test result command...done
```

```
TXE initialization state valid
TXE operation mode valid
Current operation state valid
TXE error state valid
Verifying FW Status Register1...done
```

```
Request Intel(R) TXE test result command...done
vsccommn.bin was created on 18:45:07 03/11/2013 GMT
SPI Flash ID #1 TXE VSCC value is 0x2025
SPI Flash ID #1 (ID: 0xEF6017) TXE VSCC value checked
```

```
Error 9271: Flash ID 0xEF6017 Intel(R) BIOS VSCC value mismatch
Programmed value of 0x2005 doesn't match the recommended value of
0x2025
See PCH SPI programming Guide for more details
FPBA value is 0x0
```



Request Intel(R) TXE Runtime BIST test command...done

Get Intel(R) TXE test data command...done

Total of 4 Intel(R) TXE test result retrieved

MicroKernel - Internal Hardware Tests: Internal Hardware Tests -  
Passed

NFC - General: NFC basic configuration - Passed

NFC - General: I2C connection - Passed

NFC - General: Reset pin - Failed

Error 9372: NFC reset pin failure. Check physical reset pin  
connection.

Clear Intel(R) TXE test data command...done

Error 9296: TXEManuf Test Failed

§



## 6 Intel® TXEInfo

Intel® TXEInfoWin and Intel® TXEInfo provide a simple test to check whether the Intel® Trusted Execution Engine (Intel® TXE) FW is alive or not. Both tools perform the same test; query the Intel® Trusted Execution Engine (Intel® TXE) FW and retrieve data.

It contains a list of the data that each tool returns.

The Windows\* version of TXEInfo (TXEInfoWin) requires administrator privileges to run under Windows\* OS. The user needs to use the **Run as Administrator** option to open the CLI in Windows\* 8 64/32 bit and Windows\* 8 SoC.

TXEInfoWin and Intel TXEInfo serve two purposes:

- It provides a means by which the Intel® Trusted Execution Engine (Intel® TXE) functionality can be determined (if it is “alive”).
- It displays a variety of information about the Intel® Trusted Execution Engine (Intel® TXE) and Intel® Trusted Execution Engine (Intel® TXE) components including versions, capabilities, and functionality.

### 6.1 Windows\* PE Requirements

In order for tools to work under the Windows\* PE environment, you must manually load the driver with the .inf file in the Intel® Trusted Execution Engine Interface (Intel® TXEI) driver installation files. Once you locate the .inf file you must use the Windows\* PE cmd `drvload ipc.inf` to load it into the running system each time Windows\* PE reboots. Failure to do so causes errors for some features.

**ISHLib.dll** is required to verify ISS functionality on the platform. This file must be in same folder as the TXEInfo executable or TXEInfo reports an error.

### 6.2 Usage

The executable can be invoked by:

```
TXEInfoWin.exe [-EXP] [-H|?] [-VER] [-FEAT] [-VALUE]
               [-FWSTS][-VERBOSE] [-PAGE] [-PID] [-DUMPIDLM] [-NOISH] [-ISH]
```

```
TXEInfo.efi [-EXP] [-H|?] [-VER] [-FEAT] [-VALUE]
             [-FWSTS][-VERBOSE] [-PAGE] [-PID] [-DUMPIDLM] [-NOISH] [-ISH]
```

**Table 18. Intel® TXEInfo Command Line Options**

Option	Description
No option:	If the tool is invoked without parameters, it reports information for all components listed in Table 19 below.





Option	Description
-EXP	Shows examples about how to use the tools.
-H or -?:	Displays the list of command line options supported by the Intel® TXEInfo tool.
-VER	Shows the version of the tools.
-FEAT <value>	<p>Retrieves the current value for the specified feature. If the feature name is more than one word, the entire feature name must be enclosed in quotation marks. The feature name entered must be the same as the feature name displayed by Intel TXEInfo.</p> <p>Intel TXEInfo can retrieve all of the information detailed below. However, depending on the SKU selected, some information may not appear.</p> <p>&lt;value&gt; supported in CHT/BSW platform are:</p> <ul style="list-style-type: none"> <li>- "ISH Status"</li> <li>- "FW Status"</li> <li>- "ISH Module"</li> <li>- "ISH Extended Modules FW Versions"</li> <li>- "HECI Driver Version"</li> <li>- "PCI Bus Driver Version"</li> <li>- "ISH Driver Version"</li> <li>- "ISH Sensor Info"</li> </ul>
-VALUE <value>	Compares the value of the given feature name with the value in the command line. If the feature name or value is more than one word, the entire name or value must be enclosed in quotation marks. If the values are identical, a message indicating success appears. If the values are not identical, the actual value of the feature is returned. Only one feature may be requested in a command line.
-FWSTS	<p>Decodes the Intel® Trusted Execution Engine (Intel® TXE) FW status register value field and breaks it down into the following bit definitions for easy readability:</p> <pre> FW Status Register1: 0x1F000255 FW Status Register2: 0x69000004 CurrentState:      Normal ManufacturingMode: Enabled TXEMemoryInvalId: Valid OperationalState:  M0 with UMA InitComplete:      Complete BUPLoadState:      Success ErrorCode:          No Error ModeOfOperation:   Normal Phase:              HOSTCOMM module </pre>
-VERBOSE <filename>	<p>Turns on additional information about the operation for debugging purposes. This option has to be used together with the above mentioned option(s). Failure to do so generates the error: "Error 9254: Invalid command line option".</p> <p>This option works with no option and -feat.</p>
-PAGE	When it takes more than one screen to display all the information, this option lets the user pause the display and then press any key to continue on to the next screen.
-PID <filename>	Append/Export Platform ID to the binary file.



Option	Description
- DUMPIDLM<filename>	Displays Platform ID list in an IDLM binary.
-NOISH	Do not display any information related to ISH.
-ISH <command> <options>	Display ISH information Where command include: -SensorInfo: sensor information h ?: help information -FWStat: ISS FW status -EXP: valid command line example Where options include: -page : enable paging output -verbose: enable verbose output

Table 19. Components Lists Displayed in Intel® TXEInfo

Feature Name	Feature Data Source	Supported SKUs	Supported OS	Specific Feature Dependency	Field Value
Tools Version	SW (TXEInfo)	Both	All	N/A	Version string Example: 2.x.y.ZZZZ; where x=minor, y = HF/MR, ZZZZ = Build Number.
FWSTS	Intel® Trusted Execution Engine (Intel® TXE) Kernel	Both	All	N/A	Two 32bit Hexadecimal numbers and their bit definition breakdown (only available when – verbose is used).
IAFW Version	BIOS/ Intel® Trusted Execution Engine (Intel® TXE) Kernel	Both	All	N/A	A Version string
VendorID	Intel® Trusted Execution Engine (Intel® TXE) Kernel	Both	All	N/A	A number (in Hex)
SoC Version	Intel® Trusted Execution Engine (Intel® TXE) Kernel	Both	All	N/A	A Version string.
FW Version	Intel® Trusted Execution Engine (Intel® TXE) Kernel	Both	All	N/A	A Version string 2.x.y.ZZZZ; where x=minor, y = HF/MR, ZZZZ =



Feature Name	Feature Data Source	Supported SKUs	Supported OS	Specific Feature Dependency	Field Value
					Build Number.
TXEI Driver Version	Intel® Trusted Execution Engine (Intel® TXE) Kernel	Both	All	NA	A version string.
NFC Firmware Version	NFC GUID	Both	All	NA	A version string. If NFC HW device is not found/accessible, display "Not Available".
NFC Radio Type	NFC	Both	All	NA	A version string. If NFC HW device is not found/accessible, display "Not Available".
FW Capabilities	Intel® Trusted Execution Engine (Intel® TXE) Kernel	Both	All	N/A	Combination of feature name list breakdown (with a Hexadecimal value). *This is a display of the Feature State for the Intel® Trusted Execution Engine (Intel® TXE). Is enabled / disabled on the system. Each bit in the value represents a feature state. Intel® Trusted Execution Engine (Intel® TXE) features including PTT and Anti-theft technology so on.



Feature Name	Feature Data Source	Supported SKUs	Supported OS	Specific Feature Dependency	Field Value
Last Intel® Trusted Execution Engine Interface (Intel® TXEI) Reset Reason	Intel® Trusted Execution Engine (Intel® TXE) Kernel	Both	All	N/A	Power up/ Firmware reset/ Global system reset/ Unknown
Local FWUpdate	Intel® Trusted Execution Engine (Intel® TXE) Kernel	Both	All	N/A	Enabled/Disable/ Password Protected.
BIOS Config Lock	Other (Directly reading from SPI)	Both	All	N/A	Enabled/Disabled/ Unknown.  If shown as enabled, FLOCKDN for BIOS is set.  If shown as disabled, FLOCKDN for BIOS is not set.
Host Read Access to Intel® Trusted Execution Engine Interface (Intel® TXEI)	Other (Directly reading from SPI)	Both	All	N/A	Enabled/Disabled/ Unknown.
Host Write Access to Intel® Trusted Execution Engine Interface (Intel® TXEI)	Other (Directly reading from SPI)	Both	All	N/A	Enabled/Disabled/ Unknown.
SPI Flash ID	Other (Directly reading from SPI)	Both	All	Only when there are flash parts HW installed.	A JEDEC ID number (in Hex).
TXE/BIOS VSCC register values	Other (Directly reading from SPI)	Both	All	Only when there are flash parts HW installed.	A 32bit VSCC number (in Hex).
BIOS Boot State	Intel® Trusted Execution Engine (Intel® TXE) Kernel	Both	All	N/A	Pre Boot/ In Boot/ Post Boot.
OEM Id	Intel® Trusted Execution Engine (Intel® TXE) Kernel	Both	All	Only if fw image supports OEM Id.	UUID for OEM to check during FW Update.



Feature Name	Feature Data Source	Supported SKUs	Supported OS	Specific Feature Dependency	Field Value
OEM Tag	Intel® Trusted Execution Engine (Intel® TXE) Kernel	Both	All	N/A	A 32bit Hexadecimal number.
Global Valid FPF	Intel® Trusted Execution Engine (Intel® TXE) Kernel/FPF	Both	All	N/A	Valid/Invalid.
PTT FPF	Intel® Trusted Execution Engine (Intel® TXE) Kernel/FPF	Both	All	N/A	Enabled/Disabled.
Perform Secure Boot FPF	Intel® Trusted Execution Engine (Intel® TXE) Kernel/FPF	Both	All	N/A	Enabled/Disabled.
OEM Public Key Hash FPF	Intel® Trusted Execution Engine (Intel® TXE) Kernel/FPF	Both	All	N/A	A 32 byte number (in Hex).
Key Manifest ID FPF	Intel® Trusted Execution Engine (Intel® TXE) Kernel/FPF	Both	All	N/A	A 8bit number (in Hex).
Alternative BIOS Limit FPF	Intel® Trusted Execution Engine (Intel® TXE) Kernel/FPF	Both	All	N/A	A 16bit number (in Hex).
OEM unique Device ID FPF	Intel® Trusted Execution Engine (Intel® TXE) Kernel/FPF	Both	All	N/A	A 64bit number (in Hex)
Secure Boot Status	Intel® Trusted Execution Engine (Intel® TXE) Kernel/FPF	Both	All	N/A	Not Executed/ Executed.
Secure Boot Recovery Status	Intel® Trusted Execution Engine (Intel® TXE) Kernel	Both	All	N/A	Not Executed/ Executed.
PTT Lockout Override	Intel® Trusted Execution	Both	All	N/A	A Number



Feature Name	Feature Data Source	Supported SKUs	Supported OS	Specific Feature Dependency	Field Value
Counter	Engine (Intel® TXE) Kernel				
Keybox	Other (Directly reading from SPI)	Both	All	N/A	Not Provisioned/ Provisioned.

## 6.3 Examples

This is a simple test that indicates whether the FW is alive. If the FW is alive, the test returns device-specific parameters. The output is from the Windows\* version.

### 6.3.1 Dump Full Detail Info about Intel® Trusted Execution Engine (Intel® TXE) and its Application Feature Values

```
TXEINFOWIN.exe
```

```
Intel(R) TXEInfo Version: 2.0.0.1003
```

```
Copyright(C) 2007 - 2014, Intel Corporation. All rights reserved.
```

```
Intel(R) TXE code versions:
```

```
BIOS Version: Alpha 1.04
```

```
VendorID: 8086
```

```
SOC Version: 5
```

```
FW Version: 2.0.0.1057
```

```
TXEI Driver Version: 2.0.0.1054
```

```
Get NFC Versions command...done
```

```
NFC FW Version: 2.10
```

```
NFC Radio Type: NXP
```

```
FW Capabilities: 0xA0101060
```

```
Intel(R) Anti-Theft Technology - PRESENT/ENABLED
```



```
Intel(R) Capability Licensing Service - PRESENT/ENABLED
```

Protect Audio Video Path - PRESENT/ENABLED

```
Intel(R) Dynamic Application Loader - PRESENT/ENABLED
```

Intel(R) NFC Capabilities - PRESENT/ENABLED

Last TXE reset reason: Power up

Local FWUpdate: Enabled

```
Get BIOS flash lockdown status...done
```

```
BIOS Config Lock:                               Enabled
```

```
Get flash master region access status...done
```

Host Read Access to TXE: Enabled

Host Write Access to TXE: Enabled

SPI Flash ID #1: EF6017

SPI Flash ID VSCC #1: 20252025

```
SPI Flash BIOS VSCC:                20052005
```

BIOS boot State: Post Boot

OEM Id: 00000000-0000-0000-0000-000000000000

Capability Licensing Service: Enabled

```
Get TXE FWU OEM Tag command...done
```

OEM Tag: 0x00000000

Global Valid FPF: Valid

PTT FPF: Enabled

```
Perform Secure Boot FPF:           Enabled
```

[illegible]

Key Manifest ID FPF: 00

Alternative BIOS Limit FPF: 07DF

```
Secure Boot Status:                               Not Executed
```



Secure Boot Recovery Status: Not Executed  
PTT Lockout Override Counter: 10

### 6.3.2 Retrieve Current Value of Flash Version

```
C:\> TXEInfoWin.exe -feat "BIOS boot state"

Intel(R) TXEInfo Version: 2.0.0.1003

Copyright(C) 2007 - 2014, Intel Corporation. All rights reserved.

BIOS boot State: Post Boot

> TXEInfo.efi -feat "BIOS boot state"

Intel(R) TXEInfo Version: 2.0.0.1003

Copyright(C) 2005 - 2012, Intel Corporation. All rights reserved.

BIOS boot State: Post Boot
```

### 6.3.3 Check if Computer has Completed Setup and Configuration Process

```
C:\> TXEInfoWin.exe -feat "Setup and Configuration" -value "Not Completed"

Intel(R) TXEInfo Version: 2.0.0.1003

Copyright(C) 2007 - 2014, Intel Corporation. All rights reserved.

Local FWUpdate: Success - Value matches FW value.

> TXEInfo.efi -feat "Setup and Configuration" -value "Not Completed"

Intel(R) TXEInfo Version: 2.0.0.1003

Copyright(C) 2007 - 2014, Intel Corporation. All rights reserved.

Local FWUpdate: Success - Value matches FW value.
```

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## 7 Intel® Trusted Execution Engine Interface (Intel® TXEI) Firmware Update

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FWUpdate allows an end user, such as an IT administrator, to update Intel® Trusted Execution Engine (Intel® TXE) FW without having to reprogram the entire flash device. It then verifies that the update was successful.

FWUpdate does not update the BIOS, or Descriptor Regions. It updates the FW code portion that Intel provides on the OEM website. Note that Intel® FWUpdate updates the entire Intel® Trusted Execution Engine (Intel® TXE) code area only and keep same data area.

The image file that the tool uses for the update is the same image file that is used by the FITC tool to create a firmware image for use in the SPI. A sample FW image file for updating would be 'CHV\_SEC\_REGION.bin. These file is located in the 'Image Components\TXE' sub-folder of the firmware kit package.

FWUpdate takes approximately 1-4 minutes to complete depending on the flash device on the system.

After FWUpdate a host reset is needed to complete FW update. The user can also use the -FORCERESET option to do this automatically.

### 7.1 Requirements

FWUpdLclWin.exe and FWUpdLclWin64.exe are command line executable that can be run on an Intel® Trusted Execution Engine (Intel® TXE)-enabled system that needs updated FW.

FW can only be updated when the system is in an S0 state. FW updates are NOT supported in the S3/S4/S5 state.

Intel® Trusted Execution Engine (Intel® TXE) FWUpdate must be enabled in through BIOS.

The Intel® Trusted Execution Engine (Intel® TXE) Interface driver must be installed for running this tool in a Windows\* environment.

### 7.2 Windows\* PE Requirements

For tools to work under Windows\* PE environment, the user will need to manually load a driver by using the .inf file in the Intel® Trusted Execution Engine Interface (Intel® TXEI) driver installation files. Once the .inf file located, the user will need to



use Windows\* PE command `drvload *.inf` to load it into the running system each time Windows\* PE reboots. Failure to do so causes a tools reporting error.

## 7.3 Usage

**Note:** In this section, <Image File> refers to an Intel-provided image file of the section of the FW to be updated, not the image file used in FITC to program the entire flash memory.

```
FWUpdLclWin.exe [-H|?] [-VER] [-EXP] [-VERBOSE] [-F] [-Y] [-SAVE]
                [-FWVER] [-ALLOWSV] [-FORCERESET] [-OEMID] [-GENERIC]
```

```
FWUpdLcl.efi   [-H|?] [-VER] [-EXP] [-VERBOSE] [-F] [-Y] [-SAVE]
                [-FWVER] [-ALLOWSV] [-FORCERESET] [-OEMID]
```

**Note:** Image File is the image file of the FW to be updated. Is the same image file used by FITC.

Table 20. Image File Update Options

Option	Description
-H or -?	Displays the list of command line options supported by the Intel TXEInfo tool.
-VER	Shows the version of the tools.
-EXP	Shows examples about how to use the tools.
-VERBOSE [<FILE>]	Verbose. Enables additional information about the tool's operation to be displayed for debugging purposes.
-F <FILE>	File. Specifies the FWUpdate image file to be used for performing an update.
-Y	Ignore warning. If the warning asks for input "Y/N", this flag makes the tool automatically take "y" as the input.
-SAVE <file>	Restore Point. Retrieves an update image from the FW based on the currently running FW. The update image is saved to the user-specified file.
-FWVER	Display FW version.
-ALLOWSV	Allow Same Version. Allows the version of the input FW (based on the file input) to be the same as the version of the FW currently on the platform. Without this option, an attempt to perform an update on the same version will not proceed.
-FORCERESET	Force Reset. The tool automatically reboots the system after the update process with FW is complete. The system reboot is necessary for the new FW to take effect. An attempt to update the FW without this option will end with a message telling the user to reset the platform for the changes to take effect.
-OEMID <UUID>	OEM ID. The tool uses the specified OEM ID during the transaction of the new FW image with the Security Engine. The purpose of the OEM ID is for manufacturers to have an identifier for their system. Using any other OEM



Option	Description
	ID value other than what is on the FW running on the target platform results in a failure of the FWUpdate process. The full image (including all necessary flash partitions) flashed to the system can be configured with the Flash Image Tool to specify the OEM ID (this tool specifies a default of zeros for the OEM ID.) If this command line option is not used, the default OEM ID used for the update is zeros. The OEM ID is configured in the existing FW image running on the platform. The OEM ID value is specified in the UUID format (8-4-4-4-12).
-GENERIC	Intel® Trusted Execution Engine Interface (Intel® TXEI). Specifies that the tool performs the update over the Intel® TXEI interface. Intel® Trusted Execution Engine Interface (Intel® TXEI) is used even if the FW supports a network-based update. <b>NOTE:</b> This option is only supported in the Windows* version of the tool.

## 7.4 Examples

### 7.4.1 Updates Intel® Trusted Execution Engine Interface (Intel® TXEI) with Firmware Binary File

This command updates TXE with FW.BIN file. If the firmware on current platform is newer than then version in FW.BIN file, tools will promote a warning to let user know there will be a firmware downgrade (rollback) event and let user choose Y/N to continue. User can always use -y to skip this warning automatically. If the firmware on the platform is the same as the version in FW.BIN, tools will return an error. User can use -allowsv to allow same version update.

```
FWUpdLclWin.exe -f FW.BIN
```

```
EFI:
FWUpdLcl.efi -f FW.BIN
```

```
C:\> FWUpdLclWin.exe -f upd.bin -allowsv
Intel (R) Firmware Update Utility version 2.0.0.1003
Copyright (C) 2007-2014, Intel Corporation. All rights reserved.
```

```
Trying to connect to TXEI driver.
```

```
Communication Mode: TXEI
Checking firmware parameters...
```

```
Warning: Do not exit the process or power off the machine before the
firmware update process ends.
Initiating firmware update process...
```

```
Sending the update image to FW for
verification.....
.....
Image successfully sent to FW.
FW verifying the image...
```

```
Trying to receive update status...
```



Trying to connect to TXEI driver.

FW Update is complete and a reboot will run the new FW.

**Note:** The final output message could change as per the reset type required by the update. If the update only requires TXE reset then the success text will be "FW Update is completed successfully" else if the reset type is host or global reset then the success text will be "FW Update is complete and a reboot will run the new FW." The Reset Type will be automatically determined by the FW on an update.

## 7.4.2 Display Supported Commands

Display a list of supported command line sequences based on the arguments provided. The arguments relevant for this usage are any of the command line options with the prefix '-' removed. The tool will display all valid command sequences based on the options provided. Below is an example which displays valid command sequences with the -exp option.

```
C:\> FWUpdLclWin.exe -exp save
```

```
Intel (R) Firmware Update Utility Version: 2.0.0.1003
Copyright (C) 2007 - 2012, Intel Corporation. All rights reserved.
```

The parameters provided are supported in the following command-line sequences:

```
1. SAVE<file> [VERBOSE[<file>]]
```

Using -EXP without any additional input will display examples of common command-line input.

EFI:

```
> FWUpdLcl.efi -exp save
```

```
Intel (R) Firmware Update Utility Version: 2.0.0.1003
Copyright (C) 2007 - 2012, Intel Corporation. All rights reserved.
```

The parameters provided are supported in the following command-line sequences:

```
1. SAVE<file> [VERBOSE[<file>]]
```

Using -EXP without any additional input will display examples of common command-line input.

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## 8 Calibration Tool

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The calibration tool is intended to extract the relevant data (needed for sensor calibration) from the ISS firmware and uses it to calculate the calibration coefficients for the sensor calibration, and burn the new coefficients to the ISS firmware. For more detail, refer Intel ISH calibration tool user guide release in both FDK and TXE FW kit.

The calibration tool can work in two operation modes:

1. Full calibration mode:

In this mode the calibration tool makes the whole three steps of calibration:

- Extract the needed data for calibration from ISS.
- Calculates the calibration coefficients needed per sensor calibration.
- Burn the calibration coefficients in the ISS firmware image.

2. In conjugation with any other calibration tool:

In this mode the calibration tool will work as extractor of parameters and burner of calibration coefficients into the ISS firmware, the actual calibration task will be done by 3rd party calibration tool– this mode is being supported to make sure ISS can be compatible with various sensors that were not integrated by Intel and are added by customers using the FDK or any other way.

Tools can be used in Windows\* and Android\* OS environment.

Windows\* operation:

The tool has two modes of operations under Windows\* OS:

1. Command line version
2. GUI version

Both versions are feature identical and are made to be able to support per model and system calibration in development and in the manufacturing line.

Android\* operation:

1. Command line version
2. No GUI version available

### 8.1 Usage

The command line calibration tool executable can be invoked by:

Windows\* CalibrationTool.exe [-ImportXML <filename>] [-Save <filename>]

Windows\* CalibrationTool.exe -Calibrate <sensor> -HorizontalField <horizontal-magnetic-field> -VerticalField <vertical-magnetic-field> [-LoadDataDump <dump-file>]



path>] | DumpData <dump-file-path> [-UpdateFW] [-ExportXml <filename>] [-Save <filename>]

Windows\* CalibrationTool.exe -CalibrateOffline <sensors> -HorizontalField <horizontal-magnetic-field> -VerticalField <vertical-magnetic-field> -LoadDataDump <dump-file-path> -ExportXml <filename>

**Table 21. Intel® Calibration Command Line Options**

Option	Description
-ImportXML <xml-file-path>	Import calibration data from XML file.
-Save <xml-file-path>	Save current FW calibration data to XML file.
-CalibrateOffline	Run the calibration off line without machine dependency.
-Calibrate <sensors>	Run calibration flow on selected sensors.
-ExportXML <xml-file-path>	Export the newly calculated calibration data to XML file.
-DumpData <dump-file-path>	Dump the data sampled during the calibration to a file.
-LoadDataDump <dump-file-path>	Read the sensors data from a file instead of sampling sensors.
-HorizontalField <horizontal-magnetic-field>	Horizontal magnetic field measured in this location.
-VerticalField <vertical-magnetic-field>	Vertical magnetic field measured in this location.
-UpdateFW	Flush the calculated calibration data to the firmware.
-Verbose	Enables verbose output.
-NoLog	Disable the automatic log file creation.
-H	Show help message.

## 8.2 Examples

Following are some examples of calibration tool CLI usage:

- CalibrationTool.exe -Calibrate motion -HorizontalField 100 -VerticalField 200 -UpdateFW -ExportXml filename.xml -Save filename.xml.
- CalibrationTool.exe -Calibrate motion -HorizontalField 100 -VerticalField 200 -UpdateFW -LoadDataDump filename.csv.
- CalibrationTool.exe -Save filename.xml.
- CalibrationTool.exe -ImportXml filename.xml.

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## 9 Intel® Manifest Generation Tool

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The SPI image creation flow with signed BIOS image included is centered on the Manifest Generation Tool. Intel will deliver the Manifest Generation tool and Manifest Signing tool in FW kit release. Note that SampleSigner is not allowed to be used by customers to generate their production FW image due to legal concerns. Customers need to use their own signing tool and infrastructure for the flow of key pair generation, BIOS signing and key hash generation. Refer Platform BIOS signing user guide for detail which it's only available for Tablet segment.

The Manifest Generation tool is used to:

- Calculate the Hash of a public key.
- Create a Secure boot/Key Manifest.

To avoid common errors that may result in a non-bootable IBB, the Manifest Generation tool will return as a unit the IBB and manifests as the result of the last stage in the secure boot manifest creation flow (signature insertion).

The tool will verify as well that the result passes authentication and authorization. In case of any error the tool will return the error and it will not return the IBB and manifests.

The signed BIOS Image with manifest creation stages will be:

### 1. Manifest Candidate Creation:

Taking as input the IBB, Secure Boot fuses configuration, Public Key, OEM block and other manifest data, the manifest candidate and returns the hash to be signed by the private key.

### 2. Signing the Manifest:

The hash returned by the Manifest Generation Tool will be signed using the PKCS 1.5 scheme with the private key using the OEM signing infrastructure.

### 3. Inserting the signature in the manifest:

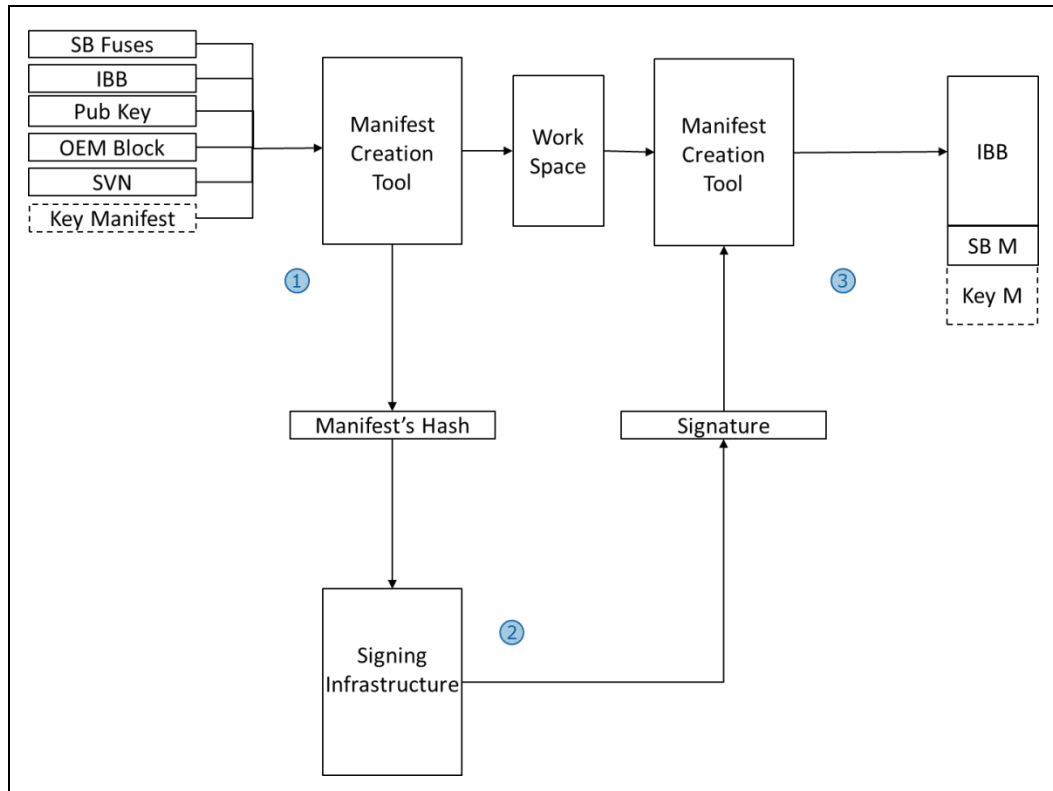
The Manifest Generation Tool will verify that the signature is OK, then insert it in the manifest candidate making it a valid manifest and return the IBB and the manifest as they should be in the BIOS layout.

### 4. Stitching the BIOS:

The OEM need to stitch the output of the Manifest Generation Tool with the rest of the BIOS.

The Manifest Generation Tool will verify at every step the coherency of the data and it will fail on error indicating what the problem is. If the Manifest Generation Tool completed successfully the last step of the manifest creation the result MUST successfully pass authentication.

Figure 26. Manifest Generation Flow



## 9.1 Manifest Generation Tool

FLAMInGo.exe is Windows\* based SPI flash Manifest Generation Tool which will be released in FW kit. It can be used to create secure boot Manifest and Key Manifest with command line support only.

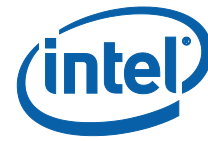
To create a SHA256 digest (hash) of a given public key, the executable can be invoked in command line by:

```
FLAMInGo.exe HashKey --out [HashOutputFile] --key [PublicKeyFileToHash]
```

Table 22. Tool Options for Public Key Hash Generation

Option	Description
HashKey	Ask tool to create a SHA256 digest (hash) of a given public key.
--out [HashOutputFile]	Name of the file to place the SHA256 digest of the public key.
--key [PublicKeyFileToHash]	Public key file to calculate SHA256 form.
-?	To displays the list of command line options.





Following command example takes the public key from the MyKey.cer file (public and write its hash value to MyKeyHash.txt file:

```
FLAMInGO.exe HashKey --out MyKeyHash.txt --key MyKey.cer
```

To create a partial image manifest and a hash file to sign, the executable can be invoked in command line by:

```
FLAMInGo.exe ImageManCreate --Name [ManifestName] --Fuse [FuseConfigFile]
[--Unsigned UnsignedFile] --KeySign [SigningKey] --SVN [SVN]
--Type ImageType [--OEMDataFile <OEMDataFile>]
--Image ImageFile [--KeyMan <KeyManifestFile>] [-?]
```

**Table 23. Tool Options for Partial Secure Boot Manifest Generation**

Option	Description
ImageManCreate	Asks tool to create a partial image manifest and a hash file to sign.
--Name ManifestName	String that identifies the manifest, same name must be used when completing the manifest generation process.
--Fuse FuseConfigFile	Name of the file that contains the fuses configuration.
--Unsigned UnsignedFile	Name of the file that place then unsigned data of the manifest.
--KeySign SigningKey	Name of the file that contains the public key of the key that is used to sign the manifest.
--SVN SVN	Security Version Number.
--Type ImageType	Type of image to sign (IBB or ISH).
--OEMDataFile OEMDataFile	Name of the file that contains OEM data (maximum 400 bytes).
--Image ImageFile	Name of the file that contains image to sign.
--KeyMan KeyManifestFile	Name of the file that contains a valid key manifest generated by this tool.
-?	To displays the list of command line options.

To take an image manifest hash signature and generates an image manifest, the executable can be invoked in command line by:

```
FLAMInGo.exe ImageManComplete --Name [ManifestName] --Fuse [FuseConfigFile]
[--signature SignatureFile] [-?]
```

**Table 24. Tool Options for Secure Boot Manifest Generation**

Option	Description
ImageManComplete	Asks tool to take a secure boot manifest hash signature and generates a secure boot manifest.
--Name ManifestName	String that identifies the manifest, same name must be used when completing the manifest generation process.



Option	Description
--Fuse FuseConfigFile	Name of the file that contains the fuses configuration.
--signature SignatureFile	Name of the file that contains an RSA signature of the hash file generated when creating a manifest.
-?	To displays the list of command line options.

To create a partial Key manifest and a hash file to sign, the executable can be invoked in command line by:

```
FLAMInGo.exe KeyManCreate --Name [ManifestName] --Fuse [FuseConfigFile]
[--Unsigned <UnsignedFile>] --Keysign [SigningKey] --SVN [SVN]
--Type [ImageType] --KeyCert [PublicKeyKeyFileToCerify] [-?]
```

**Table 25. Tool Options for Partial Key Manifest Generation**

Option	Description
KeyManCreate	Asks tool to create a partial Key manifest and a hash file.
--Name ManifestName	String that identifies the manifest, same name must be used when completing the manifest generation process.
--Fuse FuseConfigFile	Name of the file that contains the fuses configuration.
--Unsigned <UnsignedFile>	Name of the file that place then unsigned data of the manifest.
--Keysign SigningKey	Name of the file that contains the public key of the key that is used to sign the manifest.
--SVN SVN	Security Version Number.
--Type ImageType	Type of image to sign (IBB or ISH).
--KeyCert PublicKeyFileToCerify	Name of the file that contains the key to certify by the key manifest.
-?	To displays the list of command line options.

To take a key manifest hash signature and generates a key boot manifest, the executable can be invoked in command line by:

```
FLAMInGo.exe KeyManComplete --Name [ManifestName] --Fuse [FuseConfigFile]
[--signature SignatureFile] [-?]
```

**Table 26. Tool Options for Key Manifest Generation**

Option	Description
KeyManComplete	Asks tool to take a Key manifest hash signature and generates a Key manifest.
--Name ManifestName	String that identifies the manifest, same name must be used when completing the manifest generation process.
--Fuse FuseConfigFile	Name of the file that contains the fuses configuration.



Option	Description
--signature SignatureFile	Name of the file that contains an RSA signature of the hash file generated when creating a manifest.
-?	To displays the list of command line options.

To verify if an ingredient image contains a valid manifest and matches the fuse configuration file.

FLAMInGo.exe VerifyImage --Image [ImageFile] --Fuse [FuseConfigFile] [-?]

**Table 27. Tool Options for BIOS Image Verification**

Option	Description
VerifyImage	Asks tool to verify if given BIOS image contain a valid manifest and match the fuse configuration file or not
--Image ImageFile	Name of the file that contains image to verify
--Fuse FuseConfigFile	Name of the file that contains the fuses configuration
-?	To displays the list of command line options

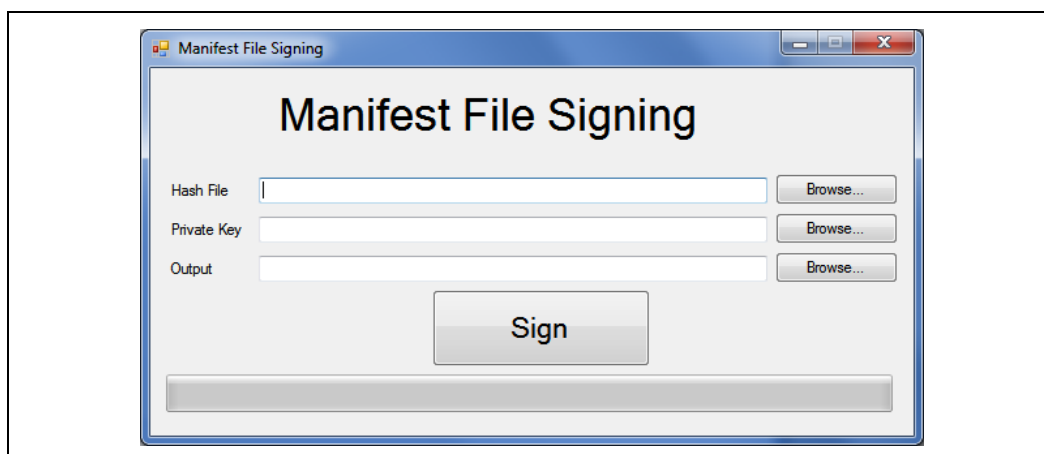
## 9.2 Signing Tool

SampleSigner.exe is Windows\* based tool which will be released in FW kit and used for generating signature for Manifest Hash file by taking Private Key. This tool support both GUI and command line mode. GUI based dialog shows up if you double click SampleSigner.exe from Windows\* environment.

Parameters:

1. Hash file to sign
2. Private key
3. The output location of the signed file.

**Figure 27. Manifest File Signing Tool**





As for command line mode, the executable can be invoked in command line by:

SampleSigner.exe [HashFileToSign] [PrivateKeyFile] [OutSignatureFile]

To displays the list of command line options supported by:

SampleSigner.exe -?

Option	Description
HashFileToSign	The Hash file plan to be signed
PrivateKeyFile	Private key from OEM key pair
OutSignatureFile	The output location path of the signed output hash file
-?	To displays the list of command line options

## 9.3 Example Command

### 9.3.1 Secure Boot Manifest Creation

*FLAMInGO.exe SBManCreate Fuses.txt MySBManifest IBB.bin 1 MySBSigningKey.cer - OEMDataFile myOEMdata.bin -KeyManifestFile MyManifest\_manifest.bin*

The above example command starts the secure boot manifest creation process. It uses the fuse configuration from the Fuses.txt file, and it certifies the IBB data contained in the IBB.bin file the SVN is 1.

Secure Version Number (SVN) is just a monotonic increasing unsigned integer. The SVN should be incremented only if a critical bug that compromises very sensitive assets was fixed and the usage of previous version should be avoided.

MySBSigningKey.cer file contains the key that is used to sign the manifest. The name for the manifest is MySBManifest and should be used when completing the manifest creation process. This command creates a file call MySBManifest\_Hash.bin that contains the hash of the manifest to be signed.

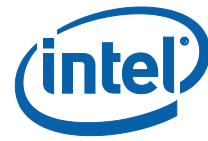
This command will add OEM data from the myOEMdata.bin file to the manifest as well. The manifest will and contains the previously created Key Manifest that is in the MyManifest\_manifest.bin file. The last two fields (OEMdata and Key Manifest are not mandatory).

Similarly as in the Key Manifest, we need to sign the manifest hash by following command:

*SampleSigner.exe MySBManifest\_Hash.bin MySBSigningKey.cer  
MySBManifest\_signature.bin*

Once we have the signature, we can complete the process by following command:

*FLAMInGO.exe SBManComplete Fuses.txt MSByManifest  
MySBManifest\_signature.bin*



This above command creates a secure boot manifest. It'll use the fuse configuration from the Fuses.txt file - make sure it's the same file used in the previous FLAMInGO command. It uses the same name - MySBManifest, and reads the signature from the MySBManifest\_signature.bin created in the last step. Once this command completes, a new file will be created - MSByManifest\_manifest.bin which contains the secure boot manifest itself.

### 9.3.2 Key Manifest Creation

*FLAMInGO.exe KeyManCreate Fuses.txt MyManifeste MyKey.cer 1 MySigningKey.cer*

This above example command will start the key manifest creation process. It'll use the fuse configuration from the Fuses.txt file, the key to be certified the key in the MyKey.cer file, the SVN is 1.

The MySigningKey.cer file contains the key that is used to sign the manifest. The name for the manifest is MyManifest and should be used when completing the manifest creation process. This command will create a file call MyManifest\_Hash.bin that contains the hash of the manifest to be signed.

Now we need to sign the manifest hash, we can use the SampleSigner to sign or any other standard signing infrastructure.

*SampleSigner.exe MyManifest\_Hash.bin MySigningKey.cer MyManifest\_signature.bin*

This above command will sign the hash file with the private key from the MySigningKey.cer file. The signature will be written to the MyManifest\_signature.bin file. We will use this file as input to complete the manifest creation process.

*FLAMInGO.exe KeyManComplete Fuses.txt MyManifest MyManifest\_signature.bin*

This above command will create a key manifest. It'll use the fuse configuration from the Fuses.txt file - make sure it's the same file used in the previous FLAMInGO command. It uses the same name - MyManifest, and reads the signature from the MyManifest\_signature.bin created in the last step. Once this command completes, a new file will be created - MyManifest\_manifest.bin which contains the manifest itself.

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## Appendix A Fixed Offset Variables

This appendix only covers fixed offset variables that are directly available to FPT and FPTW. A complete list of fixed offset variables can be found in the Firmware Variable Structures for Intel® Trusted Execution Engine. All of the fixed offset variables have an ID and a name. The -fovs option displays a list of the IDs and their respective names. The variable name must be entered exactly as displayed below.

**Table 28. Fixed Offset Item Descriptions**

Fixed Offset Name	FPT ID	Fixed Offset ID	Description	Data Length (in Bytes)	Expected Value	Secure	Reset Type		
Non-Application Specific Fixed Offset Item Descriptions									
OEM Sku Rule	7	0x000A	<p>UINT32 (little endian) value. This controls what features are permanently disabled by OEM.</p> <p><b>NOTE:</b> There are reserved bits that the must not be changed for proper platform operation. The user should only modify the bit(s) for the feature(s) they wish to change. There is NO ability to change features one at a time. This FOV sets OEM Permanents Disable for ALL features. In addition prior updating or changing any of available setting it is highly recommended that the user first retrieves the current OEM Sku Rule and toggling only the desired bits, and then resave them.</p> <p>This will not enable functionality that is not capable of working in the target hardware SKU. refer respective Firmware Bring-up Guide with what firmware bundle and Hardware SKU of Intel Cherry Trail SoC.</p>	4	Feature Capable: 1 Feature Permanently disabled: 0			No	Global
					Bit	Description	Notes		
					31	Near Field Communications			
					30	Reserved			
					29:22	Reserved			
					21	Reserved			
					20	DAL			
					19	Reserved			
					18	Reserved			
					17	Reserved			
					16	Reserved			
					15:13	Reserved			
					12	PAVP			
					11:6	Reserved			
					5	Reserved			
					4:3	Reserved			
					2	Reserved			
1	Reserved								
0	Reserved								

Fixed Offset Name	FPT ID	Fixed Offset ID	Description	Data Length (in Bytes)	Expected Value	Secure	Reset Type																		
Feature Shipment Time State	8	0x000B	<p>UINT32 (little endian) value. This controls what features are enabled or disabled. These features may be enabled / disabled by mechanisms such as provisioning. This setting is only relevant for features NOT permanently disabled by the OEM Permanent Disable.</p> <p>This will not enable functionality that is not capable of working in the target hardware SKU. refer respective Firmware Bring-up Guide with what firmware bundle and Hardware SKU of Intel Cherry Trail SoC</p> <p><b>NOTE:</b> There are reserved bits that the must not be changed for proper platform operation. The user should only modify the bit(s) for the feature(s) they wish to change. There is NO ability to change features one at a time. This FOV sets OEM Permanents Disable for ALL features. In addition prior updating or changing any of available setting it is highly recommended that the user first retrieves the current Feature Shipment Time State and toggling only the desired bits, and then resave them.</p>	4	<p>Feature Capable: 1 Feature Permanently disabled: 0</p> <table><tr><th>Bit</th><th>Description</th><th>Note</th></tr><tr><td>31:30</td><td>Reserved</td><td></td></tr><tr><td>29</td><td>PTT</td><td>1</td></tr><tr><td>28:3</td><td>Reserved</td><td></td></tr><tr><td>2</td><td>Reserved</td><td></td></tr><tr><td>1:0</td><td>Reserved</td><td></td></tr></table> <p><b>NOTE:</b> Bit 29 is only applicable to TXE Firmware.</p>	Bit	Description	Note	31:30	Reserved		29	PTT	1	28:3	Reserved		2	Reserved		1:0	Reserved		No	Global
Bit	Description	Note																							
31:30	Reserved																								
29	PTT	1																							
28:3	Reserved																								
2	Reserved																								
1:0	Reserved																								



Fixed Offset Name	FPT ID	Fixed Offset ID	Description	Data Length (in Bytes)	Expected Value	Secure	Reset Type
OEM_TAG	34	0x000F	A human readable 32-bit number to describe the flash image represented by value	4	Readable 32 bit hex value identifying the image. Can be empty (Null).	No	TXE
Revenue Sharing Related FOV Item Descriptions							
ODM_ID		0x5003	FOV used for setting the ODM ID Used by Intel Services  <b>NOTE:</b> This FOV / NVAR can be set only once. Once it is set in FITC or committed following being set via the FOV, it cannot be changed. Also Note: Unlike most other NVARs, the value cannot be read until it has been set.	4	32-bit value Value 0x00000000 < n < 0xFFFFFFFF	No	TXE
System Integrator ID		0x5004	Used for setting the System Integrator ID used by Intel® Services  <b>NOTE:</b> This FOV / NVAR can be set only once. Once it is set in FITC or committed following being set via the FOV, it cannot be changed.  <b>NOTE:</b> Unlike most other NVARs, the value cannot be read until it has been set.	4	32-bit value Value: 0x00000000 < n < 0xFFFFFFFF	No	TXE





Fixed Offset Name	FPT ID	Fixed Offset ID	Description	Data Length (in Bytes)	Expected Value	Secure	Reset Type
Reserve dID		0x5005	<p><b>NOTE:</b> This FOV / NVAR can be set only once. Once it is set in FITC or committed following being set via the FOV, it cannot be changed.</p> <p><b>NOTE:</b> Unlike most other NVARs, the value cannot be read until it has been set.</p>	4	32-bit value Value: 0x00000000 < n < 0xFFFFFFFF	No	TXE

**NOTE:** All Fixed Offset Variables (FOVs) have corresponding Named Variables (NVARs) however not all Named Variables (NVARs) have Firmware Offset Variables (FOVs) associated with them.

Additionally some Fixed Offset Variables (FOVs) have different name designations than Named Variable (NVARs) counterparts.

FPT NVAR Retrieve command:

fpt.exe -r <name> | all [-f <file>] [options]

Required Parameters

<name> Name of NVAR OR All retrieves all the NVARs

FPT FOV / NVAR naming Comparison	
Named Variables (NVARs)	Fixed Offset Variables (FOVs)
OEMSKURule	OEMSKURule
FeatureShipState	FeatureShipState
OEM_TAG	OEM_TAG
ODM ID used by Intel® Services	ODM_ID
System Integrator ID used by Intel® Services	SystemIntegratorId
Reserved ID used by Intel® Services	ReservedId
All remaining NVARS	All remaining NVARs do not have corresponding FOVs to allow configuration post image creation

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## Appendix B Tool Detail Error Codes

### B.1 Common Error Code for all Tools

Error Code	Error Message	Response
0	Success	
1	Memory allocation error occurred.	Ensure there is enough memory in the system.
2	Invalid descriptor region.	Check descriptor region.
3	Region does not exist.	Check region to be programmed.
4	Failure. Unexpected error occurred.	Contact Intel.
5	Invalid data for Read ID command.	Contact Intel.
6	Error occurred while communicating with SPI device.	Check SPI device.
7	Hardware sequencing failed. Make sure that access permissions are correct for the target flash area.	Check descriptor region access settings.
8	Software sequencing failed. Make sure that access permissions are correct for the target flash area.	Check descriptor region access settings.
9	Unrecognized value in the HSFSTS register.	Unrecognized value in the HSFSTS register.
10	Hardware Timeout occurred in SPI device.	Hardware Timeout occurred in SPI device.
11	AEL is not equal to zero.	AEL is not equal to zero.
12	FCERR is not equal to zero.	FCERR is not equal to zero.
25	The host CPU does not have write access to the target flash area. To enable write access for this operation the user needs to modify the descriptor settings to give host access to this region.	Check descriptor region access settings.
26	The host CPU does not have read access to the target flash area. To enable read access for this operation the user needs to modify the descriptor settings to give host access to this region.	Check descriptor region access settings.
27	The host CPU does not have erase access to the target flash area. To enable erase access for this operation the user needs to modify the descriptor settings to give host access to this region.	Check descriptor region access settings.

Error Code	Error Message	Response
28	Protected Range Registers are currently set by BIOS, preventing flash access. Contact the target system BIOS vendor for an option to disable Protected Range Registers.	Assert Flash Descriptor Security Override Strap (GPIO_SUS[5]) to Low, Power Cycle, and Retry. If Protected Range Registers are still set, contact the target BIOS vendor.
50	General Erase failure.	Attempt the command again. If it fails again, contact Intel.
51	An attempt was made to read beyond the end of flash memory.	Check address.
52	An attempt was made to write beyond the end of flash memory.	Check address.
53	An attempt was made to erase beyond the end of flash memory.	Check address.
54	The address <address> of the block to erase is not aligned correctly.	Check address.
55	Internal Error.	Contact Intel.
56	The supplied zero-based index of the SPI Device is out of range.	The supplied zero-based index of the SPI Device is out of range.
57	AEL or FCERR is not equal to zero for Software Sequencing.	AEL or FCERR is not equal to zero for Software Sequencing.
75	File not found.	Check file location.
76	Access was denied opening the file.	Check file location.
77	An unknown error occurred while opening the file.	Verify the file is not corrupt.
78	Failed to allocate memory for the flash part definition file.	Check system memory Verify the file is not corrupt.
79	Failed to read the entire file into memory.	Check system memory Verify the file is not corrupt.
80	Parsing of file failed	Check system memory Verify the file is not corrupt.
100	This error can occur if both Software and Hardware sequencing are not available and the SPI Flash configuration registers are write protected by the Flash Configuration Lock-Down bit (FLOCKDN). Contact the BIOS vendor to unlock this bit or enable hardware sequencing in descriptor mode.	Check with BIOS vendor or SPI programming Guide.
101	No SPI flash device could be identified. Verify if Fparts.txt has support for this part.	Verify <b>Fparts.txt</b> contains device supported.
102	Failed to read the device ID from the SPI flash part.	Verify <b>Fparts.txt</b> has correct values



Error Code	Error Message	Response
103	There are no supported SPI flash devices installed. Check connectivity and orientation of SPI flash device.	Verify <b>Fparts.txt</b> has correct values. Check SPI Device.
104	The two SPI flash devices do not have compatible command sets.	Verify both SPI devices on the system are compatible.
105	An error occurred while writing to the write status register of the SPI flash device. This program will not be able to modify the SPI flash.	Check SPI Device.
202	Confirmation is not received from the user to perform operation.	
203	Flash is not blank.	
204	Data verify mismatch found.	
205	Unexpected failure occurred.	
207	Invalid parameter value specified by user. The option specified cannot be run on a platform with Intel® ME Ignition FW.	
208	Intel® Trusted Execution Engine Interface (Intel® TXEI) is disabled.	
209	Intel® Trusted Execution Engine Interface (Intel® TXEI) failed to reset.	
210	Requesting Intel® Trusted Execution Engine Interface (Intel® TXEI) FW Reset failure.	
211	Communications error between FPT and the ME.	
212	The request to disable the ME failed.	
213	Intel® Trusted Execution Engine Interface (Intel® TXEI) disable is not required.	
214	Intel® Trusted Execution Engine Interface (Intel® TXEI) is already disabled.	
215	The attempt to commit the FOVs has failed.	
216	The Close Manufacturing process failed.	
217	Setting Global Reset Failed.	
240	Access was denied opening the file.	
241	Access was denied creating the file.	
242	An unknown error occurred while opening the file.	
243	An unknown error occurred while creating.	
244	Not a valid file.	
245	File not found error.	
246	Failed to read the entire file into memory.	
247	Failed to write the entire flash contents to file.	
248	File already exists.	

Error Code	Error Message	Response
249	The file is longer than the flash area to write.	
250	The file is smaller than the flash area to write.	
251	Length of image file extends past the flash area.	
252	Image file not found.	
253	file does not exist.	
254	Not able to open the file.	
255	Error occurred while reading the file.	
256	Error occurred while writing to the file.	
280	Failed to disable write protection for the BIOS space.	
281	The Enable bit in the LPC RCBA register is not set. The value of this register cannot be used as the SPI BIOS base address.	
282	Failed to get information about the installed flash devices.	
283	Unable to write data to flash.	
284	Fail to load driver (PCI access for Windows*). The tool needs to run with an administrator privilege account.	
320	FPT General failure error	
321	The address is outside the boundaries of the flash area.	
360	Invalid Block Erase Size value in.	
361	Invalid Write Granularity value in.	
362	Invalid Enable Write Status Register Command value.	
363	Invalid Chip Erase Timeout value.	
360	Invalid Block Erase Size value in.	
361	Invalid Write Granularity value in.	
362	Invalid Enable Write Status Register Command value.	
363	Invalid Chip Erase Timeout value.	
360	Invalid Block Erase Size value in.	
361	Invalid Write Granularity value in.	
362	Invalid Enable Write Status Register Command value.	
363	Invalid Chip Erase Timeout value.	
440	Invalid Fixed Offset variable name.	
441	FOV invalid variable ID.	



Error Code	Error Message	Response
442	Param file is already opened.	
443	FOV exists already.	
444	Invalid name or Id of FOV.	
445	Invalid length of FOV value. Check FOV configuration file for correct length.	
446	Password does not match the criteria.	
447	Error occurred while reading FOV configuration file.	
448	Invalid hash certificate file.	
449	Valid PID/PPS/Password records are not found in.	
450	Invalid ME Manufacturing Mode Done value entered.	
451	Unable to get master base address from the descriptor.	
452	Verification of End Of Manufacturing settings failed.	
453	End Of Manufacturing Operation failure - Verification failure on ME Manufacturing Mode Done settings.	
454	End Of Manufacturing Operation failure - Verification failure on Intel® TXE Manuf counter.	
455	End Of Manufacturing Operation failure - Verification failure on Descriptor Lock settings.	
456	Invalid hexadecimal value entered for the FOV.	
457	Parsing of file failed.	
480	The setup file header has an illegal UUID.	
481	The setup file version is unsupported.	
482	Reserved.	
483	Given buffer length is invalid.	
484	Record chunk count cannot contain all of the setup file record data.	
485	Setup file header indicates that there are no valid records (RecordsConsumed >= RecordCount).	
486	Given buffer is invalid.	
487	A record entry with an invalid Module ID was encountered.	
488	A record was encountered with an invalid record number.	
489	The setup file header contains an invalid module ID list.	

Error Code	Error Message	Response
490	The setup file header contains an invalid byte count.	
491	The setup file record id is not found.	
492	The list of data record entries is invalid.	
493	Reserved.	
494	Reserved.	
495	The PID is invalid.	
496	The PPS is invalid.	
497	The PID checksum failed.	
498	The PPS checksum failed.	
499	Reserved.	
500	Reserved.	
501	The data record is missing a PID entry.	
502	The data record is missing a PPS entry.	
503	The header chunk count cannot contain all of the setup file header data.	
504	The requested index is invalid.	
505	Failed to write to the given file.	
506	Failed to read from the given file.	
507	Failed to create random numbers.	
508	The data record is missing a PKI DNS Suffix entry.	
509	The data record is missing a Config Server FQDN entry.	
510	The data record is missing a ZTC entry.	
511	The data record is missing a Pre-Installed Certificate enabled entry.	
512	The data record is missing a User defined certificate config entry.	
513	The data record is missing a User defined certificate Add entry.	
514	The data record is missing a SOL/IDER enable entry.	
515	OEM Firmware Update Qualifier data missing in USB file.	
1000	Invalid command line option(s).	
1001	Unsupported OS.	
8192	General error.	
8193	Cannot locate ME device.	



Error Code	Error Message	Response
8194	Memory access failure.	
8195	Write register failure.	
8196	OS failed to allocate memory.	
8197	Circular buffer overflow.	
8198	Not enough memory in circular buffer.	
8199	Communication error between application and Intel® Trusted Execution Engine Interface (Intel® TXEI) <HECI command name>	Contact Intel.
8200	Unsupported HECI bus message protocol version.	
8201	Unexpected interrupt reason.	
8202	Reserved.	
8203	Unexpected result in command response <HECI command name>	Contact Intel.
8204	Unsupported message type.	
8205	Cannot find host client.	
8206	Cannot find Intel® Trusted Execution Engine Interface (Intel® TXEI) client.	
8207	Client already connected	
8208	No free connection available.	
8209	Illegal parameter.	
8210	Flow control error.	
8211	No message.	
8212	Requesting HECI receive buffer size is too large.	
8213	Application or driver internal error.	
8214	Circular buffer not empty.	





## B.2 Firmware Update Errors

Error Code	Error Message
0	Success.
1	Reserved.
2	Reserved.
3	Reserved.
4	Reserved.
8193	Intel® Trusted Execution Engine (Intel® TXE) Interface : Cannot locate Intel® Trusted Execution Engine Interface (Intel® TXEI) device driver.
8704	Firmware update operation not initiated due to a SKU mismatch.
8705	Firmware update not initiated due to version mismatch.
8706	Firmware update not initiated due to integrity failure or invalid FW image.
8707	Firmware update failed due to an internal error.
8708	Firmware Update operation not initiated because a firmware update is already in progress.
8710	Firmware update tool failed due to insufficient memory.
8713	Firmware update not initiated due to an invalid FW image header.
8714	Firmware update not initiated due to file open or read failure.
8716	Invalid usage.
8718	Update operation timed-out; cannot determine if the operation succeeded.
8719	Firmware update cannot be initiated because Local Firmware update is disabled.
8722	Intel® TXE Interface : Unsupported message type.
8723	No Firmware update is happening.
8724	Platform did not respond to update request.
8725	Failed to receive last update status from the firmware.
8727	Firmware update tool failed to get the firmware parameters.
8728	This version of the Intel I® FW Update Tool is not compatible with the current platform.
8741	FW Update Failed.
8743	Unknown or unsupported Platform.
8744	OEM ID verification failed.
8745	Firmware update cannot be initiated because the OEM ID provided is incorrect.
8746	Firmware update not initiated due to invalid image length.
8747	Firmware update not initiated due to an unavailable global buffer.
8748	Firmware update not initiated due to invalid firmware parameters.



Error Code	Error Message
8754	Encountered error writing to file.
8757	Display FW Version failed.
8758	The image provided is not supported by the platform.
8759	Internal Error.
8760	Update downgrade vetoed.
8761	Firmware write file failure.
8762	Firmware read file failure.
8763	Firmware delete file failure.
8764	Partition layout NOT compatible.
8765	Downgrade NOT allowed, data mismatched.
8766	Password did not match.
8768	Password Not provided when required.
8769	Polling for FW Update Failed.
8772	Invalid usage, -allowsv switch required to update the same version firmware
8778	Unable to read FW version from file. Verify the update image used.
8787	Password exceeded maximum number of retries.

## B.3 TXEManuf Errors

Error Codes	Error Messages
9248	Intel® Trusted Execution Engine Interface (Intel® TXEI) internal communication error (BIST).
9249	Intel® Trusted Execution Engine Interface (Intel® TXEI)internal communication error (FW).
9250	Reserved.
9251	Fail to create verbose log file %s. Where %s is the log file name user specified.
9252	Reserved.
9254	Reserved.
9255	Internal error.
9256	Communication error between host application and Intel® Trusted Execution Engine Interface (Intel® TXEI) FW.
9257	Reserved.
9261	Hibernation is not supported by the OS, Intel® Trusted Execution Engine Interface (Intel® TXEI) test cannot run.
9262	Reserved.
9263	Reserved.

Error Codes	Error Messages
9264	Reserved.
9265	Reserved.
9266	Reserved.
9267	Fail to establish a communication with SPI flash interface.
9268	Fail to load vsccommn.bin.
9269	Zero flash device found for VSCC check.
9270	Fail to load driver (PCI access for Windows*). Tool needs to run with an administrator privilege account.
9271	Flash ID 0x%06X Intel® TXE VSCC mismatch. Programmed value of 0x%X does not match the recommended value of 0x%X. refer Cherry Trail SoC SPI programming Guide for more details.
9272	No recommended Intel® TXE VSCC value found for flash ID 0x%06X.
9273	Reserved.
9275	Reserved.
9276	Fail to read FW Status Register value 0x%X.
9277	Reserved.
9278	Cannot locate hardware platform identification. This program cannot be run on the current platform. Unknown or unsupported hardware platform. or A %s hardware platform is detected. This program cannot be run on the current platform. Unknown or unsupported hardware platform. Where %s is the official name of the hardware platform.
9279	SPI flash Intel® TXE region is not locked.
9280	Intel® TXE has read or write access to BIOS region.
9281	SPI flash descriptor region is not locked.
9282	BIOS has granted Intel® TXE access to its region.
9283	Region access permissions do not match Intel recommended values.
9284	Read firmware flash master region permission failure.
9285	Reserved.
9286	Reserved.
9287	Reserved.
9288	Reserved.
9289	Reserved.
9290	Reserved.
9291	Reserved.



Error Codes	Error Messages
9292	Reserved.
9295	Reserved.
9296	TXEManuf Test Failed. Or TXEManuf End-Of-Line Test Failed. Or TXEManuf Operation Failed.
9297	Reserved.
9298	Reserved.
9299	Single flash part found, Flash Partition Boundary Address must be zero.
9300	Flash Partition Boundary Address should be in between flash parts.
9301	The two flash parts on this platform require different BIOS VSCC values.
9302	Reserved.
9303	Memory allocation failed for checking variable "<Variable Name>"
9304	Variable "<Variable Name>" mismatch, actual value is - <Variable Value>
9305	Intel® TXE firmware version mismatch, actual value is - <Version String> BIOS version mismatch, actual value is - <Version String>
9306	Reserved.
9307	Reserved.
9308	Security Descriptor Override Strap (SDO) is enabled.
9309	End-Of-Post message is not sent.
9310	Unable to determine Intel® TXE Manufacturing Mode status. Intel® Trusted Execution Engine Interface (Intel® TXEI) is still in Manufacturing Mode.
9311	Intel® Trusted Execution Engine Interface (Intel® TXEI) test failed to start, error 0x%X returned.
9312	Intel® Trusted Execution Engine Interface (Intel® TXEI) test timeout (exceeded 30 seconds).
9313	Reserved.
9314	Reserved.
9315	Intel® Trusted Execution Engine Interface (Intel® TXEI) test is currently running, try again.
9316	Reserved.
9317	Reserved.
9318	TXEManuf End-Of-Line Test config file generation failed.
9319	Reserved.
9320	Internal error.
9321	TXEManuf End-Of-Line Test Failed.

Error Codes	Error Messages
9322	TXEManuf Operation Failed.
9324	Reserved.
9325	Reserved.
9326	Reserved.
9327	Reserved.
9328	Internal error.
9329	Internal error.
9330	Internal error.
9331	SMBus hardware is not ready.
9332	Internal error.
9333	SMBus encountered time-out.
9334	Failed to retrieve password from SPI.
9335	Internal error.
9336	Internal error.
9337	Internal error.
9338	Failed to retrieve test result from SPI.
9339	Failed to retrieve power rule from SPI.
9340	Failed to retrieve power source.
9341	Reserved.
9342	Reserved.
9343	Internal error.
9344	Reserved.
9345	Reserved.
9346	Reserved.
9347	Power source is not AC.
9348	Internal error.
9349	Internal error.
9350	Internal error.
9351	Reserved.
9352	Reserved.
9353	Reserved.
9354	Reserved.
9355	Reserved.
9356	Reserved.
9357	Reserved.



Error Codes	Error Messages
9358	Reserved.
9359	Reserved.
9360	Reserved.
9361	Reserved.
9362	Internal error.
9363	Internal error.
9364	The compressed data is incorrect.
9365	Reserved.
9366	Reserved.
9367	Firmware is in recovery mode.
9368	SMBus address is not configured correctly.
9369	Could not register for SMBus alert.
9370	Communication interference.
9371	SMBUS connection failed. Check connection or SMBUS address.
9372	GPIO connection failed. Check connection or GPIO configuration.
9373	NFC Radio – Unknown error.
9374	NFC RF Test – Error returned from radio.
9375	NFC RF Test – Communication interference or bad response returned from radio.
9376	NFC RF Test – Timeout.
9377	NFC RF Test – Unknown error.
9400	Reserved.
9401	Reserved.
9402	Reserved.
9403	Reserved.

## B.4 TXEInfo Errors

Error Code	Error Messages
9450	Reserved.
9451	Reserved.
9452	Communication error between application and Intel® TXE module (iCLS client).
9455	Failed to read FW Status Register value 0x%X.
9457	Failed to create verbose log file %s: Where %s is the log file name user specified.



Error Code	Error Messages
9458	Communication error between application and Intel® Trusted Execution Engine Interface (Intel® TXEI) module (FW Update client).
9459	Internal error (Could not determine FW features information).
9460	Cannot locate hardware platform identification. This program cannot be run on the current platform. Unknown or unsupported hardware platform. Or A %s hardware platform is detected. This program cannot be run on the current platform. Unknown or unsupported hardware platform. Where %s is the official name of the hardware platform.
9461	Communication error between application and Intel® Trusted Execution Engine Interface (Intel® TXEI) module (HCI client).
9462	Communication error between application and Intel® Trusted Execution Engine Interface (Intel® TXEI) module (Kernel Client).
9467	Cannot use zero as SPI Flash ID index number.
9468	Could not find a matching SPI Flash ID.
9469	Access to SPI Flash device(s) failed.
9470	Failed to load driver (PCI access for Windows*). Tool needs to run with an administrator privilege account.
9471	Invalid feature name XXXXX: Where XXXXX is the feature name.
9472	XXXXX feature was not available: Where XXXXX is the feature name.
9473	XXXXX actual value is – YYYYY: Where XXXXX is the feature name. Where YYYYY is the feature value.
9474	Error reporting revenue share information – Invalid index used
9475	Error reporting revenue share information – Index already in use.
9476	Error reporting revenue share information – Slot is empty.
9478	End of file encountered when reading first record.
9479	Non-Intel chipset is found in first record.
9480	Invalid marker found in first record.
9481	Unable to locate CODE manifest marker. Or Failed to locate DATA manifest marker.
9482	Failed to locate PID module entry.
9483	This PID cannot be used since the PID matches the known PID for Pre-Production SoCs.

## B.5 FPT Errors

Error Code	Error
<b>Invalid Parameters</b>	
200	Invalid parameter value specified by the user. Use -? Option to refer help.
<b>Invalid Verbose File</b>	
254	Not able to open the file <FILENAME>.
<b>Unsupported Platform</b>	
201	<EXENAME> cannot be run on the current platform. Contact vendor.
<b>Unsupported OS</b>	
9254	Unsupported OS
<b>Commit FOVs Operation</b>	
517	Get NVAR - Read Failed.
518	Get NVAR - Invalid NVAR specified.
519	Get NVAR - Out of Memory.
520	Get NVAR - Blob Integrity Failed.
8193	Intel® TXE Interface : Cannot locate ME device driver.
8199	Intel® TXE Interface : TXE Device not ready for data transmission.
8204	Intel® TXE Interface : Unsupported message type.
8213	Intel® TXE Interface : Buffer too small.
<b>Compare FOV(s) Operation</b>	
517	Get NVAR - Read Failed.
518	Get NVAR - Invalid NVAR specified.
519	Get NVAR - Out of Memory.
520	Get NVAR - Blob Integrity Failed.
8193	Intel® TXE Interface : Cannot locate ME device driver.
8199	Intel® TXE Interface : TXE Device not ready for data transmission.
8204	Intel® TXE Interface : Unsupported message type..
8213	Intel® TXE Interface : Buffer too small.
<b>Retrieve NVAR Operation</b>	
517	Get NVAR - Read Failed.
518	Get NVAR - Invalid NVAR specified.
519	Get NVAR - Out of Memory.
520	Get NVAR - Blob Integrity Failed.



Error Code	Error
8193	Intel® TXE Interface : Cannot locate TXE device driver.
8199	Intel® TXE Interface : TXE Device not ready for data transmission.
8204	Intel® TXE Interface : Unsupported message type.
8213	Intel® TXE Interface : Buffer too small.
<b>Updating Parameters Operations</b>	
493	Reserved.
506	Failed to read from the given file.
3003	Error occurred while opening image file.
3004	Parsing of image file failed.
3005	Heci communication failed.
3006	File does not exist.
3007	Operating system is not supported.
3008	Reserved.
3009	User defined certificate hash table is full.
3010	Unable to start HECI.
3011	Invalid input file name
3012	Chipset not supported by the tool.
3013	PID value is NULL.
3014	PPS value is NULL.
3015	Configuration Server FQDN value is NULL.
3016	PKI DNS Suffix value is NULL.
3017	Host Name value is NULL.
3018	Domain Name value is NULL.
3054	Unable to create Logfile.
3055	System failed to retrieve current firmware feature state.
3056	Unable to Save updated parameter as factory defaults on FW image.
3057	Unable to complete FOV commit option.
<b>Widevine Keybox Provision</b>	
576	Keybox file invalid.
581	Invalid keybox status in data out response.



## Appendix C Tool Option Dependency on BIOS/Intel® TXE Status

Tools Options	Intel® Trusted Execution Engine Interface (Intel® TXEI) Manufacturing Mode Done Bit		End of Post		CF9GR Locking	
	1	0	Yes	No	Yes	No
FPT -Greset	Not related	Not related	Not related	N/A Not related	Fail	Work
FPT -R	Depends on End of post status	Work	Depends on Intel® Trusted Execution Engine Interface (Intel® TXEI) manufacturing mode donebit status	Work	Not related	Not related
Intel TXEMANUF -EOL config	Depends on End of post status	Work	Depends on Intel® Trusted Execution Engine Interface (Intel® TXEI) manufacturing mode donebit status	Work	Not related	Not related

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