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Intel® Management Engine Firmware Integrated Clock Controller (ICC) Tool

Tools User Guide

February 2018

Revision 1.2

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Contents

Revision History

Revision Number	Description	Revision Date
0.5	• Initial release.	June 2017
1.0	• Added Set/Get Register commands • Added Set/Get mPHY commands • Removed Set/Get Record Commands • Removed Set/Get chipset Init commands • Listed examples for newly added commands	September 2017
1.1	• Corrected typos	November 2017
1.2	• Added new command to read from Chipset Init file	February 2018

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Intel Confidential User Guide

1　*Introduction*

The purpose of the document is to provide guidance on the usage of the tools provided for Intel® Management Engine (Intel® ME) Firmware Integrated Clock Controller (ICC) included within the Intel firmware kit.

1.1　Terminology

Acronym or Term	Definition
API	Application Programming Interface
BIOS	Basic Input Output System
CCT	Clock Commander Tool
CCTwin	Windows* command line version of the Clock Commander Tool.
CPU	Central Processing Unit
DLL	Dynamic Link Library
Intel® FIT	Intel® Flash Image Tool
FW	Firmware
Intel® ICCS	Intel® Integrated Clock Controller Services
Intel® ME	Intel® Management Engine
Intel® MEI	Intel® Management Engine Interface (formerly HECI)
PCH	Platform Controller Hub
Permanent UOB	UOB that is applied on every boot.
UOB	Update on Boot. A record of ICC registers setting that is applied on the next platform boot.
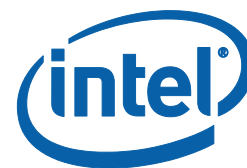
1.2 Reference Documents

Document	Document No./Location
Cannon Lake Platform Controller Hub (CNL PCH) SPI Programming Guide	FW release kit
Cannon Lake Platform Controller Hub (CNL PCH) Intel® Management Engine Firmware Bring Up Guide	FW release kit
Cannon Lake Platform Controller Hub (CNL PCH) External Design Specification (EDS) Vol 1 & Vol 2	CDI#: Vol 1 → 566439 Vol 2 → 565870

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2 Intel® Clock Commander Tool (CCT)

Intel® Clock Commander Tool (CCT) tool is mainly used to collect register programming and clock details of Intel® Management Engine (Intel® ME) Firmware Integrated Clock Controller (ICC) module.

This document covers the usage of the CCT tool available in the **..\Tools\ICC_tools** directory within the Intel® ME FW kit. Details on tools available in the **..\Tool\System Tool** is available in the Intel® System Tools User Guide document within the Intel® ME FW kit.

Note: The Intel® Clock Commander Tool (CCT) tools included in Intel® ME 12.x.x.xxxx kit are designed to be used with Cannon Lake-H/LP Intel® C620 Chipset Family.

2.1 Command Line Interface

CCT.exe and CCTwin.exe support the following command line options.

Note: The Windows* version of the tool - CCTwin.exe - requires that the Intel® Management Engine Interface driver is loaded for it to function.

The command syntax for the CCT tool is CCT [**Verbose options**] **command** [**arguments**].

The available **options** are:

/v0 - verbose level 0. This is the default mode and provides the smallest amount of information.

/v1 - verbose level 1. This is the debug mode and includes additional debug information including the raw Intel® MEI message information.

The available CCT commands are:

Commands	Action
? Or h	Help Menu
gcc	Get ICC Clocks Capabilities
gp	Get ICC Profile
sp	Set ICC Profile
gc	Get ICC Clock Settings
sc	Set ICC Clock Settings

Commands	Action
gm	Get mPHY Settings
sm	Set mPHY Settings
gr	Get Register
sr	Set Register
rm	Read from Chipset Init file
rvrt	Revert FW to defaults or nominal

Note: Refer the next section to get detail of usage, syntax and supported/expected argument options with each command.

2.2 Detail on Supported Commands

2.2.1 ? Or h - Help Menu

Usage: This is command to display help menu. It lists available commands supported by CCT tool.

Syntax:

   CCT*.exe ?

Arguments:

   No Arguments.

The help flag can also be added after any of the commands in the above table.

e.g. CCT*.exe gcc ?

The response would include all the arguments that the command can take (mandatory and optional ones) and would show an example (or more) of an applicable syntax.

2.2.2 gcc – Get Clock Capabilities

Usage: This command displays the HW Product Family, ICC FW version info, and ICC HW SKU info.

Syntax:

   CCT*.exe gcc

Arguments:

No arguments.

2.2.3   gp – Get ICC Profile

Usage: This command displays detail related to the ICC profile index, OEM Profile Setup Parameters, Runtime profile selection is enabled or disabled, and total number of available profiles from Full SPI image flashed on the platform.

Syntax:

CCT*.exe gp

Arguments:

No arguments

2.2.4   sp – Set ICC Profile

Usage: This command allows user to set the ICC profile to the number specified in the profile number argument. This command will not work after the BIOS sends the End of Post Intel® MEI message. Up to 16 ICC profiles can be added via Intel® Flash Image Tool but only one profile out of all can be used as a boot profile. This command allows user to change ICC boot profile. After this command is used, Intel® ME FW executes global reset to apply the change.

Syntax:

CCT*.exe sp [Index]

Arguments:

[Index] - requested ICC profile number.

2.2.5   gc – Get ICC Clock Settings

Usage: This command displays details of current ICC clock settings.

Syntax:

CCT*.exe gc [clockid] [settingtype]

Arguments:

- [Clockid] – specifies clock for which ICC settings should be displayed.

Valid Argument Options for Clockid	Usage
BCLK	Displays ICC settings for BCLK clock
PCIE	Displays ICC settings for PCIE/USB3PCIeGen2 clock

- [Settingtype] – specifies which ICC record to be used to display clock settings mentioned by clockid.

Valid Argument Options for Clockid	Usage
Current	Displays current ICC settings for clock id mentioned by clockid argument
Persistent	Displays Persistent ICC settings for clock id mentioned by clockid argument
OEM	Displays OEM ICC settings for clock id mentioned by clockid argument

2.2.6   sc – Set ICC Clock Settings

Usage: This command allows user to set ICC Clock

Syntax:

CCT*.exe sc [clockid] [flag] [UserFrequency] [sscMode] [sscPercent] [Current Flags][SetToNominal] [ForcePowerFlow] [Type]

Arguments:

- [clockid] – specifies clock for which ICC settings should be changed.

Valid Argument Options for Clockid	Usage
BCLK	Sets ICC settings for BCLK clock
PCIE	Sets ICC settings for PCIE/USB3PCIeGen2 clock

- [Flag] – This is optional parameter to choose how frequency should be set.

Valid Argument Options for Flag	Usage
1	When set, indicates to FW that Set Clock Settings should only translate the User Frequency and return actual frequency.

- [UserFrequency] – User defined frequency.
- [sscMode] – Specifies whether the spread spectrum clocking mode is down-spread or none.
- [sscPercent] – Specifies percentage of the frequency range to spread. Example: a value of 50 indicates 0.50%.
- [Current Flags] – Flags indicating current state of clock

Field	Applicable Value	Usage
Force Power Flow	N/A	Clock settings will include a power flow (platform dependent)
Type	0 – Permanent 1 - Dynamic	Specifies that the settings that were applied to the clock

Set To Default	N/A	Clock will be reverted to either permanent state or Default state

2.2.7   gm – Get mPHY Settings

Usage: This command retrieves the current mPHY settings that are provided to the PMC for application.

Syntax:

    CCT*.exe gm

Arguments:

    No arguments

2.2.8   sm – Set mPHY Settings

Usage: This command programs the current mPHY settings that are provided to the PMC for application. The mPHY settings are provided in a table file that should carry the same name of the mPHY and reside in the tool's root folder.

Syntax:

    CCT*.exe sm

Arguments:

    No arguments

2.2.9   gr - Get Register

Usage: This command is used for retrieving IOSF registers.

Syntax:

    CCT*.exe gr [endpoint_value] [offset]

Arguments:

- [endpoint_value] – Endpoint ID of the appropriate IOSF entity
- [offset] – Offset inside he endpoint space

2.2.10   sr - Set Register

Usage: This command is used for setting IOSF registers.

Syntax:

    CCT*.exe sr –ep [endpoint_value] –offset [offset] -mask [mask] [mode] –p [profile_index] -val[value]

Arguments:

- [endpoint_value] - Endpoint ID of the appropriate IOSF entity
- [offset] – Offset inside he endpoint space
- [mask] – State of bins which writing will only be made to
- [mode] – Specifies the survivability of the set register

Valid Argument Options for mode	Usage
temp	Temporary
perm	Permanent

- [profile_index] – Need to specify the profile to 'patch' to have permanent changes
- [value] – Value to be written on the register

2.2.11   rm – Read from Chipset Init file

Usage: This command is used to read from the Chipset Init file.

Syntax:

   CCT*.exe rm [offset] [bytes]

Arguments:

- [offset] – Offset in the file to starting reading from
- [bytes] – Number of bytes to read

2.2.12   rvrt - Revert FW to defaults
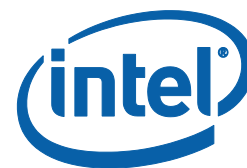
Usage: This command reverts FW to its nominal configuration.

Syntax:

   CCT*.exe rvrt [Revert_type]

Arguments:

   [Revert_type] – 0: To nominal (default configuration)

                   1: To factory defaults

2.3 Examples – How to Use CCT Commands

Below are the examples on how to use CCT tool supported commands. Please note that arguments used in the below examples may differ in value depending on the platform the commands executed on.

2.3.1 Help Menu

```
C:\cct>cctwin.exe ?

Intel (R) Clock Commander Tool Version: 12.0.0.1016
Copyright (C) 2009 - 2018 Intel Corporation. All rights reserved.
usage:
        cctWin.exe [options] command [arguments]

Available options:
/v0     - Verbose level 0 (default mode, smallest amount of
information).
/v1     - Verbose level 1 (debug). Includes raw HECI messaging.

Available commands:
sr      - Set ICC Registers
gr      - Set ICC Registers
gcc     - Get ICC Clocks Capabilities
gp      - Get ICC Profile
sp      - Set ICC Profile
gc      - Get ICC Clock Settings
sc      - Set ICC Clock Settings
gm      - Get mPHY
sm      - Set mPHY
rm      - Read from Chipset Init file
rvrt    - Revert FW to defaults

To get help on specific command, use "cctWin.exe command ?"
```
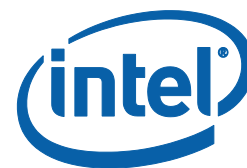
2.3.2 Get Clock Capabilities

```
C:\cct>cctwin gcc
Intel (R) Clock Commander Tool Version: 12.0.0.1016
Copyright (C) 2009 - 2018 Intel Corporation. All rights reserved.

HW Product Family: CNP-LP
HW Stepping:A0
FW Version Major: 12
FW Version Minor: 0
FW Version Hotfix: 0
FW Version Build: 7090
ICC HW SKU = ENHANCED

HECI CMD Status = 0x00000000 (SUCCESS)
```

2.3.3 Get Profiles

```
C:\cct>cctwin gp

Intel (R) Clock Commander Tool Version: 12.0.0.1016
Copyright (C) 2009 - 2018 Intel Corporation. All rights reserved.

number_of_icc_profiles      = 1
failsafe_boot_profile_index = 0
icc_profile_is_selected_by  = runtime profile selection NOT allowed
current_boot_profile_index  = 0
Profile0 Name = Profile 0
Profile0 Base = Standard

HECI CMD Status = 0x00000000 (SUCCESS)
```

2.3.4 Set Profile

```
C:\cct>cctwin sp 1

Intel (R) Clock Commander Tool Version: 12.0.0.1016
Copyright (C) 2009 - 2018 Intel Corporation. All rights reserved.

HECI CMD Status = 0x00000000 (SUCCESS)
```

2.3.5 Get Clock Settings

```
C:\cct>cctwin gc pcie current

Intel (R) Clock Commander Tool Version: 12.0.0.1016
Copyright (C) 2009 - 2018 Intel Corporation. All rights reserved.

frequency        = 100000000 HZ
user frequency   = 100000000 HZ
max frequency    = 100000000 HZ
min frequency    = 99500000 HZ
ssc mode         = 2
ssc percent      = 50
max ssc percent  = 50
current flags    = 0x0000
       force_power_flow:0
       settodefault:0
       pwr_cycle_pending:0
support flags    = 0x0042
       down_spreac:1
       up_spread:0
       ctr_spread:0
       change_allowed:0
       halt_allowed:0
       Source PLL:Unknown Source

HECI CMD Status = 0x00000000 (SUCCESS)
```

2.3.6   Set Clock Settings

```
C:\cct>cctwin sc BCLK 99800000 3 perm

Intel (R) Clock Commander Tool Version: 12.0.0.1016
Copyright (C) 2009 - 2018 Intel Corporation. All rights reserved.

Frequency is: 99800000

HECI CMD Status = 0x00000000 (SUCCESS)
```

2.3.7   Get mPHY

```
C:\CSME_PETS>cctwin gm

Intel (R) Clock Commander Tool Version: 12.0.0.1016
Copyright (C) 2009 - 2018 Intel Corporation. All rights reserved.

CRC      : 0x6195
Version  : 19
Product  : CNPLP
Stepping : 0
Length   : 0x1838

0x0000 : 95 61 13 C0 00 00 08 51 0F 83 45 F4 46 F5 00 0F
0x0010 : 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x0020 : 00 00 00 00 28 A8 07 00 01 00 30 80 01 04 30 00
0x0030 : 28 A8 07 00 01 00 3C 80 02 00 00 00 28 A8 07 00
0x0040 : 0F 00 48 80 00 00 21 01 28 A8 07 00 0F 00 4C 80
0x0050 : 00 0C 00 00 28 A8 07 00 0F 00 60 80 01 00 00 00
0x0060 : 28 A8 07 00 04 00 E8 80 80 08 19 3C 28 A8 07 00
0x0070 : 08 00 38 81 AC D4 00 00 28 A8 07 00 0B 00 90 81
0x0080 : 02 06 01 0C 28 A8 07 00 05 00 A8 81 06 00 1F 00
HECI CMD Status = 0x00000000 (SUCCESS)
```

2.3.8   Set mPHY

```
C:\CSME_PETS>cctwin sm

Intel (R) Clock Commander Tool Version: 12.0.0.1016
Copyright (C) 2009 - 2018 Intel Corporation. All rights reserved.

HECI CMD Status = 0x00000000 (SUCCESS)
```

2.3.9   Get Register

```
C:\CSME_PETS>cctwin gr -ep 0x000000AD -offset 0x00004010

Intel (R) Clock Commander Tool Version: 12.0.0.1016
Copyright (C) 2009 - 2018 Intel Corporation. All rights reserved.

Value = 0x08010804

HECI CMD Status = 0x00000000 (SUCCESS)
```

2.3.10 Set Register

```
C:\CSME_PETS>cctwin sr -ep 0xdc -offset 0x808 -mask 0x1 -temp -val 0x0

Intel (R) Clock Commander Tool Version: 12.0.0.1016
Copyright (C) 2009 - 2018 Intel Corporation. All rights reserved.

HECI CMD Status = 0x00000000 (SUCCESS)
```

2.3.11 Read from Chipset Init file

```
C:\CSME_PETS>cctwin rm 0x100 0x400

Intel (R) Clock Commander Tool Version: 12.0.0.1016
Copyright (C) 2009 - 2018 Intel Corporation. All rights reserved.

Returned bytes: 0x400

0x0000 : 02 D4 05 D3 00 00 61 11 0E C3 4E 35 00 0F 00 00
0x0010 : 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x0020 : 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x0030 : 28 A8 07 00 01 00 3C 80 06 00 00 00 28 A8 07 00
…..
…..
…..
0x03E0 : 28 AA 07 00 08 00 B4 FE 40 40 81 2C 28 AA 07 00
0x03F0 : 04 00 10 FC 00 00 BF 72 28 AA 07 00 04 00 00 FC

HECI CMD Status = 0x00000000 (SUCCESS)
```
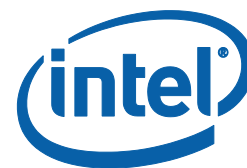
2.3.12 Revert FW to Default

```
C:\CSME_PETS>cctwin rvrt

Intel (R) Clock Commander Tool Version: 12.0.0.1016
Copyright (C) 2009 - 2018 Intel Corporation. All rights reserved.

HECI CMD Status = 0x00000000 (SUCCESS)
```

2.4 Error and Status Messages

2.4.1 Clock Commander Tool Error and Status Messages

When a command is executed the Clock Commander Tool will display status and error messages to indicate the result of the operations. The messages and their definitions are listed in the following table.

Table 2-1. CCT Error and Status Messages

CCT Message	Definition
SUCCESS	The command executed successfully.
FAILURE	The command failed to execute.
INVALID OPTION	An invalid option was specified for the command.
INVALID COMMAND	The command entered was invalid.
INVALID ARGUMENT	The argument entered was invalid.
REGISTER OFFSET OUT OF RANGE	The register offset entered was outside the allowable range.
TOO FEW ARGUMENTS	Arguments missing from the command.
HECI INITIALIZATION FAILED	Initialization of the Intel® MEI interface failed.
HECI READ FAILED	A read from the Intel® MEI interface failed.
HECI WRITE FAILED	A write to the Intel® MEI interface failed.
INVALID RESPONSE	The command received an invalid response.
INVALID_FUNCTION	An invalid function was sent to the FW.
INVALID_PARAMS	A command failed due to invalid parameters.
FLASH_WEAR_OUT_VIOLATION	FW is indicating a flash wear out violation.
FLASH_CORRUPTION	FW is indicating that the flash is corrupted.
PROFILE_NOT_SELECTABLE_BY_BIOS	The ICC profile is not selectable by BIOS. It is selectable by a soft strap.
TOO_LARGE_PROFILE_INDEX	The profile sent by the command exceeds the number of profiles present in the flash.

CCT Message	Definition
NO_SUCH_PROFILE_IN_FLASH	The profile sent by the command does not exist in the flash.
CMD_NOT_SUPPORTED_AFTER_END_OF_POST	A command was attempted that is not allowed after end of post is received from the BIOS.
NO_SUCH_RECORD	A command attempted to access a non-existent record.
NO_SUCH_REGISTER	A command attempted to access a non-existent register.
NO_SUCH_TARGET_ID	A command attempted to access a non-existent target ID.
TOO_LARGE_REGISTER_INDEX	The register index is outside the allowable range.
TOO_LARGE_UOB_RECORD	A write UOB command failed because the UOB exceeded the allowable size.
REGISTER_IS_LOCKED	Access to the ICC register is denied because it is locked.
FUNCTION_NOT_SUPPORTED_AFTER_EOP_OVER_THIS_HECI	A command was attempted that is not allowed after end of post is received from the BIOS.
FUNCTION_NOT_SUPPORTED_OVER_SMBUS	A command is sent that is not supported over the SMBus.
UOB_RECORD_IS_ALREADY_INVALID	This error occurs when CCT attempts to invalidate a UOB that is already invalid.
ONE_UOB_RECORD_IS_ALREADY_VALID	An attempt is made to create a UOB when one is already valid.
OCKEN_MASK_VIOLATION	An attempt is made to write to the OCKEN register that violates the clock enables mask settings.
SUCCESS_OCKEN_AUTO_LOCKED	The OCKEN register was successfully auto locked by FW.
RANGE_VIOLATION_FREQ_TOO_HIGH_CLK[x]	A command failed because the frequency exceeded the allowable range.
RANGE_VIOLATION_FREQ_TOO_LOW_CLK[x]	A command failed because the frequency exceeded the allowable range.
SSC_MODE_CHANGE_NOT_SUPPORTED_CLK[x]	A command failed because a change to the spread spectrum mode is not supported for that clock.

CCT Message	Definition
AS EXPECTED, RESPONSE FROM Intel® ME FW NOT RECEIVED	No response from Intel® ME FW received

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