



Intel® Solid-State Drive Data Center Tool

User Guide

September 2014

Software Version 2.1.3



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Revision History

Revision	Description	Revision Date
001	Initial release	June 2014
002	Added dump, start, and delete functionality. Firmware update for Intel® SSD DC P3700/P3600 Series was made available. The Modify Device Property TempThreshold is now measured in Celsius degrees. It was previously measured in Kelvin units. The show verb now shows support for the <code>-display (-d)</code> option with the <code>-intelssd</code> target.	September 2014



1 Introduction

This guide describes how to use the Intel® Solid-State Drive (SSD) Data Center Tool (DCT). This tool provides a command line interface for interacting with and issuing commands to Intel SSD Data Center drives. It is intended to configure and check the state of Intel PCIe* SSDs and SATA SSDs for a production environment.

Note: The Intel SSD Data Center Tool provides manageability and configuration functionality for Intel PCIe* and SATA SSDs only.

1.1 Features

The Intel SSD Data Center Tool provides a suite of capabilities for interacting with Intel PCIe* and SATA SSD drives. The functionality includes:

- Detecting drives attached on the system
- Parsing a drive's Identify Device information
- Parsing a drive's SMART (Self-Monitoring and Reporting Technology) information
- Resizing the SSD's usable storage capacity by changing its max LBA
- Updating SSD firmware
 - The tool carries a firmware payload for all supported drives.
 - When displaying drive information, the tool will indicate if a new firmware is available.
- Calculating drive life expectancy (Endurance Analyzer)
- Power Governor Mode (vendor unique). Three modes are supported:
 - 0: 25-watts for NVMe* devices; Unconstrained for ATA devices
 - 1: 20-watts for NVMe* devices; Typical (7-watts) for ATA devices
 - 2: 15-watts for NVMe* devices; Low (5-watts) for ATA devices

The following functionality and features apply to Intel® SSD DC S3700 and Intel® SSD DC S3500 Series only:

- Enabling and disabling Spread Spectrum Clocking (SSC)
- Issuing SCT Error Recover Control command
- Setting drive PHY Speed: 1.5Gbs, 3.0Gbs, and 6.0Gbs
- Setting PHY configurations:
 - 0 (Default Enterprise Settings)
 - 1 (Client Settings)
 - 2 (Alternate Enterprise Settings)
- Support for SCT Feature Control:
 - Write cache state
 - Write cache reordering state
 - Temperature logging interval
 - PLI Cap test time interval (vendor unique)
 - Power Governor Burst power (vendor unique)
 - Power Governor Average power (vendor unique)
- Parse ATA HDA Temp (SCT command)
- Parsing PHY Counters (ATA command)
- Reading ATA General Purpose Logs (GPL) (generic)
- ATA Standby Immediate
- ATA Drive Self-Test



The following functionality applies to Intel® SSD DC P3700 and P3600 Series only:

- Executing an NVMe* Format command
- Extracting device log data to a file
- Reading and setting temperature threshold
- Dumping NLOGS and Event Logs

1.2 System Requirements

The Intel SSD Data Center Tool is supported on the following operating systems:

- Windows* Server 2012
- Windows* Server 2012 R2
- Windows* Server 2008 SP2 / R2
- Windows* 7
- Windows* 8
- Windows* 8.1
- Red Hat* Enterprise Linux* (RHEL) 6.5, 7.0

NOTES:

- On Windows* Server 2012/2008/R2 and Windows* 7/8/8.1, administrator access is required. Open a command prompt as administrator and run the tool via the commands as described in this document.
- On Linux* systems, the tool must be run with root privileges. This can be done through either sudo or su commands.
- The tool only works with Intel provided Windows* driver. Click [here](#) for the latest drivers.

1.3 Supported SSDs

The following Intel SATA and PCIe* SSDs are recognized and supported by the Intel SSD Data Center Tool.

- Intel® Solid-State Drive DC S3700 Series
- Intel® Solid-State Drive DC S3500 Series
- Intel® Solid-State Drive DC P3700 Series
- Intel® Solid-State Drive DC P3600 Series

NOTES:

1. Not all functions are available for all drives.
2. The Intel SSD Data Center Tool supports directly-attached SATA drives only.
3. The tool does not support SATA drives behind HBAs and RAID controllers.
4. The PCIe* Intel® Solid-State Drive 910 Series is not supported.



1.4 Document Format

Throughout this guide, the format of each command is documented in a gray colored text box.

- Items in [brackets] are optional.
- For options and targets, each possible value is separated by a bar, '|', meaning "or" and the default value is listed first.
- Items in (parenthesis) indicate a user supplied value.

For example, the following **set** command is interpreted as follows:

- The verb **set** can be followed by an optional modifier (help).
- The target `-intelssd` is required but the value for *Index* is optional.
- It also specifies a required property *Test* in which valid values are `Test1` or `Test2`.

```
isdct set [-h|-help] -intelssd [(Index)] Test=(Test1|Test2)
```

1.5 Running the Data Center Tool

Run the Intel® SSD Data Center Tool from either a Windows* command prompt or a Linux* terminal window. The tool is run as a single command by supplying the command and parameters immediately following the `isdct` executable.

```
isdct show -intelssd
```

1.6 Command Syntax

The command line syntax is case insensitive and is interpreted in English-only. It follows the Distributed Management Task Force (DMTF) Server Management (SM) Command Line Protocol (CLP), or DMTF SM-CLP standard with the exception of the target portion of the command. Document number DSP0214 and can be found at <http://www.dmtf.org>.

Target specification in SM-CLP identifies CIM instances using CIM object paths. The modified syntax implemented utilizes key properties of the target without requiring a syntactically correct CIM object path. Generally, the form of a user request is:

```
isdct <verb>[<options>][<targets>][<properties>]
```

A command has a single verb that represents the action to be taken. Following the verb are can be one or more options that modifies the action of the verb, overriding the default behavior with explicitly requested behavior.

Options generally have a short and long form (for example, `-a` | `-a11`). One or more targets are normally required to indicate the object of the action. However, there are a few cases where a target is not required. Finally, zero or more properties defined as a key/value pair can be used to modify the target.



1.7 Targets

In general, if there is only one object of a specific target type, a target value is not accepted.

Unless otherwise specified, when there are multiple objects of a specific target type, not supplying a target value implies the command should operate on all targets of that type. This is the case for the **show device** command, which will display all devices if no target value is specified.

```
isdct show -intelssd
```

The same operation can be limited to a single object by supplying a specific target value.

```
isdct show -intelssd 1
```



2 Command Line Options

The Intel® SSD Data Center Tool uses a Command Line Interface (CLI). The following table is a summary of the types of action commands (verbs), targets, and command option properties available with the tool. Further details for each command is provided in subsequent sections of this document.

Verb	Description	Target	Properties
help	Shows help for the supported commands.		[Verb=(verb)] [CommandName=(command)]
load	Updates the firmware on an Intel SSD.	-intelssd (<i>Index</i>)	
set	Modifies the configurable settings on the selected Intel SSD.	-intelssd (<i>Index</i>)	[EnduranceAnalyzer='reset'] [MaximumLBA=(xGB x% LBA 'native')] [PhyConfig=(0 1 2)] [PhysicalSectorSize=(0 1)] [PhySpeed=(1.5 3 6)] [PLITestTimeInterval=(0-6)] [PowerGovernorMode=(0 1 2)] [ReadErrorRecoveryTimer=(0-65535)] [SSCEnabled=('True' 'False')] [TempLoggingInterval=(0-65535)] [TempThreshold=(0-75)] [WriteCacheState=(1 2 3)] [WriteErrorRecoveryTimer=(0-65535)]
start	Starts selected functions.	-intelssd (<i>Index</i>)	[Function='nvmeformat' 'standbyimmediate' 'shortselftest' 'extendedselftest' 'conveyanceselftest'] [LBAFormat=(0-NumLBAFormats)] [SecureEraseSetting=(0 1 2)] [ProtectionInformation=(0 1)] [MetadataSetting=(0 1)]
dump	Dumps device log data to a file.	-intelssd (<i>Index</i>)	DataType=('identify' 'nvme-log' 'nlog' 'eventlog' 'gpl' 'hdatemperature' 'phycounters') [LogID=(1 2 3 196 197 202)] [LogAddress=0-255] [PageNum=0-65535] [Sectors=0-65535]
show	Shows information about one or more Intel SSDs.	-intelssd [(<i>Index</i>)]	
show	Shows SMART Attributes for one or more Intel SSDs.	-sensor [-intelssd (<i>Index</i>)]	[ID=(<i>valid SMART ID</i>)]
version	Shows Version and End-User License Information.		
Delete	Delete Intel SSD erasing all data	-intelssd [(<i>Index</i>)]	



2.1 Intel SSD Discovery

2.1.1 Show Device

Shows information about one or more Intel SSDs. The tool only recognizes the Intel® SSD Data Center Family.

2.1.1.1 Syntax

```
isdct show [-all|-a] [-display|-d] [-help|-h] -intelssd [(Index)]
```

2.1.1.2 Options

Option	Description
[-all -a]	Shows all properties.
[-display -d]	Filters the returned properties by explicitly specifying a comma separated list of any of the properties defined in the Return Data section.
[-help -h]	Displays help for the command.

2.1.1.3 Targets

Target	Description
-intelssd [(Index)]	Restricts output to specific Intel SSD by supplying the device's Index. By default, the command displays all Intel SSDs.

2.1.1.4 Properties

This command does not support any properties.

2.1.1.5 Return Data

By default, a table is displayed with the following default properties. Use the options to show more detail.

Property	Description
DevicePath	(Default) Shows the OS path to the device (\\.\PhysicalDrive0).
DeviceStatus	(Default) Report the device's status. In the current implementation, this will look at ErrorString and if it is empty, it will report "Healthy;" otherwise, it will report the value of ErrorString.
Firmware	(Default) Shows the firmware revision of the device.
FirmwareUpdateAvailable	(Default) Shows the firmware revision available for update. Firmware updates are carried within the tool as a "payload" binary for each supported drive. This reports 'No update available' if the device's firmware is up to date.



Property	Description
Index	(Default) Shows the Intel SSD device index, used for device selection.
ProductFamily	(Default) Shows the Intel SSD Series name.
ModelNumber	(Default) Shows the model number assigned to the device.
SerialNumber	(Default) Shows the serial number assigned to the device.
AggregationThreshold	(For NVMe* devices only) Shows the minimum number of completion queue entries to aggregate per interrupt vector before signaling an interrupt to the host. This value is zero-based.
AggregationTime	(For NVMe* devices only) Shows the recommended maximum time in 100 microsecond increments that a controller may delay an interrupt due to interrupt coalescing.
ArbitrationBurst	(For NVMe* devices only) Shows the maximum number of commands that the controller may launch at one time. This value is specified in 2^n . A value of 7 indicates no limit.
AsynchronousEventConfiguration	(For NVMe* devices only) Determines whether an asynchronous event notification is sent to the host for the corresponding Critical Warning specified in the SMART / Health Information Log.
ControllerDescription	(Currently in Windows OS only) Shows a description of the controller the device is attached to.
ControllerIDEMode	Shows if the controller the device is attached to is in IDE mode. Returns either True or False.
ControllerManufacturer	(Currently in Windows OS only) The manufacture of the controller that the device is attached to.
ControllerService	(Currently in Windows OS only) Displays the controller driver sys file that the attached device is connected to.
DriverDescription	(Currently in Windows OS only) Shows a description of the controller driver that the device is attached to.
DriverMajorVersion	(Currently in Windows OS only) Shows the major version of the controller driver that the device is attached to.
DriverManufacturer	(Currently in Windows OS only) Shows the manufacture of the controller driver that the device is attached to.
DriverMinorVersion	(Currently in Windows OS only) Shows the minor version of the controller driver that the device is attached to.
EnduranceAnalyzer	The drives life expectancy in years. This utilizes the 0xE2, 0xE3 and 0xE4 SMART attributes. If these SMART attributes have a value of 0xFFFF then they are still in the reset state and a 60+ minute workload has yet to run. If the media wear indicator is zero then the workload has not induced enough wear to calculate an accurate life expectancy.
ErrorString	Shows a description of the error state of the drive. NOTE: The drive is not in an error state if the value is blank.



Property	Description
HighPriorityWeightArbitration	(For NVMe* devices only) Shows the number of commands that can be executed from the high priority services class in each arbitration round. This is a 0's based value.
IEEE1667Supported	(For ATA devices only) Shows if the IEEE1667 protocol is supported. Reports True or False.
IOCompletionQueuesRequested	(For NVMe* devices only) Shows the number of IO Completion Queues requested.
IOSubmissionQueuesRequested	(For NVMe* devices only) Shows the number of IO Submission Queues requested.
LBAFormat	(For NVMe* devices only) Shows the LBA Format that the drive is configured with. This has a possible value of 0 to 'NumLBAFormats'. Details of the different LBA formats can be found in Identify Namespace.
LowPriorityWeightArbitration	(For NVMe* devices only) Shows the number of commands that can be executed from the low priority services class in each arbitration round. This is a 0's based value.
MaximumLBA	Shows the devices maximum logical block address.
MediumPriorityWeightArbitration	(For NVMe* devices only) Shows the number of commands that can be executed from the medium priority services class in each arbitration round. This is a 0's based value.
MetadataSetting	(For NVMe* devices only) Shows the device's Metadata setting. One of either: <ul style="list-style-type: none"> 0: Metadata is transferred as part of a separate contiguous buffer. 1: Metadata is transferred as part of an extended data LBA. This can be changed by issuing an NVMe* format.
NativeMaxLBA	Shows the devices native maximum logical block address set in manufacturing. This value cannot be changed. It represents the physical maximum number of LBAs for the device.
NumErrorLogPageEntries	(For NVMe* devices only) Shows the number of Error Information log entries that are stored by the controller. This value is zero-based.
NumLBAFormats	(For NVMe* devices only) Shows the number of different LBA Formats the device supports. This value is zero-based. For example, a value of 6 means there are 0 to 6 possible LBA Formats (7 total).
NVMePowerState	(For NVMe* devices only) Shows the power state of the controller. Supported power states are described in the Identify Controller data structure. This is an NVMe* Get Feature (feature ID=2)
PhyConfig	(For ATA devices only) Shows the devices PHY Configuration. One of the following: <ul style="list-style-type: none"> 0: Default enterprise settings 1: Client settings 2: Alternate enterprise settings



Property	Description
PhysicalSectorSize	(For ATA devices only) Shows the physical sector size in bytes. One of either: <ul style="list-style-type: none"> • 512 • 4096
PhysicalSize	The physical size of the device in bytes. Value is in decimal format.
PhySpeed	(For ATA devices only) Shows the maximum physical speed (in gigabits-per-second) of the device. One of the following: <ul style="list-style-type: none"> • 1.5 • 3 • 6
PLITestTimeInterval	(For ATA devices only) Shows the PLI Test Time interval in minutes of the device. One of: <ul style="list-style-type: none"> • 0: 0 min, no immediate test. • 1: 0 min, do immediate test. • 2: 60 min, do immediate test. • 3: 1440 min, do immediate test. • 4: 4320 min, do immediate test. • 5: 10080 min, do immediate test. • 6: 20160 min, do immediate test.
PowerGovernorAveragePower	(For ATA devices only) Shows the device's power governor average power in milliwatts.
PowerGovernorBurstPower	(For ATA devices only) Shows the device's power governor burst power in milliwatts.
PowerGovernorMode	Shows the devices Power Governor state. One of: <ul style="list-style-type: none"> • 0: 25-watts for NVMe* devices; Unconstrained for ATA devices. • 1: 20-watts for NVMe* devices; Typical (7-watts) for ATA devices. • 2: 15-watts for NVMe* devices; Low (5-watts) for ATA devices.
ProtectionInformation	(For NVMe* devices only) Shows the device's protection information type setting. One of: <ul style="list-style-type: none"> • 0: Protection information is not enabled. • 1: Protection information type 1 is enabled.
ProtectionInformationLocation	(For NVMe* devices only) Shows the device's protection information location setting. One of: <ul style="list-style-type: none"> • 0: Protection information is transferred as the last 8 bytes of metadata. • 1: Protection information is transferred as the first 8 bytes of metadata. This can be changed by issuing an NVMe* Format command.
RAIDMember	Shows if the device is part of a RAID. Currently only support RST RAID drivers.



Property	Description
ReadErrorRecoveryTimer	(For ATA devices only) Shows the time limit for read error recovery. Time limit is in 100 millisecond units.
SataGen1	(For ATA devices only) Shows if the device supports SATA Gen 1 speed. Reports True or False.
SataGen2	(For ATA devices only) Shows if the device supports SATA Gen 2 speed. Reports True or False.
SataGen3	(For ATA devices only) Shows if the device supports SATA Gen 3 speed. Reports True or False.
SataNegotiatedSpeed	(For ATA devices only) Coded value indicating current negotiated SATA signal speed. One of: <ul style="list-style-type: none">• 1: SATA Gen1 rate of 1.5 Gbps• 2: SATA Gen2 rate of 3 Gbps• 3: SATA Gen3 rate of 6 Gbps
SectorSize	Shows the sector size in bytes.
SecurityEnabled	(For ATA devices only) Shows if the device is in security enabled state. Reports True or False.
SecurityFrozen	(For ATA devices only) Shows if the device is in security frozen state. Reports True or False.
SecurityLocked	(For ATA devices only) Shows if the device is security locked. Reports True or False.
SMARTEnabled	Shows if SMART capabilities are enabled on the device. Reports True or False.
SSCEnabled	(For ATA devices only) Shows if the device has spread spectrum clocking enabled or not. Reports True or False.
TempLoggingInterval	(For ATA devices only) Shows the time interval for temperature logging.
TempThreshold	(For NVMe* devices only) Shows the temperature threshold of the overall device. Units are in Celsius.
TimeLimitedErrorRecovery	(For NVMe* devices only) Shows the limited retry timeout value in 100 millisecond units. This applies to I/O commands that indicate a time limit is required. A value of 0 indicates that there is no timeout.
WriteAtomicityDisableNormal	(For NVMe* devices only) Shows the atomic write status. One of: <ul style="list-style-type: none">• 0: If cleared to '0', the atomic write unit for normal operation shall be honored by the controller.• 1: The host specifies that the atomic write unit for normal operation is not required and the controller shall only honor the atomic write unit for power fail operations.
WriteCacheEnabled	(For ATA devices only) Shows if the device has write cache enabled. Reports True or False.



Property	Description
WriteCacheState	(For ATA devices only) Shows the device's write cache state. One of: <ul style="list-style-type: none"> • 1: Write cache state is determined by ATA Set Features • 2: Write cache is enabled. • 3: Write cache is disabled.
WriteCacheSupported	(For ATA devices only) Shows if the device supports write cache capabilities. Reports True or False.
WriteErrorRecoveryTimer	(For ATA devices only) Shows the time limit for write error recovery in 100 millisecond units.

2.1.1.6 Examples

```
isdct show -intelssd
```

Lists the default fields for each Intel® Data Center SSD.

```
isdct show -a -intelssd 1
```

Lists all properties for the Intel SSD at index 1.



2.2 Configure Intel SSDs

Configuring SSDs requires the CLI verbs **Load** (Firmware Update), **Set** (Modify Device), and **Start** (NVMe* Format).

2.2.1 Firmware Update

Updates the firmware on the selected Intel SSD. On the next reset, the firmware will become active.

2.2.1.1 Syntax

```
isdct load [-force|-f] [-help|-h] -intelssd (Index)
```

2.2.1.2 Options

Option	Description
[-force -f]	Displays a prompt by default when invoking the Firmware Update command. Use this option to bypass the prompt.
[-help -h]	Displays help for the command.

2.2.1.3 Targets

Target	Description
-intelssd (Index)	Updates the firmware on the specified Intel SSD. Firmware binaries are embedded into the tool. See the FirmwareUpdateAvailable property for firmware update eligibility.

2.2.1.4 Properties

This command does not support any properties.

2.2.1.5 Limitations

To run this command, you must have the appropriate host system privileges and the specified Intel SSDs must be manageable by the host software.

2.2.1.6 Return Data

The CLI indicates the status of the firmware update operation.



2.2.1.6.1 Sample Output

```
>isdct.exe load -intelssd 0
WARNING! You have selected to update the drives firmware!
Proceed with the update? (Y|N): y
Updating firmware...

The selected Intel SSD contains current firmware as of this tool release.

>isdct.exe load -intelssd 0
WARNING! You have selected to update the drives firmware!
Proceed with the update? (Y|N): n
Canceled.

>isdct.exe load -f -intelssd 0
Updating firmware...
The selected Intel SSD contains current firmware as of this tool release.
```

```
>isdct.exe load -intelssd 0
WARNING! You have selected to update the drives firmware!
Proceed with the update? (Y|N): y
Updating firmware...
Firmware update successful.
```

2.2.1.7 Examples

```
isdct load -intelssd 1
```

Updates the firmware on the device at index 1.



2.2.2 Modify Device

Changes the configurable settings on an Intel SSD.

NOTE: You can only change one setting at a time.

2.2.2.1 Syntax

```
isdct set [-help|-h] -intelssd (Index) [...]
```

2.2.2.2 Options

Option	Description
[-help -h]	Displays help for the command.

2.2.2.3 Targets

Target	Description
-intelssd (Index)	Modifies the selected Intel SSD by supplying its Index value.

2.2.2.4 Properties

One, and only one, property must be specified.

Property	Description
EnduranceAnalyzer	Resets the SMART attributes: E2, E3, and E4. The Valid value is reset . As a result, the reported raw value of these attributes will be 0xFFFF. Once the values have been reset, the device must go through a 60+ minute workload for the attributes to trip.
MaximumLBA	Sets the device's Maximum LBA value. This operation will overprovision the drive. The MaximumLBA can be specified in the following ways: <ul style="list-style-type: none">• xGB - Sets the devices maximum LBA such that the total capacity is the specified GB value. Value must be at least 1 and cannot exceed devices total native capacity.• X% - Sets the devices maximum LBA to the given percentage. Allowed values are 1-100%. 100% equals native maximum LBA.• LBA - Sets the devices maximum LBA value to the given LBA. Given value must be a decimal literal. The LBA value must be at least XYZ and it cannot exceed the native maximum LBA value.• "native" - Sets the devices maximum LBA value back to its native maximum.



Property	Description
PhyConfig	<p>(For ATA devices only) Changes the PHY configuration of the selected device. Valid values are:</p> <ul style="list-style-type: none"> • 0: Default enterprise settings. • 1: Client settings • 2: Alternate enterprise settings
PhysicalSectorSize	<p>(For ATA devices only) Changes the devices physical sector size. Values are in byte units. Valid values are:</p> <ul style="list-style-type: none"> • 512 • 4096
PhySpeed	<p>(For ATA devices only) Changes the devices maximum allowed PHY Speed it is allowed to negotiate. Valid values are:</p> <ul style="list-style-type: none"> • 1.5: SATA Gen 1 speed of 1.5 Gbs • 3: SATA Gen 2 speed of 3 Gbs • 6: SATA Gen 3 speed of 6 Gbs <p>Actual negotiated speed is also determined by the controller the device is attached to.</p>
PLITestTimeInterval	<p>(For ATA devices only) Changes the devices PLI test time interval setting. Valid values are:</p> <ul style="list-style-type: none"> • 0: 0 min, no immediate test • 1: 0 min, do immediate test • 2: 60 min, do immediate test • 3: 1440 min, do immediate test • 4: 4320 min, do immediate test • 5: 10080 min, do immediate test • 6: 20160 min, do immediate test
PowerGovernorMode	<p>Changes the devices power governor mode settings. Valid values are:</p> <ul style="list-style-type: none"> • 0: 25-watts for NVMe* devices; Unconstrained for ATA devices. • 1: 20-watts for NVMe* devices; Typical (7-watts) for ATA devices. • 2: 15-watts for NVMe* devices; Low (5-watts) for ATA devices.
ReadErrorRecoveryTimer	<p>(For ATA devices only) Sets the devices error recovery timer for reads. Value is in 100-microsecond units. Valid values are:</p> <ul style="list-style-type: none"> • 0-65535
SSCEnabled	<p>(For ATA devices only) Toggles the devices spread spectrum clocking feature on and off.</p> <ul style="list-style-type: none"> • "True" - enable SSC • "False" - disable SSD <p>Device must be power cycled after setting.</p>
TempLoggingInterval	<p>(For ATA devices only) Sets the devices temperature logging interval. Value is in seconds. Valid values are:</p> <ul style="list-style-type: none"> • 0-65535



Property	Description
TempThreshold	(For NVMe* devices only) Sets the devices temperature threshold. Value is in degrees Celsius. Valid values are: <ul style="list-style-type: none">• 0-75 NVMe devices only.
WriteCacheState	(For ATA devices only) Sets the devices write cache state. Valid values are: <ul style="list-style-type: none">• 1 : Write cache state is determined by ATA Set Features• 2: Write cache is enabled.• 3: Write cache is disabled.
WriteErrorRecoveryTimer	(For ATA devices only) Set the devices error recovery timer for writes. Value is in 100-microsecond units. Valid values are: <ul style="list-style-type: none">• 0-65535

2.2.2.5 Limitations

To run this command, you must have the appropriate host system privileges and the specified Intel SSD must be manageable by the host software.

2.2.2.6 Return Data

The CLI indicates the status of the operation.

2.2.2.6.1 Sample Output

```
Set WriteCacheState successful.
```

2.2.2.7 Examples

```
isdct set -intelssd 0 WriteCacheState=3
```

Disables the write cache state of the Intel SSD at index 0 by setting its WriteCacheState to 3.



2.2.3 Execute Device Function

Use the **start** verb to execute a function on the selected device.

2.2.3.1 Syntax

```
start [-help|-h] [-force|-f] -intelssd (Index) Function=('nvmeformat' | 'standbyimmediate'
| 'shortselftest' | 'extendedselftest' | 'conveyanceselftest') [LBAFormat]
[SecureEraseSetting] [ProtectionInformation] [MetadataSetting]
```

2.2.3.2 Options

Option	Description
[-help -h]	Displays help for the command.
[-force -f]	Displays a prompt by default when invoking NVMe* Format functionality. Use this option to bypass the prompt.

2.2.3.3 Targets

Target	Description
-intelssd (Index)	Issue NVMe* Format on selected Intel SSD. Data on this SSD will be erased!!

2.2.3.4 Properties

Properties supported for the **start** verb are list below. Function is required as it specifies which function to start. The properties LBAFormat, SecureEraseSetting, ProtectionInformation, and MetadataSetting are required when Function=nvmeformat.

Property	Description
Function	Specifies which function to run. Valid functions are: <ul style="list-style-type: none"> nvmeformat (NVMe* devices only): Issues an NVMe* Format command to the selected Intel SSD, which must be an NVMe* device, and erases all data on the selected device. standbyimmediate (SATA devices only): Issues a SATA Standby Immediate command to the drive and prepares the drive for power removal. shortselftest (SATA devices only): Runs a short self-test for the drive. This is run in captive mode. extendedselftest (SATA devices only): Runs an extended self-test for the drive. This is run in captive mode. conveyanceselftest (SATA devices only): Runs a conveyance self-test for the drive. This is run in captive mode.
LBAFormat	Sets a value that corresponds to one of the supported LBA Formats described in Identify Namespace. Valid values are: <ul style="list-style-type: none"> 0-NumLBAFormats: See NumLBAFormats Property for max value.



Property	Description
SecureEraseSetting	Specifies the setting for Secure Erase. Valid values are: <ul style="list-style-type: none">• 0: No secure erase.• 1: User data erase.• 2: Crypto erase.
ProtectionInformation	Enables different protection information types. Valid values are: <ul style="list-style-type: none">• 0: Protection information is not enabled.• 1: Protection information type 1 is enabled.
MetadataSetting	Specifies how metadata is transferred. Valid values are: <ul style="list-style-type: none">• 0: Metadata is transferred as part of a separate contiguous buffer.• 1: Metadata is transferred as part of an extended data LBA.

2.2.3.5 Limitations

To run this command, you must have the appropriate host system privileges and the specified Intel SSD must be manageable by the host software.

2.2.3.6 Return Data

The CLI returns the status of the command.

2.2.3.7 Examples

```
start -intelssd 1 Function=nvmeformat LBAFormat=0 SecureEraseSetting=0  
ProtectionInformation=0 ProtectionInformationLocation=0 MetadataSetting=0
```

Issue NVMe* Format to the Intel SSD at index 1.

```
start -intelssd 1 Function=nvmeformat LBAFormat=3 SecureEraseSetting=0  
ProtectionInformation=1 ProtectionInformationLocation=0 MetadataSetting=0
```

Issue NVMe* Format to the Intel SSD at index 1 and set the LBA Format to 3 and enable Type 1 protection information.

```
start -intelssd 1 Function=standbyimmediate
```

Issue an ATA Standby Immediate to the Intel SSD at index 1. This will prepare the drive for power removal.



2.3 Instrumentation Commands

Instrumentation commands utilize command target options **Sensor** and **Dump**.

2.3.1 Sensor

Sensor terminology indicates equivalent SMART Attributes for a drive. The **show -sensor** command shows the SMART attributes for one or more Intel SSDs.

2.3.1.1 Syntax

```
isdct show [-display|-d] [-help|-h] -sensor [-intelssd (Index)] [(ID)]
```

2.3.1.2 Options

Option	Description
[-display -d]	Filters the returned properties by explicitly specifying a comma separated list of any of the properties defined in the Return Data section.
[-help -h]	Displays help for the command.

2.3.1.3 Targets

Target	Description
-sensor	Displays Sensors for device(s).
[-intelssd (Index)]	Restricts output to the sensors on a specific Intel SSD by supplying the Intel SSD Index. The default is to display sensors for all manageable Intel SSDs.

2.3.1.4 Properties

This command option does not support any properties.

Property	Description
ID	Filters the Sensor output to a specific SMART attribute by specifying the SMART ID token. See Example below.

2.3.1.5 Limitations

To run this command option, the specified Intel SSD(s) must be manageable by the host software.



2.3.1.6 Return Data

The command displays the following properties for each sensor command option. This output could be filtered by specifying the Properties with the `-display` option. It can be further filtered by specifying the ID property.

NOTE: Some optional properties are not supported on all device sensors.

Property	Description
ID	Shows the SMART Attribute ID token.
Description	Shows a string representation of the ID token.
Raw	Shows the raw value of the SMART Attribute. Value is in decimal.
Normalized	Shows the normalized value of the SMART attribute.
Threshold	(Optional) Shows the SMART Attributes threshold value.
Worst	(Optional) Shows the SMART attributes worst normalized value. Maintained for the life of the device.
Status	(Optional) Shows the status flags for the SMART attribute: <ul style="list-style-type: none">• Bit 0 Pre-failure/advisory bit• Bit 1 Online data collection• Bit 2 Performance attribute• Bit 3 Error rate attribute• Bit 4 Event count attribute• Bit 5 Self-preserving attribute• Bits 6 – 15 Reserved
Action	(Optional) Shows the Pass/Fail status based on the Pre-failure/advisory status bit.

2.3.1.7 Examples

```
isdct show -sensor
```

Gets all sensor information for all Intel SSDs.

```
isdct show -sensor -intelssd 1 ID=E9
```

Shows all the properties of the SMART E9 Attribute for the Intel SSD at Index 1.

```
isdct show -d raw -sensor ID=E9
```

Shows only the raw value of the SMART E9 Attribute for all Intel SSDs.



2.3.2 Dump Device Data

This command will read and parse specific data from the device and save it to file. This feature currently supports dumping:

- Device Identify data
- NVMe* Log pages.
- nLog
- Event Log
- SATA General Purpose Logs (GPL)
- HDA Temperature
- SATA PHY Counters

2.3.2.1 Syntax

```
dump [-help|-h] -destination (filename) -intelssd (Index) (DataType) [LogID] [LogAddress]
[PageNum] [Sectors]
```

2.3.2.2 Options

Option	Description
[-help -h]	Displays help for the command.
-destination (filename)	(Required) Specifies a filename to save the dump data to. See the DataType property for the file types returned.

2.3.2.3 Targets

Target	Description
-intelssd (Index)	Dump the selected data from the given Intel SSD.



2.3.2.4 Properties

The following properties are used to determine which data is retrieved from the selected device.

Property	Description
DataType	<p>(Required) Specifies which type of data to dump. Valid values are:</p> <ul style="list-style-type: none">• <code>identify</code>: Parses the device's identify information. Output is in comma separated format (CSV). For NVMe* devices, it parses the Controller and Namespace identify structures. For ATA devices it will parse the Identify Device structure.• <code>NvmeLog</code> (NVMe* devices only): Parses the NVMe* logs. You must specify the log with the <code>LogID</code> property. Output is in comma separated format (CSV).• <code>nlog</code>: Reads and saves the device's NLOG binary data.• <code>eventlog</code>: Reads and saves the device's event log binary data.• <code>gp1</code> (SATA devices only): Reads the SATA GPL binary and saves it to file. By default, it reads 1 sector from Log Address 0 and page Number 0. Specify the <code>LogAddress</code>, <code>PageNum</code>, and <code>Sectors</code> properties to change which GPL is read.• <code>hdtemperature</code> (SATA devices only): Parses the device's HDA temperature data. Output is in CSV format.• <code>Phycounters</code> (SATA devices only): Parses the device's PHY Counters. Output is in CSV format.
LogID	<p>Specifies which NVMe* log to parse. This is only required if <code>DataType=nvmeLog</code>. Valid values are:</p> <ul style="list-style-type: none">• 1 - Error Log Information• 2 - SMART / Health Information• 3 - Firmware Slot Information• 197 - Temperature Statistics• 202 - SMART Attributes
LogAddress	<p>Only used when <code>DataType=gp1</code>. Optional; Default = 0. This specifies which GPL log to read. Allowed values are: 0-255. Note: not all values correspond to a GPL.</p>
PageNum	<p>Only used when <code>DataType=gp1</code>. Optional; Default = 0. This specifies which page offset to read from the given <code>LogAddress</code>. Allowed values are: 0-65535.</p>
Sectors	<p>Only used when <code>DataType=gp1</code>. Optional; Default = 1. This specifies the number of sectors to read from the given <code>LogAddress</code>. Allowed values are: 0-65535.</p>



2.3.2.5 Limitations

To run this command, the specified Intel SSD must be manageable by the host software.

2.3.2.6 Return Data

The CLI indicates the status of the dump command.

2.3.2.6.1 Sample Data

```
Dump successful. Data saved to: identifydata.csv
```

```
Error: The selected drive does not support this feature.
```

2.3.2.7 Examples

```
dump -destination identifydata.csv -intelssd 1 DataType=identify
```

Parse the identify structure(s) for the Intel SSD at index 1 and save the data to CSV file named: identifydata.csv.

```
dump -destination nvmeLog2data.csv -intelssd 1 DataType=nvmeLog LogID=2
```

Parse the NVMe* Log 2 (SMART / Health Information) for the Intel SSD at index 1 and save the data to CSV file named: nvmeLog2data.csv.

```
dump -destination nlogdata.bin -intelssd 1 DataType=nlog
```

Read the nlog binary from the Intel SSD at Index 1 and save it to nlogdata.bin.

```
dump -destination gp1.bin -intelssd 1 DataType=gp1 LogAddress=0xDF PageNum=0 Sectors=600
```

Read 600 sectors the GPL at address 0xDF, Page Number 0 and save it to binary file: gp1.bin.



2.3.3 Delete Device

Delete Intel SSD will erase all the data on the drive. For SATA devices, this will issue an ATA Secure Erase. For NVMe* devices, this will issue an NVMe* Format command. The function will keep the drive's current configuration.

When invoked, the tool will prompt you to proceed with the delete. To bypass the prompt, use the `-force` option.

2.3.3.1 Syntax

```
delete [-help|-h] [-force|-f] -intelssd (Index)
```

2.3.3.1

Options

Option	Description
<code>[-help -h]</code>	Displays help for the command.
<code>-destination (filename)</code>	The tool will display a prompt by default when invoking delete. Use this option to bypass the prompt. This option will also ignore partitions on the device.

2.3.3.2 Targets

Target	Description
<code>-intelssd (Index)</code>	Delete the selected Intel SSD Device and erase all data.

2.3.3.3 Properties

This command does not support any properties.

2.3.3.4 Limitations

To successfully execute this command, the caller must have the appropriate privileges and the specified Intel SSD must be manageable by the host software.

2.3.3.5 Return Data

The CLI will return status of the command.

2.3.3.6 Examples

```
delete -intelssd 1
```

Delete the device at index 1 and erase all user data.



2.4 Support Commands

Support commands consist of **Help** and **Version**.

2.4.1 Help Command

Shows help for the supported commands.

2.4.1.1 Syntax

```
isdct help [-help|-h] [Verb=(verb)] [CommandName=(command)]
```

2.4.1.2 Options

Option	Description
[-help -h]	Displays help for the command.

2.4.1.3 Targets

This command does not support any targets.

2.4.1.4 Properties

Property	Default	Description
Verb	All Verbs	Filters help to a specific verb. One of: <ul style="list-style-type: none"> • dump • help • load • set • show • start • version
CommandName	All commands	Filters help to a specific command by name.

2.4.1.5 Return Data

By default, the command displays an introduction to DCT followed by a list of the supported commands. When the command list can be filtered to just one command, detailed information is displayed. When the command list includes more than one command, only the command name and synopsis are displayed.



2.4.1.5.1 Sample Output (Multiple Commands)

```
Usage: isdct <verb>[<options>][<targets>][<properties>]

Commands:
Help:
Retrieve a list of commands supported by Intel SSD Data Center Tool. Filter the results by
providing a specific verb or command name. By default, if the filter is specific enough to
indicate a single command, detailed help will be displayed for that command.

    help [-help|-h] [CommandName = (name)] [verb = (verb)]

intelssd:
Get a list of Intel SSDs attached to a system. The default behavior is to list a few key
properties for each device; the options can be used to expand/restrict the output. If more
than one device is installed output can be restricted to a single device by supplying its
index.

    isdct show [-all|-a] [-help|-h] -intelssd [(device index)]
```

2.4.1.5.2 Sample Output (Verb Filter to Multiple Commands)

```
Commands:
EnduranceAnalyzer:
Reset the device's timed workload indicators.

    set [-help|-h] -intelssd (device index) EnduranceAnalyzer = ('reset')

PhyConfig:
Set the SATA device's PHY configuration. The device must be power cycled after changing
the configuration.

    set [-help|-h] -intelssd (device index) PhyConfig = (0|1|2)

PhysicalSectorSize:
Set the SATA device's physical sector size.

    set [-help|-h] -intelssd (device index) PhysicalSectorSize = (0|1)

PLITestTimeInterval:
Set the SATA device's PLI test time interval. All values except 0 will do an immediate
test when set.

    set [-help|-h] -intelssd (device index) PLITestTimeInterval = (0-6)

PowerGovernorMode:
Set the device's Power Governor Mode.

    set [-help|-h] -intelssd (device index) PowerGovernorMode = (0|1|2)
```

Specifying the CommandName property filters the list to a specific command and detailed information is returned.



2.4.1.5.3 Sample Output (Single Command)

```
Name: WriteCacheState
Description:
Set the SATA device's write cache state.
Synopsis:
    set [-help|-h] -intelssd (device index) WriteCacheState = (1|2|3)
Verb:
    Set
Options:
    [-help|-h] - Display help for the command.
Targets:
    -intelssd (device index) - Device index is required.
Properties:
    WriteCacheState = (1|2|3) - 1 = write cache state is determined by Set Features.
    2 = write cache is enabled. 3 = write cache is disabled.
```

2.4.1.6 Examples

```
isdct help
```

Lists all supported commands

```
isdct help verb=set
```

Lists all commands where the verb is set

```
isdct help CommandName=WriteCacheState
```

Lists the detailed help for the given CommandName WriteCacheState



2.4.2 Version Command

Shows the Intel® SSD Data Center Tool's version and end-user license.

2.4.2.1 Syntax

```
isdct version [-help|-h] [-display|-d] [-all|-a]
```

2.4.2.2 Options

Option	Description
[-help -h]	Displays help for the command.
[-display -d]	Filters the returned properties by explicitly specifying a comma separated list of any of the properties defined in the Return Data section.

2.4.2.3 Targets

This command does not support any targets.

2.4.2.4 Properties

This command does not support any properties.

2.4.2.5 Return Data

By default, the command returns the Intel SSD Data Center Tool's version information. With the `-display` option, it shows the License property.

Property	Description
License	Shows the End-User License for the Intel SSD Data Center Tool.

2.4.2.5.1 Sample Output

```
Intel(R) Data Center Tool  
Version 2.0.0  
Interact and configure Intel SSDs.
```

2.4.2.6 Examples

```
version
```

Displays the available version information for the DCT software.

```
version -d license
```

Displays the End-User License for the DCT software components.



3 Response Codes

The following table lists all the possible error and status codes that are returned from the Intel® SSD Data Center Tool. The first column lists the numeric value of the error/status code that is returned by the tool. In Windows, to display the numeric return value, type the following in the command prompt after running the tool:

Code	Response Code Text
0	Completed successfully.
1	Ready to run.
2	Canceled.
3	The tool cannot communicate with the selected Intel SSD. Consider changing to another storage driver compatible with your system and try the tool again.
4	Error: Could not communicate with drive.
5	Feature has not been run.
6	Error: The max LBA for this drive was read as zero.
7	Error: Scan failed calculating free space of partition. Reboot and try again.
8	The Intel SSD does not contain enough free space to run this feature. Free up space by deleting files and try again.
9	Error: Scan failed opening a file necessary for the feature. Reboot and try again.
10	Error: Failed reading a file necessary for the feature. Reboot and try again.
11	Error: Data mismatch detected.
12	Error: The selected Intel SSD is in the Security Frozen state. Secure Erase cannot run until the Security Freeze Lock is cleared. To remove the lock, power-cycle the SSD while the operating system is running. This can be done by unplugging and plugging in the SSD.
13	Selected Drive contains a partition
14	The selected Intel SSD has no partition. This feature requires a partition to run.
15	Error: Secure Erase Unit command failed. Reboot and try again. If error persists, consider using a DOS-based tool for Secure Erase.
16	Error: Secure Erase Prepare command failed. Reboot your system and try again. If error persists, consider using a DOS-based tool for Secure Erase.
17	Error: Security Set Password command failed. Reboot your system and try again. If error persists, consider using a DOS-based tool for Secure Erase.
18	The selected Intel SSD contains current firmware as of this tool release.
19	Error: Firmware update failed.
20	Error: Identify device command failed.
21	Error: This functionality has not been implemented.
22	Error: SMART read thresholds command failed.



Code	Response Code Text
23	Error: SMART read data command failed.
24	The Intel SSD Optimizer cannot run due to the presence of Volume Shadow Copy Service data. The likely cause is a backup in progress. Try again when the backup is finished.
25	Error: The Intel SSD Optimizer encountered an error (25). Reboot and try again.
26	Error: The Intel SSD Optimizer encountered an error (26). Reboot and try again.
27	Error: The Intel SSD Optimizer encountered an error (27). Reboot and try again.
28	Error: The Intel SSD Optimizer encountered an error (28). Reboot and try again.
29	Error: The Intel SSD Optimizer encountered an error (29). Reboot and try again.
30	Error: The Intel SSD Optimizer encountered an error (30). Reboot and try again.
31	Error: The Intel SSD Optimizer encountered an error (31). Reboot and try again.
32	Error: The Intel SSD Optimizer encountered an error (32). Reboot and try again.
33	Error: The Intel SSD Optimizer encountered an error (33). Reboot and try again.
34	Error: The Intel SSD Optimizer encountered an error (34). Reboot and try again.
35	Error: The Intel SSD Optimizer encountered an error (35). Reboot and try again.
36	Error: The Intel SSD Optimizer encountered an error (36). Reboot and try again.
37	Error: The Intel SSD Optimizer encountered an error (37). Reboot and try again.
38	Error: The Intel SSD Optimizer encountered an error (38). Reboot and try again.
39	Error: The Intel SSD Optimizer encountered an error (39). Reboot and try again.
40	Error: The Intel SSD Optimizer encountered an error (40). Reboot and try again.
41	Error: RAID array detected. If RAID array not present, reboot and try again.
42	Error: The Intel SSD Optimizer cannot determine if the selected drive is encrypted or is a RAID volume.
43	Error: The Intel SSD Optimizer encountered an error (43). Reboot and try again.
44	Error: The Intel SSD Optimizer encountered an error (44). Reboot and try again.
45	Error: Drive is not an Intel SSD.
46	Feature is not optimized.
47	Feature is optimized.
48	Error: Failed to check superfetch service.
49	Error: Failed to check superfetch registry settings.
50	Error: Failed to check readyboost service.
51	Service not found.
52	Error: Failed to connect to task scheduler (52).
53	Error: Failed to connect to task scheduler (53).
54	Error: Failed to connect to task scheduler (54).



Code	Response Code Text
55	Error: Failed to connect to task scheduler (55).
56	Error: Failed to connect to task scheduler (56).
57	Error: Failed to connect to task scheduler (57).
58	Error: Failed to connect to task scheduler (58).
59	Error: Failed to connect to task scheduler (59).
60	Error: Defrag not found.
61	Error: Failed to connect to task scheduler (61).
62	Error: Failed to connect to task scheduler (62).
63	Error: Failed to connect to task scheduler (63).
64	Error: Failed to connect to task scheduler (64).
65	Error: Failed to disable defrag.
66	Your Intel SSD has pre-production firmware. Please contact Intel Customer Support for further assistance at the following website: http://www.intel.com/go/ssdsupport .
67	Your Intel SSD has unsupported firmware. Please contact Intel Customer Support for further assistance at the following website: http://www.intel.com/go/ssdsupport .
68	Please contact Intel Customer Support for further assistance at the following website: http://www.intel.com/go/ssdsupport .
69	The firmware update process cannot be completed in Windows for this firmware. Please use the Intel SSD Firmware Update Tool in DOS.
70	Error: Failed to check DIPM registry setting.
71	Current storage driver does not support DIPM settings. Consider changing to another storage driver compatible with your system.
72	Error: No drives were found. Ensure the tool or command prompt is being run as administrator.
73	Error: Invalid arguments provided.
74	Running...
75	RST RAID volume found containing all Intel SSDs.
76	No RST RAID volume found containing all Intel SSDs.
77	Error: This feature cannot run on a RAID member.
78	This drive does not support Trim.
79	The selected partition does not have an NTFS file system. This feature runs on partitions formatted as NTFS only.
80	The Volume Shadow Copy Service is disabled. The Intel SSD Optimizer can only run when the Volume Shadow Copy Service is enabled, as it is used to protect data during the Intel SSD Optimizer process.
81	Canceled.
82	Error: An error was detected reading data from the selected Intel SSD.
83	The selected Intel SSD has no partition letter. This feature requires a partition letter to run.
84	Error: Failed to enable SMART.



Code	Response Code Text
85	Error: Failed to disable SMART.
86	Error: ATA Stand By Immediate command failed.
87	Error: Given drive index is invalid. Drive could not be found.
88	The selected Intel SSD does not have a formatted partition. This feature requires a formatted partition to run.
89	The tool cannot set the state of defrag, but the operating system may do so automatically for SSDs.
90	Error: Failed to connect to WMI.
91	Error: Failed to run query using WMI.
92	The system is a desktop and does not support this feature.
93	The selected drive is part of a dynamic partition. This feature is not supported on a dynamic partition.
94	Error: Failed to retrieve information about the system.
95	Feature is ready to be run.
96	Intel SSD Optimizer cannot run due to the presence of Volume Shadow Copy Service data. This is either due to a backup in progress or Shadow Copies have been enabled. If due to in-progress backup, try again when the backup is finished. If due to Shadow Copies being enabled, you cannot run the Intel SSD Optimizer until Shadow Copies is disabled.
97	This feature cannot run on a RAID volume. Select a specific RAID member to run this feature.
98	Your system is in IDE Mode making it incompatible with Windows-based firmware updates. Please use the Intel SSD Firmware Update Tool in DOS to complete the firmware update.
99	Error: The Intel SSD Optimizer encountered an error (99). Reboot and try again.
100	Error: The Intel SSD Optimizer encountered an error (100). Reboot and try again.
101	Error: The Intel SSD Optimizer encountered an error (101). Reboot and try again.
102	Error: The Intel SSD Optimizer encountered an error (102). Reboot and try again.
103	Please contact your system vendor for the most current firmware for this drive.
104	Error: Invalid model number.
105	Error: Invalid serial number.
106	Error: Invalid firmware version.
107	Error: SMART attribute is failing.
108	Error: Set Feature command failed.
109	Error: ATA read native max command failed.
110	Error: ATA Set native max command failed.
111	Error: ATA standby immediate command failed.
112	Error: Failed to read the saved SMART data. Did you reset the SMART attributes?
113	Error: Selected SSD Generation does not support Endurance Analyzer.
114	Error: Failed to start Endurance Analyzer. Invalid SSD Generation. Intel Postville SSD must have firmware version 02M0 or newer.



Code	Response Code Text
115	Error: Given drive serial is invalid. Drive could not be found.
116	Error: Write SMART Log command failed.
117	Error: Read SMART Log command failed.
118	Error: The selected drive does not support this feature.
119	Error: Read Log Extended command failed.
120	Error: Failed to issue SMART execute offline immediate command.
121	Error: Failed to save SMART attributes file for Endurance Analyzer.
122	Error: Failed to write file.
123	No Intel drives were found.
124	Error: Drive does not support DIPM.
125	Error: Drive does not support Write Cache.
126	Error: Given drive letter is invalid. Drive could not be found.
127	Error: ATA Check Power Mode command failed.
128	Error: Unable to check if partition exists on the selected drive.
129	Error: Failed ReadFile or WriteFile command.
130	Error: ATA command failed.
131	Error: SCSI command failed.
132	Error: Failed sending an ATA command to the selected RAID member.
133	Error: Write commands not supported with this driver.
134	Error: 48-bit ATA commands are not supported with this driver.
135	Error: Failed to close the connection to the drive.
136	The firmware cannot be updated on the selected drive because ATA security is enabled. Consider turning off ATA security before updating the firmware with the tool.
137	Error: Unable to communicate with the selected drive.
138	Error: Failed to read all log pages from the selected drive.
139	Error: The selected drive failed the health check.
140	The asynchronous command is waiting for completion.
141	Error: The supplied buffer is not large enough for this command.
142	Error: The Intel SSD Optimizer encountered an error (142). Reboot and try again.
143	The Intel SSD Optimizer can only run on a RAID0 array using an Intel RST driver version 11.0 or later.
144	The Intel SSD Optimizer cannot run on a RAID array using an Intel RST driver version earlier than 11.0. Consider upgrading to Intel RST 11.0 or newer to utilize the SSD Optimizer with a RAID0 array.
145	Unable to retrieve driver information for the RAID array. Ensure most current driver installed or reinstall current storage driver.



Code	Response Code Text
146	The Intel SSD Optimizer cannot run on the selected RAID array because it is degraded, rebuilding, or in a failed state.
147	Error: Failure detected in log data.
148	Error: Invalid drive SKU.
149	Secure Erase cannot be run on the selected drive because ATA security is enabled. Consider turning off ATA security before erasing the selected drive with the tool.
150	Error: The selected Intel SSD is in the Security Frozen state. Secure Erase cannot run until the Security Freeze Lock is cleared. Unfortunately, this system does not support the ability to remove the Security Freeze Lock with a power cycle.
151	This feature cannot be run on the selected drive because ATA security is enabled. Consider turning off ATA security before using this feature.
152	The selected Intel SSD is part of a Storage Space. The SSD must be removed from the Storage Space to use this feature.
153	The superfetch service was not found on the system.
154	The Intel SSD Optimizer cannot run on the selected RAID array. One or more of the drives does not support Trim.
155	Secure Erase cannot be run on the selected drive because it is not a supported feature under Windows 8 or Windows Server 2012*.
156	The Intel SSD Optimizer cannot run on a RAID array under Windows 8 or Windows Server 2012.
157	Error: Invalid PHY speed given. Supported values are: 1.5 3.0 and 6.0.
158	Error: Invalid error recovery control option given. See -help for valid options.
159	Error: Invalid power mode given. Valid modes are 0 1 and 2.
160	Error: Invalid thermal throttle options give. Valid options are: 'enable' and 'disable'.
161	Error: Invalid SCT feature control options given. see -help for proper usage.
162	Error: Invalid time given for temperature logging interval. Value must be between 1 and 65535 (inclusive).
163	Error: Invalid write cache state option given. Valid options are: 1 2 and 3.
164	Error: Invalid value given for PLI test time interval. Valid values are: 0-6 (inclusive).
165	Error: Invalid write cache reordering option given. Valid options are: 'enable' and 'disable'.
166	Error: Invalid write same options given. See -help for proper usage.
167	Error: Write same command failed.
168	Error: Invalid self-test given. Valid tests are: 'short' 'extended' and 'conveyance'.
169	Error: Drive self-test failed.
170	Error: Invalid write same parameters. LBA and count must be numeric.
171	Error: Given LBA is not in user LBA range.
172	Error: Given count will exceed LBA range.
173	Error: Invalid write same pattern given.
174	Life of the drive is lower than requested.
175	Error: The tool failed to rollback the system configuration setting.



Code	Response Code Text
176	The system configuration setting is unable to be rolled back because it was not previously tuned by this tool.
177	The system configuration setting has already been tuned.
178	Error: The tool or specific feature has not been properly initialized.
179	Error: Standby Immediate command failed. Reboot your system and try again. If error persists, consider using a DOS-based tool for Secure Erase.
180	Error: Only one session is allowed at a time.
181	Error: The provided session is invalid.
182	Error: The provided session is already in use.
183	Error: Invalid PHY Config value given. Supported values are: 0 1 and 2.
184	Error: The given system configuration XML is in an invalid format.
185	Error: Unable to duplicate administrator privileges for another thread. Reboot your system and try again.
186	Error: Unable to pass administrator privileges to another thread. Reboot your system and try again.
187	Error: The drive is in a degraded state.
188	Error: The device fault is set on the selected drive. This functionality is not supported in the device fault state.
189	Error from Windows NVMe* Driver.
190	Error: NVMe* Command failed.
192	Error: Invalid clock speed given. See -help for proper usage.
193	Error: Invalid NAND speed option given. See -help for proper usage.
194	Error: Failed to recover the drive.
195	Error: Write Log Extended command failed.
196	No assert found.
197	Invalid custom PHY settings given.
198	Error: Scan was not run. Please run Scan before using GetDeviceList or GetDeviceString.
199	Error: Given device ID is invalid. Drive could not be found.
201	Error: Invalid feature ID given.
202	Error: Invalid log ID given.
203	Error: Given drive path is invalid. Drive could not be found.
204	Error: Given CSMI information is invalid. Drive could not be found.
205	Note: Workload did not induce any wear on the drive. Expected life calculation is invalid. Ensure that workloads run for an hour or more for valid calculations.
206	Alert: NAND program errors.
207	Alert: NAND uncorrectable program errors.
208	Error: LBA mismatch.
209	Error: SMART threshold exceeded.



Code	Response Code Text
210	Alert: die taken offline.
211	Alert: NAND read-retry failure.
212	Alert: NAND read-retry failure.
213	Alert: SATA transfer abort error.
214	Error: failure during slow context load.
215	Alert: NAND ECC fatal during defrag.
216	Alert: NAND program fail.
217	Alert: XOR recovery fail due to multiple ECC across same page in a band.
218	Alert: XOR recovery rejected due to disabled band.
219	Error: SMART self-test hardware check.
220	Error: command timeout.
221	Error: command timeout.
222	Error: failure during fast context load.
223	Error: assert during PLI.
224	Error: bad context.
225	Error: PLI bad context.
226	Error: XASSERT.
227	Alert: DRAM uncorrectable detected.
228	Error: drive went to disable logical mode during the load of fast context.
229	Error: drive went to disable logical mode during the load of slow context.
230	Error: drive is in disable logical due to context restore failure.
231	Error: PLI capacitance is too low.
232	Error: PLI capacitance is too high.
233	Error: stuck band during erase.
234	Alert: SATA CRC error.
235	Error: firmware is out of clean bands.
236	Error: command timeout.
237	Alert: Secure Erase.
238	Error: failed to reset Adapter.
239	Error: System rescan failed.
240	Error: Invalid serial number. 8MB issue detected.
246	Selected drive does not support this command.
247	Error: revert SP failed.



Code	Response Code Text
248	Error: failed to start trusted peripheral session.
249	Error: Trusted Peripheral is busy. A Session may already be open. Try power cycling the drive and rerunning the tool.
250	Error: Entered an invalid PSID for the selected drive.
252	Error: Selected drive is in a disable logical state.
253	Error: Opal is not activated on the selected drive. Unable to revert.
254	Error: unexpected Nlog binary provided. Please provide a valid binary.
255	Error: This feature cannot run on a RAID member.
256	Error: Vendor write command failed.
257	Error: Vendor read command failed.
258	Error: Vendor command failed.
265	Media Workload Indicators have reset values. Run 60+ minute workload prior to running the endurance analyzer.
269	No supported devices were found.
270	Failed to load TDK library. Is the library in the correct location?
275	IEEE1667 is already supported.
276	Error: enabling IEEE1667 with this tool is not supported on the selected Intel SSD. Please ensure the tool and the drive's firmware are up to date.
277	Error: Opal is not in the ready state. Ensure Opal is not already in use.
278	Error: Available space has fallen below the threshold.
279	Error: Temperature has exceeded a critical threshold.
280	Error: Device reliability has been degraded.
281	Error: Media has been placed in read only mode.
282	Error: Volatile memory backup device has failed.



4 Examples

4.1 Display Tool Help

Use **help** command line option to display the help table.

```
isdct.exe help
```

4.2 Display Tool License

Use the **version** command with the license property to display the End-User license agreement for Intel® SSD Data Center Tool.

```
isdct.exe version -d license
```

4.3 Displaying Drives

Use the **show** command to display a list of drives on the system.

```
isdct.exe show -intelssd
```

4.4 Bypass Prompts (force)

Use the force option to bypass the warning prompts associated with **load** and **start** commands.

4.5 Debug Log Files

The tool generates a detailed log of the tool's functionality that you can use for debugging purposes and send out for further analysis of tool issues. The default log filename is TDKI.log.

In Windows, log files are stored in the c:\intel\logs directory.

In Linux, log files are stored in the /var/log directory.

4.6 Display Drive Info

Use the **show** command's **-intelssd** option to select which drive to execute functions on and provides a simple summary of each drive found. Use the **show** command's **-a -intelssd 1** option to display a verbose output of all the information the tool can get on that particular drive.

```
isdct.exe -a -intelssd 1
```



4.7 Identify Device

Use the **dump** command to read and parse specific data from the device and save it to a file. This feature currently supports dumping Device Identify (SATA) and NVMe* Log pages. The `-destination (filename.csv)` argument is required.

NOTE: Identify device is a large table and the console window may not be large enough to display it in a readable format.

```
isdct.exe dump -destination (filename.csv) -intelssd 1 datatype=identify
isdct.exe dump -destination myfile.csv -intelssd 1 datatype=nvmeLog LogId=2 =LogID=2
```

NOTE: The current version of this tool does not dump parse data to the screen.

4.8 Sensor or SMART data

Use the **sensor** command to read and parse the SMART or SMART equivalent information of the selected drive.

```
isdct.exe show -sensor
```

Shows all the sensor information for all Intel SSDs

```
isdct.exe show -sensor -intelssd 1
```

Shows all the SMART properties for the Intel SSD at index 1.

4.9 NVMe Format

Use the **NVMe Format** command to erase all the data on the drive.

```
isdct.exe start -intelssd 1 Function=nvmeformat LBAformat=0 SecureEraseSetting=0
ProtectionInformation=0 ProtectionInformationLocation=0
MetadataSetting=0
```

You will be prompted unless using the `-force` option.

```
WARNING: You have selected to format the drive!
Proceed with the format? (Y/N)
```

To bypass the warning prompts, use the `-force` option.

```
isdct.exe start -f -intelssd 1 Function=nvmeformat LBAformat=0
SecureEraseSetting=0 ProtectionInformation=0
ProtectionInformationLocation=0 MetadataSetting=0
```



4.10 Change Maximum LBA

Use the MaximumLBA property to change the drive's maximum storage capacity up to the native capacity of the drive (that is, MAX LBA).

NOTE: You should run the **delete** command before altering the Maximum LBA of a drive. After modifying the maximum LBA, a complete power shutdown is required to properly reflect the changes.

The MaximumLBA property has four options:

The native option resets the drive back to its native Max LBA, or 100% of the drive.

```
isdct.exe set -intelssd 1 MaximumLBA=native
```

The LBA option specifies the drive's max LBA with a specific number. The number entered must be a decimal literal.

This example sets the drive's Max LBA to 55555:

```
isdct.exe -drive_index 1 MaximumLBA=55555
```

The x% percent changes the drive's size based on a percentage of native max. Values of 1-100 are valid, where a value of 100 is equivalent to using the native option.

```
isdct.exe -drive_index 1 MaximumLBA=80%
```

The xGB capacity option sets the drive to a specific capacity in gigabytes. This will result in an error if the given number of gigabytes is less than 1 or is greater than the drive's max capacity.

```
isdct.exe -drive_index 1 MaximumLBA=80GB
```

4.11 Update Firmware

Firmware Update is achieved through the load command verb and is used to update the firmware of the selected drive:

```
isdct.exe load -intelssd 1
```



4.12 Endurance Analyzer

Use the `enduranceanalyzer` property to calculate the life expectancy of the drive based on a user workload.

The steps are:

1. Reset SMART Attributes using the `reset` option. This will also save a file that contains the base SMART data. This file is needed, and used, in step 4 when the life expectancy is calculated.

```
isdct.exe set -intelssd 2 enduranceanalyzer=reset
```

2. Remove the SSD and install in test system.
3. Apply minimum 60-minute workload to SSD.
4. Reinstall SSD in original system. Compute endurance using the `show` command.

```
isdct.exe show -a -intelssd 2
```

5. Read the Endurance Analyzer value which represents the drive's life expectancy in years

4.13 Power Governor Mode

Use `PowerGovernorMode` to display and/or change the selected drive's power governor mode. The supported modes are:

- 0 – 25 watts for NVMe* drives, unconstrained for ATA devices
- 1 – 20 watts for NVMe* drives, Typical (7W) for ATA devices
- 2 – 15 watts for NVMe* drives, Low (5W) for ATA devices

To view the current setting, use the **show** command and view the current setting:

```
isdct.exe show -a -intelssd 1
```

To explicitly set the power governor mode, provide one of the supported mode options.

```
isdct.exe set -intelssd 1 PowerGovernorMode=0
```

Re-run without arguments to view the new setting.