



Intel® Memory and Storage Tool (CLI)

Release Notes

January 2021
Revision 1.5

Intel may make changes to specifications and product descriptions at any time, without notice. Designers must not rely on the absence or characteristics of any features or instructions marked "reserved" or "undefined". Intel reserves these for future definition and shall have no responsibility whatsoever for conflicts or incompatibilities arising from future changes to them. The information here is subject to change without notice. Do not finalize a design with this information.

Intel disclaims all express and implied warranties, including without limitation, the implied warranties of merchantability, fitness for a particular purpose, and non-infringement, as well as any warranty arising from course of performance, course of dealing, or usage in trade.

The products described in this document may contain design defects or errors known as errata which may cause the product to deviate from published specifications. Current characterized errata are available on request.

Contact your local Intel sales office or your distributor to obtain the latest specifications and before placing your product order.

For copies of this document, documents that are referenced within, or other Intel literature, please contact your Intel representative.

All products, computer systems, dates, and figures specified are preliminary based on current expectations, and are subject to change without notice.

© Intel Corporation. Intel, the Intel logo, and other Intel marks are trademarks of Intel Corporation or its subsidiaries. Other names and brands may be claimed as the property of others.

Intel® Memory and Storage Tool Revision History

Date	Software Revision	Description
January 2021	1.5	Changes in revision 1.5 of the Intel® Memory and Storage Tool (Intel® MAS) CLI include: <ul style="list-style-type: none"> • Fixed issues with Opal State reporting • Added limited set feature support on MSFT NVMe driver • ESXi 7.0 U1 support (VMware ESXi 7.0.1) • Added feature to pull drive logs, run data integrity scans and run read scans • Updated device self-test, SMART health and command effects log page parsers
November 2020	1.4	Changes in revision 1.4 of the Intel® Memory and Storage Tool (Intel® MAS) CLI include: <ul style="list-style-type: none"> • Fix issue with RAID member drives showing 'Unknown' as drive health status • Fix persistent event log bug when reading a SMART Health Snapshot event • Enable Optimizer in Intel MAS CLI • Added log specific fields (LSP) parameter for NVMe log page • Add ability to select drive based on device path • Add ability to select device that is part of a MegaRAID via device path • Fix issue with inaccurate native max address status on DC P5500 Series (Arbordale Plus) • Fix issue with JSON output related to Intel SSD dual port products • Updated wording for CVE document (see Intel Advisory INTEL-SA-00362)
October 2020	1.3	Changes in revision 1.3 of the Intel® Memory and Storage Tool (Intel® MAS) CLI include: <ul style="list-style-type: none"> • Added firmware (FW) for Intel® Optane™ Memory H10 with Solid State Storage to FW G002-0440 • Added persistent event log parsing feature • Added RHEL 8.0 to supported distros • Clarify help for performance booster, drive self-test, and telemetry log • Bug fix for json output on certain CLI features • Add include NVMe health log property for SMART feature • Fix issue with retrieving namespace data on MSFT driver • SMART attribute description updates
August 2020	1.2	This release includes the following changes/updates for: <ul style="list-style-type: none"> • Intel® Optane™ SSD DC P4800X Series FW update to FW 485 (for ESXi) • Update Intel® SSD D5-P4320 and Intel® SSD D5-P4326 firmware to 3DV10130 and 8DV10560 respectively • Added SMART health attribute to SMART feature • Ability to get NVMe log by id (int, hex) • NVME Reset: Changed "IntelMAS start -intelssd # -nvmereset" syntax to "IntelMAS reset -intelssd # -nvmecontroller" • Allow NVMe Reset command separately from FW Activate • Fixed issue of Mansion Beach drive FW update failures from E2010325
July 2020	1.1	This release includes the following changes/updates: <p>Added firmware update for Intel® Optane™ Memory, Intel® Optane™ SSD 905P/900P, Intel® Optane™ SSD DC P4800X/P4801X, Intel® SSD D3-S4510/D3-S4610, DC S3100, DC P4101, E 6100p, E 5400s, E 5100s, Pro 7600p, Pro 6000p, Pro 5450s, Pro 5400s, 760p, 660p, and 540s.</p>

June 2020	1.0.6	<p>This release includes the following changes/updates:</p> <ul style="list-style-type: none"> • Intel® Optane™ SSD 800P firmware update to 440 • Intel SSD DC P3520 firmware update to MDV10291 • Intel SSD DC S3610, Intel SSD DC S3710 and Intel SSD DC S3500 (M.2 and HD) firmware update to G2010170 • Intel Optane SSD DC P4800X/P4801X: <ul style="list-style-type: none"> ○ Windows/Linux – E2010485 ○ ESXi – E2010475 • Intel SSD DC P4511 M.2 firmware update to VCV10370 • Intel SSD D3-S4510 and SSD D3-S4610: <ul style="list-style-type: none"> ○ Firmware update to XCV10120 with SMART attributes fix firmware ○ Hop-on Firmware XCV1011D is integrated in the tool • Intel SSD D3-S4510 M.2: <ul style="list-style-type: none"> ○ Firmware update to XC311120 with SMART attributes fix firmware ○ Hop-on Firmware XC31111D is integrated in the tool
January 2020	1.0.5	<p>This is the first revision of the Intel® Memory and Storage (Intel® MAS Tool)</p> <p>This version of the tool contains a Command Line Interface (CLI) and the functionality of many current tools, see the User Guide for more information, with support for Client and Datacenter SSD's and Intel® Optane™ Memory</p>

NOTE: If you purchased your Intel SSD from an OEM, your firmware version may have a different naming sequence. Contact your local OEM representative for the latest firmware revisions.

List of Intel® Solid State Drives

Solid State Drive	Latest Firmware Version(s)
Intel® Optane™ SSD DC P4800X/P4801X	Windows/Linux - E2010485, ESXi - E2010485
Intel® Optane™ SSD 905P	E2010480
Intel® Optane™ SSD 900P	E2010480
Intel® SSD DC P4510/P4610	VDV10170
Intel® SSD DC P4500/P4600	QDV10170
Intel® SSD D5-P4320	3DV10130
Intel® SSD D5-P4326	8DV10560
Intel® SSD DC P4101	008D
Intel® SSD DC P3520	MDV10291
Intel® SSD DC P3100	119D
Intel® SSD D3-S4610	XCV10120
Intel® SSD D3-S4510	XCV10132 (2.5-inch) XC311132 (M.2)
Intel® SSD DC S4500/S4600	SCV10150
Intel® SSD DC S3710	G2010160 – same as S3610
Intel® SSD DC S3700	5DV12270
Intel® SSD DC S3610	G2010160 – same as S3710
Intel® SSD DC S3520	N2010121
Intel® SSD DC S3510	G2010150

Solid State Drive	Latest Firmware Version(s)
Intel® SSD DC S3500	Default: D2012370 M.2: G2010150 HD: G2010150
Intel® SSD DC S3100	043D
Intel® SSD E 6100p	005E
Intel® SSD E 6000p	121E
Intel® SSD E 5400s	043E
Intel® SSD E 5100s	LHF004E: 128 GB and 256 GB 2.5-inch/M.2 80mm LHF0AE3: 64 GB 2.5-inch/M.2 80mm
Intel® SSD Pro 7600p	005P
Intel® SSD Pro 6000p	131P
Intel® SSD Pro 5450s	LHF005P: 256 GB & 512 GB 2.5-inch/M.2 80mm LHF0B3P: 1 TB 2.5-inch
Intel® SSD Pro 5400s	043P 017P: 256 GB & 512 GB
Intel® SSD Pro 2500	M.2: TG16, 2.5-inch: TG21
Intel® SSD 760p	005C
Intel® SSD 750	Firmware: 8EV101H0 Bootloader: 8B1B0133
Intel® SSD 660p	004C
Intel® SSD 600p	121C
Intel® SSD 545s	LHF005C: 128 GB, 256 GB and 512 GB 2.5-inch/M.2 80mm LHF0B3C: 1 TB 2.5-inch
Intel® SSD 540s	043C 017C: 256 GB & 512 GB
Intel® SSD 535	M.2: RG11 2.5-inch: RG21
Intel® SSD 530	M.2: DC31, 2.5-inch: DC32, mSATA: DC33
Intel® SSD 335	335u
Intel® SSD 320	4PC10362
Intel® X25-E (50nm) SSD	045C8855
Intel® X18-M/X25-M (50nm) SSD	045C8820
Intel® X18-M/X25-M/25-V (34nm) SSD	2CV102M3

List of Intel® Optane™ Memory Devices

Memory	Latest Firmware Version(s)
Intel® Optane™ Memory H10	G002-0440
Intel® Optane™ Memory	K4110440

Intel® Optane™ Memory H10 Revision History

Date	Revision	Description
September	G002-0440	This firmware version has below fixes; <ul style="list-style-type: none"> Complaint with Ice Lake (ICL) Platform

Intel® Optane™ SSD 905P/900P Revision History

Date	Revision	Description
July 2020	E2010480	This firmware version has below fixes; <ul style="list-style-type: none"> Fix for drive fails to set correct Native Max LBA when forcing max address capacity to smaller one Fix for media errors + E2E error increments after coming back to the native capacity Fix for drive sometimes fails PCIe training during reboots resulting in reduced link width or speed Fix Link width degrades during link disable/enable on some platforms Fix for Serial number is all zeroes after U.2 drive hot plug operation Fix for Quality Reliability Test encountered Cold ECC Failure “Mitigates security vulnerability (see Intel Advisory INTEL-SA-00362)”

Intel® Optane™ SSD DC P4800X and P4801X Revision History

Date	Revision	Description
August 2020	Windows/Linux - E2010485 ESXi - E2010485	Intel® Optane™ SSD DC P4800X Series FW update to FW 485 (for ESXi)
July 2020	Windows/Linux - E2010485 ESXi - E2010475	P4800X 375 GB AIC SKU now supported for upgrade
May 2020	Windows/Linux - E2010485 ¹ ESXi - E2010475 ¹	This revision adds the following firmware updates for Intel® Optane™ SSD DC P4800X/P4801X: <ul style="list-style-type: none"> Windows/Linux - E2010485 ESXi - E2010475 Note: 1. P4800X 375 GB AIC SKU with firmware E2010211 will not support upgrade firmware to E2010475 or E2010485, this is targeted for a future release. <ul style="list-style-type: none"> Minor Bug fixes and enhancements
December 2019	E2010435	The following changes are included in this firmware update: <ul style="list-style-type: none"> QAN 9871
February 2018	E2010324 (375 GB) EB3B0306 E2010325 (750 GB) EB3B0309	The following changes are included in this firmware update: <ul style="list-style-type: none"> Bug fixes from previous firmware on 375 GB (from FW: E2010320) Note that 750 GB was qualified on firmware E2010325. There is no maintenance release past that FW. Additionally, there is limited applicability of this firmware on qual samples. Please reach out to Intel representative if your 750 GB samples are on earlier revision than FW E2010325.

Intel® SSD D5-P4320 and D5-P4326 Revision History

Date	Revision	Description
August 2020	3DV10130 8DV10560	Intel® SSD D5-P4320 and Intel® SSD D5-P4326 firmware update to 3DV10130 and 8DV10560 respectively

Intel® SSD D3-S4510 and D3-S4610 Revision History

Date	Revision	Description
July 2020	XCV10132 (2.5") XC311132 (M.2)	<p>XCV10132 (2.5-inch) – The following changes are included in this firmware update:</p> <ul style="list-style-type: none"> In-field SMART CRC Error Count “C7h” attribute RESET capability with vendor unique command Built-in HOP-on capability for SMART structure mismatch issue with XCV10120 firmware MRR (Moving Read Reference) table updated to recover reads caused by corner case read-intensive workload Corrected LED blinking activity during Read Verify command Fixed condition causing a non-responsive state after soft-reboot following Windows installation <p>XC311132 (M.2) – The following changes are included in this firmware update:</p> <ul style="list-style-type: none"> In-field SMART CRC Error Count “C7h” attribute RESET capability with vendor unique command Built-in HOP-on capability for SMART structure mismatch issue with XC311120 firmware MRR (Moving Read Reference) table updated to recover reads caused by corner case read-intensive workload Corrected LED blinking activity during Read Verify command Fixed condition causing a non-responsive state after soft-reboot following Windows installation
December 2019	XCV10120	MR2 Firmware Release

Intel® SSD DC S3100 Revision History

Date	Revision	Description
July 2020	043D	This firmware version contains fix for below issue <ul style="list-style-type: none"> Optimizations for NAND data refresh algorithms
March 2018	042D	This firmware version contains fixes for the following issues: <ul style="list-style-type: none"> Fixed issue that, in some extreme cases, may result in user losing access to drive.
May 2017	041D	<p>This firmware versions contain the following enhancements:</p> <ul style="list-style-type: none"> Optimized SATA signal integrity Optimized behavior entering and resuming from low-power states <p>This firmware versions contain fixes for the following issues:</p> <ul style="list-style-type: none"> Intermittent errors when resuming from unsafe shutdown Fixed issues around use in Connected Standby Fixes to intermittent boot error in Linux <p>Mitigates a security vulnerability which in some cases resulted in corruption of user's data (see Intel Advisory INTEL-SA-00079)</p>
July 2016	036D	<p>This firmware release provides the following change</p> <ul style="list-style-type: none"> Fixes issue that BSOD occurs during S3/S4 resume on systems supporting devsleep <p>Mitigates a security vulnerability which in some cases resulted in corruption of user's data (see Intel Advisory INTEL-SA-00055)</p>
June 2016	031D	<p>This firmware release provides the following changes:</p> <ul style="list-style-type: none"> Corrected SMART AAh, E8h, ABh, and ACh behavior Corrected DIPM enabled after COMRESET issue Corrected errant FIS causing BSOD when Write Cache disabled Corrected SATA NCQ Command Error log reporting issue Mitigated a security vulnerability which in some cases resulted in corruption of user's data (see Intel Advisory INTEL-SA-00053).

Intel® SSD DC P4101 Revision History

Date	Revision	Description
July 2020	008D	This firmware version contains below fixes; <ul style="list-style-type: none"> Fixes SSD FW hang seen during D3 entry for Windows Modern Standby that may cause system timeout Improves power during D3 state for Windows Modern Standby Fixes SSD DRAM training error during FW boot that may cause system timeout during device low power resume Fixes stability of SSD during system boot causing occasional system timeout “Mitigates security vulnerability (see Intel Advisory INTEL-SA-00362)”
December 2019	007D	MR2 Firmware Release

Intel® SSD E 6100p Revision History

Date	Revision	Description
July 2020	005E	This firmware contains the following fixes: <ul style="list-style-type: none"> Fixes SSD FW hang seen during D3 entry for Windows Modern Standby that may cause system timeout Improves power during D3 state for Windows Modern Standby Fixes SSD DRAM training error during FW boot that may cause system timeout during device low power resume Fixes stability of SSD during system boot causing occasional system timeout “Mitigates security vulnerability (see Intel Advisory INTEL-SA-00362)”
November 2018	004E	This firmware version contains fixes for the following enhancements: <ul style="list-style-type: none"> Fixed PS4 power state transition issue causing system BSOD or system hang Fixed intermittent system hang caused by pin-based interrupt issue with shared resources Improvements to enable NVM Subsystem Reset Fixed unexpected power loss SMART reporting Enhanced error logging for SSD failure analysis Improved NAND refresh algorithms Improved software full disk encryption time

Intel® SSD E 5400s Revision History

Date	Revision	Description
July 2020	043E	This firmware version contains fix for below issue <ul style="list-style-type: none"> Optimizations for NAND data refresh algorithms
March 2018	042E	This firmware version contains fixes for the following issues: <ul style="list-style-type: none"> Fixed issue that, in some extreme cases, may result in user losing access to drive.
May 2017	041E	This firmware versions contain the following enhancements: <ul style="list-style-type: none"> Optimized SATA signal integrity Optimized behavior entering and resuming from low-power states This firmware versions contain fixes for the following issues: <ul style="list-style-type: none"> Intermittent errors when resuming from unsafe shutdown Fixed issues around use in Connected Standby Fixes to intermittent boot error in Linux Mitigates a security vulnerability which in some cases resulted in corruption of user's data (see Intel Advisory INTEL-SA-00079)
July 2016	036E	This firmware release provides the following change <ul style="list-style-type: none"> Fixes issue that BSOD occurs during S3/S4 resume on systems supporting devsleep Mitigates a security vulnerability which in some cases resulted in corruption of user's data (see Intel Advisory INTEL-SA-00055)
June 2016	031E	This firmware release provides the following changes: <ul style="list-style-type: none"> Corrected SMART AAh, E8h, ABh, and ACh behavior Corrected DIPM enabled after COMRESET issue Corrected errant FIS causing BSOD when Write Cache disabled Corrected SATA NCQ Command Error log reporting issue

Intel® SSD E 5100s Revision History

Date	Revision	Description
July 2020	LHF004E LHFOA3E	This firmware version contains below fixes; <ul style="list-style-type: none"> "Mitigates security vulnerability (see Intel Advisory INTEL-SA-00362)"
October 2018	LHF003E LHFOA2E	This firmware version contains fixes for the following enhancements: <ul style="list-style-type: none"> Improved SMART E8/E9 implementation Improved NAND data refresh algorithms Improved SSD recovery flows from unsafe shutdown scenarios Optimized firmware policies to: <ul style="list-style-type: none"> Prevent premature retirement of NAND blocks as bad Manage media page count changes during power state transitions Handle FW flows when E2E errors are triggered during secure erase operation

Intel® SSD Pro 7600p Revision History

Date	Revision	Description
July 2020	005P	This firmware contains the following fixes: <ul style="list-style-type: none"> Fixes SSD FW hang seen during D3 entry for Windows Modern Standby that may cause system timeout Improves power during D3 state for Windows Modern Standby Fixes SSD DRAM training error during FW boot that may cause system timeout during device low power resume Fixes stability of SSD during system boot causing occasional system timeout "Mitigates security vulnerability (see Intel Advisory INTEL-SA-00362)"
September 2018	004P	This firmware version contains fixes for the following enhancements: <ul style="list-style-type: none"> Fixed PS4 power state transition issue causing system BSOD or system hang Fixed intermittent system hang caused by pin based interrupt issue with shared resources Improvements to enable NVM Subsystem Reset Fixed unexpected power loss SMART reporting Enhanced error logging for SSD failure analysis Improved NAND refresh algorithms Improved software full disk encryption time

Intel® SSD Pro 6000p Revision History

Date	Revision	Description
July 2020	131P	This firmware contains the below fixes; <ul style="list-style-type: none"> "Mitigates security vulnerability (see Intel Advisory INTEL-SA-00362)"
May 2017	121P	This firmware versions contain the following enhancements: <ul style="list-style-type: none"> Improved link initializations This firmware versions contain fixes for the following issues: <ul style="list-style-type: none"> Drive hangs intermittently after Format NVM command. Format NVM command occasionally failing with PCIe ASPM enabled. Data miscompare caused by intermittent data corruption during heavy write workload with small file transfer size. Incorrect drive behavior for command with Forced Unit Access setting.
December 2016	109P	This firmware versions contain the following enhancements: <ul style="list-style-type: none"> Improvements to PHY initialization process Improved end of life management of bad blocks for better reliability These firmware versions contain fixes for the following issues: <ul style="list-style-type: none"> Fixed potential issue of incorrect data may be read during resume from low power state

Intel® SSD Pro 5450s Revision History

Date	Revision	Description
July 2020	LHF005P LHF0B3P	This firmware version contains fix for the below issue <ul style="list-style-type: none"> "Mitigates security vulnerability (see Intel Advisory INTEL-SA-00362)"
October 2018	LHF004P LHF0B2P	This firmware version contains fixes for the following enhancements: <ul style="list-style-type: none"> Improved SMART E8/E9 implementation Improved NAND data refresh algorithms Improved SSD recovery flows from unsafe shutdown scenarios Optimized firmware policies to: <ul style="list-style-type: none"> Prevent premature retirement of NAND blocks as bad Manage media page count changes during power state transitions Handle FW flows when E2E errors are triggered during secure erase operation

Intel® SSD Pro 5400s Revision History

Date	Revision	Description
July 2020	043P/017P	This firmware has below fixes; <ul style="list-style-type: none"> Optimizations for NAND data refresh algorithms “Mitigates security vulnerability (see Intel Advisory INTEL-SA-00362)”
March 2018	042P/016P	This firmware version contains fixes for the following issues: <ul style="list-style-type: none"> Fixed issue that, in some extreme cases, may result in user losing access to drive.
July 2017	041P/015P	Added support for 256 GB/512 GB SKUs: same firmware changes as listed below.
May 2017		This firmware versions contain the following enhancements: <ul style="list-style-type: none"> Optimized SATA signal integrity Optimized behavior entering and resuming from low-power states This firmware versions contain fixes for the following issues: <ul style="list-style-type: none"> Intermittent errors when resuming from unsafe shutdown Fixed issues around use in Connected Standby Fixes to intermittent boot error in Linux
March 2017	036P	Added support for missing 80/120 GB SKUs – same firmware changes as listed below.
July 2016		This firmware release provides the following changes: <ul style="list-style-type: none"> Fixes issue that BSOD occurs during S3/S4 resume on systems supporting devsleep Fixes drive issues occurring when using WinMagic software with drive Opal security

Intel® SSD 760p Revision History

Date	Revision	Description
July 2020	005C	This firmware contains the following fixes: <ul style="list-style-type: none"> Fixes SSD FW hang seen during D3 entry for Windows Modern Standby that may cause system timeout Improves power during D3 state for Windows Modern Standby Fixes SSD DRAM training error during FW boot that may cause system timeout during device low power resume Fixes stability of SSD during system boot causing occasional system timeout “Mitigates security vulnerability (see Intel Advisory INTEL-SA-00362)”
September 2018	004C	This firmware version contains the following enhancement: <ul style="list-style-type: none"> Fixed PS4 power state transition issue causing system BSOD or system hang Fixed intermittent system hang caused by pin based interrupt issue with shared resources Improvements to enable NVM Subsystem Reset Fixed unexpected power loss SMART reporting Enhanced error logging for SSD failure analysis Improved NAND refresh algorithms Improved software full disk encryption time

Intel® SSD 660p Revision History

Date	Revision	Description
July 2020	004C	This firmware contains below fixes <ul style="list-style-type: none"> • "Fixes SSD FW hang seen during D3 entry for Windows Modern Standby that may cause system timeout • Improves power during D3 state for Windows Modern Standby • Fixes for drive NDA during heavy workload that may cause system timeout • Fixes for FW hang cause by host request for device wake up when device transitioning between low power states • "Mitigates security vulnerability (see Intel Advisory INTEL-SA-00362)"
August 2018	002C	This firmware version contains the following enhancement: <ul style="list-style-type: none"> • Refined Power Management behavior and enhanced power state transitions.

Intel® SSD 540s Revision History

Date	Revision	Description
July 2020	043C/017C	This firmware has below fixes; <ul style="list-style-type: none"> • Optimizations for NAND data refresh algorithms
March 2018	042C/016C	This firmware version contains fixes for the following issues: <ul style="list-style-type: none"> • Fixed issue that, in some extreme cases, may result in user losing access to drive.
July 2017	041C/015C	Added support for 256 GB/512 GB SKUs: - same firmware changes as listed below.
May 2017		This firmware versions contain the following enhancements: <ul style="list-style-type: none"> • Optimized SATA signal integrity • Optimized behavior entering and resuming from low-power states This firmware versions contain fixes for the following issues: <ul style="list-style-type: none"> • Intermittent errors when resuming from unsafe shutdown • Fixed issues around use in Connected Standby • Fixes to intermittent boot error in Linux
July 2016	036C	This firmware release provides the following change <ul style="list-style-type: none"> • Fixes issue that BSOD occurs during S3/S4 resume on systems supporting devsleep
June 2016	031C	This firmware release provides the following changes: <ul style="list-style-type: none"> • Corrected SMART AAh, E8h, ABh, and ACh behavior • Corrected DIPM enabled after COMRESET issue • Corrected errant FIS causing BSOD when Write Cache disabled • Corrected SATA NCQ Command Error log reporting issue