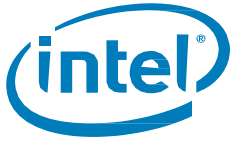


Intel® Solid State Drive Firmware Update Tool

Release Notes

July 2020
Revision 3.0.10



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Intel® SSD Firmware Update Tool Revision History

| Date | Software Revision | Description |
|----------------|-------------------|--|
| July 2020 | 3.0.10 | This revision adds a firmware update for the Intel® Optane™ Memory, Intel® Optane™ SSD 905P/900P, Intel® Optane™ SSD DC P4800X, DC P4101, D3-S4510, D3-S4610, DC S3100, E 6100p, E 6000p, E 5400s, E 5100s, Pro 7600p, Pro 6000p, Pro 5450s, Pro 5400s, 760p, 660p, and 540s. Corrected current FW version for Intel SSD DC P3520, DC S4500 and DC S4600 |
| May 2020 | 3.0.9 | This revision adds the following firmware updates: <ul style="list-style-type: none"> • Intel® Optane™ SSD DC P4800X/P4801X: <ul style="list-style-type: none"> ○ Windows/Linux - E2010485 ○ ESXi - E2010475 Note: P4800X 375 GB AIC SKU with firmware E2010211 won't support upgrade firmware to E2010475 or E2010485, this is targeted for a future release. <ul style="list-style-type: none"> • Intel® SSD DC P4511: VCV10370 • Intel® SSD D3-S4510 and SSD D3-S4610: XCV10120 (Hop-on Firmware XCV1011D is integrated in the tool) • Intel® SSD D3-S4510 M.2: XC311120 (Hop-on Firmware XC31111D is integrated in the tool) • Intel® Optane™ SSD 800P: 440 Minor Bug fixes and enhancements |
| December 2019 | 3.0.8 | This revision adds the following firmware updates: <ul style="list-style-type: none"> • Intel® SSD D3-S4610: XCV10120 • Intel® SSD D3-S4510: <ul style="list-style-type: none"> ○ 2.5": XCV10120 ○ M.2: XC311120 • Intel® Optane™ SSD DC P4800X/P4801X: E2010435 • Intel® SSD DC P4610, Intel® SSD DC P4510: VDV10170 • Intel® SSD DC P4101: 7D • Intel® Optane™ SSD 900P: E2010435 Bug Fix: Added Intel® X-25M FW 2CV102M3 back in tool Minor Bug fixes and enhancements |
| April 2019 | 3.0.7 | This revision adds a firmware update for Intel® Optane™ SSD 905P |
| February 2019 | 3.0.6 | This revision adds a firmware update for the Intel® SSD 545s drives. In addition, supports secure erase for Intel NVMe SSDs. |
| November 2018 | 3.0.5 | This revision adds a firmware update for the Intel® SSD E 6100p drives. |
| October 2018 | 3.0.4 | This revision adds a firmware update for the Intel® SSD 545s, Pro 5450s and E 5100s drives. |
| September 2018 | 3.0.3 | This revision adds a firmware update for the Intel® SSD 760p and Pro 7600p drives. |
| August 2018 | 3.0.2 | This revision adds a firmware update for the Intel® SSD 660p drives. |
| March 2018 | 3.0.1 | This revision adds a firmware update for the Intel® SSD 540s, Pro 5400s, E 5400s and DC S3100 drives. |
| February 2018 | 3.0.0 | This revision adds a firmware update for the Intel® SSD DC S4500/S4600 and Intel® SSD DC P4500/P4600 and Intel® SSD DC P4510/P4610 and Intel® Optane™ SSD DC P4800X devices along with following tool changes: <ul style="list-style-type: none"> • Convert interface from GUI to CLI only. Refer to latest user guide. |
| September 2017 | 2.2.3 | This revision adds a firmware update for the Intel® SSD 545s and DC S3520. |



| Date | Software Revision | Description |
|---------------|-------------------|---|
| July 2017 | 2.2.2 | This revision adds a firmware update for the Intel® SSD 540s and Pro 5400s. |
| May 2017 | 2.2.1 | This revision adds a firmware update for the Intel® Optane™ Memory, the Intel® SSD 600p, Pro 6000p, E 6000p, 540s, Pro 5400s and E 5400s, and Intel® SSD DC P3100 and DC S3100. Known Limitation: Intel SSD Firmware Update Tool will not work on Intel® Optane™ Memory when configured as a system accelerator. |
| April 2017 | 2.2.0 | This revision includes updates to the tool's bootable Linux environment addressing various loading issues seen on earlier versions. This revision adds firmware updates for the Intel® SSD 750, Intel® SSD Pro 5400s (80/120GB), Intel® SSD DC P3520 and Intel® SSD DC S3520 products. |
| December 2016 | 2.1.7 | This revision adds a firmware update for the Intel® SSD 600p, Intel® SSD Pro 6000p, Intel® SSD E 6000p, Intel® SSD DC P3100, Intel® SSD DC S3610 and the Intel® SSD DC S3710 products. |
| October 2016 | 2.1.6 | This revision adds a firmware update for the Intel® SSD 750 products. |
| July 2016 | 2.1.5 | This revision adds a firmware update for the Intel® SSD 540s, E 5400s, Pro 5400s and the Intel® SSD DC S3100 products. |
| June 2016 | 2.1.3 | This revision adds a firmware update for the Intel® SSD 540s, E 5400s and the Intel® SSD DC S3100 products. |
| March 2016 | 2.1.2 | This revision adds a firmware update for the Intel® SSD DC S3700, DC S3500, DC S3710, DC S3610 and DC S3510 products. |
| November 2015 | 2.1.1 | This revision adds a firmware update for the Intel® SSD 750 products. |
| October 2015 | 2.1.0 | This revision adds a firmware update for the Intel® SSD 750, 535, and Pro 2500 and the Intel® SSD DC S3710, DC S3610, DC S3510, DC S3500 M.2 and DC S3500 HD drives along with the following tool changes: <ul style="list-style-type: none"> • Prevents firmware update on unhealthy drives • Added notification if drive in bootloader state • Added detection of PCIe NVMe products |
| December 2014 | 2.0.14 | This revision clarified 512B/4KB support for the Intel® SSD DC S3700 and S3500 products. No firmware changes were made from the previous release. |
| July 2014 | 2.0.13 | This revision fixes issues associated with working on several Apple* systems. No firmware changes were made from the previous release. |
| February 2014 | 2.0.10 | This revision adds firmware updates for both Intel® SSD DC S3700 and S3500 products. |
| December 2013 | 2.0.9 | This revision adds a firmware update for all of the Intel® SSD 530 drives. |
| August 2013 | 2.0.6 | This revision adds a firmware update for the Intel® SSD 530. No other firmware changes were made from the previous release. |
| July 2013 | 2.0.4 | This revision adds a firmware update for the Intel® SSD DC S3500. No other firmware changes were made from the previous release. |
| June 2013 | 2.0.3 | This revision changes the Firmware Update Tool from a command line to a graphic user interface and adds the ability to update multiple Intel SSDs with a single button. |
| November 2012 | 1.9.3 | This revision adds a firmware update for the Intel® SSD 335 No other firmware changes were made from the previous release. |



| Date | Software Revision | Description |
|----------------|-------------------|--|
| September 2011 | 1.9.2 | This revision of the Firmware Update Tool: <ul style="list-style-type: none"> • Fixes issues associated with correctly detecting Intel SSDs in Apple* systems • Updates Intel 320 firmware specific to Lenovo* systems to the most current version. No other firmware changes were made from the previous release. |

List of Intel® Optane™ Solid State Drives

Click on the appropriate Optane SSD to go to the firmware revision history for your drive:

| Optane SSD | Latest Firmware Version(s) |
|-------------------------------------|---|
| Intel® Optane™ SSD DC P4800X/P4801X | <ul style="list-style-type: none"> ○ Windows/Linux - E2010485 ○ ESXi - E2010475 |
| Intel® Optane™ SSD 905P | E2010480 |
| Intel® Optane™ SSD 900P | E2010480 |

List of Intel® Optane™ Memory Devices

Click on the appropriate Memory to go to the firmware revision history for your unit:

| Memory | Latest Firmware Version(s) |
|-----------------------|----------------------------|
| Intel® Optane™ Memory | K4110440 |

Intel® Optane™ Memory Revision History

| Date | Revision | Description |
|-----------|----------|---|
| July 2020 | K4110440 | This firmware version contains incremental fixes |
| May 2017 | K3110310 | This firmware version contains fixes for intermittent enumeration issues. |

List of Intel® Solid State Drives

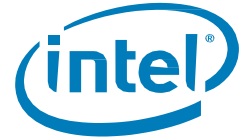
NOTE: If you purchased your Intel SSD from an OEM, your firmware version may have a different naming. Contact your local OEM representative for the latest firmware revisions.

Click on the appropriate SSD to go to the firmware revision history for your drive:

| Solid State Drive | Latest Firmware Version(s) |
|---|----------------------------|
| Intel® Solid State Drive DC P4511 | VCV10370 |
| Intel® Solid State Drive DC P4510/P4610 | VDV10170 |
| Intel® Solid State Drive DC P4500/P4600 | QDV10170 |
| Intel® Solid State Drive P4101 | 008D |
| Intel® Solid State Drive DC P3520 | MDV10291 |
| Intel® Solid State Drive DC P3100 | 119D |
| Intel® Solid State Drive D3-S4610 | XCV10132 |



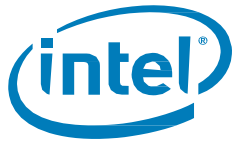
| Solid State Drive | Latest Firmware Version(s) |
|---|---|
| Intel® Solid State Drive D3-S4510 | XCV10132 (2.5") XC311132 (M.2) |
| Intel® Solid State Drive DC S4500/S4600 | SCV10150 |
| Intel® Solid State Drive DC S3710 | G2010160 – same as S3610 |
| Intel® Solid State Drive DC S3700 | 5DV12270 |
| Intel® Solid State Drive DC S3610 | G2010160 – same as S3710 |
| Intel® Solid State Drive DC S3520 | N2010121 |
| Intel® Solid State Drive DC S3510 | G2010150 |
| Intel® Solid State Drive DC S3500 | Default: D2012370 M.2: G2010150 HD: G2010150 |
| Intel® Solid State Drive DC S3100 | 043D |
| Intel® Solid State Drive E 6000p | 121E |
| Intel® Solid State Drive E 5400s | 043E |
| Intel® Solid State Drive E 5100s | LHF004E: 128GB and 256GB 2.5-inch/M.2 80mm LHF0A3E: 64GB 2.5-inch/M.2 80mm |
| Intel® Solid State Drive E 6100p | 005E |
| Intel® Solid State Drive Pro 7600p | 005P |
| Intel® Solid State Drive Pro 6000p | 131P |
| Intel® Solid State Drive Pro 5450s | LHF005P: 256GB and 512GB 2.5inch/M.2 80mm LHF0B3P: 1TB 2.5inch |
| Intel® Solid State Drive Pro 5400s | 043P 017P: 256GB/512GB |
| Intel® Solid State Drive Pro 2500 | M.2: TG16, 2.5-inch: TG21 |
| Intel® Solid State Drive 760p | 005C |
| Intel® Solid State Drive 750 | Firmware: 8EV101H0 Bootloader: 8B1B0133 |
| Intel® Solid State Drive 660p | 004C |
| Intel® Solid State Drive 600p | 121C |
| Intel® Solid State Drive 545s | LHF005C: 128GB, 256GB and 512GB 2.5inch/M.2 80mm LHF0B3C: 1TB 2.5inch |
| Intel® Solid State Drive 540s | 043C 017C: 256GB/512GB |
| Intel® Solid State Drive 535 | M.2: RG11 2.5-inch: RG21 |
| Intel® Solid State Drive 530 | M.2: DC31, 2.5-inch: DC32, mSATA: DC33 |



| Solid State Drive | Latest Firmware Version(s) |
|------------------------------------|----------------------------|
| Intel® Solid State Drive 335 | 335u |
| Intel® Solid State Drive 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 |

Intel® Optane™ Solid State Drive 905P/900P Revision History

| Date | Firmware Revision | Description |
|------------|-------------------|---|
| July 2020 | E2010480 | <p>This firmware version has below fixes;</p> <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 hotplug operation • Fix for Quality Reliability Test encountered Cold ECC Failure • Addresses CVE-2020-0584, CVE-2020-12309, CVE-2020-12310 and CVE-2020-12311 |
| April 2018 | E201043A | <p>The following changes are included in this firmware update:</p> <ul style="list-style-type: none"> • Bug fixes for performance and UBER |



Intel® Optane™ Solid State Drive DC P4800X/P4801X Revision History

| Date | Firmware Revision | Description |
|---------------|---|--|
| July 2020 | Windows/Linux - E2010485 ESXi - E2010475 | P4800X 375G AIC SKU now supported for upgrade |
| May 2020 | Windows/Linux - E2010485 ¹ ESXi - E2010475 ¹ | This revision adds the following firmware updates: <ul style="list-style-type: none"> 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 (375GB) EB3B0306 E2010325 (750GB) EB3B0309 | The following changes are included in this firmware update: <ul style="list-style-type: none"> Bug fixes from previous firmware on 375GB (from FW: E2010320) Note that 750GB 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 750GB samples are on earlier revision than FW E2010325. |

Intel® Solid State Drive DC P4511 Revision History

| Date | Firmware Revision | Description |
|----------|-------------------|--|
| May 2020 | VCV10370 | This revision adds firmware update to VCV10370 |

Intel® Solid State Drive DC P4510 and P4610 Revision History

| Date | Firmware Revision | Description |
|---------------|----------------------|--|
| December 2019 | VDV10170 | MR7 Firmware Release |
| February 2018 | VDV10120 VB1B0053 | The following changes are included in this firmware update: <ul style="list-style-type: none"> Support for higher capacity 4, 8 TB SKUs. Unified binary for 1, 2, 4, 8 TB SKUs. Other drive stability & functionality fixes. |

Intel® Solid State Drive DC P4500 and P4600 Revision History

| Date | Firmware Revision | Description |
|---------------|----------------------|---|
| February 2018 | QDV10170 QB1B0122 | The following changes are included in this firmware update: <ul style="list-style-type: none"> Fixed SATA CRC errors seen when running at 3Gbps Corrected SMART 05h behavior Fixed power consumption on Staggered Spin-up. |



Intel® Solid State Drive 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 Addresses CVE-2020-0584, CVE-2020-12309, CVE-2020-12310 and CVE-2020-12311 |
| December 2019 | 7D | <ul style="list-style-type: none"> MR2 Firmware Release |

Intel® Solid State Drive DC P3520 Revision History

| Date | Revision | Description |
|------------|----------|---|
| March 2017 | MDV10271 | This firmware versions contain the following enhancements: <ul style="list-style-type: none"> Improvements to drive behavior during die offline events, LBA mismatches, handling errors during PLI events Boot drive capability issue addressed |

Intel® Solid State Drive DC P3100 Revision History

| Date | Revision | Description |
|---------------|----------|---|
| May 2017 | 119D | 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 | 109D | 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 This 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® Solid State Drive DC S4500 and S4600 Revision History

| Date | Firmware Revision | Description |
|---------------|----------------------|---|
| February 2018 | SCV10111 SBUB0018 | <p>The following changes are included in this firmware update:</p> <ul style="list-style-type: none"> Improved Random Read performance Faster Secure Erase of the drive Bug fixes from previous firmware SCV10100. <p>Please see Intel SSD DC S4500 S4600 updated sightings report for all bug fixes in SCV10111</p> |

Intel® Solid State Drive D3-S4610 and D3-S4510 Revision History

| Date | Firmware Revision | Description |
|---------------|-----------------------------------|--|
| July 2020 | XCV10132 (2.5") XC311132 (M.2) | <p>This firmware will have following fixes:</p> <p>XCV10132 (2.5")</p> <ul style="list-style-type: none"> The following changes are included in this firmware update: 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)</p> <ul style="list-style-type: none"> The following changes are included in this firmware update: 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® Solid State Drive DC S3710 and DC S3610 Revision History

| Date | Revision | Description |
|---------------|----------|--|
| December 2016 | G2010160 | This firmware version includes support for the ACS-3 command set. |
| March 2016 | G2010150 | <p>The following changes are included in this firmware update:</p> <ul style="list-style-type: none"> Fixed SATA CRC errors seen when running at 3Gbps Corrected SMART 05h behavior Fixed power consumption on Staggered Spin-up. <p>This latest firmware also includes a fix for a specific use condition where in certain cases if the device receives a command that violates the SATA protocol specification, the drive may ASSERT or stop responding to host commands (See Intel Advisory INTEL-SA-00050).</p> |
| October 2015 | G2010140 | <p>This release provides the following improvements:</p> <ul style="list-style-type: none"> Added support for SMART Attribute F3h Modification to Secure Erase to include NAND Erase Improvements to the Maximum Latency for all Sequential and Random Write workloads Added a fourth PHY mode setting to accommodate long interconnects (> 8-inches) |

Intel® Solid State Drive DC S3700 Revision History

| Date | Revision | Description |
|---------------|----------|---|
| March 2016 | 5DV12270 | This latest firmware includes a fix for a specific use condition where in certain cases if the device receives a command that violates the SATA protocol specification, the drive may ASSERT or stop responding to host commands. (See Intel Advisory INTEL-SA-00050). |
| February 2014 | 0270 | <p>This release provides the following improvements:</p> <ul style="list-style-type: none"> In the unlikely event that a drive fails, the drive will now report the correct serial number and actual capacity. The error code is available in ID block word 140 and GPL address 0xDD. When a power-off is less than 500ms the drive will automatically reset and allow proper drive enumeration. Support for the reporting of both 512B and 4KB physical sector size. The default setting is 4K as reported in Word 106 of the identifying drive data. The default sector size can be changed by using the Intel® Solid State Drive Data Center Tool. As blocks are retired, the SMART E8h value will decrease linearly. After a power cycle, timed workload variables will resume from the last saved values and update after 60 minutes and every minute thereafter. SMART Attribute 05h now has a normalized value of 100. SMART Attribute C2h now reports the correct temperature. |
| June 2013 | 0265 | <p>This release addresses the following issues:</p> <ul style="list-style-type: none"> The drive may exhibit longer latency behind certain HBA/RAID cards under specific sequential workloads. SMART attribute EAh was not correctly incrementing. Drive returns incorrect response or becomes unresponsive to an LBA write above 32bit address. |



Intel® Solid State Drive DC S3520 Revision History

| Date | Revision | Description |
|----------------|----------------------|---|
| September 2017 | N2010121 | <p>These firmware versions contain fixes for the following issues:</p> <ul style="list-style-type: none">• Subsequent firmware updates no longer require a power cycle of the system.• Drive may enter a disabled logical state or report SMART AFh failure if powered on after storage in certain conditions.• Drive may enter disabled logical state when executing SMART Extended self-test routine in captive mode.• Sanitize feature set cannot be re-enabled following an SSP disable and COMRESET• Misc. sightings closure and improvement on product health. |
| March 2017 | N2010112 (2.5" only) | <p>These firmware versions contain fixes for the following issues:</p> <ul style="list-style-type: none">• Correction to SMART attribute BBh and F1h increment behavior• Fix to drive behavior when power loss occurs during Secure Erase• Fixed issue where SCT Extended Status Code, Action Code and Function Code were not being cleared on a COMRESET• Fix to address occasional Standby Immediate failure• Legacy ATA commands not relevant in ACS-3 no longer aborted• Correction to drive behavior when running SMART self-test using Smartctl and ABORT command received |

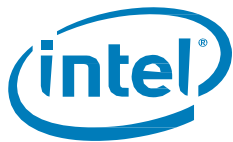
Intel® Solid State Drive DC S3510 Revision History

| Date | Revision | Description |
|--------------|----------|--|
| March 2016 | G2010150 | <p>The following changes are included in this firmware update:</p> <ul style="list-style-type: none">• Fixed SATA CRC errors seen when running at 3Gbps• Corrected SMART 05h behavior• Fixed power consumption on Staggered Spin-up. <p>This latest firmware also includes a fix for a specific use condition where in certain cases if the device receives a command that violates the SATA protocol specification, the drive may ASSERT or stop responding to host commands (See Intel Advisory INTEL-SA-00050).</p> |
| October 2015 | G2010140 | <p>This release provides the following improvements:</p> <ul style="list-style-type: none">• Added support for SMART Attribute F3h• Modification to Secure Erase to include NAND Erase• Improvements to the Maximum Latency for all Sequential and Random Write workloads• Added a fourth PHY mode setting to accommodate long interconnects (> 8-inches) |



Intel® Solid State Drive DC S3500 Revision History

| Date | Revision | Description |
|---------------|--|--|
| March 2016 | For DC S3500 M.2, DC S3500 HD only G2010150 For DC S3500 only D2012370 | These latest firmware versions include a fix for a specific use condition where in certain cases if the device receives a command that violates the SATA protocol specification, the drive may ASSERT or stop responding to host commands (See Intel Advisory INTEL-SA-00050). |
| October 2015 | For DC S3500 M.2 DC S3500 HD only G2010140 | This firmware release is only applicable for the Intel® SSD DC S3500 M.2 and DC S3500 HD drives. This release provides the following improvements: <ul style="list-style-type: none"> • Added support for SMART Attribute F3h • Modification to Secure Erase to include NAND Erase • Improvements to the Maximum Latency for all Sequential and Random Write workloads • Added a fourth PHY mode setting to accommodate long interconnects (> 8-inches) |
| February 2014 | 0370 | This release provides the following improvements: <ul style="list-style-type: none"> • In the unlikely event that a drive fails, the drive will now report the correct serial number and actual capacity. The error code is available in ID block word 140 and GPL address 0xDD. • When a power-off is less than 500ms the drive will automatically reset and allow proper drive enumeration. • Support for the reporting of both 512B and 4KB physical sector size. The default setting is 4K as reported in Word 106 of the identifying drive data. The default sector size can be changed by using the Intel® Solid State Drive Data Center Tool. • As blocks are retired, the SMART E8h value will decrease linearly. • After a power cycle, timed workload variables will resume from the last saved values and update after 60 minutes and every minute thereafter. • SMART Attribute 05h now has a normalized value of 100. • SMART Attribute C2h now reports the correct temperature. |
| July 2013 | 0355 | This release provides an update to the SMART Error Log after download microcode command is executed. Other ongoing improvements were made to address manufacturability and IOPs consistency. |



Intel® Solid State Drive 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 | 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 | 036D | 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 | 031D | 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• Mitigated a security vulnerability which in some cases resulted in corruption of user's data (see Intel Advisory INTEL-SA-00053). |

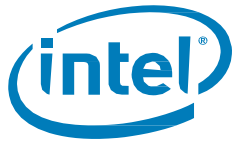


Intel® Solid State Drive E 6100p Revision History

| 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 • Addresses CVE-2020-0584, CVE-2020-12309, CVE-2020-12310 and CVE-2020-12311 |
| 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® Solid State Drive E 6000p Revision History

| Date | Revision | Description |
|---------------|----------|---|
| May 2017 | 121E | 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 | 109E | 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® Solid State Drive E 5400s Revision History

| Date | Revision | Description |
|------------|----------|---|
| July 2020 | 043E | This firmware version contains below fix <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 Mitigated a security vulnerability which in some cases resulted in corruption of user's data (see Intel Advisory INTEL-SA-00053). |

Intel® Solid State Drive E 5100s Revision History

| Date | Revision | Description |
|--------------|--------------------|---|
| July 2020 | LHF004E LHF0A3E | This firmware version contains fix for the below issue <ul style="list-style-type: none"> Addresses CVE-2020-0584, CVE-2020-12309, CVE-2020-12310 and CVE-2020-12311 |
| October 2018 | LHF003E LHF0A2E | 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® Solid State Drive Pro 7600p Revision History

| Date | Revision | Description |
|----------------|----------|---|
| July 2020 | 005P | <p>This firmware contains the following fixes:</p> <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 Addresses CVE-2020-0584, CVE-2020-12309, CVE-2020-12310 and CVE-2020-12311 |
| September 2018 | 004P | <p>This firmware versions contain the following enhancements:</p> <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® Solid State Drive Pro 6000p Revision History

| Date | Revision | Description |
|---------------|----------|--|
| July 2020 | 131P | <p>This firmware contains the below fixes;</p> <ul style="list-style-type: none"> Addresses CVE-2020-0584, CVE-2020-12309, CVE-2020-12310 and CVE-2020-12311 |
| May 2017 | 121P | <p>This firmware versions contain the following enhancements:</p> <ul style="list-style-type: none"> Improved link initializations <p>This firmware versions contain fixes for the following issues:</p> <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. Mitigates a security vulnerability INTEL-SA-00078 |
| December 2016 | 109P | <p>This firmware versions contain the following enhancements:</p> <ul style="list-style-type: none"> Improvements to PHY initialization process Improved end of life management of bad blocks for better reliability <p>These firmware versions contain fixes for the following issues:</p> <ul style="list-style-type: none"> Fixed potential issue of incorrect data may be read during resume from low power state |



Intel® Solid State Drive 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"> Addresses CVE-2020-0584, CVE-2020-12309, CVE-2020-12310 and CVE-2020-12311 |
| 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® Solid State Drive 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 Addresses CVE-2020-0584, CVE-2020-12309, CVE-2020-12310 and CVE-2020-12311 |
| 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 256GB/512GB 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 Mitigates a security vulnerability which in some cases resulted in corruption of user's data (see Intel Advisory INTEL-SA-00079) |
| March 2017 | 036P | Added support for missing 80/120GB 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 Mitigates a security vulnerability which in some cases resulted in corruption of user's data (see Intel Advisory INTEL-SA-00055) |



Intel® Solid State Drive Pro 2500 Revision History

| Date | Revision | Description |
|--------------|----------------------------|--|
| October 2015 | M.2 – TG16, 2.5" – TG21 | This firmware release provides the following changes: <ul style="list-style-type: none"> • Devsleep wake optimizations for more robust resume after devsleep • Fix for Windows' disk error occurring after devsleep on systems with ATA user password • Fix for I/O abort due to Sanitize Freeze Lock after COMRESET • Fix for Drive Self-Test reporting incorrect status after test abort |

Intel® Solid State Drive 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 • Addresses CVE-2020-0584, CVE-2020-12309, CVE-2020-12310 and CVE-2020-12311 |
| 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® Solid State Drive 750 Revision History

| Date | Revision | Description |
|---------------|----------------------|---|
| March 2017 | 8EV101H0 8B1B0133 | This firmware version contains fixes for the following issues: <ul style="list-style-type: none">• XN022 Assert Fixes• Sequential read performance improvement at end of life from firmware 8EV101F0• Misc. sightings closure and improvement on product health. |
| October 2016 | 8EV101F0 8B1B0133 | This version provides a firmware and bootloader update for the Intel® SSD 750. This firmware version contains fixes for the following issues <ul style="list-style-type: none">• Added NVME IO Queue Metrics log page support• Added Secure Erase Command Monitoring log page support• Updated Secure Erase Command User Data Erase option• Fix for drive entering disable logical mode after frequent, repeated O/S reboots• Prefetch activate/deactivate logic enhancement• Fix for sequential read performance decay• Fix for formatting 4k+DIF causing read errors when using Intel SPDK• Misc. sightings closure and improvement on product health. |
| November 2015 | 8EV10174 8B1B0131 | The latest firmware revision is 8EV10174. The latest bootloader revision is 8B1B0131 (no change). This firmware version contains fixes for the following issue: <ul style="list-style-type: none">• Fixed LED behavior to appear LED-On when drive active and LED-Off when drive idle.• Fix for some use cases where user data may be inaccessible or at risk of loss. (see Intel Advisory INTEL-SA-00047)• Misc. sightings closure and improvement on product health |
| October 2015 | 8EV10171 8B1B0131 | The latest firmware revision is 8EV10171. The latest bootloader revision is 8B1B0131. This firmware and bootloader version contains fixes for the following issues: <ul style="list-style-type: none">• Vendor Unique Command to change SM BUS address on “NVMe™ Basic Management Command”• Improved TRIM IOPS operation• In-field Drive Configuration Update capability• Windows* Driver update with bug fixes• Misc. sightings closure and improvement on product health |

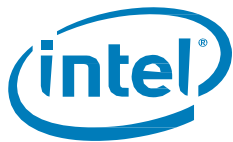


Intel® Solid State Drive 660p Revision History

| 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 • Addresses CVE-2020-0584, CVE-2020-12309, CVE-2020-12310 and CVE-2020-12311 |
| 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® Solid State Drive 545s Revision History

| Date | Revision | Description |
|----------------|--------------------|---|
| February 2019 | LHF0B2C | This firmware version contains fix for the following issue: <ul style="list-style-type: none"> • Fixed firmware update configuration for 1TB 2.5-inch SKU that were missing in previous versions of Intel® SSD FUT. |
| October 2018 | LHF004C LHF0B2C | 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 |
| September 2017 | LHF002C | These firmware versions contain the following enhancements: <ul style="list-style-type: none"> • Improved drive behavior during unsafe shutdown scenarios • Improved drive behavior with non-aligned 4K workloads • Improved garbage collection capabilities • Updates to SMART table to provide persistent SMART behavior during power cycle, firmware upgrade and secure erase Optimized Power Management behavior with DIPM enabled and transition to different power states |



Intel® Solid State Drive 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 256GB/512GB 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 Mitigates a security vulnerability which in some cases resulted in corruption of user's data (see Intel Advisory INTEL-SA-00079) |
| 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 Mitigates a security vulnerability which in some cases resulted in corruption of user's data (see Intel Advisory INTEL-SA-00055) |
| 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 Mitigated a security vulnerability which in some cases resulted in corruption of user's data (see Intel Advisory INTEL-SA-00053). |

Intel® Solid State Drive 535 Revision History

| Date | Revision | Description |
|--------------|----------------------------|---|
| October 2015 | M.2 – RG11, 2.5" – RG21 | This firmware release provides the following changes: <ul style="list-style-type: none"> Fix for Windows' disk error occurring after devsleep on systems with ATA user password Fix for I/O abort due to Sanitize Freeze Lock after COMRESET Fix for Drive Self-Test reporting incorrect status after test abort |



Intel® Solid State Drive 530 Revision History

| Date | Revision | Description |
|---------------|---|--|
| December 2013 | M.2 – DC31, 2.5" – DC32, mSATA – DC33 | This firmware release provides the following changes: <ul style="list-style-type: none"> • Default Software Settings Preservation (SSP) for DIPM is changed from a default = on, to a DEFAULT = OFF. This addresses situations in older systems where the drive was not found after a warm reset causing blue screens. • Corrects an occasional miss-reporting of SMART attribute E3h (Timed Workload Read/Write ratio). • The drive no longer increments SMART 0Ch (Power Cycle Count) after a SECURE ERASE operation. |
| August 2013 | 2.5" – DC12, mSATA – DC13 | This firmware release addresses an occasional drive hang after resume from Link Power Management slumber state. |

Intel® Solid State Drive 335 Revision History

| Date | Revision | Description |
|---------------|----------|--|
| June 2013 | 335u | This firmware revision has several continuous improvement optimizations intended to provide the best possible user experience with the Intel SSD. |
| November 2012 | 335t | This release adds a firmware update for the Intel SSD 335 fixing the following issue : - Incorrect reporting of the E9h media wear indicator value. |

Intel® Solid State Drive 320 Revision History

| Date | Revision | Description |
|-------------|----------|--|
| August 2011 | 4PC10362 | This firmware revision fixes various issues related to the BAD_CTX 13x (8MB capacity) problems associated with unsafe power-loss situations. |

Intel® X25-E (50nm product) Revision History

| Date | Revision | Description |
|---------------|-----------|--|
| August 2011 | No Change | No changes to Intel X25-E SATA SSD 50nm products. The most current firmware remains at 045C8855. |
| January 2011 | No Change | No changes to Intel X25-E SATA SSD 50nm products. The most current firmware remains at 045C8855. |
| November 2009 | 045C8855 | This firmware revision has several continuous improvement optimizations intended to provide the best possible user experience with the Intel SSD. |
| October 2009 | No Change | No change to Intel X25-E SATA SSD 50nm products. The most current firmware remains at 045C8850. |
| August 2009 | 045C8850 | This firmware revision is for Intel X25-E SATA SSD 50nm products only and has several continuous improvement optimizations intended to provide the best possible user experience with the Intel SSD. |



Intel® X18-M/X25-M (50nm product) Revision History

| Date | Revision | Description |
|---------------|-----------|---|
| August 2011 | No Change | No changes to Intel X18-M/X25-M SATA SSD 50nm products. The most current firmware remains at 045C8820. |
| January 2011 | No Change | No changes to Intel X18-M/X25-M SATA SSD 50nm products. The most current firmware remains at 045C8820. |
| November 2009 | No Change | No changes to Intel X18-M/X25-M SATA SSD 50nm products. The most current firmware remains at 045C8820. |
| October 2009 | No Change | No changes to Intel X18-M/X25-M SATA SSD 50nm products. The most current firmware remains at 045C8820. |
| August 2009 | No Change | No changes to Intel X18-M/X25-M SATA SSD 50nm products. The most current firmware remains at 045C8820. |
| August 2009 | No change | No changes to Intel X18-M/X25-M SATA SSD 50nm products. The most current firmware remains at 045C8820. |
| April 2009 | 045C8820 | This firmware revision has several continuous improvement optimizations intended to provide the best possible user experience with the Intel SSD. |

Intel® X18-M/X25-M/X25-V (34nm product) Revision History

| Date | Revision | Description |
|---------------|-----------|---|
| August 2011 | 2CV102M3 | No changes to Intel X18-M/X25-M SATA SSD 34nm products. The most current firmware remains at 2CV102M3. |
| January 2011 | 2CV102M3 | This firmware revision fixes enumeration and slow boot issues on SATA 6Gb/s controllers, adds improvements to S.M.A.R.T. attributes for more accurate reporting of drive health, along with improved NCQ capability. |
| November 2009 | 2CV102HD | This firmware revision includes several continuous improvement optimizations intended to provide the best possible user experience with the Intel SSD. |
| October 2009 | 2CV102HA | This firmware revision supports the ATA Data Set Management Command "Trim". Also, this firmware revision includes several continuous improvement optimizations that provide for increased write performance on 160GB drives. |
| August 2009 | No Change | No changes to Intel X18-M/X25-M SATA SSD 34nm products. The most current firmware remains at 2CV102G9. |
| August 2009 | 2CV102G9 | This firmware revision is for Intel X25-M SATA SSD 34nm products only (Intel X18-M SATA SSD 34nm products do not require this firmware update) and fixes the following two issues: 1) System hangs with BIOS drive password enabled. 2) System inoperable when BIOS drive password disabled or changed. |