Intel® RealSense™ Product Family D400 Series

Specification Update

Revision 032

November 2021

Contents

Table

Revision History

Document Number	Revision Number	Description	Revision Date
337125	001	Firmware 5.8.15 Release	February 2018
	002	Firmware 5.9.2 Release	March 2018
	003	Firmware 5.9.9 Release	April 2018
	004	Firmware 5.9.11 Release	May 2018
	005	Firmware 5.9.13 Release	June 2018
	006	Firmware 5.9.14	July 2018
	007	Firmware 5.10.3	August 2018
	008	Firmware 5.10.6	October 2018
	009	Firmware 5.10.13	November 2018
	010	Firmware 5.11.1	January 2019
	011	Firmware 5.11.1.100	February 2019
	012	Firmware 5.11.4	February 2019
	014	Firmware 5.11.6.250	June 2019
	015	Firmware 5.11.11.100	August 2019
	016	Firmware 5.11.15.0	September 2019
	017	Firmware 5.12.0	November 2019
	018	Firmware 5.12.1	December 2019
	019	Firmware 5.12.2.100	January 2020
	020	Firmware 5.12.3.0	February 2020
	021	Firmware 5.12.5.0	June 2020
	022	Firmware 5.12.6.0	July 2020
	023	Firmware 05.12.07.100	August 2020
	024	Firmware 05.12.08.200	October 2020
	025	Firmware 05.12.09.00	November 2020
	026	Firmware 05.12.10.00	January 2021
	027	Firmware 05.12.11.00	February 2021
	028	Firmware 05.12.12.100	March 2021
	029	Firmware 05.12.13.50	May 2021
	030	Firmware 05.12.14.50	June 2021
	031	Firmware 05.12.15.0	October 2021
	032	Firmware 05.13.0.50	November 2021

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1   *Preface*

This document is an update to the specification contained in the <u>Affected Documents</u> table below. This document is a compilation of device and documentation errata, specification clarifications and changes. It is intended for hardware systems manufactures and software developers of applications, systems or tools.

Information types defined in Nomenclature are consolidated into the specification updates and are no longer published in other documents.

This document may also contain information that was not previously published.

1.1   Affected Documents

Document Title	Location
Intel® RealSense™ D400 Series Product Family Datasheet	https://dev.intelrealsense.com/docs/intel-realsense-d400-series-product-family-datasheet

1.2   Nomenclature

Errata are design defects or errors. These may cause behavior to deviate from published specifications. Hardware and software designed to be used with any given stepping must assume that all errata documented for that stepping are present on all devices.

Specification Changes are modifications to the current published specifications. These changes will be incorporated in any new release of the specifications.

Specification Clarifications describe a specification in greater detail or further highlight a specification's impact to a complex design situation. These clarifications will be incorporated in any new release of the specification.

Documentation Changes include typos, errors, or omissions from the current published specifications. These will be incorporated in any new release of the specification.

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2   *Summary Table of Changes*

The following tables indicate the errata, specification changes, specification clarifications, or documentation changes which apply to the Product Name product. Intel may fix some of the errata in a future stepping of the component and account for the other outstanding issues through documentation or specification changes as noted.

2.1   Codes Used in Summary Tables

Status

Doc:	Document change or update will be implemented
Open:	In engineering assessment
Plan Fix:	This erratum may be fixed in a future firm of the product
Fixed:	This erratum has been previously fixed
No Fix:	There are no plans to fix this erratum

Table 2-1. Errata Summary Table

Number	Status	Errata
DSO-7194	**Fixed** in Windows 10* RS4	Windows driver [mskssrv.sys] may crash with D400 series cameras in stress test condition
DSO-7755	**Fixed** in Firmware 5.9.9	Temporary stream hang observed on disabling Auto Exposure (AE) at 1280X720 resolution after any previous 90 FPS stream
DSO-7798	**Fixed** in Firmware 5.9.2	RGB at 60 FPS may not have the right exposure set when exposure is equal/less than -2
DSO-7849	**Fixed** in Firmware 5.9.9	ROI based depth streaming immediately after change of IR projector power may result in a stream hang
DSO-7854	**Fixed** in Firmware 5.9.13	Depth Stream hang when system resumes from Sleep (S3)
DSO-7976	**Fixed** in Firmware 5.9.2	D400 Series camera is not recognized after reboot on Linux
DSO-8007	**Fixed** in Windows Driver 5.160.1.5+	Firmware updates via DFU fails when firmware update limit is reached
DSO-8328	**Fixed** in Firmware 5.9.13	Metadata attribute "Trigger" indicating Depth to Color synchronization may not have correct value
DSO-8461	Not a RealSense bug (Requires Chrome* fix)	D400 Series Windows UWP driver does not work with Chrome browser
DSO-8467	**Fixed** in LibRealSense2.10.1	Left Imager UYVY format displays green image
DSO-8538	**Fixed** in Firmware 5.9.11	Color correction parameters are not updated correctly
DSO-8565	No Fix (expected as per current design)	Infrared speckles on color image from D415 and D435 cameras

Summary Table of Changes

Number	Status	Errata
DSO-6804 DSO-8681	No Fix	D400 Series cameras intermittently enumerated as USB2 device on unplug/plug
DSO-9006	**Fixed** in Firmware 5.9.11	Frame rate does not change when manual exposure value is changed
DSO-9074	**Closed**. This is USB2 Bandwidth related	Simultaneous streaming Depth, Imager and Color may result in data stream hang when camera is connected through USB2
DSO-9094	**Fixed** in Firmware 5.9.11	Specific controls values missing in frames metadata
DSO-9153	**Fixed** in Firmware 5.9.11	D400 series camera fails to be recognized on system reboot when connected through USB3
DSO-9224	**Fixed** in Firmware 5.9.13	IR Projector pattern flicker when streaming through USB2 connection
DSO-9228	**Fixed** in Firmware 5.9.13	D400 series camera disconnects on resume from system sleep when connected through USB2
DSO-9240	**Fixed** in Firmware 5.9.13	D400 Series camera fails to be recognized on system reboot when connected through USB2
DSO-9478	**Fixed** in Firmware 5.10.6	Image Flicker when Auto Exposure (AE) is enabled
DSO-9501	**Fixed** in Windows 10* RS5	Camera is not functional after HLK Sensor test when connected through USB2
DSO-9546	**Fixed** in Firmware 5.9.14	IR projector pattern flicker when streaming at 1280X720, 4 FPS and connected through USB2
DSO-9556	**Fixed** in Firmware 5.10.3	Camera stuck after streaming start-stop at Low FPS for few times
DSO-9645	**Fixed** in Firmware 5.10.3	Darker depth frame when changing depth exposure from [165760 - 165780] and connected through USB2
DSO-10002	**Fixed** in Firmware 5.10.3	Calibration tables may get corrupted during power on and off cycles
DSO-10011	No Fix	Auto Exposure (AE) for Color is not optimized for bright sunlight
DSO-10428	**Fixed** in Firmware 5.11.4	IR Image is black in Auto Exposure (AE) mode with sudden exposure to light
DSO-10431	**Fixed** in Firmware 5.11.1	IR image may flicker in outdoor sunlight when using Auto Exposure (AE) with default set point
DSO-10503	Open	Low fill rate in outdoor environment using Auto Exposure (AE)
DSO-10603	**Fixed** in Firmware 5.12.3.0	Unable to set the Depth Exposure Time < 70 usec through USB2
DSO-10777	**Fixed** in LibRealSense	D435i - Buffer overflow on repeated start/stop
DSO-10674	**Fixed** in LibRealSense	D435i – The first (cold) start of IMU sensors in LibRealSense on Linux takes ~4 sec
DSO-10920	**Fixed** in LibRealSense	First frames not received on metadata test
DSO-11041	**Fixed** in LibRealSense	D435i – Unreasonably large accelerometer reading in Windows 10
DSO-10591	No Fix	In Multi Camera mode, sporadic and inconsistent frame drops and streaming halt
DSO-11040	**Fixed** in Firmware 5.11.4	D435 – Depth/IR corrupted image when streaming multi stream and RGB exposure is < -6

Summary Table of Changes

Number	Status	Errata
DSO-11042	**Fixed** in Firmware 5.11.11.100. LibRealSense 2.20.0 required.	D430 – RealSense Viewer errors out post reboot after using the "Hand' preset.
DSO-12586	**Fixed** in Firmware 5.11.11.100	D415, D435/D435i – RGB camera not available after FW Update process using DFU
DSO-12587 DSO-12814	**Fixed** in Firmware 5.11.6.250	D435i – Upgrading to FW version 5.11.6.200 causes corrupted calibration table. Note: Due to this issue this FW was removed.
DSO-10229 DSO-13386	**Fixed** in Firmware 5.11.15.0	Camera fail after start, stop of random profiles
DSO-13540	**Fixed** in Firmware 5.11.15.0	D415 – Intel® RealSense™ Self-Calibration doesn't converge using D415 camera
DSO-13546	**Fixed** in Firmware 5.12.0	D435i – IMU frame drops
DSO-13554	**Fixed** in Firmware 5.11.15.0	D420 – Camera will stop working after FW update
DSO-12578	**Fixed** in Firmware 5.12.3.0	Device not recognized in device manager after machine reboot
DSO-14309	**Fixed** in LibRealSense	Scale error after Tare calibration (Intel® RealSense™ Self-Calibration) was significantly degraded
DSO-14530	Open	Frame drops when running on Ubuntu 18.04 with Kernel 5
DSO-14525	**Fixed** in LibRealSense	D435i – Camera not released to idle state on Ubuntu 18.04 with Kernel 5
DSO-14504	Open	D435i – Frame drops in gyro stream on Windows
DSO-14517	**Fixed** in Firmware 5.12.5.0	10 FPS not supported on Depth/IR 848x480 when connected through USB2
DSO-14455	Open	Frames stop arriving after few minutes on Windows 10 RS4
DSO-13306	**Fixed** in Firmware 5.12.5.0	Frames stop arriving after few frames in Color/Depth stream due to unexpected halt on Windows 10 RS4
DSO-14512	**Fixed** in Firmware 5.12.6.0	D435i – Failed to start IMU stream after resetting device
DSO-14526	**Fixed** in Firmware 5.12.5.0	D435i – Sending HW_reset immediately after stop streaming causes the camera to boot into invalid state
DSO-14558	**Fixed** in Firmware 5.12.5.0	Fails USB enumeration during PC restart
DSO-14499	**Fixed** in Firmware 05.12.09.00	Config error when stopping Color stream on Windows 10 RS4
DSO-14349	**Fixed** in LibRealSense	FW Update ID mismatch before and after entering DFU
DSO-14337	**Fixed** in Firmware 5.12.5.0	IR Frames stop arriving after several camera start/stop
DSO-14308	Open	D415 - Self-Calibration/Tare fails to converge 20% of the time
DSO-14978	Open	D455 – Depth/IR frame drops

Number	Status	Errata
DSO-16289	**Fixed** in Firmware 5.12.11.0	When laser emitter is enabled via Python, laser turns on and off continuously
DSO-16765	**Fixed** in Firmware 5.12.13.50	Frames not arrived with 300fps
DSO-17659	**Fixed** in Firmware 5.13.0.50	D415 Depth Image fails upon start/stop cycling
DSO-17393	**Fixed** in Firmware 5.13.0.50	Cannot Reset Auto Exp/Gain Limit back to default value 0
DSO-17183	**Fixed** in Firmware 5.13.0.50	D430 depth fill rate is not good with high accuracy preset under 640x480
DSO-16964	**Fixed** in Firmware 5.13.0.50	Emitter_on_off stops when RGB camera stops
DSO-17567	**Fixed** in Firmware 5.13.0.50	RealSense Viewer Crashes after Surface Pro 7+ sleep

Table 2-2. Specification Changes

Number	Specification Changes
	Firmware v5.10.13 adds support for Intel® RealSense™ D435i camera.
	Firmware v5.9.2+ adds USB 2.0 support for Intel® RealSense™ D410, D415 and D435 cameras. The USB2.0 is supported for OS Linux and Windows*10 with Intel® RealSense™ SDK 2.10.4+ To ensure the best of quality of service, connection to a dedicated USB2 root port is desired.
DSO-9015	Firmware 5.11.15 allows a D4xx camera to run as an R200 via a JSON file. LibRealSense 2.20.0 or higher is required for this feature.
DSO-12258	Firmware 5.11.11.100 and LibrealSense 2.23.0 will bring improved depth linearity and absolute accuracy. Please see https://dev.intelrealsense.com/docs/white-paper-subpixel-linearity-improvement-for-intel-realsense-depth-cameras
DSO-12399	Firmware 5.11.11.100 provides USB 2.0 support for D430 module. LibRealSense 2.21.0 or higher is required for this feature.
DSO-12266 DSO-12267	Firmware 5.11.15.0 provides the ability for Self-Calibration (Intel® RealSense™ Self-Calibration) to improve depth noise/precision. Also provides the ability for Tare calibration (Intel® RealSense™ Self-Calibration) to improve absolute accuracy. LibRealSense 2.29.0 or higher is required for this feature on D400 series devices.
DSO-14282	Firmware 5.12.3.0 provides additional USB2.0 formats for depth and IR streams. The available format for depth and IR 848x480 @ 6FPS, 10FPS.
DSO-12490 DSO-12281	Firmware 5.12.5.0 provides single frame triggering feature called External Synchronization (GenLock) for D43x global shutter only cameras. The release also includes support for 256x144 @ 300FPS and 848x100 @ 300FPS formats for D43x cameras.
DSO-15547 DSO-15001 DSO-15606	Firmware 05.12.08.200 provides support for depth HDR. For the D455 camera, enable synthetic RGB from left imager and half disparity. **Note:** Firmware 05.12.08.200 includes a change in API, when using the emitter on/off feature use the latest LibRealSense 2.39.0 or newer with Firmware 05.12.08.200 or newer. Depth HDR requires the latest LibRealSense 2.39.0 or newer with Firmware 05.12.08.200 or newer.
DSO-17182	Firmware 5.12.15.50 adds 8FPS for depth+IR1+IR2@848x480 on D435/D430 over USB2
DSO-17315	Firmware 5.12.15.50 enables D400 Color AE Priority by default

Table 2-3. Specification Clarifications

No.	Specification Clarifications
	All Intel® RealSense™ camera or module firmware releases are stable releases to be used in any stage of end-user product development and production. The current cadence is approx. 2 months. Customers can take full advantage of the new features and resolved issues throughout all releases. Check this errata and release notes for the details.

Table 2-4. Documentation Changes

No.	Documentation Changes
	None for this revision of this specification update.

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3 Errata

3.1 Open

DSO-6804 DSO-8681	D400 Series camera intermittently enumerated as USB2 device on unplug/plug
Problem:	D400 Series camera intermittently enumerates as a USB 2.0 high speed device when the camera is plugged to a USB 3.1 Gen1 port.
Implication:	The issue is seen on Windows* and Linux*. The issue is not applicable when Host to Camera connection is Type-C (Host) to Type-C (Camera)
Workaround:	Plug in to Host (USB-Type A) after camera connection (Type-C) or alternately physical unplug-plug a camera with different insertion speeds. Issue more likely to occur on slow plug insertion into USB 3.1 Gen1 port.
Status:	Refer the *Summary Tables of Changes*

DSO-10503	Low fill rate in outdoor environment using Auto Exposure (AE)
Problem:	In outdoor light condition (at shaded area), the fill rate might be lower compared to older firmware versions.
Implication:	The failure is observed with Depth Camera D435
Workaround:	None
Status:	Refer the *Summary Tables of Changes*

DSO-14530	Frame drops when running on Ubuntu 18.04 with Kernel 5
Problem:	Start multiple streams (IR, Color, Gyro and Accelerometer), receive frame drops on streams.
Implication:	The failure is observed with Depth Camera D400 series
Workaround:	None
Status:	Refer the *Summary Tables of Changes*

DSO-14504	D435i – Frame drops in gyro stream on Windows
Problem:	Start multiple streams (IR, Color, Gyro and Accelerometer), receive frame drops on gyro stream.
Implication:	The failure is observed with Depth Camera D435i
Workaround:	None
Status:	Refer the *Summary Tables of Changes*

Errata

DSO-14455	Frames stop arriving after few minutes on Windows 10 RS4
Problem:	Start streams (Depth, IR, Color, Gyro and Accelerometer), frames stop arriving after a few minutes of streaming.
Implication:	The failure is observed with Depth Camera D400 series
Workaround:	None
Status:	Refer the *Summary Tables of Changes*

DSO-10591	In Multi Camera mode, sporadic and inconsistent frame drops and streaming halt
Problem:	When Multi-camera configured: • Depth+Color VGAx30FPS • Start-stop streaming, 30 sec streaming duration There is sporadic: • High rate of frame drops received • Exception 'profile not found' received
Implication:	The failure is observed with Depth Camera D400 series
Workaround:	Application should be restarted in order to continue to work
Status:	Refer the *Summary Tables of Changes*

DSO-14308	D415 – Self-Calibration/Tare fails to converge 20% of the time
Problem:	During Self-Calibration and Tare process, the calibration fails to converge 20% of the time.
Implication:	The failure is observed with Depth Camera D415
Workaround:	None
Status:	Refer the *Summary Tables of Changes*

DSO-14978	D455 – Depth/IR frame drops
Problem:	When setting depth and IR resolution 480x270 @ 5FPS, can take up to 8 sec before first frame arrives.
Implication:	The failure is observed with Depth Camera D455
Workaround:	None
Status:	Refer the *Summary Tables of Changes*

3.2 Fixed

DS0-7194	**Windows driver [mskssrv.sys] may crash with D400 Series camera in stress testing**
Problem:	Windows driver crashes in start- stop streaming iterations. It may take hundreds of start – stop streaming iterations for failure to occur.
Implication:	D400 Series camera fails to be recognized in Windows Device Manager
Status:	Refer the *Summary Tables of Changes*

DS0-7755	**Temporary stream hang observed on disabling Auto Exposure (AE) at 1280X720 resolution after any previous 90 FPS stream.**
Problem:	Play any 90 FPS depth or left or right imager stream -> stop -> play 1280x720 resolution -> disable Auto Exposure (AE) -> the stream gets stuck for few seconds.
Implication:	Depth or left and right Imager streams are stuck for a few seconds
Status:	Refer the *Summary Tables of Changes*

DSO-7798	**RGB at 60 FPS may not have the right exposure set when exposure is equal/less than -2**
Problem:	Manual exposure with value equal or less than -2 may not result in right exposure.
Implication:	Depth module D415 and Depth cameras D415 and D435 with RGB sensor are affected by this issue
Status:	Refer the *Summary Tables of Changes*

DSO-7849	**ROI based depth streaming immediately after change of IR projector power may result in a stream hang**
Problem:	Frames do not arrive after ROI (Region of Interest) is selected to start streaming immediately after a change is made to the IR projector power.
Implication:	No depth streaming
Status:	Refer the *Summary Tables of Changes*

DSO-7854	**Depth Stream hang when system resumes from Sleep (S3)**
Problem:	System resume from S3 does not resume depth streaming and requires application restart.
Implication:	Currently seen on Windows* only.
Status:	Refer the *Summary Tables of Changes*

DSO-7976	**D400 series camera is not recognized after reboot on Linux**
Problem:	Device does not appear in the device manager (lsusb)
Implication:	The frequency of the problem occurrence depends on specific Kernel version. It occurs more frequently on 4.4.0.x kernel versions and less frequently with 4.10.x kernel versions. Not seen on Windows*
Status:	Refer the *Summary Tables of Changes*

DSO-8007	**Firmware updates via DFU Service fails when firmware update limit is reached**
Problem:	D400 series firmware update engine will allow a return to a previous version or baseline version of firmware up to 20 times unless a higher version of firmware. DFU service as part of Windows Driver package updates camera firmware when camera connected has a firmware version different than expected. The DFU service fails to function when firmware update limit of 20 is reached.
Implication:	When the firmware update limit is reached, firmware update fails even if higher firmware version. DFU service is in Windows driver package only.
Status:	Refer the *Summary Tables of Changes*

DSO-8328	**Metadata attribute "Trigger" indicating Depth to Color synchronization may not have correct value**
Problem:	Trigger is a metadata field and its value indicates whether the depth and color streams are synced (1) or not (0). The value in this metadata field indicating synchronization may have the wrong value.
Implication:	D400 series cameras, D415 and D435 with color sensor
Status:	Refer the *Summary Tables of Changes*

DSO-8461	**D400 Series Windows driver does not work with Chrome browser**
Problem:	When Windows driver is installed on a Windows*10 system, chrome browser does not recognize D400 Series camera in chrome://settings/content/camera
Implication:	D400 series camera is recognized without Windows driver installed.
Status:	Refer the *Summary Tables of Changes*

DSO-8467	**Left Imager UYVY format displays green image**
Problem:	Streaming color out of left imager in UYVY format displays a green image
Implication:	RealSense Viewer displays a green image when UYVY format is selected for left imager stream
Status:	Refer the *Summary Tables of Changes*

DSO-8538	**Color correction parameters are not updated correctly**
Problem:	Color correction parameters update to default values
Implication:	This issue affects color from left imager in cameras D400, D410 & D415
Status:	Refer the *Summary Tables of Changes*

DSO-8565	**Infrared speckles on color image from D415 and D435 cameras**
Problem:	Infrared speckles are seen on color image from D415 and D435 cameras when laser power is at maximum or closer to maximum value
Implication:	Infrared speckles reduces with distance and ambient lighting
Status:	Refer the *Summary Tables of Changes*

DSO-9006	**Frame rate does not change when manual exposure value is changed**
Problem:	Frame rate (FPS) may need to change based on the exposure value and in some cases the FPS may not change as expected.
Implication:	Issue observed with camera D430 and D435
Status:	Refer the *Summary Tables of Changes*

DSO-9074	**Simultaneous streaming Depth, Imager and Color may result in data stream hang when camera is connected through USB2**
Problem:	One or two streams hangs may hang when simultaneously streaming Depth, Imager and Color data when camera is connected through USB2
Implication:	The issue is not observed when 1 or 2 data streams are simultaneously streaming. The issue is observed on Windows* and Linux*
Status:	Refer the *Summary Tables of Changes*

DSO-9094	**Specific controls values missing in frames metadata**
Problem:	Frames arrive without controls values in Metadata
Implication:	Missing metadata for valid frames. Issue observed in Linux*
Status:	Refer the *Summary Tables of Changes*

DSO-9153	**D400 series camera fails to be recognized on system reboot when connected through USB3**
Problem:	D400 Series camera may fail to be recognized on system reboot when connected through USB3
Implication:	The issue is observed on Windows*. Camera not recognized in Windows Device Manager
Status:	Refer the *Summary Tables of Changes*

DSO-9224	**IR Projector pattern flicker when streaming through USB2 connection**
Problem:	IR Projector pattern flicker maybe observed when camera is streaming through a USB2 connection
Implication:	The flicker may be observed after streaming for some time (~3 minutes) independent of resolution and frame rate. It is observed in D400 series cameras with IR projectors and on Windows* and Linux*
Status:	Refer the *Summary Tables of Changes*

DSO-9228	**D400 series camera disconnects on resume from system sleep when connected through USB2**
Problem:	D400 series camera may disconnect on resume from system sleep when connected through USB2.
Implication:	Application such as Intel® RealSense Viewer streaming before entering system sleep fail to function on resume from sleep as the camera may fail to be recognized. The issue is only observed on Linux* OS
Status:	Refer the *Summary Tables of Changes*

DSO-9240	**D400 Series camera fails to be recognized on system reboot when connected through USB2**
Problem:	D400 Series camera may fail to be recognized on system reboot when connected through USB2
Implication:	The issue is observed on Windows* and Linux*
Status:	Refer the *Summary Tables of Changes*

DSO-9478	**Image Flicker when Auto Exposure (AE) is enabled**
Problem:	Image flicker may be observed under certain light conditions when Auto Exposure (AE) is enabled
Implication:	Image flicker seen on imager output streams may impact the depth stream
Status:	Refer the *Summary Tables of Changes*

DSO-9546	**IR projector pattern flicker when streaming at 1280X720, 4 FPS and connected through USB2**
Problem:	IR projector pattern flicker may be observed when streaming at resolution 1280X720, 4 FPS and camera connected to a USB2 connection
Implication:	The issue is observed on Windows* and Linux*
Status:	Refer the *Summary Tables of Changes*

DSO-9556	Camera stuck after streaming start-stop at Low FPS for few times
Problem:	Camera depth streams at low frame rates may be stuck after start-stop streaming a few times
Implication:	The issue is observed for both, USB3 and USB2 camera connection and at 6FPS. Re-plugging the camera is required to be able to communicate with the camera again.
Status:	Refer the *Summary Tables of Changes*

DSO-9645	Darker depth frame when changing depth exposure from [165760 - 165780] and connected through USB2
Problem:	Darker (holes) depth frames are observed when depth exposure is changed between 165760 and 165780 range of values
Implication:	When streaming depth / IR configuration with resolutions [480x270/640x480] and [6/15/30/ 60] fps and camera connected through USB2
Status:	Refer the *Summary Tables of Changes*

DSO-10002	Calibration tables may get corrupted during power on and off cycles
Problem:	Power on/off cycles may cause calibration table to get corrupted
Implication:	Invalid depth stream
Status:	Refer the *Summary Tables of Changes*

DSO-10011	Auto Exposure (AE) for Color is not optimized for bright sunlight
Problem:	Auto Exposure for Color is not optimized for bright sunlight.
Implication:	Depth Cameras D415 and D435 support color through dedicated RGB sensor and are impacted by this issue. The cameras cannot be used for color in bright sunlight for use cases that require good AE based region of interest (ROI)
Status:	Refer the *Summary Tables of Changes*

DSO-10428	IR Image is black in Auto Exposure (AE) mode with sudden exposure to light
Problem:	When switching from no light to full outdoor sunlight in AE mode, IR image turns black
Implication:	The failure is observed with Depth Camera D415
Status:	Refer the *Summary Tables of Changes*

DSO-10431	IR image may flicker in outdoor sunlight when using Auto Exposure (AE) with default set point
Problem:	IR image flickers in outdoor sunlight when using Auto Exposure with default AE set-point (1536) and higher
Implication:	The failure is observed with Depth Camera D435

Status:	Refer the *Summary Tables of Changes*

DSO-10674	**D435i – The first (cold) start of IMU sensors in LibRealSense on Linux takes ~4 sec**
Problem:	Sending request to stream Accel/Gyro data results in 4 sec wait till the data starts to arrive.
Implication:	The failure is observed with Depth Camera D435i
Status:	Refer the *Summary Tables of Changes*

DSO-10777	**D435i - Buffer overflow on repeated start/stop**
Problem:	Cycling through start/stop with Depth+Gyro+Accelerator streams abruptly terminates with: Process finished with exit code 134 (interrupted by signal 6: SIGABRT)
Implication:	The failure is observed with Depth Camera D435i
Status:	Refer the *Summary Tables of Changes*

DSO-11040	**D435 – Depth/IR corrupted image when streaming multi stream and RGB exposure is < -6**
Problem:	Depth/IR corrupted image when streaming multi stream and RGB exposure is less than -6
Implication:	The failure is observed with Depth Camera D435
Status:	Refer the *Summary Tables of Changes*

DSO-11041	**D435i – Unreasonably large accelerometer reading in Windows 10**
Problem:	Unreasonably large accelerometer reading in Windows 10
Implication:	The failure is observed with Depth Camera D435i
Status:	Refer the *Summary Tables of Changes*

DSO-11042	**D430 - RealSenseViewer crash after win10 PC reboot**
Problem:	RealSense Viewer errors out post reboot after using the "Hand' preset
Implication:	The failure is observed with D415, -435, -430
Status:	Refer the *Summary Tables of Changes*

DSO-12586	**D415, D435/D435i – RGB camera not available after FW Update process using DFU**
Problem:	Upgrade device using DFU after upgrade process is complete, RGB camera not available
Implication:	The failure is observed with D435/D435i and D415
Workaround:	Do not disconnect USB cable for 20+ secs after FW update process is complete. This allows the host system to enumerate the device properly.

	If device is experiencing this issue, please use the following steps to downgrade FW to recover
	Downgrade device FW to FW 5.11.4 using DFU tool (making sure to do not disconnect USB cable for 20+ secs after FW update is complete and device has been enumerated and detected by host platform
Status:	Refer the *Summary Tables of Changes*

DSO-12587 DSO-12814	**D435i – Upgrade to latest Major FW causes corrupted calibration table**
Problem:	Upgrade device to latest Major FW causes corrupted calibration table
Implication:	The failure is observed with D435i
Workaround:	If the device has been upgraded to FW 5.11.6.200, run LibRealSense ver 2.23 (or higher), and it will correct the calibration table. Alternatively, downgrade FW to FW 5.10.13 and verify that the calibration table is OK.
Status:	Refer the *Summary Tables of Changes*

DSO-10229 DSO-13386	**Camera fail after start, stop of random profiles**
Problem:	When trying to stream more than one camera stream (depth, infrared and color) in a random profile, the camera streams aborts.
Implication:	None
Workaround:	Disconnect and reconnect camera
Status:	Refer the *Summary Tables of Changes*

DSO-13540	**D415 – Intel® RealSense™ Self-Calibration doesn't converge using D415 camera**
Problem:	When running Intel® RealSense™ Self-Calibration process via LibRealSense, the error "Calibration didn't converge! (EDGE_TO_CLOSE) please retry in different lighting conditions" is seen.
Implication:	The failure is observed with Depth Camera D415
Workaround:	None
Status:	Refer the *Summary Tables of Changes*

DSO-13554	**D420 – Camera will stop working after FW update**
Problem:	When upgrading FW, the D420 stops working.
Implication:	The failure is observed with Depth Module D420
Workaround:	If D420 is not experiencing issue, do not upgrade FW
Status:	Refer the *Summary Tables of Changes*

Errata

DSO-13546	D435i – IMU frame drops
Problem:	When depth, infrared, color, gyro and accel are streaming for a long period of time, frame drops (gyro and accel) are observed.
Implication:	The failure is observed with Depth Camera D435i
Workaround:	None
Status:	Refer the *Summary Tables of Changes*

DSO-10920	First frames not received on metadata test
Problem:	Metadata start frame on depth/IR/color stream began from 2 or 3 value, the expected value is 1.
Implication:	None
Workaround:	Ignore first frame of metadata
Status:	Refer the *Summary Tables of Changes*

DSO-12578	Device not recognized in device manager after machine reboot
Problem:	When rebooting system under Windows operating system, camera is not recognized by device manager.
Implication:	None
Workaround:	None
Status:	Refer the *Summary Tables of Changes*

DSO-14309	Scale error after Tare calibration (Intel® RealSense™ Self-Calibration) was significantly degraded
Problem:	When using Tare calibration functionality, the scale error can be significantly degraded.
Implication:	None
Workaround:	None
Status:	Refer the *Summary Tables of Changes*

DSO-9501	Camera is not functional after HLK Sensor test when connected through USB2
Problem:	Camera is not functional after HLK Sensor test when connected through USB2 (Windows HLK)
Implication:	The issue is observed on production units and not seen on pre-production samples.
Status:	Refer the *Summary Tables of Changes*

DSO-10603	Unable to set the Depth Exposure Time < 70 usec through USB2

Problem:	When connected through USB2, setting Depth Exposure Time less than 70 usec will result in artifacts and over-exposed frames.
Implication:	The failure is observed with Depth Camera D400 series
Status:	Refer the *Summary Tables of Changes*

DSO-14526	**D435i – Sending HW_reset immediately after stop streaming causes the camera to boot into invalid state**
Problem:	Sending HW_reset immediately after stop streaming causes the camera to boot into invalid state.
Implication:	The failure is observed with Depth Camera D435i
Status:	Refer the *Summary Tables of Changes*

DSO-14517	**10 FPS not supported on Depth/IR 848x480 when connected through USB2**
Problem:	When connected through USB2, 10 FPS is not available on depth or IR streams under 848x480 resolution.
Implication:	The failure is observed with Depth Camera D400 series
Status:	Refer the *Summary Tables of Changes*

DSO-14337	**IR Frames stop arriving after several camera start/stop**
Problem:	During several iterations of start of frame stream, collect frames and stop streaming, the IR frames stop arriving.
Implication:	The failure is observed with Depth Camera D400 series
Status:	Refer the *Summary Tables of Changes*

DSO-13306	**Frames stop arriving after few frames in Color/Depth stream due to unexpected halt on Windows 10 RS4**
Problem:	Frames stop arriving after few frames in Color/Depth stream due to unexpected halt on Windows 10 RS4.
Implication:	The failure is observed with Depth Camera D400 series
Status:	Refer the *Summary Tables of Changes*

DSO-14558	**Fails USB enumeration during PC restart**
Problem:	Camera sometimes fails USB3.1 enumeration during PC restart.
Implication:	The failure is observed with Depth Camera D400 series
Status:	Refer the *Summary Tables of Changes*

Errata

DSO-14512	D435i – Failed to start IMU stream after resetting device
Problem:	IMU stream fails to start after camera reset command is sent to the device.
Implication:	The failure is observed with Depth Camera D435i
Status:	Refer the *Summary Tables of Changes*

DSO-14349	FW Update ID mismatch before and after entering DFU
Problem:	Before and after entering DFU for FW Update, the FW Update ID shows mismatch.
Implication:	The failure is observed with Depth Camera D400 series
Status:	Refer the *Summary Tables of Changes*

DSO-14525	D435i – Camera not released to idle state on Ubuntu 18.04 with Kernel 5
Problem:	D435i camera not going into idle state on Ubuntu 18.04 with Kernel 5.
Implication:	The failure is observed with Depth Camera D435i
Status:	Refer the *Summary Tables of Changes*

DSO-14499	Config error when stopping Color stream on Windows 10 RS4
Problem:	With camera connected and RealSense Viewer open, starting Color stream (exposure min value), then changing exposure to max value and stopping Color stream causes error.
Implication:	The failure is observed with Depth Camera D400 series
Status:	Refer the *Summary Tables of Changes*

DSO-16289	When laser emitter is enabled via Python, laser turns on and off continuously
Problem:	When setting laser emitter to enabled in Python, laser turns on and off continuously.
Implication:	The failure is observed with Depth Camera D400 series
Status:	Refer the *Summary Tables of Changes*

DSO-16765	Frames not arrived with 300fps
Problem:	When setting depth 256x144 @ 300FPS, frames not arrived.
Implication:	The failure is observed with Depth Camera D400 Series
Status:	Refer the *Summary Tables of Changes*

4 Appendix

4.1 Functional Specification

Table 4-1. Image Formats (USB 2.0)

Format	Resolution	Frame Rate	Comment
Z [16 bits]	1280x720	6	Depth
	848x480	6,10	
	640x480	6,15,30	
	640x360	30	
	480x270	6,15,30,60	
Y8 [8 bits]	1280x720	6	Luminance Stream from Left Imager
	848x480	6,10	
	640x480	6,15,30	
	480x270	6,15,30,60	
UYVY [16 bits]	1280x720	6	Color Stream from Left Imager (D410 & D415)
	640x480	6,15,30	
	480x270	6,15,30,60	
YUY2 [16 bits]	1280x720	6, 15	Color Stream from RGB camera (Camera D415 & D435/D435i)
	640x480	6,15,30	
	424x240	6,15,30,60	
Intel® RealSense™ Self-Calibration	256x144	90	Intel® RealSense™ Self-Calibration and Tare format

NOTE:

Depth and Color are mapped as separated interfaces. Each one of the interfaces is working independent with the other interface (Virtual channel in MIPI and End Point in USB). Right infrared imager stream is supported for calibration purposes only.

Table 4-2. Simultaneous Image Streams (USB2.0)

Depth	Imager	Color (Left Imager) D400/D410	Color (RGB Camera) D415/D435/D435i/D455	IMU D435i/D455	Comment
Z16	Y8			Gyro & Accelerometer	

Appendix

Depth	Imager	Color (Left Imager) D400/D410	Color (RGB Camera) D415/D435/D435i/D455	IMU D435i/D455	Comment
Z16		UYVY		Gyro & Accelerometer	
Z16	Y8		YUY2	Gyro & Accelerometer	
Z16			YUY2	Gyro & Accelerometer	

NOTE:

1. RGB to depth hardware sync is only supported with the same frame rate for all streams.

2. For Depth and RGB camera simultaneous streaming, it is recommended to have color resolution to be the same or higher than depth resolution.

3. USB 2.0 supports a subset of the resolution/frame rate combinations given the bandwidth requirements. Max simulaneaous stream configurations are:
   - Depth: 640x480 @ 15FPS; Imager: 640x480 @ 15FPS; RGB Camera: 640x480 @ 30FPS
   - Depth: 480x270 @ 60FPS; Imager: 480x270 @ 60FPS; RGB Camera: 424x240 @ 30FPS
   - Depth: 848x480; Imager: 848x480; RGB Camera: 1280x720 @ 10FPS