

## USER'S GUIDE TO:



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## **SECTION 1 - INTRODUCTION**

The Andor **Software Development Kit (SDK)** gives the programmer access to the Andor range of CCD and Intensified CCD cameras. The key part of the SDK is the Dynamic Link Library (DLL) which can be used with a wide variety of programming environments, including, C, C++, C#, Visual Basic and LabVIEW. The library is compatible with Windows 2000, XP, Vista and Windows 7. A Linux version of the SDK is also available. Currently, Andor provides both 32-bit and 64-bit versions of the SDK, for Windows and Linux.

The SDK provides a suite of functions that allow you to configure the data acquisition process in a number of different ways. There are also functions to control the CCD temperature and shutter operations. The driver will automatically handle its own internal memory requirements.

To use the SDK effectively, the user must develop a software package to configure the acquisition, provide memory management, process the data captured, and create the user interface.

The manual is broken into several sections, and it is recommended that the user read **Sections 1 - 10** before starting to use the SDK. These sections describe the installation process, camera initialization/configuration and data capture.

**Section 11** is a complete function reference detailing the function syntax, parameters passed and error codes returned.

To further aid the user there is a comprehensive list of examples included with the SDK. The examples illustrate the use of C, Visual Basic and LabVIEW.

**TECHNICAL SUPPORT**

Contact details for your nearest representative can be found on our website.

**SOFTWARE IMPROVEMENTS AND ADDITIONAL FEATURES****Version SDK 2.100.30004.0****New Features**

- Added Super Kinetics feature - SetFastKineticsStorageMode.
- Added Time Scan feature - SetFastKineticsTimeScanMode.

**Bug Fixes:****Version SDK 2.100.30001.0****New Features****Bug Fixes:**

- Fixed indexing issues when setting Shamrock accessories (now 0 based)
- Updated Linux installer to work with newer kernels (3.19 and greater).
- Fixed issue with ShamrockGetDetectorOffsetEx not returning the correct value.

**Version SDK 2.99.30001.0****New Features**

- Adding SR500, SR750 and SR193 spectrographs to the ShamrockSDK for Linux
- Added new functions to Shamrock SDK
  - ShamrockGetPixelCalibrationCoefficients
  - ShamrockSetDetectorOffsetEx
  - ShamrockGetDetectorOffsetEx
- Added UpdateDDGTimings SDK2 function

**Bug Fixes:**

- Fix for Detector Offset Adjustment not moving the shamrock turret if using any of the side ports
- Fix for Exposure time increasing automatically for Luca-S
- Fix for Mechelle SDK files not being present in SDK installation
- Fixed crash on exit if ShutDown is not called
- Fixed crash on start up when a CCI-23 or CCI-24 was present but with no camera attached
- Fixed Fast kinetics on Ultra Release 1
- Shamrock SDK functions now exported correctly
- Updated IsCoolerOn to return 0 until CoolerON is called for iXon Ultra cameras

**Version SDK 2.98.30000.0****New Features**

- Support for new Andor SR-193 spectrograph with Focus Mirror control
- Support for new Andor iKon-XL camera with IRIG support and option of Single and All Port readout.

**Bug Fixes**

- Shamrock SDK API functions are now exported correctly without name mangling

- Fix the IsCoolerOn function for iXon Ultra so it returns the correct status
- Fix the IsTriggerModeAvailable function so it returns DRV\_INVALID\_MODE instead of DRV\_NOT\_AVAILABLE when software trigger is not available
- Fix for image problems and acquisition failing unless pre amp gain is set before starting an acquisition.
- Remove additional devices supported by the Shamrock USB device driver as they may conflict with other devices in the system.
- Driver Pack is now listed correctly in Windows Add/Remove Programs.

### **Version SDK 2.97.30000.0**

#### New Features

- Support for new USB3 iXon Ultra Camera
- Added Linux support for SR303i (i2c only)
- The spool header file now contains information on the pixel format and image size to facilitate parsing of the data.
- Added fast keep clean option for external trigger on Newton

#### Bug Fixes

- Fixed memory leak in 64-bit Mechelle SDK
- Fixed bug where real gain was not reported as being supported by iXon Ultra
- Fixed issue where software trigger was not working consistently on iXon 3 , Clara and Luca
- Fixed crash when kinetic cycle time was out of range
- The Shutter opening time is now taken into account for "Open for FVB series" and "Open for any series" shutter modes

### **Version SDK 2.96.30000.0**

#### New Features

- Added two new shutter modes: Open during FVB Series and Open during Any Series
- Added new function IsReadoutFlippedByAmplifier, to query image orientation dependent on amplifier

#### Bug Fixes

- Fixed issue where Shamrock precision was lost after power cycle
- Fixed reported timestamp for iXon3 in fast kinetics, external start
- Update SetIsolatedCropModeEx to allow setting of full sensor height and width
- Updated SetIsolatedCropModeEx to return DRV\_NOT\_AVAILABLE if readout mode is not image
- Removed shutter open/close time from fast kinetics cycle time for iXon, iXon+ and Ultra
- Improved pixel saturation on iXon+ systems when not using shutter or frame transfer
- Updating SetShutterEx to use min shutter time for internal shutter if not Permanently Open or Closed
- Fix for iXon Ultra not waiting for a trigger when in external start mode
- Set crop x and y start values to 1 for tethered crop mode functions
- Fixed issue where nodes were missing from the SetExternalTriggerTermination VI in LabVIEW
- SetIsolatedCropModeEx, SetCameralinkMode and SetTriggerLevel added to LabVIEW interface
- Fix for FVB mode where there was a step in the data for a DU970N in external trigger, conventional mode
- Fixed issue that prevented USB camera from re-initializing on some systems.

**Version SDK 2.95.30000.0**

## New Features:

- Windows 8 Support
- USB iStar now supports the option to change the gate width for each frame in a kinetic series.
- Added support for cameras that can store sensor specific acquisition configuration settings on the camera to provide backward compatibility with older software versions
- Updated Windows USB camera driver to version 1.2.6 giving better authentication support on Windows 7.
- The accuracy of the temperature reported by DU885 systems has been improved
- Added version information to the atmechelle.dll library
- GetCapabilities SDK function now includes the option to test whether a system supports the pre-scan feature.
- Support for configuring gate settings on a DG535 through GPIB
- GetAcquisitionProgress will now show the accumulation number incremented when in Accumulate mode and cosmic ray filter on.
- SetFKVShiftSpeed although deprecated can now be used with non-Classic systems
- Disabled fast kinetics for InGaAs
- Added GetRelativeImageTimes function to retrieve meta data information for a range of frames
- Support for iDus 416 camera
- Adding Extended Isolated Crop Mode functionality that allows a cropped image to be acquired from anywhere on the sensor for iXon Ultra.

## Bug Fixes:

- Fixes to prevent gating when USB iStar is not acquiring
- Fixed issue on Windows 7 which meant the number of images per DMA was fixed at 1
- Fixed a 1 row error in the position of a Fast kinetics acquisition.
- Fix for reduced frame rate when horizontally binning in crop mode.
- Fix for images saved using the SavesAs functions storing an incorrect value for the Pre Amp Gain
- Fix for External start trigger mode causing the acquisition to continuously wait and ignore triggers on iXon cameras at 3MHz readout
- Removed an arc artefact from the first frame on a DU920 BR-DD
- Fix to resolve an accumulated Odd/Even effect on iDus 401-BV cameras
- Fixed crash seen on initialising OptAcquire with 64-bit SDK
- Fixed iDus target temperature being different from the one that was set
- Shamrock device drivers are now signed and so will not generate a security warning during installation.

**Version 2.94.30005.0**

## New features:

- None

## Bug fixes:

- None

**Version 2.94.30001.0**

## New features:

- None

## Bug fixes:

- IOC not operating through SDK
- Fix to prevent crash when selecting multitrack on Luca-R
- Fix for issue that was causing SDK to not write up the last Photon Counting threshold value
- Fix for the labview Get Pixel Calibration.vi always returning ATSIF\_P2INVALID error

- Fix for external trigger, when the camera is under constant illumination the image is saturated irrespective of exposure time
- Fix for SDK defaulting to using an unavailable PAG for iXon 888
- Validation now performed on the parameters of the SetDDGTimes function
- Fix so DDG Gate mode can not be changed while acquiring
- Crop settings now stored in sif file format
- iXon Ultra Shutter fixes
- Added function GetMaximumNumberRingExposureTimes
- Fixed temperature rate control to ensure the temperature remains steady
- Added x64 LabView Shamrock Examples

### **Version 2.93.30007.0**

New features:

- None

Bug fixes:

- Fix for Neo PreAmpGainControl feature returning NOT\_IMPLEMENTED

### **Version 2.93.30006.0**

New features:

- None

Bug fixes:

- Fix for RTA mode on certain cameras under x64 Linux

### **Version 2.93.30005.0**

New features:

- None

Bug fixes:

- Fix for the SetDMAParameters function for USB systems
- Fix for temperature rate control to ensure the temperature stabilizes

### **Version 2.93.30004.0**

New features:

- None

Bug fixes:

- Increased the cooling rate for "DF8" cameras to 4 degrees/min instead of 3
- Added SetChargeShifting to C# library
- Fix for the GetReadOutTime being incorrect for iXon Ultra

### **Version 2.93.30000.0**



## New features:

- Adding function GetShutterMinTimes to get minimum times allowed for shutter open and close operations
- x64 shamrock SDK

## Bug fixes:

- Updated Labview Postprocessing Vis for 32 and 64 bit. Compatible with 7.1 and greater
- Change min shutter operation to ignore open and close times if Always open or always closed
- Fixed temperature rate control to round the set temperature to the nearest whole number as it was causing difficulties when the rate was close to the tolerance

## **Version 2.92.30008.0**

## New features:

- Added CameraLink Functionality for iXon Ultra

## Bug fixes:

- USBistar Calculation incorrect for minimum exposure time
- Fix for horizontal image shift when taking subimages with Ultra
- iXon Ultra fix for TTL IO control
- iXon Ultra multitrack fixes
- Improvements to iXon Ultra FVB mode
- Fix for isolated crop mode with iXon Ultra
- Fixed acquisition delay with multiple iXon Ultra systems
- Fixes for software trigger mode
- Change to keep cooler always on for iXon Ultra
- Fix for USB systems not acquiring under Linux

## **Version 2.92.30005.0**

## New features:

- Added support for iXon Ultra
  - GetVSAmpitudeString
  - GetVSAmpitudeFromString
  - GetVSAmpitudeValue
  - GetEMAdvanced
- Added support for USB iStar model DH312T
- Cameras now default to fastest readout speed on initialize
- GetMCPGainRange added to C# wrapper
- Added a Visual Basic 6 helper for iStar functions with 64-bit parameters

## Bug fixes:

- Updated IsPreAmpGainAvailable to make sure that a valid speed index (for the channel) is being used
- Updated 64-bit LabVIEW library
- Kinetic series of subimages not completing for Clara
- Fixed return codes for IO functions
- Fixed Count Convert using Conventional mode
- Automatically turn on EMAdvanced for OptAcquire modes with high EMGain values
- Fixed USB iStar functions in VB.NET and Delphi wrappers
- Fixed issue were the DDG appeared not to be working after the gating mode had been set to CW OFF
- Fixed bug were external trigger IOC was not triggering for each trigger

- Fixed minimum exposure time for InGaAs

### **Version 2.91.30001.0**

New features:

- Added option for user to choose between IOC series per exposure or trigger
- Added support for optical gate width
  - GetDDGTTLGateWidth
  - GetDDGOpticalWidthEnabled
  - SetDDGOpticalWidthEnabled
- USB iStar acquisition settings now stored in sif file
- Added 64-bit version of SIFIO
- Added 64-bit support for LabVIEW
- Removed limitation on the size of a kinetic series
- Added SDK version to FITS file format
- Added support for for USB iStar DH320T
- Added support for external charge shifting mode on latest iKon-M systems

Bug fixes:

- Improved accuracy of FVB timings
- Improved performance of detection of end of exposure on Clara
- Fixed issue with CoolerON and USB iStar
- Fixed behaviour of ARM signal in fast kinetics external trigger
- Fixed crash when using a large number of random tracks
- Fixed photon counting thresholds on USB iStar
- Fixed crash in PostProcessCountConvert
- Fixed number of preamp options reported for Clara
- Fixed readout time reported for Clara in overlap external exposure
- Fixed test for valid gate step settings
- Fixed problem with potentially invalid shift speed when A/D is changed
- Fixed intermittent fail in Fast Kinetics
- Fixed the number of kinetics used when operating in gate step and kinetics
- Fixed crash when selecting Integrate On Chip in external trigger
- Fixed problem with reported EM gain range
- Modified FITS keys to be 8 characters to meet standard
- Gate step should only be available for kinetics and fast kinetics mode
- Fixed crash in when spooling to FITS
- The data type calculation is applied on the generated spectrum if appropriate when using a Mechelle
- Fixed crash when spooling to sif if acquisition aborted before any frames acquired

### **Version 2.90.30003.0**

New features:

- USB iStar now supported
- Added function GetNumberPhotonCountingDivisions
- Added function GetPreAmpGainText
- Added 64-bit C# wrapper
- Added Shamrock C# wrapper
- Added 64-bit VB.NET header
- Added 64-bit LabVIEW support
- Added support for 50kHz and 1MHz on iKonM-PV inspector system

Bug fixes:

- GetKeepCleanTime not implemented for DV885

- The maximum binning should be limited by the size of the AD pipeline
- Recursive filter was not being reset between acquisitions.
- Frame Averaging filter was not working in frame transfer mode.
- Fixed crash on shutdown with iKon-L
- Fixed crash if GetAcquisitionTimings is called for random tracks before tracks are set up.
- Removed some memory leaks
- Incorrect timings from GetAcquisitionTimings on Clara.
- Fixed saving random tracks to Fits.
- Luca S did not support temperature control.
- Minimum image length for a DU860 increased to 6 to avoid problems with isolated crop mode.
- Fixed SetPreAmpGain and IsPreAmpGainAvailable functions to check that the preamp gain index parameter is within range.
- Fixed data glitch on DV885 in frame transfer, external exposure mode (requires firmware upgrade)

### **Version 2.88.30002.0**

#### New features:

- Added SDK function IsCountConvertModeAvailable to limit acquisition settings available for count convert.
- Added support for new iKon-L systems.
- Added support for new iKon-M systems.
- Added OptAcquire support for DV885 systems.

#### Bug fixes:

- Fixed race condition in WaitForAcquisitionTimeout.
- Image in crop mode on DU860 was shifting by 4 pixels for heights of less than 4.
- Fixed SR303 hardware issue where the step position of the wavelength drive will move when powered on.
- SetPCIMode should return DRV\_NOT\_SUPPORTED when not using the CCI-23/CCI-24 card.
- All Shamrock LabVIEW function names prepended with shamrock\_ to avoid conflicts.

### **Version 2.88.30000.0**

#### New features:

- Added OptAcquire feature to simplify configuration of iXon systems
- Added Count Convert feature to return data as photons or electrons
- Added Data Averaging feature for real time and post processing
- Added Spurious noise Filters for both real time and post processing
- Added Photon Counting post processing option
- Andor LabVIEW library updated to use version 8.0
- Added Dual Exposure Mode for iKon-L
- Updated SIFIO to enable the retrieval of calibration data
- Updated Shamrock SDK to include a calibration for Zolix spectrographs
- Added SDK function and capability for GetBaselineClamp
- Changed keep clean in FVB mode for iXon to prevent temperature drift

#### Bug fixes:

- Updated capability options for C#
- Updated Andor LabVIEW library
- Shutter open/close times fixed for Auto mode
- Fixed EM gain control when using multiple systems from the same executable
- Fixed isolated crop mode when data is being accumulated
- Fixed issues with control of multiple systems with multiple threads

- Fixed exposure time in software trigger mode when using large cycle time
- Fixed memory leak in GetAvailableCameras function
- Fixed random tracks stopping in video mode

## **Version 2.87.30000.0**

New features:

- Clara E now supported
- Newton DU970/71P cameras now supported
- Cycle time reduced for imaging on Newton and iVac systems
- Number of accumulations can now be set in a kinetic series in overlap mode
- FVB cycle time reduced in crop mode provided only the height of the sensor has been cropped

Bug fixes:

- Clara near infra red mode not operating correctly when using FVB read mode
- Minimum exposure time increased to 1 millisecond for Clara near infra red mode
- Change to remove odd/even pixel noise after a number of accumulations in iDus
- Change to resolve image wrap around on Newton sensors
- Image was being shifted between frames when photon counting was being used on a Clara
- Fast kinetics now working in FVB mode
- First pulse missed in ring of exposures on Clara
- Updated bitmap header data to allow avi's to play in Windows 7
- Multiple systems was not supported for 64-bit Windows
- TimeStamp from Clara meta data was incorrect for a kinetic series of accumulations
- Video mode was eventually freezing in iCam PCI systems
- Fix for Spooling to fits issue in Windows 7
- Fix for image shift seen in DU940P newton cameras

## **Version 2.86.30000.0**

New features:

- Clara meta data now stored in sif file format
- Vertical and horizontal flip tags added to the FITS header
- Newton now supports multiple images per USB interrupt to reduce CPU load
- Support added for new revision of Newton DU920P
- Control of gate mode added to iStar floating toolbar

Bug fixes:

- Fixed bug where SetPhotonCountingThreshold was always returning DRV\_NOT\_SUPPORTED
- Fixed reported acquisition timings for external trigger non frame transfer mode
- Fixed the SDK flipper mirror issue (problem with the port numbers being used) and updated shipped examples
- GetFIFOUsage is now thread safe
- USB driver for SR500 and SR750 updated to avoid conflicts with servo controllers
- Fixed External trigger, frame transfer, video mode operation

## **Version 2.85.30000.0**

New features:

- Andor Clara image quality improved
- Option to run external exposure in a kinetic series for all cameras which support iCam

- Photon Counting check added to GetCapabilities
- Added kinetic cycle time tag to spooled tiff files
- PrepareAcquisition now returns an error if insufficient memory available

Bug fixes:

- SetSpool now returns DRV\_NOT\_AVAILABLE under Linux when trying to spool to FITS
- Fixed crash on initialize when no Andor cameras were connected
- Fixed problem with reinitializing Shamrock models SR500 and SR750
- Fixed problem where calling IsCoolerOn during an acquisition could stop the acquisition
- Fixed issue where events from a previous acquisition were not getting cleared
- Additional pixel shift removed from overlap mode on Clara

### **Version 2.84.30000.0**

New features:

- Andor Clara now supported
  - [SetDACOutput](#)
  - [SetDACOutputScale](#)
  - [GetNumberIO](#)
  - [SetIODirection](#)
  - [SetIOLevel](#)
  - [GetIOLevel](#)
  - [GetIODirection](#)
  - [SetTriggerInvert](#)
  - [IsAmplifierAvailable](#)
  - [SetOverlapMode](#)
  - [SetMetaData](#)
  - [GetMetaDataInfo](#)

Bug fixes:

- Spooled files beyond 4GB could not be opened
- Data was being lost when spooled files of small images went beyond 4GB
- Spooled FITS file had cycle time saved as 0
- IsPreAmpAvailable should use channel passed rather than current one
- Random tracks data corrupted for consecutive tracks for cameras other than iXon+
- GetImages16 LabVIEW wrapper was calling wrong SDK function

### **Version 2.83.30001.0**

New features:

- Added SetImageFlip and SetImageRotate functions to LabView wrapper

Bug fixes:

- Added ShamrockGetCalibration function to the Shamrock SDK help

**Version 2.83.30000.0**

New features:

- iVac systems now fully supported
- Shamrock spectrographs SR500 and SR750 now fully supported
- Fast kinetics now available for Luca-R
- Added High Capacity Mode support for DW936 cameras

Bug fixes:

- Fixes to Delphi header
- Fixed discrepancies between cycle times for multi-track and random track
- Fixed problem in fast kinetics when there was an odd number of super pixels
- Removed corrupted fire pulse in fast kinetics, external trigger
- Fix to resolve oscillations in data for certain Newton systems
- Fix for potential fail of auto cooling on Luca systems
- Fixed maximum number in series in fast kinetics for frame transfer systems
- Fixed exposure time reported in fast kinetics

**Version 2.82.30000.0**

New features:

- Added option for horizontal binning in random track mode
- Added capabilities for Horizontal Binning, MultiTrackHRange, and No Gaps in Random Tracks
- New capability added to test for overlapped external exposure mode
- Deprecated SetGain for SetMCPGain which is a more accurate naming convention
- Added Dud column support to SDK – allows SDK to be configured to interpolate bad columns

Bug fixes:

- Fixed minimum exposure for Luca-R
- Updated documentation – error code correction for get data functions.
- Fixed missing cases of GetTemperature in LabVIEW wrapper.
- Updated documentation – Corrected contact information.
- StartAcquisition now returns an error if horizontal binning does not divide evenly into range for multi-tracks
- Fixed crash when StartAcquisition is called in random track mode before random tracks are setup
- Fixed default EM gain – Set to off when system initialized
- SetRandomTracks no longer returns an error if not in random track mode
- Image mode Linux example will now work with an InGaAs
- SetRandomTracks was not returning an error for certain incorrect track combinations
- Fixed SetBaselineClamp and SetBaselineOffset – The test for availability was not complete
- Fixed GetRingExposureRange - Now uses same limit as SetRingExposureTimes
- Fixed SetRandomTracks - Was failing for some valid tracks

- Fixed SetGain error code - Now returns DRV\_NOT\_SUPPORTED if not an ICCD
- Fixed bug in SetRandomTracks to prevent negative numbers for number of tracks with correct return code
- GetAmpMaxSpeed now tests for NULL array parameter
- SetCustomTrackHBin returns DRV\_NOT\_SUPPORTED if not available for a system
- Fixed GetAmpDesc – Tests negative value for 3rd parameter – could cause crash
- Fixed GetAmpDesc – could return unterminated string
- Luca R cooler control was never supported but SDK returned DRV\_SUCCESS - SDK functions now return proper error codes
- Fixed bug in Initialisation/Shutdown cycling – could cause crash
- Extra fire pulse when using kinetic series external exposure on DU885
- Fixed incorrect data when using kinetic series external exposure on Luca-R
- Fixed external exposure trigger mode for Luca-S

## **Version 2.81.30004.0**

New features:

- Improved noise performance on DZ936 cameras at 3 and 5MHz horizontal readout speeds

Bug fixes:

- None

## **Version 2.81.30003.1**

New features:

- None

Bug fixes:

- Fixed some documentation errors in LabVIEW context help
- Fixed Shamrock close and re-initialisation in C interface of Shamrock SDK
- Fixed Shamrock close operation in LabVIEW

## **Version 2.81.30002.0**

New features:

- None

Bug fixes:

- Fixed cooling issue on Fibre Optic systems
- Fixed hot column issue on iXon DU888 cameras.
- Fixed crash in External Trigger on Newton
- Fixed DLL error on Windows Install program.

### **Version 2.81**

New features:

- Improved shutdown in Linux during abnormal termination (Ctrl+C etc.) – signal handlers added
- CCI-24 support added to Linux SDK

Bug fixes:

- Removed Linux Device Driver compilation warnings for Kernel 2.6.23 and above.
- Crash could occur if [GetAcquiredData](#) was called before [PrepareAcquisition](#) or [StartAcquisition](#).
- [SetDriverEvent](#) causes crash when called when system not initialized.
- [GetImagesPerDMA](#) did not return correct value unless [PrepareAcquisition](#) has been called.
- Timings incorrect for Frame Transfer in iCam mode.
- [GetMostRecentImage](#)[16] now returns correct data when used in Accumulate acquisition mode
- Fixed crash that would occur if [GetNumberAvailableImages](#) called before acquisition started
- Acquisitions now complete correctly if camera is reinitialised after being previously shutdown
- 64-bit SDK will now initialise USB cameras without the necessity of having libusb0\_x64.dll in same directory as executable.
- Calibration values returned from Shamrock SDK were offset by 2 pixels from correct locations
- Fixed memory leak in [SaveAsSif](#)
- Fixed Luca re-initialisation issue - temperature reporting incorrect
- Documentation updates and corrections

### **Version 2.80**

New features:

- iKon-L support added
- Added SetAccumulationCycleTime to LabVIEW library
- Random and multi tracks now available in frame transfer mode for iXon+
- [SetNumberPrescans](#) function added
- New timing functions added
  - [GetKeepCleanTime](#)
  - [GetReadOutTime](#)

Bug fixes:

- SetEMAdvanced was not working on Luca-R
- Random tracks external start was broken on a DU888
- InGaAs was not working in last release
- Multiple USB cameras could not be controlled
- Fast Kinetics external trigger was not working on early DV885 cameras
- Kinetic cycle time calculated wrongly when accumulating



**Version 2.79**

New features:

- Memory allocation improved to allow larger kinetic series to be acquired without spooling
- Luca-R range supported
- iKon-L supported
- GetImageFlip and GetImageRotation added
- Multi tracks available in frame transfer mode for iXon+
- Random tracks available in frame transfer mode for iXon+
- Capability added to test for multi and random tracks in frame transfer
- SetMultiTrackHRange added
- Random tracks can now be configured with no gaps in between for iXon+

Bug fixes:

- Temperature drifting is now handled for all cameras
- GetTemperatureStatus did not return result for iXon
- Pixel values for last column on DU885 incorrect
- Fast kinetics, external trigger not operating correctly on a DU885
- Crash when initialising multiple usb cameras
- Kinetic cycle time could not be set reliably
- Shutter timings not correct at 35MHz on a DU885
- SetShutter function not functioning correctly for iXon+
- Grams files created not compatible with certain software packages
- EM gain could not be turned off completely
- Glitches were found in fire pulse for FVB mode on iXon+
- Image flipping and rotation properties incorrect in sif file
- CCI-20 controller card not initialising (ERROR\_ACK)

**Version 2.78.5**

New features:

- [SetIsolatedCropMode](#) added to LabVIEW library
- [SaveAsTiffEx](#) function added to provide choice of whether data is scaled

Bug fixes:

- [SaveAsTiff](#) function for a kinetic series saved the same image for every frame
- [SaveAsTiff](#) now checks for available memory to avoid crash
- [GetHeadModel](#) function was returning model in lowercase
- iXon FPGA version not being read properly in Initialize function
- [SetIsolatedCropMode](#) function repaired
- [GetAvailableCameras](#) did not update with USB devices plugged in & out
- Using [GetCameraEventStatus](#) on fast acquisitions caused acquisition to fail
- Long kinetic series of FITS was not working

**Version 2.78**

New features:

- Support for Luca 285 added.
- Data transfer from USB cameras improved.
- [SetIsolatedCropMode](#) function added to provide crop mode option (added for iXon+):
- Improved support for integrate on chip: Added  
[GetDDGIOCFrequency](#)  
[GetDDGIOCNumber](#)  
[SetDDGIOCNumber](#)
- Option to export to raw data:  
[SaveAsRaw](#)

Bug fixes:

- [SaveAsSif](#) in SDK not storing readout speed correctly.
- Shutter now works correctly for Classic cameras when the software is run for the first time after rebooting PC.
- Data was wrapping at 65K if taking a kinetic series of accumulations.

**Version 2.77**

New features:

- Supports 32 and 64-bit Windows XP and Vista
- Moved to new USB device driver libUSB
- iCam: New Run Till Abort functionality for latest iXon (with CCI-23 controller card), and Luca Cameras:  
[SendSoftwareTrigger](#)  
[SetRingExposureTimes](#)  
[GetAdjustedRingExposureTimes](#)  
[GetNumberRingExposureTimes](#)  
[GetRingExposureRange](#)  
[IsTriggerModeAvailable](#)
- New image manipulation functions:  
[SetImageFlip](#)  
[SetImageRotate](#)
- Save as GRAMS SPC file format – [SaveAsSPC](#)
- Calculate the red and blue relative to green factors to white balance a colour image - [WhiteBalance](#)

## **Version 2.76**

### New features:

- Additional capabilities added to [GetCapabilities](#) function
- [GetAmpDesc](#) function added
- Timeout added for [WaitForAcquisition](#) function

### Bug fixes:

- Error returned if an invalid EM gain mode is selected
- Fixed issues with Fast Kinetics on an iXon
- Sometimes a camera was not ready to acquire when an acquisition event was sent
- Fixed initialization problem when a '.' was in the path send to Initialize() function

## **Version 2.75**

### New features:

- Spooling to FITS, SIF and TIFF now available.
- [SetBaselineOffset](#) function added
- [SetShutterEx](#) added to control both an internal and external shutter through a DV8285
- [SaveAsSif](#) now handles spooled files

### Bug Fixes:

- [GetNumberHSSpeeds](#) now includes error checking for classics
- [GetCapabilities](#) returns correct bit depth for an iDus
- [IsPreAmpGainAvailable](#) now indicates yes for classic cameras as long as the gain index is zero and other parameters are valid
- EMGain Capability now returned correctly for iDus, Newton, USB iStar
- [SaveAsBmp](#) was not working in latest version

## **Version 2.74**

### New features:

- Support for new Luca range of Cameras
- Control of linear EM gain:  
[GetEMCCDGain](#)  
[GetEMGainRange](#)  
[SetEMGainMode](#)
- Option to save to FITS file format : [SaveAsFITS](#)
- Crop mode available with Newton: [SetCropMode](#)

## Version 2.73

New features:

- Support for Newton and SurCam range of Cameras

Bug fixes:

- [GetMostRecentImage](#) does not now prevent access to images previous to the one obtained
- Controller type can be tested.

**SECTION 2 - SOFTWARE INSTALLATIONS****PC requirements**

Please consult the Specification Sheet for your camera for the minimum and the recommended PC requirements.

**SDK WINDOWS INSTALLATION**

The installation of the Andor SDK software is a straightforward process, the steps for which are outlined below. Before proceeding with the installation, it is recommended that you read the remainder of this section first.

1. Insert the CD supplied with the SDK, and execute the "**SETUP.EXE**" program. This will take you through the complete installation process. You will be prompted to select the type of camera you have purchased as the installation needs to configure, were required, the "**Detector.ini**" file appropriately. You will also be requested to select a destination directory; this should be a directory that all users planning to use the SDK have full read/write privileges to. The directory will be created if it does not already exist. It is recommended that if you are performing an upgrade or reinstall that you do it to a clean directory.

Example programs will be copied into sub-directories of the installation directory specified above.

2. If not already installed, proceed with installing camera hardware. Consult your User guide for details. You may have to restart the PC to complete the installation
3. Navigate to the directory '`<destination directory>\Examples\C`' directory. Go into any sub directory and run the '`.exe`' file that you see there. If this runs successfully then your installation has completed. If it does not run with a successful message please consult the troubleshooting guide later in this section.

The installation process will copy the following files into the specified base directory:

**ATMCD32D.DLL (32-bit Dynamic Link Library)**

**ATMCD64D.DLL (64-bit Dynamic Link Library)**

**DETECTOR.INI (Classic CCD, ICCD and iStar cameras only)**

**ATMCD32D.H ( C, C++ only)**

**ATMCD32D.LIB (Borland compatible library, C, C++ only)**

**ATMCD32M.LIB (Microsoft compatible library, C, C++ only)**

**ATMCD32D.BAS ( Visual Basic only)**

**ATMCD32D.PAS ( Pascal only)**

**ATMCD32CS.DLL (C# only)**

**ATMCD32D.VB (VB.net)**

**NOTE:** The files are also copied into each example directory. This is to allow each example to be run as a stand-alone program.

A device driver required to support the camera will also be installed. The actual driver installed will depend on the camera type and operating system version, i.e.:

- For PCI systems the driver file is **atmcdwdm.sys** for 32-bit operating systems, or **atmcdwdm64.sys** for 64-bit operating systems.
- For USB cameras the driver file is **libusb0.sys** for 32-bit operating systems, or **libusb0\_x64.sys** for 64-bit operating systems.

**NOTE:** Do not have more than one example or other SDK software (e.g. Andor Solis™, iQ™) running at the same time.

**Installing on Windows 7**

- Some users have experienced difficulty installing the SDK on Windows 7, if so please see the [Window 7 Driver Installation Guide](#).

**If you are running a PCI camera**

- Check that the Andor Technology PCI driver appears in the Ensure that an Andor section in exists in the Device Manager and that an Andor Technology PCI driver appears in it. To access the Device Manager, go to the Control Panel and click on the “System” control. From here, select the Hardware tab and then click on the Device Manager button.
- Shut down the PC and ensure that the PCI card is seated correctly
- For 32-bit OS, ensure that the file atmcdwdm.sys file appears in the C:\WINDOWS\system32\drivers directory. The latest version is 4.29.0.0
- For 64-bit OS, ensure that the file atmcdwdm64.sys file appears in the C:\WINDOWS\system32\drivers directory. The latest version is 4.29.0.0
- If the Windows NT driver atmcd.sys is in the “Drivers” directory delete it and restart the PC.

If you are experiencing communication problems with the Andor **USB cameras** carry out the following actions:

- Confirm that the PC being used is **USB 2.0 compatible** and that a USB 2.0 port is being used for the camera
- Check the power to the iDus camera.
- Check the USB cable from the PC to the iDus camera.
- Ensure that a **LibUSB-Win32 Devices** section exists in the Device Manager and tab and that your camera is listed. To access the Device Manager, go to the Control Panel and click on the “System” control. From here, select the Hardware tab and then click on the Device Manager button. If the entry does not exist or there is an exclamation mark beside it carry out the following actions
  1. Power the camera off and on and after the new hardware is detected, follow the instructions to install a driver for the new device. When asked for a location, point to the directory where the software was installed.
  2. If there is a **USB device** with an **exclamation mark** beside it and you cannot account for this device then it is probably the Andor camera and the driver is not installed. Install the driver as described previously or right click on the entry and update driver.
  3. Close down any Andor software, remove the USB cable from either the camera or the PC and reconnect it again. Run the software to see if the camera is now detected.
  4. If still not connected then , remove the USB cable from either the PC or the camera, power the camera off and on the camera and reconnect the USB cable again.
  5. Run the software to see if the camera is now detected.

**NOTE:** If the camera is still not detected after step 6, please contact the appropriate [technical support](#) person





## SDK LINUX INSTALLATION

The first step is to unpack the archive that you have received. With the following steps replace <version> with the version number of the archive you have. E.g. 2.15

1. Open a terminal
2. Change the directory to where the `andor-<version>.tar.gz` file is located
3. Type `'tar -zxvf andor-<version>.tar.gz'`

A new directory named 'andor' is created.

To install the SDK run the script 'install\_andor' from the 'andor' directory. See the 'INSTALL' file located in the same directory, for further information.

## LABVIEW INSTALLATION

When you install the SDK onto a machine with LabVIEW installed, the SDK DLL and LabVIEW files are automatically copied into the LabVIEW install directory.

All Andor SDK function wrappers are present in a LabVIEW library file, "atmcd32d.llb", installed in your "user.lib" directory in your LabVIEW install folder.

The library can be added to any of your palette views. Instructions for adding the SDK to your palette view are described below.

**Note:** Depending on the version of LabVIEW you are using, the menu structure may be different. Please consult your LabVIEW manual for general help on adding LLBs if you have any issues.

- 1) Select the menu item **"Tools -> Advanced -> Edit Palette Views..."**
- 2) Right Click on the Functions tool bar & select **"Insert -> Submenu..."**
- 3) In the dialog select **"Link to LLB library..."**
- 4) Navigate to the user.lib directory and select **"atmcd32d.llb"** - The submenu with all SDK functions has been added
- 5) Right click on the new palette view and select **"Rename Submenu..."**
- 6) Change the name to **"Andor SDK"**
- 7) Repeat steps 2-6 for the Controls tool bar.

## Linux Troubleshooting

If you are having trouble running your camera under the Linux operating system please check the following before contacting [Technical Support](#)

For PCI,

- Check that the device driver is loaded. Type `'/sbin/lsmmod'` – `andordrvlx` should be listed.

For USB,

- Check that libUSB is available, `'whereis libusb'`
- Check that the Andor device is listed in the `/proc/bus/usb/devices` file.
- Check that the relevant device under `/proc/bus/usb/00X/00Y` has write access for all users.

## SECTION 3 - READOUT MODES

### INTRODUCTION

Andor systems are based on a detector known as a **Charged Coupled Device (CCD)**. The detector is divided up as a 2-dimensional array of pixels, each capable of detecting light. For example, systems based on an EEV 30-11 CCD chip have 1024 X 256 pixels, where each pixel is  $26\mu\text{m}^2$  (all examples given in this manual assume an EEV 30-11 based system). This 2-dimensional nature allows the device to be operated using a number of different binning patterns. We refer to these binning patterns as **Readout Modes**.

Andor has several different readout modes as follows:

- [Full Vertical Binning \(FVB\)](#)
- [Single-Track](#)
- [Multi-Track](#)
- [Random-Track](#)
- [Image](#)
- [Cropped](#)

Figure 1 shows the binning patterns :

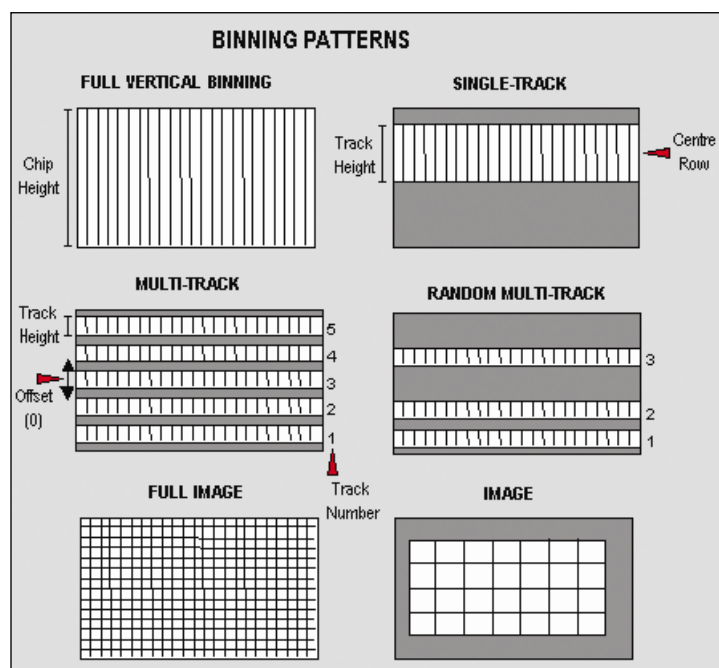


Figure 1: Binning patterns

We will now look at each of these modes in more detail.

**NOTE:** All of the patterns described can be simulated by the user in software but by carrying out the pattern in the camera greatly increases speed and improves Signal to Noise ratio.

## Full Vertical Binning

**Full Vertical Binning (FVB)** is the simplest mode of operation. It allows you to use the CCD chip as a Linear Image Sensor (similar to a photo diode array). The charge from each column of pixels is vertically binned into the shift register. This results in a net single charge per column. Therefore, for a 30-11 CCD an acquisition using **FVB** will result in 1024 data points.

To set-up a Full Vertical Binning acquisition call:

[SetReadMode\(0\)](#)

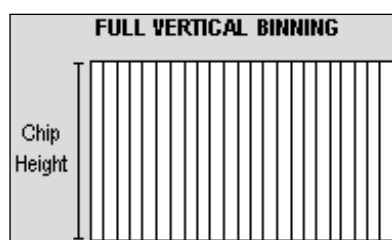


Figure 2: Full Vertical Binning

## Single-Track

**Single-Track** mode is similar to the Full Vertical Binning mode discussed previously in that upon completion of an acquisition you will have a single spectrum. However, that is where the similarities end.

With Single-Track you can specify not only the height (in pixels) of the area to be acquired but also its vertical position on the CCD. To ensure the best possible Signal to Noise ratio all the rows within the specified area are binned together into the shift register of the CCD and then digitized.

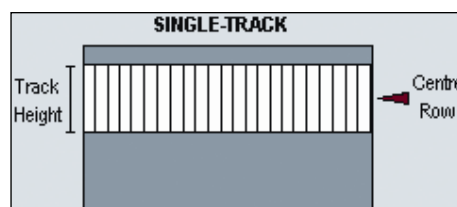


Figure 3: Single-track

Single-Track mode is useful because you are able to precisely define only the area of the CCD sensor that is illuminated by light. This is particularly important in low light level applications as it allows you to minimize the contribution of dark current in the measured signal. Also, if you are using an imaging spectrograph, such as the Shamrock, with a multiple core fiber, this mode allows you to select a single fiber for examination.

To set-up a Single-Track acquisition you need to call the following functions:

[SetReadMode\(3\);](#)

[SetSingleTrack\(128,20\);](#)

**NOTE:** If a non frame-transfer camera is used, a shutter may be required to prevent light (which would otherwise fall on the CCD-chip outside the specified track) from corrupting the data during binning. Please refer to [SECTION 7 - SHUTTER CONTROL](#) for further information.

## Multi-Track

**Multi-Track** mode allows you to create one or more tracks (each of which behaves like the **Single-Track** above). With Multi-Track you specify the number of tracks and the track height. The driver internally sets the actual position of each track so that the tracks are evenly spaced across the CCD. The tracks can be vertically shifted, en masse, by specifying a positive or negative offset about a central position. For greater control over the positioning of the tracks use **Random-Track** mode.

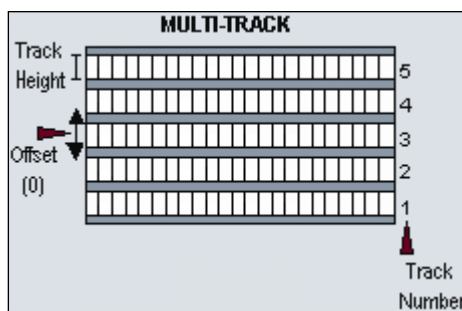


Figure 4: Multi-Track

Multi-Tracks will allow you to simultaneously acquire a number of spectra, delivered typically via a fiber bundle. If you are using a non-frame transfer camera and a continuous source, you will need to use a shutter to avoid streaking the spectra during the binning process. Please refer to [SECTION 7 - SHUTTER CONTROL](#) for further information.

To set-up a Multi-Track acquisition you need to call the following functions:

```
SetReadMode(1);  
SetMultiTrack(5,20,0,bottom, gap);
```

The [SetMultiTrack](#) function also returns the position of the first pixel row of the first track “**bottom**”, together with the gap between tracks, “**gap**”. This allows the user to calculate the actual position of each track.

### NOTE:

1. Before using Multi-Track mode with fiber bundles it is often useful to acquire a full resolution image of the output. Having observed the vertical position and spacing of the individual spectra, you can vary track height and offset accordingly.
2. Imaging spectrographs vertically invert input light (i.e. light from the top fiber will fall on the bottom track on the CCD-chip.)

## Random-Track

In Random-Track mode the position and height of each track is specified by the user, unlike Multi-Track mode where the driver sets the position of each track automatically.

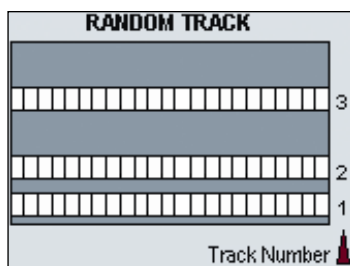


Figure 5: Random-Track

Random-Track will allow you to simultaneously acquire a number of spectra, delivered typically via a fiber bundle. Unless you are acquiring data from a pulsed source you will need to use a shutter to avoid streaking the spectra during the binning process. To set-up a Random-Track acquisition you need to call the following functions:

```
SetReadMode(2);
int position[6];
position[0] = 20;
position[1] = 30; //end of track 1, 11 rows height
position[2] = 40; //start of track 2
position[3] = 40; //end of track 2, 1 row height
position[4] = 100; //start of track 3
position[5] = 150; //end of track 3, 51 rows height
SetRandomTracks(3,position);
```

The SetRandomTracks function validates all the entries and then makes a local copy of the tracks positions. For the array of tracks to be valid the track positions MUST be in ascending order.

### NOTES:

1. A track of 1 row in height will have the same start and end positions.
2. Before using Random-Track mode with fiber bundles it is often useful to acquire a Full Resolution Image of the output.
3. Having observed the vertical positions of the individual spectra set the Random-Track mode accordingly.
4. Imaging spectrographs vertically invert input light (i.e. light from the top fiber will fall on the bottom track on the CCD-chip.)

## Image

In **Image** mode the CCD is operated much like a camera. In this mode you get a measured value for each pixel on the CCD, in effect allowing you to ‘take a picture’ of the light pattern falling on the pixel matrix of the CCD. To prevent smearing the image, light must be prevented from falling onto the CCD during the readout process. Please refer to [SECTION 7 - SHUTTER CONTROL](#) for further information.

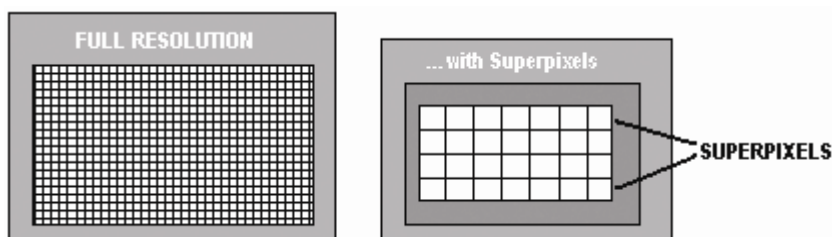


Figure 6: Image mode

To reduce the file size and increase the speed of readout it is possible to specify a sub-area of the CCD to be read out. It is also possible to bin pixels together horizontally and vertically to create super pixels.

To set up a “Full Resolution Image” acquisition you need to call the following functions:

[SetReadMode\(4\);](#)

[SetImage\(1,1,1,1024,1,256\);](#)

To acquire a sub-area with lower left co-ordinates of (19, 10), with binning of 4 in both the horizontal and vertical directions, and 100x16 pixels in the acquired image you would call the SetImage function with the following parameters:

[SetImage\(4,4,19,118,10,25\);](#)

By a process of binning charge vertically into the shift register from several rows at a time (e.g. 4) and then binning charge horizontally from several columns of the shift register at a time (e.g. 4) the ANDOR SDK system is effectively reading out charge from a matrix of super pixels which each measure 4 x 4 real pixels. The result is a more coarsely defined image, but faster processing speed, lower storage requirements, and a better signal to noise ratio (since for each element or super pixel in the resultant image, the combined charge from several pixels is being binned and read out, rather than the possibly weak charge from an individual pixel).

### Cropped

In **Cropped** mode, we can "fool" the sensor into thinking it is smaller than it actually is, and readout continuously at a much faster frame rate. The spectral time resolution is dictated by the time taken to readout the smaller defined section of the sensor.

If your experiment dictates that you need fast time resolution but cannot be constrained by the storage size of the sensor, then it is possible to readout the EMCCD in a "cropped sensor" mode, as illustrated below.

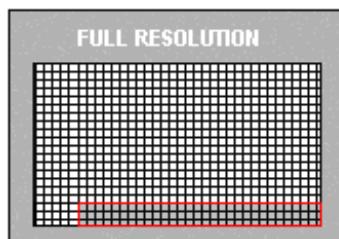


Figure 7: Cropped mode

To set up the CCD with a cropped image, as in figure 7, see [SetIsolatedCropMode](#).

**NOTE: It is important to ensure that no light falls on the excluded region otherwise the acquired data will be corrupted.**



## SECTION 4 - ACQUISITION MODES

### ACQUISITION MODE TYPES

In the previous section the different ReadOut Modes (binning patterns) supported by the Andor SDK were discussed. In addition the Andor SDK allows you to control the number and the timing details of acquisitions made using the various binning patterns. To simplify the process of controlling these acquisitions the Andor SDK has divided the acquisition process into several different **Acquisition Modes**:

- [Single Scan](#)
- [Accumulate](#)
- [Kinetic Series](#)
- [Run Till Abort](#)
- [Fast Kinetics](#)

[Single Scan](#) is the simplest form of acquisition where a single scan is captured.

[Accumulate](#) mode takes a sequence of single scans and adds them together.

[Kinetic Series](#) mode captures a sequence of single scans, or possibly, depending on the camera, a sequence of accumulated scans.

[Run Till Abort](#) continually performs scans of the CCD until aborted.

If your system is a Frame Transfer CCD, the acquisition modes can be enhanced by setting the chip operational mode to [Frame Transfer](#).

In the remainder of this section we will discuss in detail what each of these modes actually are and what needs to be specified to fully define an acquisition.

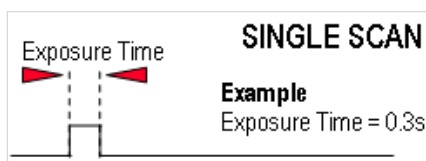
The table below summarizes the information that is needed for each acquisition mode:

MODE	EXPOSURE TIME	ACCUMULATE CYCLE TIME	NO. OF ACCUMULATIONS	KINETIC CYCLE TIME	NO. IN KINETIC SERIES
SINGLE SCAN	X				
ACCUMULATE	X	X	X		
KINETIC SERIES	X	X	X	X	X
RUN TILL ABORT	X			X	
FAST KINETICS	X	X			X

**NOTE:** For the purpose of this document an acquisition is taken to mean the complete data capture process. By contrast, a scan is a single readout of data from the CCD-Chip, i.e. a complete data acquisition comprises the capture of one or more scans.

### Single Scan

**Single Scan** is the simplest acquisition mode available with the Andor system. In this mode Andor SDK performs one scan (or readout) of the CCD and stores the acquired data in the memory of the PC.



To set the acquisition mode to Single Scan call:

[SetAcquisitionMode](#)(1)

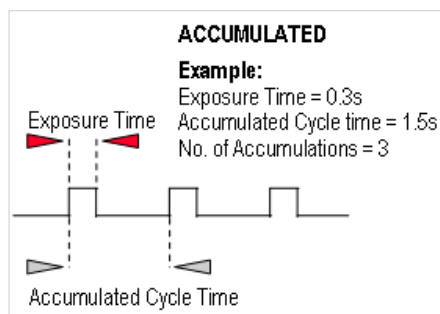
[SetExposureTime](#)(0.3)

Here the exposure time is the time during which the CCD sensor is sensitive to light. The exposure time is set via the [SetExposureTime](#) function.

**NOTE:** Due to the time needed to shift charge into the shift register, digitize it and operate shutters, where necessary, the exposure time cannot be set to just any value. For example, the minimum exposure time depends on many factors including the readout mode, trigger mode and the digitizing rate. To help the user determine what the actual exposure time will be the driver automatically calculates the nearest allowed value, not less than the user's choice. The actual calculated exposure time used by Andor SDK may be obtained via the [GetAcquisitionTimings](#) function (this function should be called after the acquisition details have been fully defined i.e. readout mode, trigger mode etc. have been set).

## Accumulate

**Accumulate** mode adds together (in computer memory) the data from a number of scans to form a single 'accumulated scan'. This mode is equivalent to taking a series of Single Scans and "manually" adding them together. However, by using the built-in Accumulate mode you gain the ability to specify the time delay (or period) between two consecutive scans and also the total number of scans to be added.



To set the acquisition mode to Accumulate call:

[SetAcquisitionMode](#) (2)

To fully define an *Accumulate* acquisition you will need to supply the follow information:

**Exposure Time.** This is the time in seconds during which the CCD sensor collects light prior to readout. Set via the [SetExposureTime](#) function.

**Number of Accumulations.** This is the number of scans to be acquired and accumulated in the memory of the PC. Set via the [SetNumberAccumulations](#) function.

**Accumulate Cycle Time.** This is the period in seconds between the start of each scan.

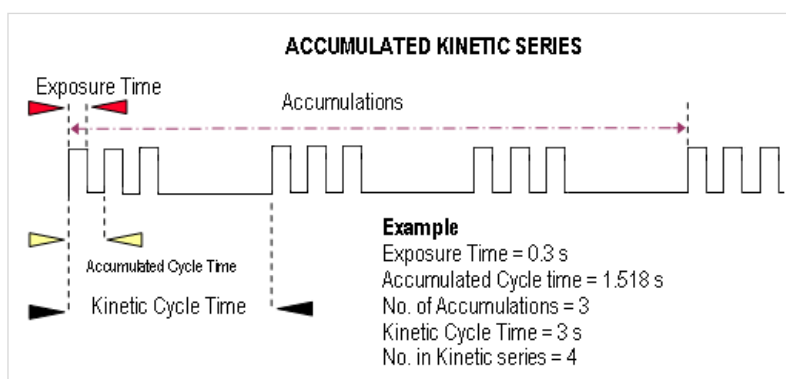
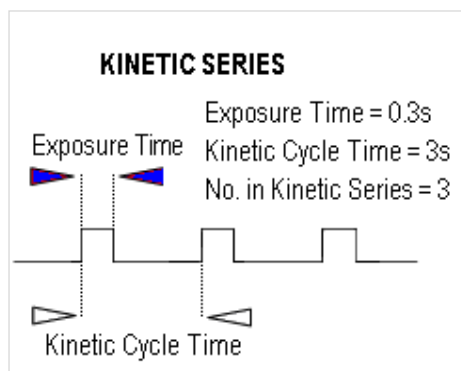
Set via the [SetAccumulationCycleTime](#) function. (This parameter is only applicable if you have selected **Internal trigger** – Please refer to [SECTION 6 – TRIGGERING](#) for further information.

### NOTES:

1. If the exposure time or the cycle time are set too low or are not permissible values, the driver will automatically calculate the nearest appropriate value.
2. The actual values used can be obtained via the [GetAcquisitionTimings](#) function (this function should be called after the acquisition has been fully defined (i.e. readout mode, trigger mode etc. have been set).
3. In External Trigger mode the delay between each scan making up the acquisition is not under the control of the Andor system but is synchronized to an externally generated trigger pulse.

## Kinetic Series

**Kinetic Series** mode captures a sequence of single scans, or a sequence of accumulated scans, into memory. This mode is equivalent to manually taking a series of single scans (or accumulated scans). However, by using the built-in Kinetic Series mode you gain the ability to specify the time delay (or period) between two consecutive scans and also the total number of scans to be acquired.



**NOTE:** In External Trigger mode the delay between each scan making up the acquisition is not under the control of the Andor SDK, but is synchronized to an externally generated trigger pulse.

To set the acquisition mode to **Kinetic Series** call:

[SetAcquisitionMode](#)(3)

To fully define a Kinetic Series acquisition you will need to supply the following information:

**Exposure Time.** This is the time in seconds during which the CCD collects light prior to readout.

Set via the [SetExposureTime](#) function.

**Number of Accumulations.** This is the number of scans you want to add together to create each member of your kinetic series. The default value of **1** means that each member of the kinetic series will consist of a single scan.

Set via the [SetNumberAccumulations](#) function.

**Accumulate Cycle Time.** This is the period in seconds between the start of individual scans (see **Number of Accumulations** above) that are accumulated in computer memory to create each member of your kinetic series - each member of the series is an 'accumulated scan'.

Set via the [SetAccumulationCycleTime](#) function.

(This parameter is only applicable if you have selected the Internal trigger and the Number of Accumulations is greater than 1- **Please refer to [SECTION 6 – TRIGGERING](#) for further information.**)

**Number in Kinetic Series.** This is the number of scans (or 'accumulated scans') you specify to be in your series.

Set via the [SetNumberKinetics](#) function.

**Kinetic Cycle Time.** This is the period in seconds between the start of each scan (or set of accumulated scans, if you have set the **Number of Accumulations** to more than 1) in the series.

Set via the [SetKineticCycleTime](#) function.

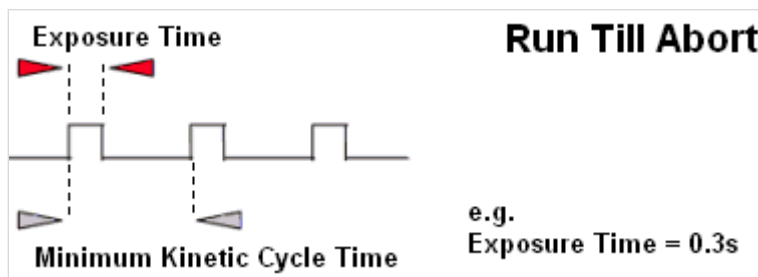
(This parameter is only applicable if you have selected the **Internal** trigger - see [Trigger Modes](#).)

**NOTE:**

1. If the exposure time or the cycle time are set too low or are not permissible values, the driver will automatically calculate the nearest appropriate value.
2. The actual values used can be obtained via the [GetAcquisitionTimings](#) function. This function should be called after the acquisition has been fully defined i.e. readout mode, trigger mode etc. have been set). If you are using a shutter, please refer to [SECTION 7 – SHUTTER CONTROL](#) for further information

## Run Till Abort

**Run Till Abort** mode continually performs scans of the CCD at the rate set by the user, until the acquisition is stopped by calling the [AbortAcquisition](#) function. The minimum possible delay between each scan will be the minimum Kinetic Cycle Time.



To set the acquisition mode to **Run Till Abort** call:

[SetAcquisitionMode](#)(5)

[SetExposureTime](#)(0.3)

[SetKineticCycleTime](#)(0)

Here the exposure time is the time during which the CCD sensor is sensitive to light.

### NOTES:

1. The total number of images acquired during the acquisition can be obtained at any time by calling the [GetTotalNumberImagesAcquired](#) function. The data acquired during the acquisition will be stored in the circular buffer until it is overwritten by new scans. The capacity of the circular buffer can be obtained by calling the [GetSizeOfCircularBuffer](#) function. To retrieve all valid data from the circular buffer before it is overwritten by new data the [GetNumberNewImages](#) and [GetImages](#) functions should be used. Alternatively, to retrieve only the most recent image the [GetMostRecentImage](#) function can be used. Finally, to retrieve the oldest image the [GetOldestImage](#) function can be used.
2. Due to the time needed to shift charge into the shift register, digitize it and operate shutters, where necessary, the exposure time cannot be set to just any value. For example, the minimum exposure time depends on many factors including the readout mode, trigger mode and the digitizing rate. To help the user determine what the actual exposure time will be, the driver automatically calculates the nearest allowed value that is not less than the user's choice. Thus, the actual calculated exposure time used by Andor SDK may be obtained via [GetAcquisitionTimings](#) (this function should be called after the acquisition details have been fully defined i.e. readout mode, trigger mode etc. have been set).

iCam Run Till Abort

When in this mode of operation (Run Till Abort) some systems have an enhanced trigger mode and enhanced exposure time capability. To check if these enhanced features are available with your system, use the function [GetCapabilities](#) and check the `ulTriggerModes` variable for bit 3 (`AC_TRIGGERMODE_CONTINUOUS`) being set.

The enhanced features include:-

1. Ring of exposures
2. Software Trigger or External trigger
3. Ability to change exposure times during acquisition without aborting the run.
4. External Level Exposure (Bulb) Trigger

These enhanced features are particularly useful in situations where you need to acquire data at a fast rate but not at some predefined rate or when you need to change the exposure time between successive scans. A good example would be calcium imaging where you need to take 2 images at different wavelengths with possibly different light levels. With this new mode of operation you would set the experiment up as follows:

1. Configure the camera to acquire an image  
[SetReadMode](#), [SetImage](#), [SetFrameTransferMode](#)
2. Select Run-till-abort mode [SetAcquisitionMode](#)
3. Select Software trigger [SetTriggerMode](#)(10)  
Confirm with [IsTriggerModeAvailable](#)(10)
4. Set exposure time. [SetExposureTime](#) or [SetRingExposureTimes](#)
5. Move filter to first position
6. Start acquisition. [StartAcquisition](#)
7. Send software Trigger. [SendSoftwareTrigger](#)
8. Wait for an acquisition event. See [SetDriverEvent](#)
9. Move Filter to next position.
10. Change exposure time. See [SetExposureTime](#)
11. Retrieve data see [GetAcquiredData](#)
12. Go to step 7

In the procedure outlined above we manually changed the exposure during the sequence. However, we could have used the new “Ring of exposures” feature to set up the two exposure times in advance and let the camera automatically switch between them as necessary. see [SetRingExposureTimes](#)

There is also the ability to detect the end of the exposure and start reconfiguring the experiment for the next acquisition while the readout of the first scan is still in progress. See [SetAcqStatusEvent](#).

**NOTE:** This will also work in External trigger mode [SetTriggerMode](#), with an external trigger source determining the start of an exposure instead of the [SendSoftwareTrigger](#) command. In external trigger care must be taken to ensure that the external trigger occurs when the camera is ready for it i.e. the frequency of the external trigger source has to be within the capabilities of the camera with the current settings.

With External Exposure trigger mode the width of the trigger pulse source will determine the exposure time and the Ring of Exposures will not be applicable.

See also [Acquisition Modes](#). [GetAdjustedRingExposureTimes](#) [GetNumberRingExposureTimes](#) [GetRingExposureRange](#) [IsTriggerModeAvailable](#) [SendSoftwareTrigger](#) [SetRingExposureTimes](#) [SetTriggerMode](#)



**Fast Kinetics**

**Fast Kinetics** is a special readout mode that uses the actual sensor as a temporary storage medium and allows an extremely fast sequence of images to be captured. The capture sequence is described with the following steps:

**Step 1:** both the Image and Storage areas of the sensor are fully cleaned out (the Keep Clean Cycle)

**Step 2:** the Keep Clean Cycle stops and the acquisition begins. The image builds up on the illuminated section of the sensor which is typically a *small* number of rows at the top of the sensor

**Step 3:** the sensor remains in this state until the exposure time has elapsed, at which point the complete sensor is clocked vertically by the number of rows specified by the user.

**Steps 4 & 5:** the process is continued until the number of images stored equals the series length set by the user.

**Step 6:** at this point the sequence moves into the readout phase by first vertically shifting the first image to the bottom row of the sensor. The sensor is then read out in the standard method.

**Points to consider for Fast Kinetics Mode:**

- Light **MUST** only be allowed to fall on the specified sub-area. Light falling anywhere else will contaminate the data.
- The maximum number of images in the sequence is set by the position of the sub-area, the height of the sub-area and the number of rows in the CCD (Image and Storage area)
- There are no Keep Clean cycles during the acquisition sequence.
- The industry fastest vertical shift speeds of the iXon<sup>EM</sup>+ enables fastest time resolution with minimal vertical smearing.
- A range of internal trigger and external trigger options are available for Fast Kinetics Readout.

## Frame Transfer

**Frame transfer** is a mode of operation of the chip that is only available if your system contains a Frame Transfer CCD (**FT CCD**). It can be switched on for any acquisition mode.

A FT CCD differs from a standard CCD in 2 ways:

- Firstly, a FT CCD contains 2 areas, of approximately equal size (see figure 7 below).
  1. The first area is the **Image area**, this area is at the top and farthest from the readout register. It is in this area that the CCD is sensitive to light.
  2. The second area is the **Storage area** and sits between the Image area and the readout register. This area is covered by an opaque mask, usually a metal film, and hence is not sensitive to light.
- The second way in which a FT CCD differs from a standard CCD is that the Image and the Storage areas can be shifted independently of each other.

These differences allow a FT CCD to be operated in a unique mode where one image can be read out while the next image is being acquired. It also allows a FT CCD to be used in imaging mode without a shutter.

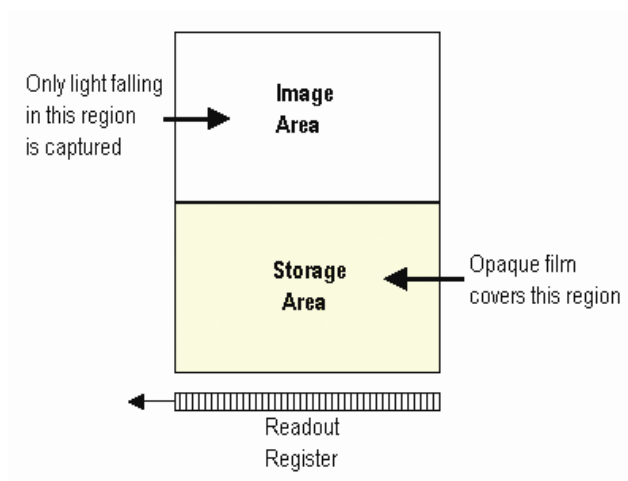


Figure 7: Frame Transfer CCD

Figure 8 takes you through the capture sequence for an FT CCD:

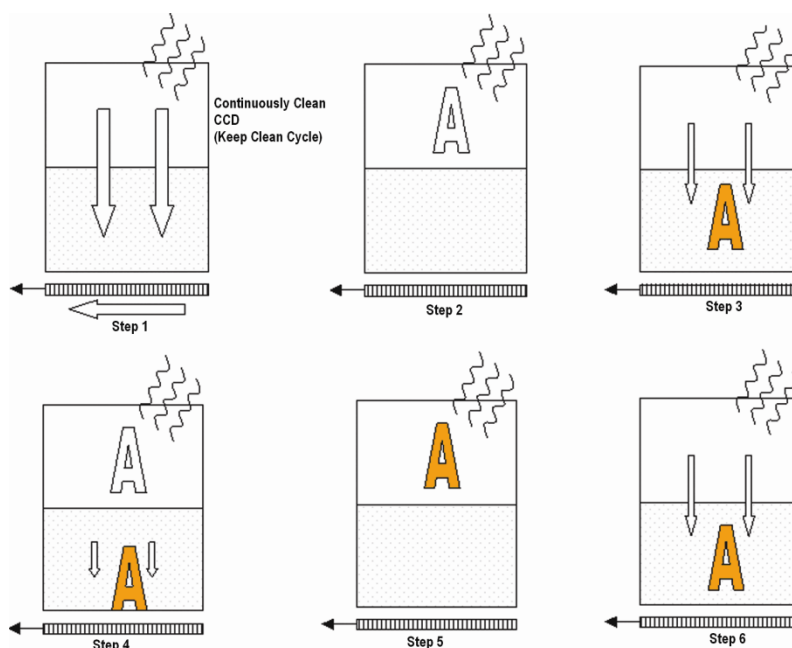


Figure 8: Capture sequence for a Frame Transfer CCD

**Step 1:** Both Image and Storage areas of the CCD are fully cleaned out. This is known as a **Keep Clean Cycle**. Keep Clean Cycles occur continuously to ensure that the camera is always ready to start an acquisition when required.

**Step 2:** On receipt of a start acquisition command the CCD stops the Keep Clean Cycle. This allows the image, photoelectric charge, to build up in the Image area of the CCD. The CCD remains in this state until the exposure time has elapsed, at which point the readout process starts.

**Step 3:** In this step the charge, built up in the Image area, is quickly shifted into the Storage area. The time required to move the charge into the storage area is calculated as follows:

$$\text{No. of Rows in the Image Area} \times \text{Vertical Shift Rate.}$$

Once the Image area has been shifted into the storage area the Image area stops vertically shifting and begins to accumulate charge again, i.e. the next exposure starts.

**Step 4:** While the Image area is accumulating charge the Storage area is being read out. This readout phase can take tens of milliseconds to seconds depending on the image size, readout pattern and readout speed.

**Step 5 & 6:** On completion of the readout, the system will wait until the exposure time has elapsed before starting the next readout (**Step 6**).

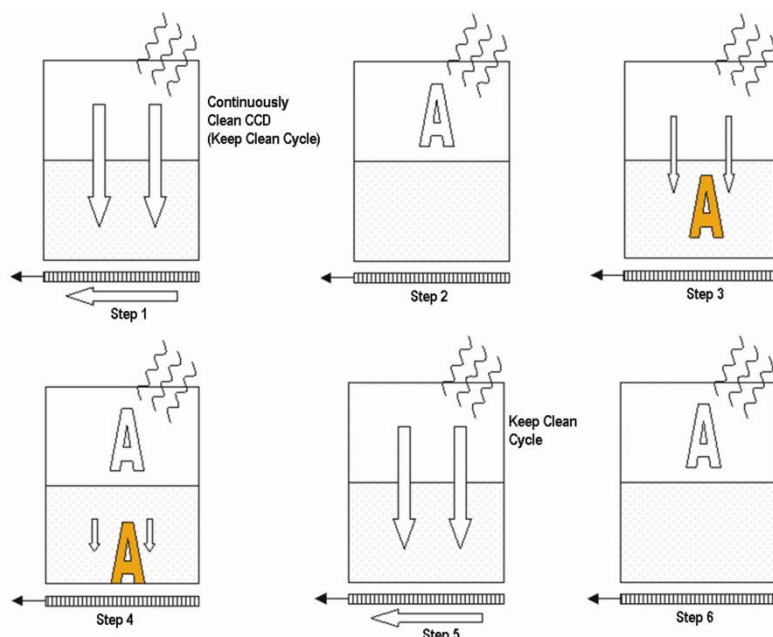
As the captured image is quickly shifted into the Storage area, a Frame Transfer CCD system can be used **without** a mechanical shutter.

## NOTES:

- When using Frame Transfer mode, the minimum exposure time for a FT CCD operated in frame transfer mode is the time taken to readout the image from the storage area.

- The Accumulation Cycle Time and the Kinetic Cycle Time are fully dependent on the exposure time and hence cannot be set via the software.
- For our Classic CCD range of cameras with frame transfer type sensors the camera can be operated in External Trigger mode. In this mode there are no keep cleans and the external trigger starts the "Readout" phase. The exposure time is the time between external triggers and hence the user cannot set the exposure or cycle times.
- For our iXon range of cameras the external trigger mode is more flexible. With these cameras the user can define the amount of time between the external trigger event occurring and the readout starting. This can be useful in those situations where the TTL trigger occurs before the light event you are trying to capture. As in the Classic Camera case, no keep cleans are running and the true exposure time is the time between triggers. However, the exposure window has moved in time by the exposure time.
- There is no need for a mechanical shutter. As the exposure time is long compared to the time required to shift the image into the storage area and therefore, image streaking will be insignificant.

It is also possible to operate a FT CCD in a non-frame transfer mode. In this standard mode of operation, an FT CCD acts much like a standard CCD. The capture sequence for this standard mode is illustrated here:



- **Step 1:** Both Image and Storage areas of the CCD are fully cleared out (the Keep Clean Cycle).
- **Step 2:** When an acquisition begins, the CCD stops the Keep Clean Cycle. The image builds up in the Image area of the CCD. The CCD remains in this state until the exposure time has elapsed, at which point the readout process starts.
- **Step 3:** The charge built up in the Image area is quickly shifted, into the Storage area. The time required to move the charge into the Storage area is the same as in the Frame Transfer mode.
- **Step 4:** With the image now in the Storage area the captured image is read out. The time taken to read out the image is again the same as in the Frame Transfer mode.
- **Step 5:** On completion of the readout, the CCD is again completely cleared, ready to acquire the next image. The CCD remains in the Keep Clean Cycle until the end of the accumulation or kinetic cycle time, depending on the acquisition mode, i.e. back to **Step 1**. As at least one Keep Clean Cycle is performed between each exposure, the minimum exposure time is no longer set by the time to read out the image.

As the captured image is quickly shifted into the Storage area, even in **non-Frame Transfer mode**, the system may still be used without a mechanical shutter.

## NOTES:

- When using an FT CCD as a standard CCD, the Exposure Time, Accumulation Cycle Time and Kinetic Cycle Time can be set independently.
- The minimum exposure time is not related to the time taken to read out the image.
- External trigger operates as if the CCD was a Non-FT CCD.
- As the captured image is quickly shifted into the storage area, even in non-frame transfer mode, the system may still be used without a mechanical shutter.
- For short exposure times the image may appear streaked as the time taken to shift the image area into the storage area may be of similar magnitude.
- Light falling on the Image area while the Storage area is being read out may contaminate the image in the Storage area due to charge spilling vertically along a column from the Image area. The slower the readout rate or the shorter the exposure time the greater the possibility of corruption. To see why this is the case, consider the following situation:

*“During a 100us exposure enough light has fallen on a pixel to register 10000 counts, or 100,000 electrons assuming 10e/count. The image is then shifted into the Storage area. To read out the image, assuming 1000x1000 pixels, it would take approximately 100ms at 10MHz readout rate. This means that during the reading out of the image 10 million counts (10000 \* 1000) will have been acquired into the pixel described above. As a pixel saturates at approximately 160,000 electrons this means that the pixel will over saturated by 60 times. All the excess charge has to go somewhere, and spreads vertically along the CCD column. As the clocks in the Image area are not actively shifting the charge, the mobility of the charge will be low and you may not see any effect. However, when you consider that more than one pixel in any given column could be exposed to 10000 counts per 100us, the chance of corrupting data is correspondingly increased. Changing the readout rate to 1 microsecond per pixel will greatly decrease the possibility of data corruption due to the reduced time to read out the image. Reducing the amount of light falling on the CCD and increasing the exposure time accordingly will also reduce the possibility of data corruption.”*

By default the system is set to non-Frame Transfer mode. To set the chip operation mode to Frame Transfer call:

[SetFrameTransferMode](#)(1)

To switch back to non-frame transfer mode call

[SetFrameTransferMode](#)(0)

To fully define a Frame Transfer acquisition you will need to supply the following information:

- **Exposure Time:** Time in seconds during which the CCD collects light prior to readout. Set via the [SetExposureTime](#) function.
- **Number of Accumulations:** Number of scans you want to add together to create each member of your kinetic series. The default value of 1 means that each member of the kinetic series will consist of a single scan. Set via the [SetNumberAccumulations](#) function.
- **Number in Kinetic Series:** Number of scans (or **accumulated scans**) you specify to be in your series. Set via the [SetNumberKinetics](#) function.

**SECTION 5 - TRIGGERING****TRIGGER MODES**

To assist the user in synchronizing data capture with external events the Andor system supports several modes of triggering, including

[Internal](#)

[External](#)

[External Start](#)

[External Exposure](#) (Bulb)

External FVB EM (only valid for EM Newton models in FVB mode) (needs added)

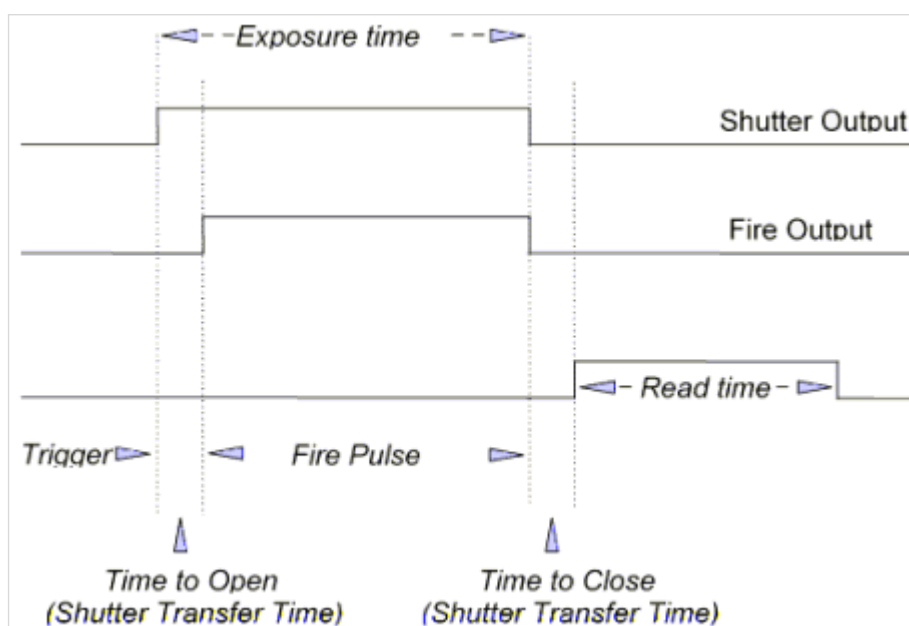
[Software](#)

The trigger mode is set via the [SetTriggerMode](#) function. In the remainder of this section we will examine the modes in detail and give some indication on the appropriate application of each trigger mode.



## Internal

In Internal Trigger Mode once an acquisition has been started via the [StartAcquisition](#) function the Andor system determines when data is actually acquired. Before the camera starts the data capture process it ensures that the CCD is in the appropriate state. This ensures that all acquisitions are identical no matter how long a time has elapsed since data was last acquired (in fact the camera continually reads out the CCD to help prevent it from being saturated by light falling on it whilst it is not acquiring data). The camera also generates all the necessary pulses for shuttering and firing external sources. These pulses are accessed directly on the camera or via the Auxiliary Connector depending on the model. The Fire Output defines the position in time during which it is safe to allow a pulsed source to fire. The figure below illustrates the timing sequence for this mode of operation.



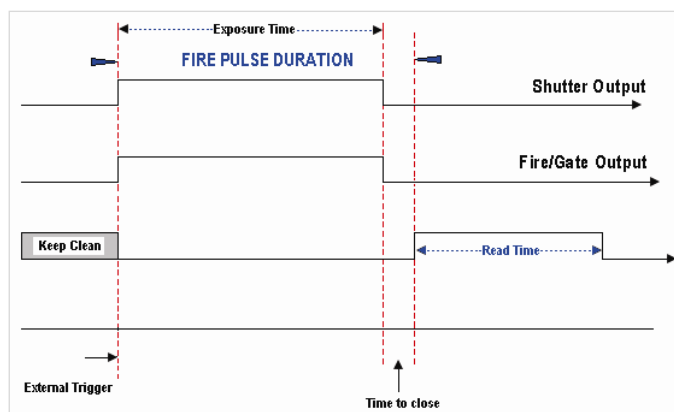
Internal Trigger Mode is ideal for situations where you are using 'continuous wave' (CW) light sources (an ordinary room light for instance) and incoming data, for the purposes of your observation, are steady and unbroken: thus you can begin acquisitions 'at will'.

You may use Internal Trigger Mode when you are able to send a trigger signal or 'Fire Pulse' to a short-duration, pulsed source (a laser, for example): in this case, initiating the data acquisition process can also signal the pulsed source to fire.

## External

In **External Trigger Mode** once an acquisition has been started via the [StartAcquisition](#) function the camera is placed into a special dumping version of the 'Keep Clean' mode, which ensures that the CCD is not saturated before the external trigger occurs. Once the External Trigger is received the Keep Clean sequence is stopped and the acquisition is initiated.

The figure below illustrates the timing sequence for this mode of operation:



The external trigger can be fed in a number of ways:

- EXT TRIG socket of the **I/O Box** (available separately, model #IO160)
- **Pin 13** of the **Auxiliary Connector** on the Andor PCI Card
- The head in the case of iDus / iXon.

External Trigger mode is suited to data acquisitions involving a 'pulsed source' (e.g. a laser) where the source does NOT allow a trigger pulse to be sent to it but can generate one. It is possible to increase the frame rate when in external trigger mode by enabling the Fast External Trigger option, see [SetFastExtTrigger](#).

When this option is enabled the system will not wait for a Keep Clean cycle to be completed before allowing an external trigger to initiate an acquisition. This may cause the background to change from one scan to another.

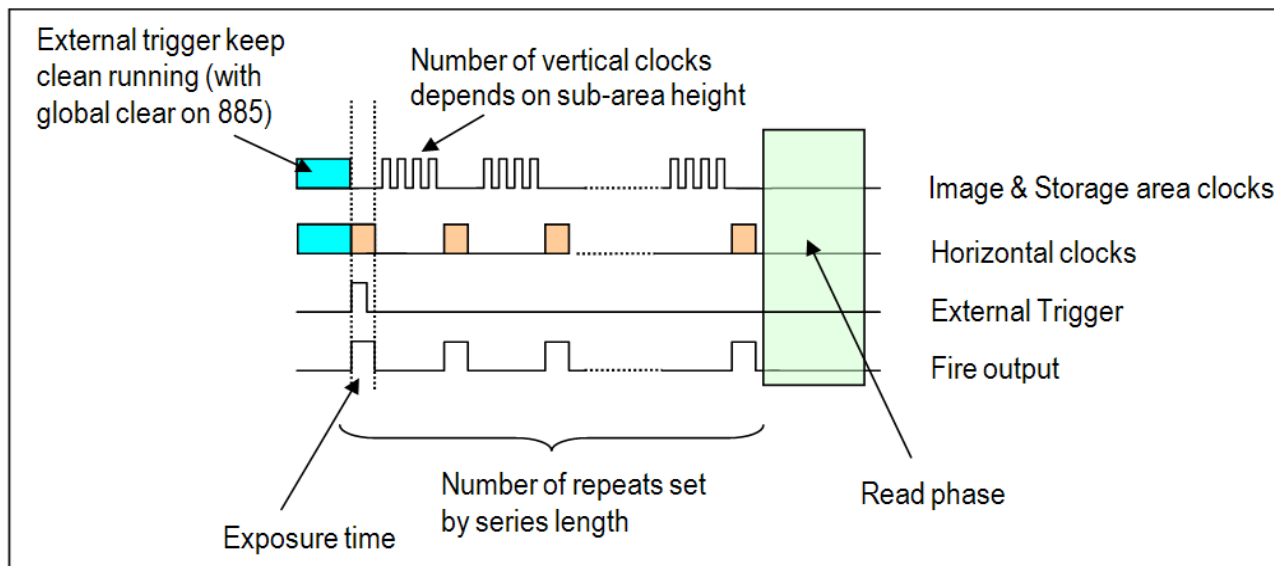
## NOTES:

1. If you have a shutter connected, and are using an external trigger, you must ensure that the shutter is open before the optical signal you want to measure occurs. When a camera is operated in frame transfer mode the external trigger sequence is different. Please refer to the camera user manual for a full description.
2. Some cameras may support the [iCam](#) technology. If they do, it will be fully operational in external trigger mode. It is very similar to the Software trigger functionality except that instead of a Software command instigating the acquisition, an external source does so. All the benefits described in the [Software Trigger](#) section can also be applied to the external trigger mode. It is set up in the same way with the same modes except that the trigger mode is set to External.

Frame transfer is also fully functional in iCam External Trigger mode. When Frame Transfer is on it means that the Arm signal from the camera will be enabled during the current readout at a point to ensure the next exposure will end after the current readout is finished. This will give the fastest frame rate and also ensure that the next exposure cannot end until the previous one has been readout.

## External Start

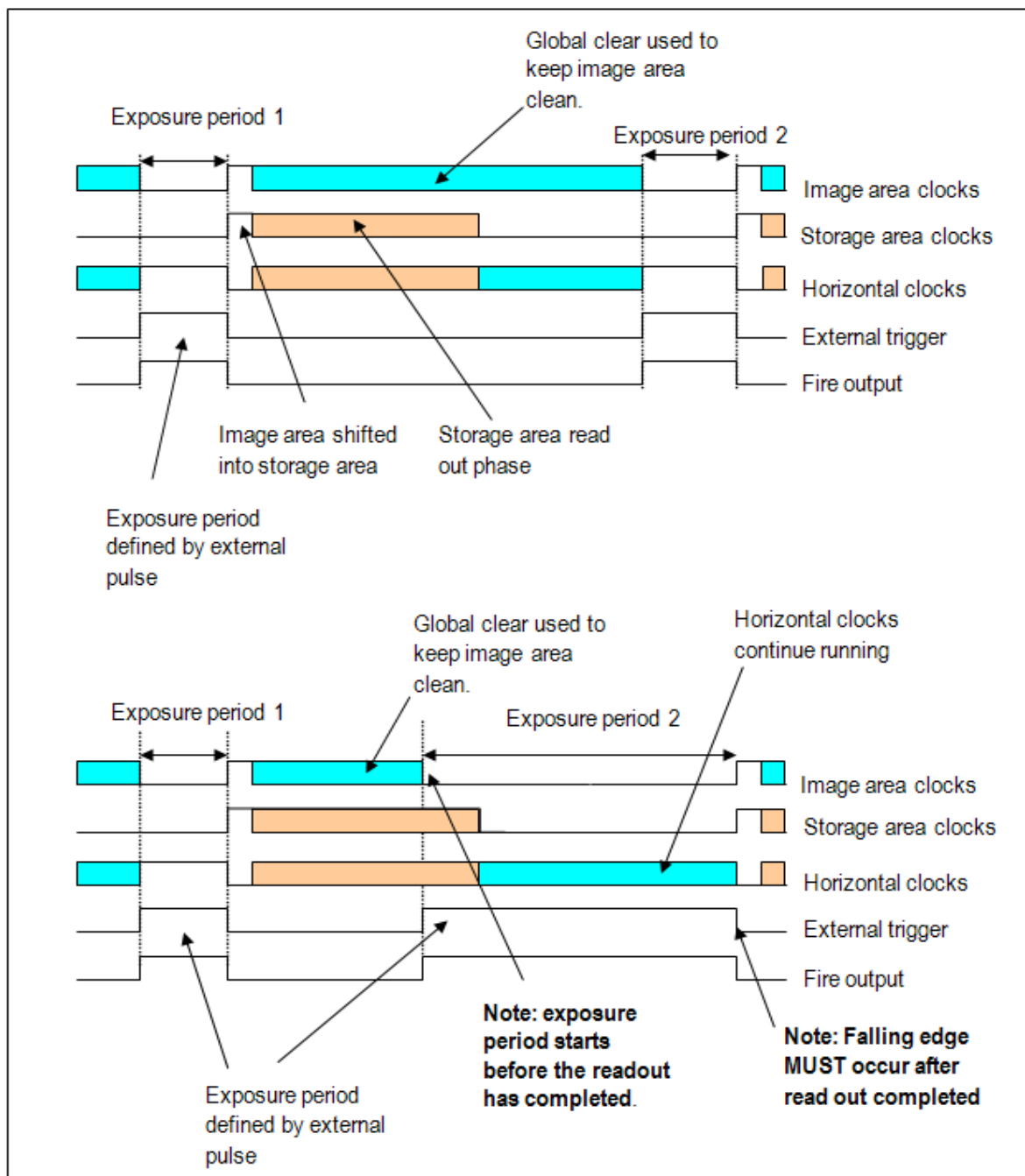
In **External Start Trigger Mode**, once an acquisition has been started via the [StartAcquisition](#) function, the camera system is placed into an external keep clean mode, which ensures that the CCD is not saturated before the external trigger occurs. Once the External Trigger is received, the Keep Clean sequence is stopped and the acquisition is initiated. After the initial acquisition the system will then continue to operate as in internal trigger mode. The figure below illustrates the timing sequence for this mode of operation.



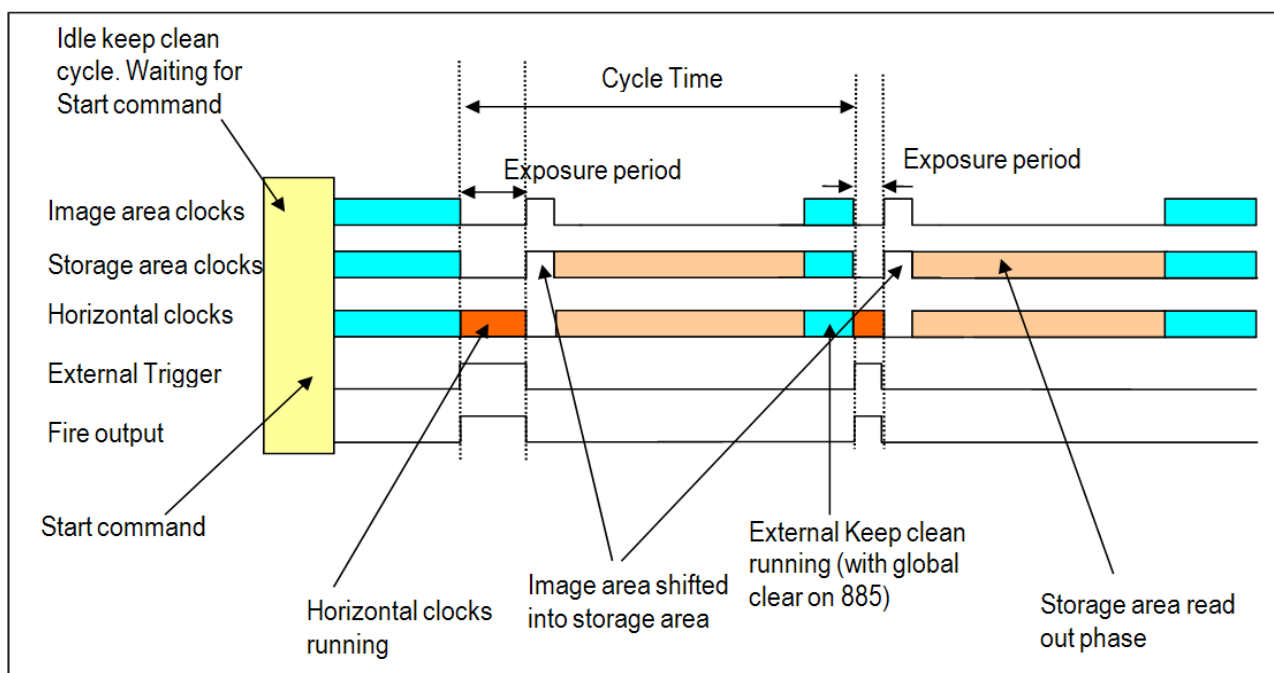
External Start trigger in Fast Kinetics mode

## External Exposure

The **External Exposure** trigger is a mode of operation where the exposure time is fully controlled by the external trigger input. While the trigger input is high the CCD is accumulating charge in the Image area. When the external trigger goes low, the accumulated charge is quickly shifted into the Storage area and then read out in the normal manner. The figures below illustrate the timing sequences for this mode of operation.



External Exposure Trigger in Frame Transfer mode (885 model only)



External Exposure Trigger in Non-Frame Transfer mode

Note that not all systems support External Exposure mode. To check if this feature is available with your system, use the function [GetCapabilities](#) and check the `ulTriggerModes` variable for bit 5 (`AC_TRIGGERMODE_EXTERNALEXPOSURE`) being set. If this bit is set, please use the function [GetCapabilities](#) again and check the `ulFeatures` variable for bit 12 (`AC_FEATURES_FTEXTERNALEXPOSURE`) being set when Frame Transfer mode is used, and bit 13 (`AC_FEATURES_KINETICEXTERNALEXPOSURE`) being set when Kinetc and Frame Transfer modes are used together.

## External FVB EM

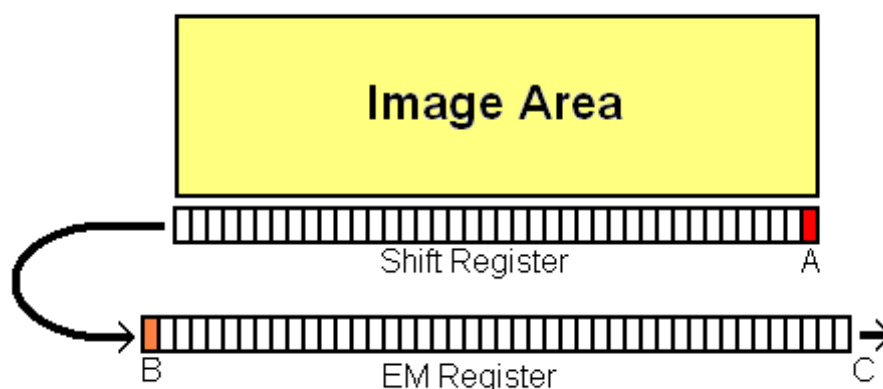
**External FVB EM Trigger Mode** is much like operating an acquisition in FVB read mode with EM gain applied using external trigger with Keep cleans turned off. The difference surrounds the readout of the collected data and therefore the associated readout time:

When using EM gain a second (EM) register is used to apply the gain to the acquired data, The diagram below gives a quick overview of the readout process used in both processes.

Imagine a 'pixel' at position A.

Normally for the readout cycle to complete, this pixel will have to shift along the shift register and then along the entire length of the EM Register to C before the next acquisition can begin.

When using FVB EM Trigger Mode however, the EM Register is used as a temporary storage area and so the pixel at A no longer needs to travel all the way to C but can stop at position B as this leaves sufficient space in the shift register for the next acquisition; the data is in effect 'pipelined'.



Note that not all systems support External FVB EM Trigger mode. To check if this enhanced feature is available with your system, use the function [GetCapabilities](#) and check the ulFeature variable for bit 10 (AC\_FEATURES\_KEEPCLEANCONTROL) being set.

**Software**

In **Software Trigger Mode**, once an acquisition has been started via the [StartAcquisition](#) function, the user software determines when data is actually acquired via the [SendSoftwareTrigger](#) command. This will give full control to the user software to ensure that it only requests an acquisition when it is ready. It permits the highly efficient upload of new exposure times between acquisitions and even allows a pre-load of up to 16 exposures to the camera which will be cycled through with each acquisition. It also permits the user software to perform certain actions before requesting the next acquisition, such as moving an external stage or even to change the exposure time.

Note that not all systems support Software Trigger mode. To check if these enhanced features are available with your system, use the function [GetCapabilities](#) and check the ulTriggerModes variable for bit 3 (AC\_TRIGGERMODE\_CONTINUOUS) being set. If this bit is set and the system is configured with the following modes:

- [Read mode](#) set to image
- Acquisition mode set to [Run till abort](#)
- [Trigger mode](#) set to 10

Then the [SendSoftwareTrigger](#) command will cause the acquisition to be taken.

It is recommended that you call [IsTriggerModeAvailable](#)(10) to check if your system is set up to use the [SendSoftwareTrigger](#) function.

If a [SendSoftwareTrigger](#) command is issued when the camera is not ready for it, it will be ignored and an appropriate return code returned.

The extra functionality of pre-loading exposures (up to a maximum of 16) to the camera is configured with the [SetRingExposureTimes](#) command. When the first acquisition is requested ([SendSoftwareTrigger](#)) the camera will take an acquisition with the first exposure in its list. When the second acquisition is requested the next exposure in the list will be used and so on. When the camera uses the final exposure in its list it will loop to the beginning again.

**Notes on Frame Transfer**

- On Frame Transfer systems, the Frame Transfer mode can be activated or deactivated. Currently, not all cameras can take advantage of the frame transfer operation in Software Trigger mode. By the nature of frame transfer, an exposure can be occurring when the previous acquisition is being read out. **Currently, no PCI connected cameras can be sent a software trigger when the camera is reading out.**
- USB cameras that support Software trigger can be sent a software trigger command during readout.
- Frame transfer is fully supported in external trigger mode.



**SECTION 6 - SHIFT SPEEDS**

The Andor system allows you to set the speed at which charge is shifted horizontally and vertically on the CCD.

The horizontal and vertical shift speeds are set via the [SetHSSpeed](#) and [SetVSSpeed](#) functions respectively.

The vertical shift speed is the speed at which each row on the CCD is shifted vertically into the Shift Register. The number of vertical shift speeds and their actual values are determined via the [GetNumberVSSpeeds](#) and [GetVSSpeed](#) functions.

The horizontal shift speed is the speed at which the charge in the shift register is shifted horizontally. It is also the speed at which the signal is digitized via the on board A/D converters. The number of horizontal shift speeds and their actual values are determined via the [GetNumberHSSpeeds](#) and [GetHSSpeed](#) functions. The horizontal shift speed is dependant on the CCD type and the model of plug-in card in the system. The shift speeds are always returned fastest first.

The following example retrieves the number of horizontal speeds allowed and their actual values in microseconds. Finally, it selects the fastest speed as follows:

```
GetNumberHSSpeeds(0, 0, &a); //first A-D, request data speeds for (l = 0; l < a; l++)  
GetHSSpeed(0, 0, l, &speed[l]);  
SetHSSpeed(0, 0); /* Fastest speed */
```

## SECTION 7 - SHUTTER CONTROL

### SHUTTER MODES

In the sections on Acquisition modes and Readout modes the use of a shutter was highlighted to prevent the smearing of data. Smearing occurs if light is allowed to fall on to the CCD while the pixel charges are being binned into the shift register prior to readout. The Andor system has a dedicated shutter control line that ensures that the shutter is correctly operated at all times.

The [SetShutter](#) and [SetShutterEx](#) functions provide you with a selection of options that determine when and how a shutter should be used.

#### **Fully Auto**

Fully Auto is the simplest shutter mode because it leaves all shuttering decisions to the Andor system. The shutter opens and closes automatically in accordance with any acquisition parameters you have set.

This option will automatically provide suitable shuttering for the majority of data acquisitions.

#### **Permanently Open**

If the shutter mode is set to **Permanently Open** the shutter will be open before, during and after any data acquisition. Choose this option if you wish to take a series of acquisitions with the shutter opened at all times (e.g. if you are taking a series of acquisitions with a pulsed source with little or no background illumination).

#### **Permanently Closed**

If the shutter mode is set to **Permanently Close** the shutter remains closed before, during and after any data acquisition. Choose this option if you wish to take an acquisition in darkness (e.g. if you are acquiring a background scan).

#### **Open during any series**

If the shutter mode is set to **Open during any series** the shutter remains closed before and after any data acquisition, but will act as Permanently Open during the series acquisition. Choose this option if you wish to keep your camera in darkness while not acquiring.

#### **Open during FVB series**

If the shutter mode is set to **Open during FVB series** the shutter remains closed before and after any data acquisition, but will act as Permanently Open during any FVB series acquisition. The Shutter will act as if it was set to Fully Auto when acquiring any other types of data. Choose this option if you wish to keep your camera in darkness while not acquiring FVB.

## SHUTTER TYPE

The shutter control line is a TTL compatible pulse, which can be either active high or active low to allow the control of an external shutter.

**NOTE:** If the camera has an internal shutter (the function [IsInternalMechanicalShutter](#) can be used to test this) but cannot control the internal and external shutter independently (check the capability [AC\\_FEATURES\\_SHUTTEREX](#)) then the TTL pulse will always be active high.

- If you set the shutter type to **TTL High** with [SetShutter](#) or [SetShutterEx](#), the Andor SDK will cause the output voltage to go 'high' to open the shutter.
- If you set the shutter type to **TTL Low** with [SetShutter](#) or [SetShutterEx](#), the Andor SDK will cause the output voltage to go 'low' to open the shutter.

For Classic systems this pulse will be sent through the Andor PCI card. For other systems this pulse will be sent through the shutter SMB connector on the camera.

The documentation supplied by the shutter manufacturer will advise the user whether your shutter opens at a high or a low TTL level.

**NOTE:** With Full Vertical Binning there is no shutter pulse. The shutter will always be in the Open position. See Shutter Mode on the previous page and Shutter Transfer Time on the next page.

The **I/O Box** also contains a 30V shutter jack socket, which produces the same signal as the TTL output but is always high to open (see User Guide for further details). **NOTE: Only applicable to classic systems.**

For iXon+ cameras that have independent shutter control (capability [AC\\_FEATURES\\_SHUTTEREX](#)) we can control the TTL type and mode of the internal (if available) and external shutter independently using function [SetShutterEx](#). The external shutter signal will be output through the Shutter SMB port on the rear of the camera. The internal and external shutters will have the same opening and closing times.

### SHUTTER TRANSFER TIME

Mechanical shutters take a finite time to open or close. This is sometimes called the **Shutter Transfer Time** and can be of the order of tens to hundreds of milliseconds. The Transfer Time is important for many reasons.

Firstly, if your shutter takes 40ms to open and you specify an exposure time of 20ms then the shutter will simply not get the time to open fully. Similarly, if you are triggering a pulse light source via the Fire pulse then you will want to ensure that the Fire pulse goes high only when the shutter is opened. Also, if you are acquiring data in an imaging mode (Multi-Track, Random-Track, Single-Track or Image), with either a continuous light source or a large high background illumination with a pulsed source, the shutter must be fully closed before readout begins. Otherwise, a smeared image will result.

The [SetShutter](#) and [SetShutterEx](#) functions allow you to specify a Transfer Time for both opening and closing the shutter.

The time you specify for the shutter **opening time** will affect the minimum exposure time you can set via the [SetExposureTime](#) function. For example, if you set the opening time to 0ms then the minimum exposure time will be set to the amount of time needed to clean the shift register on the CCD. However, if the **opening time** is set to a larger value than is needed to clean the shift register, say 50ms, then the minimum exposure time will be 51ms i.e. 1ms more than the time needed to open the shutter.

The [SetExposureTime](#) is in effect setting the length of time the shutter output will be in the 'open' state. The rising edge of the **Fire** output signal follows the start of the shutter open state after a delay, equal to the value you set for the opening time via the [SetShutter](#) functions.

Andor SDK also automatically adds the Transfer Time for the closing of the shutter to the end of the acquisition sequence, introducing an appropriate delay between the start of the shutter 'closed' state and the commencement of the data being read out. This value is set via the **closing time** parameter in the [SetShutter](#) and [SetShutterEx](#) functions.

Figures 10 & 11 on the next page show the timing sequence for both Internal and External triggering modes.

## SIGNALS & DELAYS

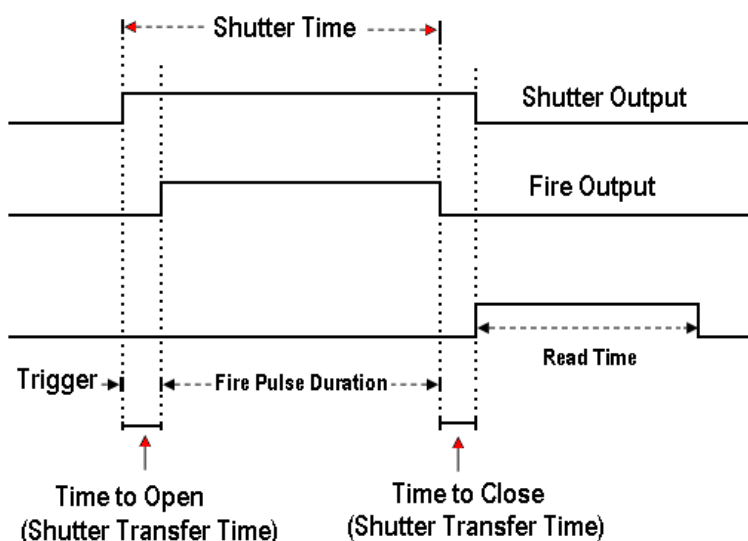


Figure 9: Timing diagram for shutter and fire pulses in internal trigger mode

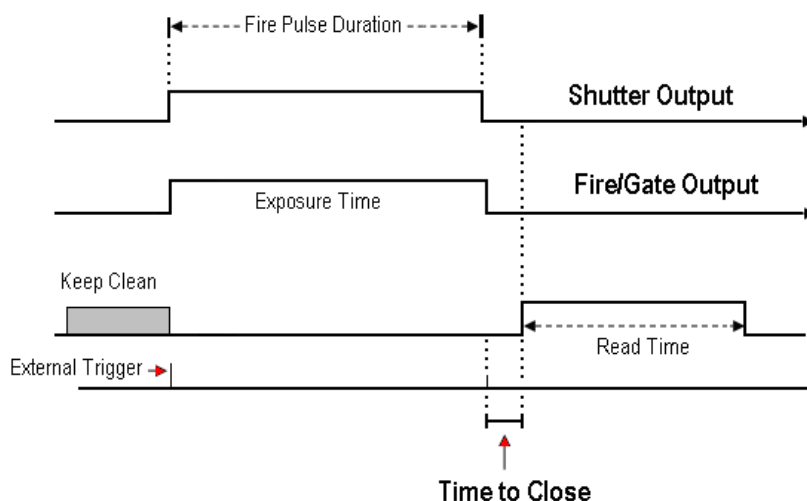


Figure 10: Timing diagram for shutter and fire pulses in external trigger mode

### NOTES:

1. In the case of external triggering, the external trigger pulse, the shutter pulse and the fire pulse are all coincident. If you are using a shutter and externally triggering the Andor system then the external trigger must be pulsed early enough to ensure that the shutter is fully opened before the light pulse arrives. Please consult the documentation supplied by the shutter manufacturer to get an indication of the transfer time you can expect from your particular shutter.
2. If you do not have a shutter connected, set the Closing Time and Opening Time parameters to 0. Setting these parameters to any other value will insert extra delays into cycle time calculations.

## SECTION 8 - TEMPERATURE CONTROL

The Andor camera incorporates a CCD, which is fabricated using a process known as Multi-Pin Phasing (MPP). As a result the dark current is reduced by a factor of approximately 100 compared to standard devices at the same temperature. To reduce the dark current even further Andor SDK allows you to cool and monitor the CCD temperature through a number of functions. The desired temperature is set via the [SetTemperature](#) function whilst the actual cooling mechanism is switched On and Off via the [CoolerON](#) and [CoolerOFF](#) functions.

The table below shows a typical example of temperatures attainable with the various systems available, with and without the assistance of water-cooling. Please refer to the specification supplied with your particular model for full details. The possible temperature range available to the [SetTemperature](#) function can be obtained using the [GetTemperatureRange](#) function.

Moderate Cooling		High Cooling		Ultra-High Cooling	
Air	Water	Air	Water	Air	Water
-5°C	-25°C	-30°C	-55°C	-75°C	-90°C

### NOTES:

1. Because rapid cooling and heating can cause thermal stresses in the CCD the rate of cooling and heating is regulated to be <10°C per minute on some systems.
2. While the system is cooling, or heating, you can acquire data but the 'Background Level' WILL change with temperature. The current temperature can be read using the [GetTemperature](#) function. This function also returns the status of any cooling process including whether the cooler is ON or OFF.
3. If the [GetTemperature](#) function returns the DRV\_TEMP\_STABILIZED status flag then the temperature is within 3°C of the set temperature and the microprocessor is no LONGER regulating the cooling rate. At this point the temperature regulation is controlled via analog electronics.

**SECTION 9 - SPECIAL GUIDES****CONTROLLING MULTIPLE CAMERAS**

Using the SDK It is possible to control multiple Andor cameras. The following SDK functions permit the selection and use of one Andor camera at a time.

- [GetAvailableCameras](#)
- [GetCameraHandle](#)
- [SetCurrentCamera](#)
- [GetCurrentCamera](#)
- [Initialize](#)

**\*NOTE: If only one camera is available it is not necessary to use any of these functions since that camera will be selected by default.**

A maximum of eight cameras can be controlled by the SDK. This can be a combination of USB and PCI cameras. The maximum number of PCI cameras will be limited by the number of available slots and the ability of the PC to transfer the data.

While using more than one camera the other SDK functions are used in the normal way. When a function is called it only affects the currently selected camera and is not sent to all cameras. This allows each camera to be programmed individually but it also means that each camera has to be individually initialized and shut down.

Another aspect of this control method is that cameras cannot be simultaneously triggered using the software - if simultaneous triggering is required then external triggers should be used.

**USING MULTIPLE CAMERA FUNCTIONS**

The [GetAvailableCameras](#) function is used to return the number of Andor cameras available. A handle for each camera is obtained using the [GetCameraHandle](#) function (this handle should be stored for the lifetime of the application).

Any of the available cameras can then be selected by calling the [SetCurrentCamera](#) function and passing in the camera handle. Once a camera has been selected any other SDK function can be called as normal but it will only apply to the selected camera. [Initialize](#) must be called once for each camera that you wish to use. At any stage the [GetCurrentCamera](#) function can be called and it will return the handle of the currently selected camera.

**NOTE:**

1. It is not possible to unplug any cameras or plug in new ones during the lifetime of the application.
2. It is not possible to trigger cameras simultaneously using software. To simultaneously trigger more than one camera external triggers can be used or alternatively one camera can be triggered by software and the fire pulse from this camera used to trigger the others.
3. Currently, if only one camera is installed there is no need to obtain the camera handle or select it since this camera will be used by default.



This example pseudo code demonstrates how to use the functions relating to the operation of multiple cameras:

```
//  
// Multiple Camera Pseudo Code Example  
// Note: This code does not compile  
//  
// This example demonstrates how to: -  
// 1. Determine the number of cameras available  
// 2. Obtain a handle for each camera  
// 3. Initialize each camera  
// 4. Perform a single scan acquisition with each camera  
// 5. Check which camera is currently selected  
// 6. Shut down each camera  
//  
  
// Start of program  
  
// Determine the number of cameras available  
GetAvailableCameras (NumberOfCameras)  
  
// Allocate memory for NumberOfCameras handles  
long CameraHandles[NumberOfCameras]  
  
// Obtain a handle for each camera and initialize  
for (index = 0 to NumberOfCameras-1)  
{  
    GetCameraHandle(index, CameraHandles[index])  
    SetCurrentCamera(CameraHandles[index])  
    Initialize(...)  
}  
  
// Set an exposure time for each camera and start the acquisition  
for (index = 0 to NumberOfCameras-1)  
{  
    SetCurrentCamera(CameraHandles[index])  
    SetAcquisitionMode(1)  
    SetExposureTime(...)  
  
    // Any other camera settings  
  
    StartAcquisition()  
  
    // Wait until acquisition has finished  
    ...  
    ...  
}  
  
// Check which camera is currently selected  
long UnknownCameraHandle  
GetCurrentCamera (UnknownCameraHandle)  
  
// Shut down each camera  
for (index = 0 to NumberOfCameras-1)  
{  
    SetCurrentCamera(CameraHandles[index])  
    ShutDown()  
}  
  
// End of program
```

Figure 11: Example of Multiple Camera Pseudo Code

## DATA RETRIEVAL METHODS

## How to determine when new data is available

There are a wide of range of functions available for retrieving data from the camera. Deciding which functions should be used depends on whether the data will be retrieved during an acquisition or once the acquisition is complete. See [Retrieving Image Data](#)

For certain cases it may be useful to know what stage an acquisition is at. The [GetStatus](#) function can be used to get the current status of the acquisition. It will return information such as, the acquisition is in progress or it is finished. See [GetStatus](#) for full list of return information.

Another way to know if an acquisition is finished is with the [WaitForAcquisition](#) function. When an acquisition is started, the [WaitForAcquisition](#) function can be called, it does not return from this function until the acquisition is finished. The function can be cancelled by calling the [CancelWait](#) function although this will require the user application to be multi-threaded.

```
//  
// WaitForAcquisition Pseudo Code Example  
// Note: This code does not compile  
//  
  
// Start of program  
  
// Initialize camera  
Initialize(...)  
  
// Start the acquisition  
StartAcquisition()  
  
// Wait for the acquisition to complete  
WaitForAcquisition()  
  
// Retrieve data  
...  
  
// Shut down camera  
ShutDown()  
  
// End of program
```

Figure 12: Example of [WaitForAcquisition](#) Pseudo Code

The [SetDriverEvent](#) function can be used in conjunction with event handles. If an event is created using the WIN32 CreateEvent function and passed to the SDK using the [SetDriverEvent](#) function an event handle now exists which the SDK can use to inform the application that something has occurred.

To ensure that the event has been set by a new image arriving and not something else (e.g. temperature change) the [GetTotalNumberImagesAcquired](#) function can be used. This function will return the total number of images acquired and transferred to the Andor SDK, and which are now available to be retrieved by the user. (see section [Retrieving Image Data](#)). Comparing the new value to a previously stored one is an effective way of checking that there are new images available.

```
//
// SetDriverEvent Pseudo Code Example
// Note: This code does not compile
//

// Start of program

// Initialize camera
Initialize(...)

// Create an event handle
HANDLE hEvent = CreateEvent()

// Set the driver event
SetDriverEvent(hEvent)

// Start the acquisition
StartAcquisition()

// Wait for the acquisition to complete
WaitForSingleObject()

// Retrieve data
...

// Shut down camera
ShutDown()

// End of program
```

Figure 13: Example of [SetDriverEvent](#) Pseudo Code

## Retrieving Image Data

Depending on the image settings there may be more than one image available after each notification. It is important to ensure that all of the new images are retrieved if they are required. The recommended functions for retrieving image data are as follows:

- [GetOldestImage](#)
- [GetMostRecentImage](#)
- [GetImages](#)
- [GetAcquiredData](#)

[GetOldestImage](#), [GetMostRecentImage](#), and [GetImages](#) are used to retrieve data from an internal 48MB circular buffer that is written to by all acquisition modes. They are particularly useful for retrieving data while an acquisition is taking place especially during run till abort mode but can also be used when the acquisition is complete. For all acquisition modes (except [Run Till Abort](#)) the [GetAcquiredData](#) function can be used to retrieve all the acquired data once the acquisition is complete.

**NOTE: All functions mentioned here refer to retrieving 32-bit data but there are also 16-bit versions of these functions available.**

[GetOldestImage](#) will retrieve the oldest available image from the circular buffer. Once the oldest image has been retrieved it is no longer available and calling [GetOldestImage](#) again will retrieve the next image. This is a useful function for retrieving a number of images. For example if there are 5 new images available, calling [GetOldestImage](#) 5 times will retrieve them all. [GetMostRecentImage](#) will retrieve the most recent image from the circular buffer. This provides a method for displaying the most recent image on screen while the acquisition is in progress (should be used in conjunction with the [GetNumberNewImages](#) function).

The [GetNumberNewImages](#) function returns the start and end index of the images that are available in the circular buffer. These indexes should be used along with the [GetImages](#) function to retrieve all of the available data. This provides an effective way of retrieving a number of new images in one function call.

[GetAcquiredData](#) should be used once the acquisition is complete to retrieve all the data from the series. This could be a single scan or an entire kinetic series.

**DETERMINING CAMERA CAPABILITIES****Retrieving capabilities from the camera**

It is important to be able to determine the capabilities of the camera. This allows the user to take the full benefit of all the features available.

There are a number of functions available which can be used to obtain this information and these can be found in the following areas of this section.

- **Horizontal Pixel Shift Capabilities**
- **Vertical Pixel Shift Capabilities**
- **Other Capabilities**

Depending on the camera type and model there will be variations in the number of A/D channels, the number of Output Amplifiers, the number & range of Horizontal Shift Speeds and the number & range of Pre-Amp Gains. The first step in this process is to determine the following:

- Number of A/D channels using the [GetNumberADChannels](#) function
- Number of output amplifiers using the [GetNumberAmp](#) function
- Maximum number of pre-amp gains using the [GetNumberPreAmpGains](#) function

**NOTE: Not all PRE-AMP gains are available for each horizontal shift speed. The [IsPreAmpGainAvailable](#) function is used to determine which are valid for a particular horizontal shift speed and this will be explained later.**

The bit depth of each A/D channel can be found using the [GetBitDepth](#) function.

Once this information has been obtained the next step is to find the number of available horizontal shift speeds for each output amplifier on each A/D channel using the [GetNumberHSSpeeds](#) function. Following this the value of each horizontal shift speed can be found using the [GetHSSpeed](#) function.

Each horizontal shift speed has an associated number of valid pre-amp gains. The next step is to obtain the value of each pre-amp gain using the [GetPreAmpGain](#) function. Not all pre-amp gains are available for each horizontal shift speed so using the [IsPreAmpGainAvailable](#) function it is possible to check which pre-amp gains are valid. Once the information has been retrieved the relevant selections can be made using the functions that follow:

- [SetADChannel](#)
- [SetOutputAmplifier](#)
- [SetHSSpeed](#)
- [SetPreAmpGain](#)

An example of the pseudo code for this capability is shown here:

```
//  
// Horizontal Pixel Shift Pseudo Code Example  
// Note: This code does not compile  
//  
  
// Start of program  
  
// Initialize camera  
Initialize(...)  
  
long NumChannels, NumAmp, NumPreAmpGains  
long BitDepth, NumHSPeeds, IsPreAmpAvailable  
float HSSpeed  
  
GetNumberADChannels (NumChannels)  
GetNumberAmp (NumAmp)  
GetNumberPreAmpGains (NumPreAmpGains)  
  
for (i = 0 to NumChannels-1)  
{  
    GetBitDepth(i, BitDepth)  
    for (j = 0 to NumAmp-1)  
    {  
        GetNumberHSPeeds(i, j, NumHSPeeds)  
        for (k = 0 to NumHSPeeds)  
        {  
            GetHSSpeed(i, j, k, HSSpeed)  
            for (m = 0 to NumPreAmpGains-1)  
            {  
                GetPreAmpGain(m, PreAmpGain)  
                IsPreAmpGainAvailable(i, j, k, m, IsPreAmpAvailable)  
            }  
        }  
    }  
}  
  
// Shut down camera  
ShutDown()  
  
// End of program
```

Figure 14: Example of Horizontal Pixel Shift Pseudo Code



Depending on the camera type and model there will be variations in the number of Vertical Shift Speeds available.

The first step in this process is to determine the number of vertical shift speeds using the [GetNumberVSSpeeds](#) function. Following this the value of each vertical shift speed can be found using the [GetVSSpeed](#) function.

Since the camera may be capable of operating at more than one vertical shift speed the [GetFastestRecommendedVSSpeed](#) function will return the index and the value of the fastest recommended speed available. The very high vertical shift speeds may require an increase in the amplitude of the vertical clock voltage using the [SetVSAmplitude](#) function.

The [GetFastestRecommendedVSSpeed](#) function returns the fastest speed which does not require the vertical clock voltage to be adjusted. If the fastest recommended speed is selected the vertical clock voltage should be set as normal.

**NOTE: Exercise caution when increasing the amplitude of the Vertical Clock voltage, since higher clocking voltages may result in increased Clock-Induced Charge in your signal. In general, only the very highest speeds are likely to benefit from increased vertical clock voltage amplitude.**

Once the information has been retrieved the relevant selections can be made using these functions:

- [SetVSSpeed](#)
- [SetVSAmplitude](#)

An example of the pseudo code for this capability is shown in figure 15:

```
//  
// Vertical Pixel Shift Pseudo Code Example  
// Note: This code does not compile  
//  
  
// Start of program  
  
// Initialize camera  
Initialize(...)  
  
long NumVSSpeeds, RecommendedVSSpeedIndex  
float VSSpeed  
  
GetNumberVSSpeeds(NumVSSpeeds)  
GetFastestRecommendedVSSpeed(RecommendedVSSpeedIndex, VSSpeed)  
  
for (i = 0 to NumChannels-1)  
{  
    GetVSSpeed(i, VSSpeed)  
}  
  
// Shut down camera  
ShutDown()  
  
// End of program
```

Figure 15: Example of vertical pixel shift pseudo code



Other information about the camera can be obtained using the following functions:

- [GetCapabilities](#)
- [IsInternalMechanicalShutter](#)

The [GetCapabilities](#) function populates an **AndorCapabilities** structure with information associated with the camera. Afterwards this structure can be used to determine details about the camera e.g. supported acquisition modes, supported trigger types.

The [IsInternalMechanicalShutter](#) function is used to determine if the camera has an internal mechanical shutter.

**Output Amplifiers**

Depending on the camera type and model there will be variations Output Amplifiers that can be applied to your acquisition:

- **EMCCD Gain**
- **Extended NIR**
- **High Capacity**

By using the [GetCapabilities](#) function you can determine which amplifiers are available to your camera, the [ulSetFunctions](#) field will return the relevant information.

**EMCCD Gain**

EMCCD is a quantitative digital camera technology that is capable of detecting single photon events whilst maintaining high Quantum Efficiency, achievable by way of a unique electron multiplying structure built into the sensor. If ulSetFunctions bit 5 returns 1 then EM Gain can be set by either the [SetOutputAmplifier](#) or the [SetHSSpeed](#) functions. (figure 16).

```
//  
//EMCCD Gain Pseudo Code Example  
//Note: This code does not compile  
//  
  
//Start of program  
  
//Initialize camera  
Initialize(...)  
  
//Using SetHSSpeed()  
SetHSSpeed(0,0);  
  
//  
//    OR  
//  
  
//Using SetOutputAmplifier()  
SetOutputAmplifier(0);  
  
//Shut down camera  
Shutdown()  
  
//End of Program
```

Figure 16: Example of EMCCD Gain Pseudo Code

### Extended NIR

When using Extended is increased. This in turn increases the response of the sensor to these wavelengths with a QE increase from 40% Near Infra-Red Mode the increased thickness of the silicon on which the CCD is formed and by manipulating the voltages applied to the silicon substrate, the depth of the region where red and NIR light can convert to photoelectrons to 60% at 650 nm. If ulSetFunctions bit 7 returns 1 then Extended NIR mode can be activated by using either the [SetOutputAmplifier](#) or the [SetHSSpeed](#) functions. (figure 17).

```
//  
//Extended NIR Pseudo Code Example  
//Note: This code does not compile  
//  
  
//Start of program  
  
//Initialize camera  
Inititalize(...)  
  
//Using SetHSSpeed()  
SetHSSpeed(1,0);  
  
//  
// OR  
//  
  
//Using SetOutputAmplifier()  
SetOutputAmplifier(1);  
  
//Shut down camera  
Shutdown()  
  
//End of Program
```

Figure 17: Example of Extended NIR Pseudo Code

### High Capacity

With High capacity enabled the responsivity of the sensor is reduced thus allowing the reading of larger charge packets during binning operations. If ulSetFunctions bit 7 returns 1 then High Capacity mode can be activated bu using the [SetHighCapacity](#) function.

(figure 19).

```
//  
//High Capacity Pseudo Code Example  
//Note: This code does not compile  
//  
  
//Start of program  
  
//Initialize camera  
Inititalize(...)  
  
//Enable High Capacity  
SetHighCapacity(1);  
  
//Shut down camera  
Shutdown()  
  
//End of Program
```

Figure 18: Example of High Capacity mode Pseudo Code



### iCam

iCam technology is a combined firmware and software innovation that has been incorporated into Andor's EMCCD imaging cameras. iCam offers enhanced performance for acquisitions whether software triggered or hardware (externally) triggered, with absolute minimal overheads. It allows for faster frame rates in software by dedicated timing patterns that eliminate unnecessary overhead times. This, alongside the bi-directional communication between camera and PC, facilitates unparalleled synchronization with other peripheral equipment. A ring mode offers the capacity to use up to 16 different timing patterns uploaded into the camera head, thus trigger events can yield virtually instantaneous switching between exposure channels.

This new functionality has been added to the [Run Till Abort](#) acquisition mode and currently will only operate with [Image](#) readout mode. Cameras must contain a suitable firmware and if a PCI card is being used it must be a CCI-23 card and have a suitable firmware loaded. If you are unsure if your current Hardware is iCam compatible please download the 'iCam compatibility checker' from [andor.com](http://andor.com).

It will operate in [Software](#) and [External](#) trigger mode, with both [Frame Transfer](#) and Non Frame Transfer mode.

The idea behind this is that the SDK puts the camera into a 'heightened state of readiness' and when a trigger comes (either software or hardware) the acquisition can be taken immediately.

If your hardware is compatible and needs to be upgraded please contact [productsupport@andor.com](mailto:productsupport@andor.com) for a further application which will upgrade your system.

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It will operate in [Software](#) and [External](#) trigger mode, with both [Frame Transfer](#) and Non Frame Transfer mode.

The idea behind this is that the SDK puts the camera into a 'heightened state of readiness' and when a trigger comes (either software or hardware) the acquisition can be taken immediately.

If your hardware is compatible and needs to be upgraded please contact [productsupport@andor.com](mailto:productsupport@andor.com) for a further application which will upgrade your system.

This is a unique interface whereby a user can choose from a pre-determined list of camera set-up configurations. The user need only choose how they would like their camera to be optimized, e.g. for 'Sensitivity and Speed', 'Dynamic Range and Speed', 'Time Lapse'. Parameters such as EM gain value, vertical shift speed, vertical clock amplitude, pre-amp sensitivity and horizontal readout speed will then be optimized accordingly, 'behind the scenes'. Furthermore, the option exists to create additional user-defined configurations. Pre-defined OptAcquire modes include:

**1. Sensitivity and Speed (EM Amplifier)**

Optimized for capturing weak signal at fast frame rates, with single photon sensitivity. Suited to the majority of EMCCD applications.

**2. Dynamic Range and Speed (EM Amplifier)**

Configured to deliver optimal dynamic range at fast frame rates. Moderate EM gain applied.

**3. Fastest Frame Rate (EM Amplifier)**

For when it's all about speed! Optimized for absolute fastest frame rates of the camera. Especially effective when combined with sub-array/binning selections.

**4. Time Lapse (EM Amplifier)**

Configured to capture low light images with time intervals between exposures. Overlap ('frame transfer') readout is deactivated.

**5. Time Lapse and Short Exposures (EM Amplifier)**

Configured to minimize vertical smear when using exposure times less than 3ms.

**6. EMCCD Highest Dynamic Range (EM Amplifier)**

Combines EMCCD low light detection with the absolute highest dynamic range that the camera can deliver. Since this requires slower readout, frame rate is sacrificed.

**7. CCD Highest Dynamic Range (Conventional Amplifier)**

Optimized for slow scan CCD detection with highest available dynamic range. Recommended for brighter signals *OR* when it is possible to apply long exposures to overcome noise floor.

**8. Photon Counting EM**

Configuration recommended for photon counting with individual exposures < 10sec.

**9. Photon Counting with Long Exposures (> 1sec)**

Configuration recommended for photon counting with individual exposures > 1sec.

The following list details the valid acquisition parameters and input values for use with OptAcquire functions.

**Parameter:** output\_amplifier

**Type:** String

**Valid Values:** "Conventional" or "Electron Multiplying".

**Parameter:** frame\_transfer

**Type:** String

**Valid Values:** "ON" or "OFF".

**Parameter:** readout\_rate

**Type:** Float

**Valid Values:** A valid and supported value which can be retrieved by subsequent calls to [GetNumberHSSpeeds\(\)](#) and [GetHSSpeed\(\)](#).

**Parameter:** shift\_speed

**Type:** Float



**Valid Values:** A valid and supported value which can be retrieved by subsequent calls to [GetNumberVSSpeeds\(\)](#) and [GetVSSpeed\(\)](#).

**Parameter:** electron\_multiplying\_gain

**Type:** Integer

**Valid Values:** A valid and supported value which can be retrieved from a call to [GetEMGainRange\(\)](#).

**Parameter:** vertical\_clock\_amplitude

**Type:** Integer

**Valid Values:** A valid and supported integer value in the range 0 – 4.

**Parameter:** preamplifier\_gain

**Type:** Integer

**Valid Values:** A valid and supported value which can be retrieved from subsequent calls to [GetNumberPreAmpGains\(\)](#) and [GetPreAmpGain\(\)](#).

An example of the pseudo code for using OptAcquire is shown in figure 16 and figure 17:

```
//
// Example use of OptAcquire Functions
// Start OptAcquire using the Preset Modes
//

// Initialise, specifying a user xml file to use. The file does not need
// to exist at this stage however a file name must be provided.
// This must be the first call before using any other OptAcquire function
OA_Initialize("MyFile.xml", FileNameLength);

// Get Number of Preset Modes
OA_GetNumberOfPreSetModes(NumberOfModes);

// Get all the Mode Names available, allocate enough space to retrieve all the mode names
// i.e. buffer to retrieve list of modes must be capable of storing the maximum number of
// characters allowed for a mode name (255) * number of modes
OA_GetPreSetModeNames(ListOfPresetModeNames);

// Get the number of acquisition parameters associated with a particular mode
OA_GetNumberOfAcqParams(ModeName, NumberOfParams);

// Get the name of all the acquisition parameters for a particular mode
// i.e. buffer to retrieve list of modes must be capable of storing the maximum number of
// characters allowed for a parameter (255) * number of params
OA_GetModeAcqParams(ModeName, ListOfParams);

// Get the details of each of the acquisition parameters for the mode
OA_GetInt (ModeName, "electron_m multiplying_gain", IntValue);
OA_GetFloat (ModeName, "readout_rate", FloatValue);
OA_GetString (ModeName, "output_amplifier", StringValue, StringLen);
....

// Enable a Mode
OA_EnableMode(ModeName);
```

Figure 16: Example of OptAcquire using Preset Modes

```
// Adding a New Mode to a User File

// Initialise, specifying a user xml file to use. The file does not need
// to exist at this stage however a file name must be provided.
// This must be the first call before using any other OptAcquire function
OA_Initialize("MyFile.xml", FileNameLength);

// Add a new mode, maximum length for mode name is 255 characters and also
// for mode description is 255 characters
OA_AddMode(ModeName, ModeNameLength, ModeDescription, ModeDescriptionLength);

// Define the Acquisition Parameters which make up the new mode. Acquisition
// parameters must be valid parameters supported by OptAcquire
OA_SetInt (ModeName, "electron_multiplying_gain", IntValue);
OA_SetFloat (ModeName, "readout_rate", FloatValue);
OA_SetString (ModeName, "output_amplifier", StringValue, StringLen);
....

// Write the new mode to file
// Note: Modes CANNOT be written to the Preset file
OA_WriteToFile("MyFile.xml", FileNameLen);
```

Figure 17: Example of OptAcquire Adding a New Mode

## DATA AVERAGING FILTERS

### Recursive Averaging Filter

The recursive filter produces a “running average”, each output frame consisting of an average of the current frame and some previous frames, as per the following equation:

$$lout_{(n)} = lout_{(n-1)} + \frac{\{Vin_{(n)} - lout_{(n-1)}\}}{F}$$

Where:

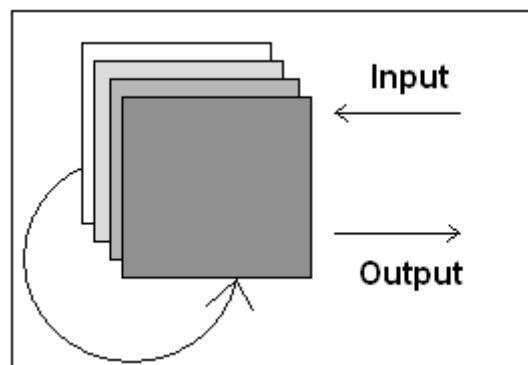
$Vin_{(n)}$  = Latest frame in the series

$lout_{(n-1)}$  = Previous output frame

$lout_{(n)}$  = Recursively averaged output frame

$F$  = Averaging factor

It should be noted that recursive averaging can produce an improved signal to noise in the frame whilst maintaining the native frame rate. However recursive filtering is not recommended for following highly dynamic events, since smearing within the frame is likely.



### Frame Averaging Filter

The frame averaging filter improves signal to noise by yielding an arithmetic mean output frame for every ‘F’ number of frames input, as per the following equation:

$$lout_{(n)} = \frac{\sum_{n=1}^F Vin_{(n)}}{F}$$

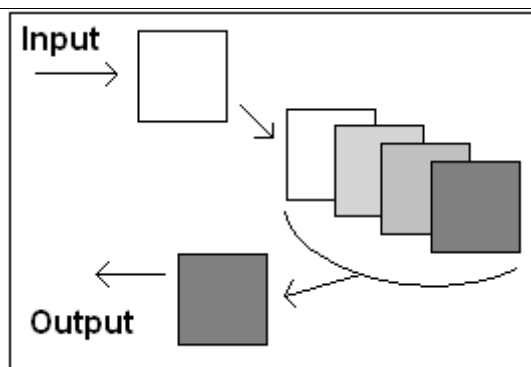
Where:

$Vin_{(n)}$  = Latest frame in the series

$lout_{(n)}$  = Frame averaged output frame

$F$  = Number of frames included in average series

Frame averaging is suited to dynamic events that can be temporarily sampled by a ‘camera frame rate’/‘F’ rate of frame output. However, if events occur faster than this it can result in frame smearing, in this situation either reduce the value of ‘F’ or deactivate completely.

**Note:**

Filters are only valid when using video mode or kinetic series

## SPURIOUS NOISE FILTERS

It can be desirable to optionally filter spurious background events to give as 'black' a background as possible, eradicating any remaining 'salt and pepper' noise. It is important to utilize noise selection and filter algorithms that are intelligent enough to accomplish this task without impacting the integrity of the signal itself. This is realized through the Spurious Noise Filter (SNF) functionality, which offers the user a choice of advanced algorithms to try. SNF can be applied either in real time or as a post-processing step. The options available to the user for using Spurious Noise filter are:

- Median (available in Real Time & Post-Processing)
- Level Above (available in Real Time & Post-Processing)
- Interquartile Range (available in Real Time & Post-Processing)
- Noise Threshold (available in Post-Processing)

### Median Filter

Each pixel is measured relative to the median value of its nearest neighbor pixels. A pixel is replaced with the median value of a 3x3 array centered on the pixel concerned if the pixel value is greater than the median by a given multiplication factor (defined by the user).

### Level Above

The user defines the threshold based on the number of counts above the baseline. Spurious noise events are defined as those pixels in the image which are above this threshold. A pixel is replaced with the median value of a 3x3 array centered on the pixel concerned if the pixel is above the threshold AND six or more of the nearest neighbours (contained within the 3x3 array) are below the threshold.

### Interquartile Range

For each pixel, the Median and Interquartile values of a 3x3 square centred on the pixel concerned are calculated. A pixel is replaced with the median value the 3x3 array centered on the pixel concerned if the pixel is greater than the median plus the interquartile ranges times a given multiplication factor (defined by the user) AND six or more of the nearest neighbours (contained within the 3x3 array) are below the threshold.

### Noise Threshold Filter

The Standard Deviation's of 10x10 pixel sub images from the whole image are first calculated. The mean of the lowest 10% of these standard deviations defines the Image Noise. A pixel is replaced with the median value of the 3x3 array centered on the pixel concerned if the pixel is greater than the median plus the Image Noise times a given multiplication factor (defined by the user) AND six or more of the nearest neighbours (contained within the 3x3 array) are below the threshold.

Note: The spurious noise filters should NEVER be used in conjunction with Photon counting mode and not all cameras support real-time processing (this can be queried through [GetCapabilities](#))



**SECTION 10 - EXAMPLES****INTRODUCTION**

We present here a number of examples of controlling Andor SDK to acquire data. Source code for each example can be found on the disk. Each example is presented in three different languages, Visual Basic, LabVIEW and C.

The examples were devised to demonstrate the wide versatility and range of the data acquisition mechanisms available with Andor SDK. The examples are all based on variations of the flowchart described on the following pages.

The flowchart is a basic demonstration of how to set up and control the Andor system to acquire data with the appropriate Andor SDK commands located just to the right of the flowchart.

The flowchart is divided into three sections, the first deals with the initialization of the system and controlling the sensor temperature. The second section deals with the data acquisition process while the third illustrates the proper shutdown procedure.

**NOTE: Do not have more than one example or other SDK software (e.g. Andor Solis™, iQ™) running at the same time.**



## RUNNING THE EXAMPLES

## C

The C examples are supplied as ready to run executable files (both 32-bit and 64-bit) and with complete source code. The code has been tested with Microsoft VC++ 5.0 and Borland Developer Studio 2006.

You are free to modify the example source code in the “C” directory to be compatible with your own compiler.

In order to compile your own C or C++ programs you will need the following files:

- **ATMCD32D.H** C Header File
- **ATMCD32D.LIB / ATMCD64D.LIB** Import Library (Borland compatible)
- **ATMCD32M.LIB / ATMCD64M.LIB** Import Library (Microsoft compatible)

## LabVIEW

The LabVIEW examples are contained in the sub-directory “LabVIEW” of the installation directory. The LabVIEW examples are in the form of VI's and must be run through LabVIEW 7.0 or higher (32-bit).

## Visual Basic

The Visual Basic examples are contained in the sub-directory **VBasic** of the installation directory. Each example contains all the source code, forms and project files to re-build executable files.

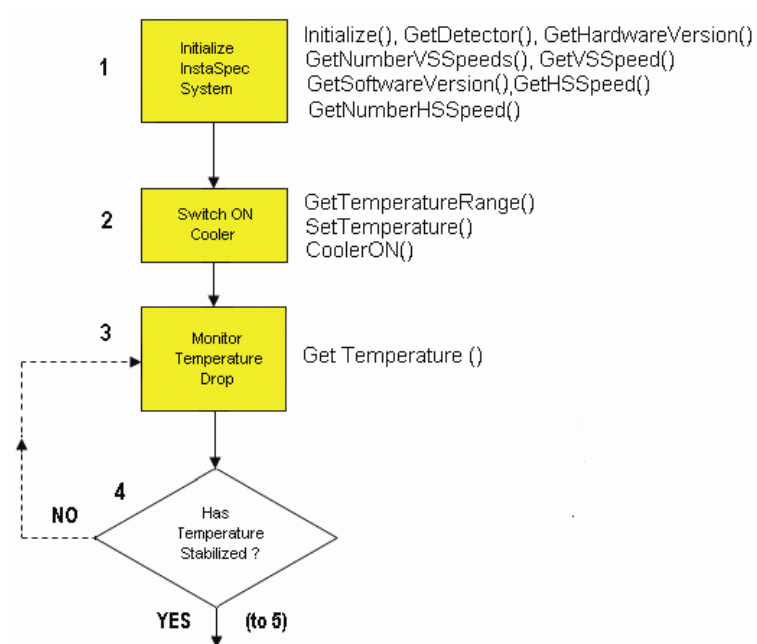
Each of the Visual Basic examples comes with a ready to run executable file.

When building you own projects you must include the file **ATMCD32D.BAS**. This file contains the Andor SDK function prototypes for interfacing with the dynamic link library **ATMCD32D.DLL**

**NOTE: To run any of the examples you will need the following files:**

- **ATMCD32D.DLL / ATMCD64D.DLL** (depending on system)
- **DETECTOR.INI**: Contains initialization information (not required on iDus, iXon or Newton systems)

## FLOW CHART OF THE FUNCTION CALLS NEEDED TO CONTROL ANDOR CAMERA



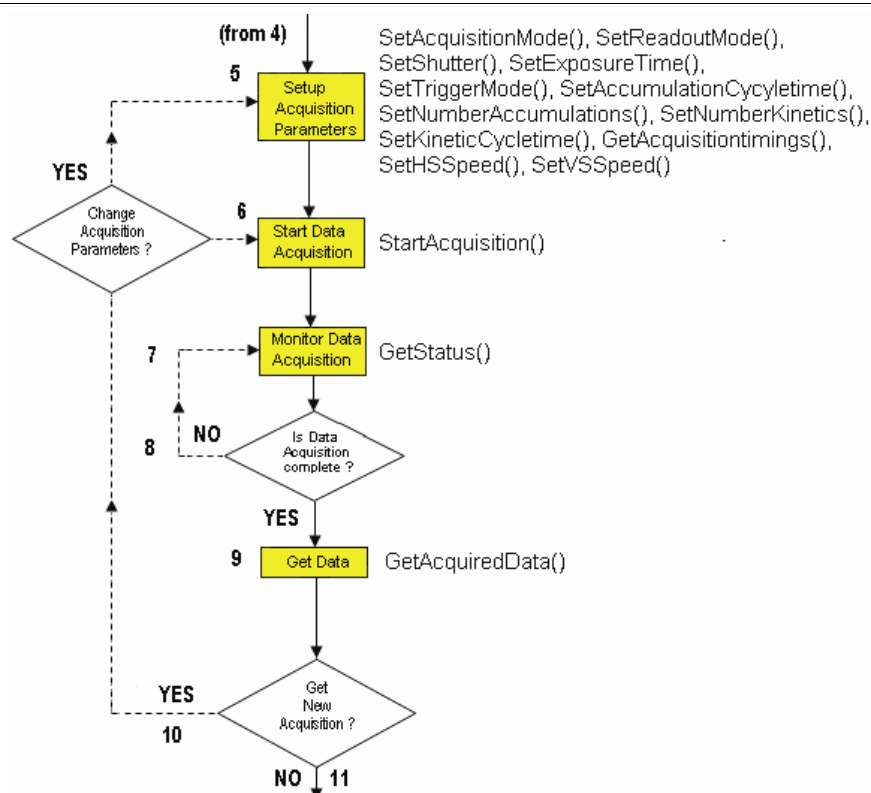
1. The application initializes the camera then obtains information relating to the capabilities of the system.

**NOTE: The Andor SDK takes several seconds to Auto-Calibrate the on-board A/D converter whenever the Initialize function is called.**

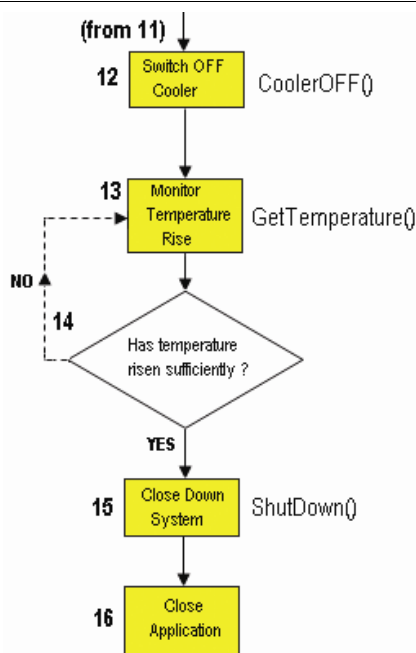
2. The CCD sensor's operating temperature is set to some value within the allowed temperature range (e.g. -2 °C), and the cooler is switched on.

3 - 4. The current temperature is periodically monitored to check if the temperature has stabilized to the set value. The temperature can take several minutes to stabilize and with the appropriate programming techniques the user should be able to set up other tasks, as illustrated in the C examples.

Once the CCD sensor temperature has stabilized you can start acquiring data.



5. The acquisition parameters are programmed to match the specifications of the user, e.g. acquisition mode (single scan etc.), readout mode (full vertical binning etc.) and the trigger mode (Internal etc.).
6. You are now ready to start an acquisition.
- 7 - 8. The current acquisition status is periodically monitored to check if the data acquisition is complete.
9. After a successful data acquisition the data is transferred from the Andor driver into the application.
10. At this point the user may choose to capture a new acquisition or not.
11. Yes: capture a new scan. The user may decide to alter the acquisition set-up (e.g. change the exposure time) or simply use the current parameters.



**12.** When the user has completely finished acquiring data the shutdown procedure is started. The cooler is switched off. It is important to control both the heating and cooling rates of the CCD sensor otherwise the temperature gradients may damage the sensor. Thus it is **highly recommended** that the user uses the correct exiting procedure rather than, for example, simply switching off the computer.

**13 – 14.** The current temperature is periodically monitored to check if the temperature has risen to a sufficiently high value.

**15.** For Classic & ICCD systems wait until the temperature has risen above **-20°C**. The user may now shut down the Andor SDK system.

**16.** The program releases any memory still being used and exits the application.

**Cooler**

This example is different from all the previous examples in that its main goal is not to acquire data but to demonstrate the proper use of the cooling capabilities of the Andor SDK System. It includes the taking of a single FVB scan for completeness. This example is an expanded version of Example 1.

**DDG™**

The digital delay generator for iStar systems is demonstrated by this example. The user can control the gate times, gain level and integrate on chip parameters. The acquisition is set to a kinetic series of full vertically binned scans.

**EMCCD**

This example demonstrates acquisitions with an EMCCD detector, and in particular the Gain setting that can be applied to these devices

**Events**

The events example shows the alternative method of handling acquisitions, using Windows events to signal when the acquisition is complete instead of timer polling used in other examples. A kinetic series of full vertically binned scans is taken and the events signalled by the Andor SDK are indicated in the status window as they arrive

**Frame Transfer**

The frame transfer example is similar to the kinetics example, except that the accumulate cycle and kinetic series times can not be set independently, as they rely solely on the exposure time setting

**FVB**

This example illustrates the simplest mode of operation of the Andor system. It initializes the system and then acquires a single spectrum using the Full Vertical Binning readout mode. The user is given the ability to specify the trigger mode and exposure time (as the examples progress the user is given more and more options to set).

**Image**

This example is slightly more complicated than the first example with the addition of a shutter. In general a shutter must be used whenever the readout mode is anything other than Full Vertical Binning. For this example we will use the readout mode Image with the horizontal and vertical binning set to 1. The user is given the ability to specify the exposure time, trigger mode and some of the shutter details.

**Image Binning**

This example shows how to acquire single images with possible binning. The sub image to be read can be entered and the binning for each dimension can be set.

**Kinetics/Accumulate**

For this example we go back to the Full Vertical Binning readout mode as in example 1. However, we introduce a new acquisition mode, Kinetic Series. Kinetic Series is the most complex acquisition mode with up to 5 parameters to be set. The user is given the ability to specify the number of accumulations per scan, accumulation cycle time, number of scans in Kinetic series, Kinetic cycle time and the exposure time.

### Kinetic Image

This example is a combination of the imaging and kinetic examples.

### Multi-Track

This example illustrates the use of the Multi-Track readout mode. The acquisition mode is constrained to Single Scan and uses internal triggering. As this example uses imaging we again use a shutter. The user has the ability to specify both the shutter and Multi-Track parameters

### Random-Track

This example is similar to **Multi-Track** readout mode as described above. The user has the ability to add/select their own track parameters, i.e. Start & Stop, number of tracks (Maximum of 20 tracks for iDus) and they can also select the shutter parameters.

### Spool

This example demonstrates the use of spooling to disk. Spooling can be enabled or disabled and the stem of the created spool files can be entered. The acquisition mode is set to Kinetic Series

### Continuous mode

This is a simple example to demonstrate the iCam functionality that some cameras may have.

## SECTION 11 - FUNCTIONS

This section provides details of the various Functions available.

### AbortAcquisition

#### unsigned int WINAPI AbortAcquisition(void)

<b>Description</b>	This function aborts the current acquisition if one is active.	
<b>Parameters</b>	NONE	
<b>Return</b>	unsigned int	
	DRV_SUCCESS	Acquisition aborted.
	DRV_NOT_INITIALIZED	System not initialized.
	DRV_IDLE	The system is not currently acquiring.
	DRV_VXDNOTINSTALLED	VxD not loaded.
	DRV_ERROR_ACK	Unable to communicate with card.

**See also** [GetStatus](#) [StartAcquisition](#)

### CancelWait

#### unsigned int WINAPI CancelWait(void)

<b>Description</b>	This function restarts a thread which is sleeping within the <a href="#">WaitForAcquisition</a> function. The sleeping thread will return from <a href="#">WaitForAcquisition</a> with a value not equal to DRV_SUCCESS.	
<b>Parameters</b>	NONE	
<b>Return</b>	unsigned int	
	DRV_SUCCESS	Thread restarted successfully.

**See also** [WaitForAcquisition](#)

### unsigned int WINAPI CoolerOFF(void)

**Description** Switches OFF the cooling. The rate of temperature change is controlled in some models until the temperature reaches 0°. Control is returned immediately to the calling application.

**Parameters** NONE

**Return** unsigned int

DRV_SUCCESS	Temperature controller switched OFF.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with card.
DRV_NOT_SUPPORTED	Camera does not support switching cooler off.

**See also** [CoolerON](#), [SetTemperature](#), [GetTemperature](#), [GetTemperatureF](#), [GetTemperatureRange](#), [GetStatus](#)

**NOTE:** Not available on Luca R cameras – always cooled to -20.

**NOTE:** (Classic & ICCD only)

1. When the temperature control is switched off the temperature of the sensor is gradually raised to 0°C to ensure no thermal stresses are set up in the sensor.
2. When closing down the program via [ShutDown](#) you must ensure that the temperature of the detector is above -20°C, otherwise calling [ShutDown](#) while the detector is still cooled will cause the temperature to rise faster than certified.



**unsigned int WINAPI CoolerON(void)**

**Description** Switches ON the cooling. On some systems the rate of temperature change is controlled until the temperature is within 3° of the set value. Control is returned immediately to the calling application.

**Parameters** NONE

**Return** unsigned int

DRV_SUCCESS	Temperature controller switched ON.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with card.

**See also** [CoolerOFF](#), [SetTemperature](#), [GetTemperature](#), [GetTemperatureF](#), [GetTemperatureRange](#), [GetStatus](#)

### NOTE:

The temperature to which the detector will be cooled is set via [SetTemperature](#). The temperature stabilization is controlled via hardware, and the current temperature can be obtained via [GetTemperature](#). The temperature of the sensor is gradually brought to the desired temperature to ensure no thermal stresses are set up in the sensor.

Can be called for certain systems during an acquisition. This can be tested for using [GetCapabilities](#).

## DemosaicImage

**unsigned int WINAPI DemosaicImage(WORD\* grey, WORD\* red, WORD\* green, WORD\* blue, ColorDemosaicInfo\* info)**

**Description**      **For colour sensors only**

Demosaics an image taken with a CYMG CCD into RGB using the parameters stored in info. Below is the ColorDemosaicInfo structure definition and a description of its members:

```
typedef struct COLORDEMOSAICINFO {
    int iX; // Number of X pixels. Must be >2.
    int iY; // Number of Y pixels. Must be >2.
    int iAlgorithm; // Algorithm to demosaic image.
    int iXPhase; // First pixel in data (Cyan or Yellow/Magenta or Green).
    int iYPhase; // First pixel in data (Cyan or Yellow/Magenta or Green).
    int iBackground; // Background to remove from raw data when demosaicing.
} ColorDemosaicInfo;
```

- **iX** and **iY** are the image dimensions. The number of elements in the input red, green and blue arrays is **iX** x **iY**.
- **iAlgorithm** sets the algorithm to use: 0 for a 2x2 matrix demosaic algorithm or 1 for a 3x3 one.

The CYMG CCD pattern can be broken into cells of 2x4 pixels, e.g.:



- **iXPhase** and **iYPhase** store what colour is the bottom-left pixel.
- **iBackground** sets the numerical value to be removed from every pixel in the input image before demosaicing is done.

**Parameters**

WORD\* grey: pointer to image to demosaic

WORD\* red: pointer to the red plane storage allocated by the user.

WORD\* green: pointer to the green plane storage allocated by the user.

WORD\* blue: pointer to the blue plane storage allocated by the user.

ColorDemosaicInfo\* info: pointer to demosaic information structure.

**Return**

unsigned int	
DRV_SUCCESS	Image demosaiced
DRV_P1INVALID	Invalid pointer (i.e. NULL).
DRV_P2INVALID	Invalid pointer (i.e. NULL).
DRV_P3INVALID	Invalid pointer (i.e. NULL).
DRV_P4INVALID	Invalid pointer (i.e. NULL).
DRV_P5INVALID	One or more parameters in info is out of range

**See also**      [GetMostRecentColorImage16](#), [WhiteBalance](#)

## EnableKeepCleans

### unsigned int WINAPI EnableKeepCleans (int mode)

<b>Description</b>	<p>This function is only available on certain cameras operating in FVB external trigger mode. It determines if the camera keep clean cycle will run between acquisitions.</p> <p>When keep cleans are disabled in this way the exposure time is effectively the exposure time between triggers.</p> <p>The Keep Clean cycle is enabled by default.</p> <p>The feature capability AC_FEATURES_KEEPCLEANCONTROL determines if this function can be called for the camera.</p>		
<b>Parameters</b>	<p>int mode: mode</p> <p>0 OFF</p> <p>1 ON</p>		
<b>Return</b>	unsigned int		
	DRV_SUCCESS	Keep clean cycle mode set.	
	DRV_NOT_INITIALIZED	System not initialized.	
	DRV_NOT_AVAILABLE	Feature not available.	
<b>See also</b>	<a href="#">GetCapabilities</a>		
<b>NOTE:</b>	<b>Currently only available on Newton and iKon cameras operating in FVB external trigger mode.</b>		

## EnableSensorCompensation

### unsigned int WINAPI EnableSensorCompensation (int iMode)

<b>Description</b>	This function enables/disables the on camera sensor compensation.		
<b>Parameters</b>	<p>int iMode: mode.</p> <p>0 OFF</p> <p>1 ON</p>		
<b>Return</b>	unsigned int		
	DRV_SUCCESS	Mode successfully selected.	
	DRV_NOT_INITIALIZED	System not initialized.	
	DRV_ACQUIRING	Acquisition in progress.	
	DRV_NOT_SUPPORTED	Feature not supported on this camera.	
	DRV_P1INVALID	Requested mode isn't valid.	
<b>See also</b>	<a href="#">GetCapabilities</a>		
<b>NOTE</b>	<p><b>Not all cameras support this feature. To check if your camera supports this feature use the <a href="#">GetCapabilities</a> function to check the ulFeature for AC_FEATURES_SENSOR_COMPENSATION.</b></p>		

## FreeInternalMemory

### unsigned int WINAPI FreeInternalMemory(void)

**Description** The FreeInternalMemory function will deallocate any memory used internally to store the previously acquired data. Note that once this function has been called, data from last acquisition cannot be retrived.

**Parameters** NONE

**Return** unsigned int

DRV_SUCCESS	Memory freed.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with card.

**See also** [GetImages](#), [PrepareAcquisition](#)

## Filter\_GetAveragingFactor

### unsigned int WINAPI Filter\_GetAveragingFactor (int \* averagingFactor)

**Description** Returns the current averaging factor value.

**Parameters** int \* averagingFactor: The current averaging factor value.

**Return** unsigned int

DRV_SUCCESS	Averaging factor returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_P1INVALID	Invalid averagingFactor (i.e. NULL pointer).

**See also** [Filter\\_SetAveragingFactor](#)

## Filter\_GetAveragingFrameCount

### unsigned int WINAPI Filter\_GetAveragingFrameCount (int \* frames)

**Description** Returns the current frame count value.

**Parameters** int \* frames: The current frame count value.

**Return** unsigned int

DRV_SUCCESS	Frame count returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_P1INVALID	Invalid frame count (i.e. NULL pointer).

**See also** [Filter\\_SetAveragingFrameCount](#)

## Filter\_GetDataAveragingMode

**unsigned int WINAPI Filter\_GetDataAveragingMode (int \* mode)**

**Description** Returns the current averaging mode.

**Parameters** int \* mode: The current averaging mode.

**Return** unsigned int

DRV_SUCCESS	Averaging mode returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_P1INVALID	Invalid threshold (i.e. NULL pointer).

**See also** [Filter\\_SetDataAveragingMode](#)

---

## Filter\_GetMode

**unsigned int WINAPI Filter\_GetMode (unsigned int \* mode)**

**Description** Returns the current Noise Filter mode.

**Parameters** unsigned int \* mode: Noise Filter mode.

**Return** unsigned int

DRV_SUCCESS	Filter mode returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_NOT_SUPPORTED	Noise Filter processing not available for this camera.
DRV_P1INVALID	Invalid mode (i.e. NULL pointer)

**See also** [Filter\\_SetMode](#)

---

## Filter\_GetThreshold

**unsigned int WINAPI Filter\_GetThreshold (float \* threshold)**

**Description** Returns the current Noise Filter threshold value.

**Parameters** float \* threshold: The current threshold value.

**Return** unsigned int

DRV_SUCCESS	Threshold returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_NOT_SUPPORTED	Noise Filter processing not available for this camera.
DRV_P1INVALID	Invalid threshold (i.e. NULL pointer).

**See also** [Filter\\_SetThreshold](#)

---

## Filter\_SetAveragingFactor

**unsigned int WINAPI Filter\_SetAveragingFactor (int averagingFactor)**

**Description** Sets the averaging factor to be used with the recursive filter. For information on the various data averaging filters available see [DATA AVERAGING FILTERS](#) in the Special Guides section of the manual.

**Parameters** int averagingFactor: The averaging factor to use.

**Return**

unsigned int	
DRV_SUCCESS	Averaging factor set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_P1INVALID	Invalid averagingFactor.

**See also** [Filter\\_GetAveragingFactor](#)

---

## Filter\_SetAveragingFrameCount

**unsigned int WINAPI Filter\_SetAveragingFrameCount (int frames)**

**Description** Sets the number of frames to be used when using the frame averaging filter. For information on the various data averaging filters available see [DATA AVERAGING FILTERS](#) in the Special Guides section of the manual.

**Parameters** int frames: Number of frames to be averaged.

**Return**

unsigned int	
DRV_SUCCESS	Averaging frame count set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_P1INVALID	Invalid frame count.

**See also** [Filter\\_GetAveragingFrameCount](#)

---

## Filter\_SetDataAveragingMode

**unsigned int WINAPI Filter\_SetDataAveragingMode (int mode)**

**Description** Sets the current data averaging mode. For information on the various data averaging filters available see [DATA AVERAGING FILTERS](#) in the Special Guides section of the manual.

**Parameters** int mode: The averaging factor mode to use.

Valid options are:

- 0 – No Averaging Filter
- 5 – Recursive Averaging Filter
- 6 – Frame Averaging Filter

**Return** unsigned int

DRV_SUCCESS	Averaging mode set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_P1INVALID	Invalid mode.

**See also** [Filter\\_GetDataAveragingMode](#)

---

## Filter\_SetMode

**unsigned int WINAPI Filter\_SetMode (unsigned int mode)**

**Description** Set the Noise Filter to use; For information on the various spurious noise filters available see [SPURIOUS NOISE FILTERS](#) in the Special Guides section of the manual.

**Parameters** unsigned int mode: Filter mode to use.

Valid options are:

- 0 – No Filter
- 1 – Median Filter
- 2 – Level Above Filter
- 3 – Interquartile Range Filter
- 4 – Noise Threshold Filter

**Return** unsigned int

DRV_SUCCESS	Filter set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_NOT_SUPPORTED	Noise Filter processing not available for this camera.
DRV_P1INVALID	Invalid mode.

**See also** [Filter\\_GetMode](#)

---

### unsigned int WINAPI Filter\_SetThreshold (float threshold)

**Description** Sets the threshold value for the Noise Filter. For information on the various spurious noise filters available see [SPURIOUS NOISE FILTERS](#) in the Special Guides section of the manual.

**Parameters** float threshold: Threshold value used to process image.

Valid values are: 0 – 65535 for Level Above filter.

0 – 10 for all other filters.

unsigned int

DRV\_SUCCESS Threshold set.

DRV\_NOT\_INITIALIZED System not initialized.

DRV\_NOT\_SUPPORTED Noise Filter processing not available for this camera.

DRV\_P1INVALID Invalid threshold.

**See also** [Filter\\_GetThreshold](#)

## GetAcquiredData

### unsigned int WINAPI GetAcquiredData(at\_32\* arr, unsigned long size)

**Description** This function will return the data from the last acquisition. The data are returned as long integers (32-bit signed integers). The “array” must be large enough to hold the complete data set.

**Parameters** at\_32\* arr: pointer to data storage allocated by the user.

unsigned long size: total number of pixels.

**Return** unsigned int

DRV\_SUCCESS Data copied.

DRV\_NOT\_INITIALIZED System not initialized.

DRV\_ACQUIRING Acquisition in progress.

DRV\_ERROR\_ACK Unable to communicate with card.

DRV\_P1INVALID Invalid pointer (i.e. NULL).

DRV\_P2INVALID Array size is incorrect.

DRV\_NO\_NEW\_DATA No acquisition has taken place

**See also** [GetStatus](#), [StartAcquisition](#), [GetAcquiredData16](#)



## GetAcquiredData16

**unsigned int WINAPI GetAcquiredData16(WORD\* arr, unsigned long size)**

**Description** 16-bit version of the [GetAcquiredData](#) function. The “array” must be large enough to hold the complete data set.

**Parameters** WORD\* arr: pointer to data storage allocated by the user.

long size: total number of pixels.

**Return** unsigned int

DRV_SUCCESS	Data copied.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with card.
DRV_P1INVALID	Invalid pointer (i.e. NULL).
DRV_P2INVALID	Array size is incorrect.
DRV_NO_NEW_DATA	No acquisition has taken place

**See also** [GetStatus](#), [StartAcquisition](#), [GetAcquiredData](#)

## GetAcquiredFloatData

**unsigned int WINAPI GetAcquiredFloatData (float\* arr, unsigned long size)**

**Description** THIS FUNCTION IS RESERVED.

### GetAcquisitionProgress

**unsigned int WINAPI GetAcquisitionProgress(long\* acc, long\* series)**

**Description** This function will return information on the progress of the current acquisition. It can be called at any time but is best used in conjunction with [SetDriverEvent](#).

The values returned show the number of completed scans in the current acquisition.

If 0 is returned for both accum and series then either:-

- No acquisition is currently running
- The acquisition has just completed
- The very first scan of an acquisition has just started and not yet completed

[GetStatus](#) can be used to confirm if the first scan has just started, returning DRV\_ACQUIRING, otherwise it will return DRV\_IDLE.

For example, if *accum*=2 and *series*=3 then the acquisition has completed 3 in the series and 2 accumulations in the 4 scan of the series.

**Parameters** long\* acc: returns the number of accumulations completed in the current kinetic scan.  
long\* series: return the number of kinetic scans completed

**Return** unsigned int  
DRV\_SUCCESS Number of accumulation and series scans completed.  
DRV\_NOT\_INITIALIZED System not initialized.

**See also** [SetAcquisitionMode](#), [SetNumberAccumulations](#), [SetNumberKinetics](#), [SetDriverEvent](#)

## GetAcquisitionTimings

**unsigned int WINAPI GetAcquisitionTimings(float\* exposure, float\* accumulate, float\* kinetic)**

**Description** This function will return the current “valid” acquisition timing information. This function should be used after all the acquisitions settings have been set, e.g. SetExposureTime, SetKineticCycleTime and SetReadMode etc. The values returned are the actual times used in subsequent acquisitions.

This function is required as it is possible to set the exposure time to 20ms, accumulate cycle time to 30ms and then set the readout mode to full image. As it can take 250ms to read out an image it is not possible to have a cycle time of 30ms.

**Parameters** float\* exposure: valid exposure time in seconds  
float\* accumulate: valid accumulate cycle time in seconds  
float\* kinetic: valid kinetic cycle time in seconds

**Return** unsigned int  
DRV\_SUCCESS Timing information returned.  
DRV\_NOT\_INITIALIZED System not initialized.  
DRV\_ACQUIRING Acquisition in progress.  
DRV\_INVALID\_MODE Acquisition or readout mode is not available.

**See also** [SetAccumulationCycleTime](#), [SetAcquisitionMode](#), [SetExposureTime](#), [SetHSSpeed](#), [SetKineticCycleTime](#), [SetMultiTrack](#), [SetNumberAccumulations](#), [SetNumberKinetics](#), [SetReadMode](#), [SetSingleTrack](#), [SetTriggerMode](#), [SetVSSpeed](#)

## GetAdjustedRingExposureTimes

**unsigned int WINAPI GetAdjustedRingExposureTimes (int inumTimes, float \* fptimes)**

**Description** This function will return the actual exposure times that the camera will use. There may be differences between requested exposures and the actual exposures.

**Parameters** int inumTimes: Numbers of times requested.  
float \* fptimes: Pointer to an array large enough to hold \_inumTimes floats.

**Return** unsigned int  
DRV\_SUCCESS Success.  
DRV\_NOT\_INITIALIZED System not initialized  
DRV\_P1INVALID Invalid number of exposures requested

**See also** [GetNumberRingExposureTimes](#), [SetRingExposureTimes](#)

## GetAlIDMAData

unsigned int WINAPI GetAlIDMAData (at\_32\* arr, unsigned long size)

**Description** THIS FUNCTION IS RESERVED.

## GetAmpDesc

unsigned int WINAPI GetAmpDesc (int index , char\* name, int len)

**Description** This function will return a string with an amplifier description. The amplifier is selected using the index. The SDK has a string associated with each of its amplifiers. The maximum number of characters needed to store the amplifier descriptions is 21. The user has to specify the number of characters they wish to have returned to them from this function.

**Parameters**

Int index: The amplifier index.

char\* name: A user allocated array of characters for storage of the description.

int len: The length of the user allocated character array.

**Return**

unsigned int	
DRV_SUCCESS	Description returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_P1INVALID	The amplifier index is not valid.
DRV_P2INVALID	The desc pointer is null.
DRV_P3INVALID	The len parameter is invalid (less than 1)

**See also** [GetNumberAmp](#)

## GetAmpMaxSpeed

**unsigned int WINAPI GetAmpMaxSpeed (int index , float\* speed)**

**Description** This function will return the maximum available horizontal shift speed for the amplifier selected by the index parameter.

**Parameters** Int index:amplifier index  
float\* speed:horizontal shift speed

**Return** unsigned int  
DRV\_SUCCESS Speed returned.  
DRV\_NOT\_INITIALIZED System not initialized.  
DRV\_P1INVALID The amplifier index is not valid

**See also** [GetNumberAmp](#)

## GetAvailableCameras

**unsigned int WINAPI GetAvailableCameras(long\* totalCameras)**

**Description** This function returns the total number of Andor cameras currently installed. It is possible to call this function before any of the cameras are initialized.

**Parameters** long\* totalCameras: the number of cameras currently installed

**Return** unsigned int  
DRV\_SUCCESS Number of available cameras returned.  
DRV\_GENERAL\_ERRORS An error occurred while obtaining the number of available cameras.

**See also** [SetCurrentCamera](#), [GetCurrentCamera](#), [GetCameraHandle](#)

## GetBackground

**unsigned int WINAPI GetBackground (at\_32\* arr, unsigned long size)**

**Description** THIS FUNCTION IS RESERVED.

## GetBaselineClamp

**unsigned int WINAPI GetBaselineClamp(int\* state)**

**Description** This function returns the status of the baseline clamp functionality. With this feature enabled the baseline level of each scan in a kinetic series will be more consistent across the sequence.

**Parameters** int \* state: Baseline clamp functionality Enabled/Disabled

1 – Baseline Clamp Enabled

0 – Baseline Clamp Disabled

**Return** unsigned int

DRV_SUCCESS	Parameters set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_NOT_SUPPORTED	Baseline Clamp not supported on this camera
DRV_P1INVALID	State parameter was not zero or one.

**See also** [SetBaselineClamp](#), [SetBaselineOffset](#)

## GetBitDepth

**unsigned int WINAPI GetBitDepth(int channel, int\* depth)**

**Description** This function will retrieve the size in bits of the dynamic range for any available AD channel.

**Parameters** int channel: the AD channel.  
int\* depth: dynamic range in bits

**Return** unsigned int

DRV_SUCCESS	Depth returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_P1INVALID	Invalid channel

**See also** [GetNumberADChannels](#), [SetADChannel](#)

## GetCameraEventStatus

**unsigned int WINAPI GetCameraEventStatus (DWORD \* camStatus)**

<b>Description</b>	This function will return if the system is exposing or not.		
<b>Parameters</b>	DWORD * camStatus: The status of the firepulse will be returned that the firepulse is low  0 Fire pulse low  1 Fire pulse high		
<b>Return</b>	unsigned int		
	DRV_SUCCESS	Status returned	
	DRV_NOT_INITIALIZED	System not initialized	
<b>See also</b>	<a href="#">SetAcqStatusEvent</a> , <a href="#">SetPCIMode</a>		
<b>NOTE</b>	<b>This is only supported by the CCI23 card.</b>		

## GetCameraHandle

**unsigned int WINAPI GetCameraHandle(long cameraIndex, long\* cameraHandle)**

<b>Description</b>	This function returns the handle for the camera specified by cameraIndex. When multiple Andor cameras are installed the handle of each camera must be retrieved in order to select a camera using the <a href="#">SetCurrentCamera</a> function.  The number of cameras can be obtained using the GetAvailableCameras function.		
<b>Parameters</b>	long cameraIndex: index of any of the installed cameras. <div>Valid values      0 to NumberCameras-1 where NumberCameras is the value returned by the <a href="#">GetAvailableCameras</a> function.</div> long* cameraHandle: handle of the camera.		
<b>Return</b>	unsigned int <div>DRV_SUCCESS                      Camera handle returned.</div> <div>DRV_P1INVALID                   Invalid camera index.</div>		
<b>See also</b>	<a href="#">SetCurrentCamera</a> , <a href="#">GetAvailableCameras</a> , <a href="#">GetCurrentCamera</a>		

## GetCameraInformation

**unsigned int WINAPI GetCameraInformation (int index, long \* information)**

**Description** This function will return information on a particular camera denoted by the index.

**Parameters** Int index: (reserved)

Long\* information: current state of camera

**Bit:1** 1 - USB camera present

**Bit:2** 1 - All dlls loaded properly

**Bit:3** 1 - Camera Initialized correctly

**Return** unsigned int

DRV\_SUCCESS Driver status return

DRV\_VXDNOTINSTALLED Driver not installed

DRV\_USBERROR USB device error

**See also** [GetCameraHandle](#), [GetHeadModel](#), [GetCameraSerialNumber](#), [GetCapabilities](#)

**NOTE** Only available in iDus. The index parameter is not used at present so should be set to 0. For any camera except the iDus The value of information following a call to this function will be zero.

## GetCameraSerialNumber

**unsigned int WINAPI GetCameraSerialNumber (int\* number)**

**Description** This function will retrieve camera's serial number.

**Parameters** int \*number: Serial Number.

**Return** unsigned int

DRV\_SUCCESS Serial Number returned.

DRV\_NOT\_INITIALIZED System not initialized.

**See also** [GetCameraHandle](#), [GetHeadModel](#), [GetCameraInformation](#), [GetCapabilities](#)



**unsigned int WINAPI GetCapabilities(AndorCapabilities\* caps)**

**Description** This function will fill in an AndorCapabilities structure with the capabilities associated with the connected camera. Before passing the address of an AndorCapabilities structure to the function the ulSize member of the structure should be set to the size of the structure. In C++ this can be done with the line:

**caps->ulSize = sizeof(AndorCapabilities);**

Individual capabilities are determined by examining certain bits and combinations of bits in the member variables of the AndorCapabilities structure. The next few pages contain a summary of the capabilities currently returned.

**Parameters** Andor capabilities\* caps: the capabilities structure to be filled in.

**Return** unsigned int  
DRV\_NOT\_INITIALIZED System not initialized  
DRV\_SUCCESS Capabilities returned.  
DRV\_P1INVALID Invalid caps parameter (i.e. NULL).

**See also** [GetCameraHandle](#), [GetCameraSerialNumber](#), [GetHeadModel](#), [GetCameraInformation](#)

**Acquisition Modes - AndorCapabilities Member: ulAcqModes****Capability:** AC\_ACQMODE\_SINGLE**Description:** Single Scan Acquisition Mode available using [SetAcquisitionMode](#).**Bit:** 0**State:** 1**Capability:** AC\_ACQMODE\_VIDEO**Description:** Video (Run Till Abort) Acquisition Mode available using [SetAcquisitionMode](#).**Bit:** 1**State:** 1**Capability:** AC\_ACQMODE\_ACCUMULATE**Description:** Accumulation Acquisition Mode available using [SetAcquisitionMode](#).**Bit:** 2**State:** 1**Capability:** AC\_ACQMODE\_KINETIC**Description:** Kinetic Series Acquisition Mode available using [SetAcquisitionMode](#).**Bit:** 3**State:** 1**Capability:** AC\_ACQMODE\_FRAMETRANSFER**Description:** Frame Transfer Acquisition Mode available using [SetAcquisitionMode](#).**Bit:** 4**State:** 1**Capability:** AC\_ACQMODE\_FASTKINETICS**Description:** Fast Kinetics Acquisition Mode available using [SetAcquisitionMode](#).**Bit:** 5**State:** 1**Capability:** AC\_ACQMODE\_OVERLAP**Description:** Overlap Acquisition Mode available using [SetAcquisitionMode](#).**Bit:** 6**State:** 1

**Read Modes - AndorCapabilities Member: ulReadModes****Capability:** AC\_READMODE\_FULLIMAGE**Description:** Full Image Read Mode available using [SetReadMode](#).**Bit:** 0**State:** 1**Capability:** AC\_READMODE\_SUBIMAGE**Description:** Sub Image Read Mode available using [SetReadMode](#).**Bit:** 1**State:** 1**Capability:** AC\_READMODE\_SINGLETRACK**Description:** Single track Read Mode available using [SetReadMode](#).**Bit:** 2**State:** 1**Capability:** AC\_READMODE\_FVB**Description:** Full Vertical Binning Read Mode available using [SetReadMode](#).**Bit:** 3**State:** 1**Capability:** AC\_READMODE\_MULTITRACK**Description:** Multi Track Read Mode available using [SetReadMode](#).**Bit:** 4**State:** 1**Capability:** AC\_READMODE\_RANDOMTRACK**Description:** Random-Track Read Mode available using [SetReadMode](#).**Bit:** 5**State:** 1

**Read Modes - AndorCapabilities Member: ulFTReadModes****Capability:** AC\_READMODE\_FULLIMAGE**Description:** Full Image Read Mode available using [SetReadMode](#).**Bit:** 0**State:** 1**Capability:** AC\_READMODE\_SUBIMAGE**Description:** Sub Image Read Mode available using [SetReadMode](#).**Bit:** 1**State:** 1**Capability:** AC\_READMODE\_SINGLETRACK**Description:** Single track Read Mode available using [SetReadMode](#).**Bit:** 2**State:** 1**Capability:** AC\_READMODE\_FVB**Description:** Full Vertical Binning Read Mode available using [SetReadMode](#).**Bit:** 3**State:** 1**Capability:** AC\_READMODE\_MULTITRACK**Description:** Multi Track Read Mode available using [SetReadMode](#).**Bit:** 4**State:** 1**Capability:** AC\_READMODE\_RANDOMTRACK**Description:** Random-Track Read Mode available using [SetReadMode](#).**Bit:** 5**State:** 1

## Trigger Modes - AndorCapabilities Member: ulTriggerModes

**Capability:** AC\_TRIGGERMODE\_INTERNAL

**Description:** Internal Trigger Mode available using [SetTriggerMode](#).

**Bit:** 0

**State:** 1

**Capability:** AC\_TRIGGERMODE\_EXTERNAL

**Description:** External Trigger Mode available using [SetTriggerMode](#).

**Bit:** 1

**State:** 1

**Capability:** AC\_TRIGGERMODE\_EXTERNAL\_FVB\_EM

**Description:** External FVB EM Trigger Mode available using [SetTriggerMode](#).

**Bit:** 2

**State:** 1

**Capability:** AC\_TRIGGERMODE\_CONTINUOUS

**Description:** Continuous Trigger Mode available using [SetTriggerMode](#).

**Bit:** 3

**State:** 1

**Capability:** AC\_TRIGGERMODE\_EXTERNALSTART

**Description:** External Start Trigger Mode available using [SetTriggerMode](#).

**Bit:** 4

**State:** 1

**Capability:** AC\_TRIGGERMODE\_BULB

**Description:** Bulb Trigger Mode available using [SetTriggerMode](#).

**Bit:** 5

**State:** 1

Note: This capability is deprecated by AC\_TRIGGERMODE\_EXTERNALEXPOSURE.

**Capability:** AC\_TRIGGERMODE\_EXTERNALEXPOSURE

**Description:** External Exposure Trigger Mode available using [SetTriggerMode](#).

**Bit:** 5

**State:** 1

**Capability:** AC\_TRIGGERMODE\_INVERTED

**Description:** Inverted Trigger Mode available using [SetTriggerInvert](#).

**Bit:** 6

**State:** 1

**Capability:** AC\_TRIGGERMODE\_EXTERNAL\_CHARGESHIFTING

**Description:** External Charge Shifting Trigger Mode available using [SetChargeShifting](#).

**Bit:** 7

**State:** 1

**Camera Type - AndorCapabilities Member: ulCameraType****Capability:** AC\_CAMERATYPE\_PDA**Description:** Camera is an Andor PDA.**Bits:** 0-31**Value:** 0**Capability:** AC\_CAMERATYPE\_IXON**Description:** Camera is an Andor iXon.**Bits:** 0-31**Value:** 1**Capability:** AC\_CAMERATYPE\_ICCD**Description:** Camera is an Andor ICCD.**Bits:** 0-31**Value:** 2**Capability:** AC\_CAMERATYPE\_EMCCD**Description:** Camera is an Andor EMCCD.**Bits:** 0-31**Value:** 3**Capability:** AC\_CAMERATYPE\_CCD**Description:** Camera is an Andor CCD.**Bits:** 0-31**Value:** 4**Capability:** AC\_CAMERATYPE\_ISTAR**Description:** Camera is an Andor iStar.**Bits:** 0-31**Value:** 5**Capability:** AC\_CAMERATYPE\_VIDEO**Description:** Camera is a third party camera.**Bits:** 0-31**Value:** 6

**Capability:** AC\_CAMERATYPE\_IDUS

**Description:** Camera is an Andor iDus.

**Bits:** 0-31

**Value:** 7

**Capability:** AC\_CAMERATYPE\_NEWTON

**Description:** Camera is an Andor Newton.

**Bits:** 0-31

**Value:** 8

**Capability:** AC\_CAMERATYPE\_SURCAM

**Description:** Camera is an Andor Surcam.

**Bits:** 0-31

**Value:** 9

**Capability:** AC\_CAMERATYPE\_USBICCD

**Description:** Camera is an Andor USB ICCD.

**Bits:** 0-31

**Value:** 10

**Capability:** AC\_CAMERATYPE\_LUCA

**Description:** Camera is an Andor Luca.

**Bits:** 0-31

**Value:** 11

**Capability:** AC\_CAMERATYPE\_RESERVED

**Description:** Reserved.

**Bits:** 0-31

**Value:** 12

**Capability:** AC\_CAMERATYPE\_IKON

**Description:** Camera is an Andor iKon.

**Bits:** 0-31

**Value:** 13

**Capability:** AC\_CAMERATYPE\_INGAAS

**Description:** Camera is an Andor InGaAs.

**Bits:** 0-31

**Value:** 14

**Capability:** AC\_CAMERATYPE\_IVAC

**Description:** Camera is an Andor iVac.

**Bits:** 0-31

**Value:** 15



**Capability:** AC\_CAMERATYPE\_CLARA

**Description:** Camera is an Andor Clara.

**Bits:** 0-31

**Value:** 17

**Capability:** AC\_CAMERATYPE\_USBISTAR

**Description:** Camera is an Andor USB iStar.

**Bits:** 0-31

**Value:** 18

**Capability:** AC\_CAMERATYPE\_IXONULTRA

**Description:** Camera is an Andor iXon Ultra.

**Bits:** 0-31

**Value:** 21

**Capability:** AC\_CAMERATYPE\_IVAC\_CCD

**Description:** Camera is an Andor iVac CCD.

**Bits:** 0-31

**Value:** 23

**Capability:** AC\_CAMERATYPE\_IKONXL

**Description:** Camera is an Andor iKon XL.

**Bits:** 0-31

**Value:** 28

**Capability:** AC\_CAMERATYPE\_ISTAR\_SCMOS

**Description:** Camera is an Andor iStar sCMOS.

**Bits:** 0-31

**Value:** 30

**Capability:** AC\_CAMERATYPE\_IKONLR

**Description:** Camera is an Andor iKon LR.

**Bits:** 0-31

**Value:** 31

All other values reserved.

**Pixel Mode - AndorCapabilities Member: ulPixelModes****Capability:** AC\_PIXELMODE\_8BIT**Description:** Camera can acquire in 8-bit mode.**Bit:** 0**State:** 1**Capability:** AC\_PIXELMODE\_14BIT**Description:** Camera can acquire in 14-bit mode.**Bit:** 1**State:** 1**Capability:** AC\_PIXELMODE\_16BIT**Description:** Camera can acquire in 16-bit mode.**Bit:** 2**State:** 1**Capability:** AC\_PIXELMODE\_32BIT**Description:** Camera can acquire in 32-bit mode.**Bit:** 3**State:** 1**Capability:** AC\_PIXELMODE\_MONO**Description:** Camera acquires data in grey scale.**Bits:** 16-31**Value:** 0**Capability:** AC\_PIXELMODE\_RGB**Description:** Camera acquires data in RGB mode.**Bits:** 16-31**Value:** 1**Capability:** AC\_PIXELMODE\_CMY**Description:** Camera acquires data in CMY mode.**Bits:** 16-31**Value:** 2

**Available Set Functions - AndorCapabilities Member: ulSetFunctions**

**Capability:** AC\_SETFUNCTION\_VREADOUT

**Description:** The vertical readout speed can be set with the [SetVSSpeed](#) function.

**Bit:** 0

**State:** 1

**Capability:** AC\_SETFUNCTION\_HREADOUT

**Description:** The horizontal readout speed can be set with the [SetHSSpeed](#) function.

**Bit:** 1

**State:** 1

**Capability:** AC\_SETFUNCTION\_TEMPERATURE

**Description:** The target temperature can be set using the [SetTemperature](#) function.

**Bit:** 2

**State:** 1

**Capability:** AC\_SETFUNCTION\_MCPGAIN (AC\_SETFUNCTION\_GAIN Deprecated)

**Description:** Gain through the [SetMCPGain](#) function is available.

**Bit:** 3

**State:** 1

**Capability:** AC\_SETFUNCTION\_EMCCDGAIN

**Description:** Gain through the [SetEMCCDGain](#) function is available.

**Bit:** 4

**State:** 1

**Capability:** AC\_SETFUNCTION\_BASELINECLAMP

**Description:** Baseline clamp can be turned on or off with the [SetBaselineClamp](#) function.

**Bit:** 5

**State:** 1

**Capability:** AC\_SETFUNCTION\_VSAMPLITUDE

**Description:** The vertical clock voltage can be set with the [SetVSAmpitude](#) function.

**Bit:** 6

**State:** 1

**Capability:** AC\_SETFUNCTION\_HIGHCAPACITY

**Description:** High capacity mode can be turned on or off with the [SetHighCapacity](#) function.

**Bit:** 7

**State:** 1

## GetCapabilities (Available Set Functions) - Continued

**Capability:** AC\_SETFUNCTION\_BASELINEOFFSET

**Description:** The baseline offset can be set with the [SetBaselineOffset](#) function.

**Bit:** 8

**State:** 1

**Capability:** AC\_SETFUNCTION\_PREAMPGAIN

**Description:** The pre amp gain can be set with the [SetPreAmpGain](#) function.

**Bit:** 9

**State:** 1

**Capability:** AC\_SETFUNCTION\_CROPMODE

**Description:** Crop mode can be selected using the [SetCropMode](#) or [SetIsolatedCropMode](#) functions.

**Bit:** 10

**State:** 1

**Capability:** AC\_SETFUNCTION\_DMAPARAMETERS

**Description:** The DMA parameters can be set with the [SetDMAParameters](#) function.

**Bit:** 11

**State:** 1

**Capability:** AC\_SETFUNCTION\_HORIZONTALBIN

**Description:** The horizontal binning can be set for the relative read mode.

**Bit:** 12

**State:** 1      **See Note.**

**Capability:** AC\_SETFUNCTION\_MULTITRACKHRANGE

**Description:** The multitrack horizontal range can be set using the [SetMultiTrackHRange](#) function.

**Bit:** 13

**State:** 1

**Capability:** AC\_SETFUNCTION\_RANDOMTRACKNOGAPS

**Description:** Random tracks can be set with no gaps inbetween with the [SetRandomTracks](#) or [SetComplexImage](#) functions.

**Bit:** 14

**State:** 1

**NOTE:** For iDus, the horizontalbin capability will be 0, as it is not recommended, but it is possible.

**Capability:** AC\_SETFUNCTION\_EMADVANCED

**Description:** Extended EM gain range can be accessed using [SetEMAdvanced](#).

**Bit:** 15

**State:** 1

## GetCapabilities (Available Set Functions) - Continued

**Capability:** AC\_SETFUNCTION\_GATEMODE**Description:** The gate mode can be set with the [SetGateMode](#) function.**Bit:** 16**State:** 1**Capability:** AC\_SETFUNCTION\_DDGTIMES**Description:** The USB iStar DDG gate times can be set with the [SetDDGGateTime](#) function.**Bit:** 17**State:** 1**Capability:** AC\_SETFUNCTION\_IOC**Description:** Integrate on chip can be set with the [SetDDGIOC](#) function.**Bit:** 18**State:** 1**Capability:** AC\_SETFUNCTION\_INTELLIGATE**Description:** Intelligate can be selected using the [SetDDGIntelligate](#) function.**Bit:** 19**State:** 1**Capability:** AC\_SETFUNCTION\_INSERTION\_DELAY**Description:** Insertion delay can be set with the [SetDDGInsertionDelay](#) function.**Bit:** 20**State:** 1**Capability:** AC\_SETFUNCTION\_GATESTEP**Description:** Gate step can be configured using the [SetDDGGateStep](#) function.**Bit:** 21**State:** 1**Capability:** AC\_SETFUNCTION\_GATEDELAYSTEP**Description:** Gate step can be configured using the [SetDDGGateStep](#) function.**Bit:** 21**State:** 1**Capability:** AC\_SETFUNCTION\_TRIGGERTERMINATION**Description:** The trigger termination can be set using the [SetExternalTriggerTermination](#) function.**Bit:** 22**State:** 1**Capability:** AC\_SETFUNCTION\_EXTENDEDNIIR**Description:** Extended NIIR mode can be set using the [SetHSSpeed](#) function.**Bit:** 23**State:** 1

**Capability:** AC\_SETFUNCTION\_SPOOLTHREADCOUNT

**Description:** The number of parallel threads can be set using the [SetSpoolThreadCount](#) function.

**Bit:** 24

**State:** 1

**Capability:** AC\_SETFUNCTION\_REGISTERPACK

**Description:** Sub-image packing can be set using the [SetReadoutRegisterPacking](#) function.

**Bit:** 25

**State:** 1

**Capability:** AC\_SETFUNCTION\_PRESCANS

**Description:** The number of prescans can be set using the [SetNumberPrescans](#) function.

**Bit:** 26

**State:** 1

**Capability:** AC\_SETFUNCTION\_GATEWIDTHSTEP

**Description:** The gate width step can be set using the [SetDDGWidthStepCoefficients](#) function.

**Bit:** 27

**State:** 1

**Capability:** AC\_SETFUNCTION\_EXTENDED\_CROP\_MODE

**Description:** Extended crop mode can be set using the [SetIsolatedCropModeEx](#) function.

**Bit:** 28

**State:** 1

**Capability:** AC\_SETFUNCTION\_SUPERKINETICS

**Description:** This mode can be configured using the [SetFastKineticsStorageMode](#) function.

**Bit:** 29

**State:** 1

**Capability:** AC\_SETFUNCTION\_TIMESCAN

**Description:** This mode can be configured using the [SetFastKineticsTimeScanMode](#) function.

**Bit:** 30

**State:** 1

**Capability:** AC\_SETFUNCTION\_CROPMODETYPE

**Description:** This mode can be configured using the [SetIsolatedCropModeType](#) function.

**Bit:** 31

**State:** 1

## Available Get Functions - AndorCapabilities Member: ulGetFunctions

**Capability:** AC\_GETFUNCTION\_TEMPERATURE

**Description:** The current temperature can be determined using the [GetTemperature](#) function.

**Bit:** 0

**State:** 1

**Capability:** AC\_GETFUNCTION\_TEMPERATURERANGE

**Description:** The range of possible temperatures can be determined using the [GetTemperatureRange](#) function.

**Bit:** 2

**State:** 1

**Capability:** AC\_GETFUNCTION\_DETECTORSIZE

**Description:** The dimensions of the detector can be determined using the [GetDetector](#) function.

**Bit:** 3

**State:** 1

**Capability:** AC\_GETFUNCTION\_MCPGAIN (AC\_GETFUNCTION\_GAIN deprecated)

**Description:** Reserved capability.

**Bit:** 4

**State:** 1

**Capability:** AC\_GETFUNCTION\_EMCCDGAIN

**Description:** The gain can be determined using the [GetEMCCDGain](#) function.

**Bit:** 5

**State:** 1

**Capability:** AC\_GETFUNCTION\_GATEMODE

**Description:** The gate mode can be determined using the [GetGateMode](#) function.

**Bit:** 7

**State:** 1

**Capability:** AC\_GETFUNCTION\_DDGTIMES

**Description:** The gate times can be determined using the [GetDDGGateTime](#) function.

**Bit:** 8

**State:** 1

**Capability:** AC\_GETFUNCTION\_IOC

**Description:** Integrate on chip state can be determined using the [GetDDGIOC](#) function.

**Bit:** 9

**State:** 1

**Capability:** AC\_GETFUNCTION\_INTELLIGATE

**Description:** Intelligate state can be determined using the [GetDDGIntelligate](#) function.

**Bit:** 10

**State:** 1

**Capability:** AC\_GETFUNCTION\_INSERTION\_DELAY

**Description:** The insertion delay can be determined using the [GetDDGInsertionDelay](#) function.

**Bit:** 11

**State:** 1

**Capability:** AC\_GETFUNCTION\_PHOSPHORSTATUS

**Description:** The phosphor status can be determined using the [GetPhosphorStatus](#) function.

**Bit:** 13

**State:** 1

**Capability:** AC\_GETFUNCTION\_BASELINECLAMP

**Description:** The gain can be determined using the [GetBaselineClamp](#) function.

**Bit:** 15

**State:** 1



**SDK Features Available - AndorCapabilities Member: ulFeatures****Capability:** AC\_FEATURES\_POLLING**Description:** The status of the current acquisition can be determined through the [GetStatus](#) function call.**Bit:** 0**State:** 1**Capability:** AC\_FEATURES\_EVENTS**Description:** A Windows Event can be passed to the SDK to alert the user at certain stages of the Acquisition. See [SetDriverEvent](#)**Bit:** 1**State:** 1**Capability:** AC\_FEATURES\_SPOOLING**Description:** Acquisition Data can be made to spool to disk using the [SetSpool](#) function.**Bit:** 2**State:** 1**Capability:** AC\_FEATURES\_SHUTTER**Description:** Shutter settings can be adjusted through the [SetShutter](#) function.**Bit:** 3**State:** 1**Capability:** AC\_FEATURES\_SHUTTEREX**Description:** Shutter settings can be adjusted through the [SetShutterEx](#) function.**Bit:** 4**State:** 1**Capability:** AC\_FEATURES\_EXTERNAL\_I2C**Description:** The camera has its own dedicated external I2C bus.**Bit:** 5**State:** 1**Capability:** AC\_FEATURES\_SATURATIONEVENT**Description:** Sensor saturation can be determined through the [SetSaturationEvent](#) function.**Bit:** 6**State:** 1

**Capability:** AC\_FEATURES\_FANCONTROL

**Description:** Fan settings can be adjusted through the [SetFanMode](#) function.

**Bit:** 7

**State:** 1

**Capability:** AC\_FEATURES\_MIDFANCONTROL

**Description:** It is possible to select a low fan setting through the [SetFanMode](#) function.

**Bit:** 8

**State:** 1

**Capability:** AC\_FEATURES\_TEMPERATUREDURINGACQUISITION

**Description:** It is possible to read the camera temperature during an acquisition with the [GetTemperature](#) function.

**Bit:** 9

**State:** 1

**Capability:** AC\_FEATURES\_KEEPCLEANCONTROL

**Description:** It is possible to turn off keep cleans between scans.

**Bit:** 10

**State:** 1

**Capability:** AC\_FEATURES\_DDGLITE

**Description:** Reserved for internal use.

**Bit:** 11

**State:** 1

**Capability:** AC\_FEATURES\_FTEXTERNALEXPOSURE

**Description:** The combination of Frame Transfer and External Exposure modes is available.

**Bit:** 12

**State:** 1

**Capability:** AC\_FEATURES\_KINETICEXTERNALEXPOSURE

**Description:** External Exposure trigger mode is available in Kinetic acquisition mode.

**Bit:** 13

**State:** 1

**Capability:** AC\_FEATURES\_DACCONTROL

**Description:** Reserved for internal use.

**Bit:** 14

**State:** 1

**Capability:** AC\_FEATURES\_METADATA

**Description:** System supports metadata. [SetMetaData](#)

**Bit:** 15

**State:** 1

**Capability:** AC\_FEATURES\_IOCONTROL

**Description:** Configurable IO's available. See [SetIOLevel](#).

**Bit:** 16

**State:** 1

**Capability:** AC\_FEATURES\_PHOTONCOUNTING

**Description:** System supports photon counting. See [SetPhotonCounting](#) .

**Bit:** 17

**State:** 1

**Capability:** AC\_FEATURES\_COUNTCONVERT

**Description:** System supports Count Convert. See [SetCountConvertMode](#).

**Bit:** 18

**State:** 1

**Capability:** AC\_FEATURES\_DUALMODE

**Description:** Dual exposure mode. See [SetDualExposureMode](#).

**Bit:** 19

**State:** 1

**Capability:** AC\_FEATURES\_OPTACQUIRE

**Description:** OptAcquire features are available. See [OA\\_Initialize](#).

**Bit:** 20

**State:** 1

**Capability:** AC\_FEATURES\_REALTIMESPURIOUSNOISEFILTER

**Description:** Real time noise filtering is available. See [Filter\\_SetMode](#).

**Bit:** 21

**State:** 1

**Capability:** AC\_FEATURES\_POSTPROCESSSPURIOUSNOISEFILTER

**Description:** Post process noise filtering is available. See [PostProcessNoiseFilter](#).

**Bit:** 22

**State:** 1

**Capability:** AC\_FEATURES\_DUALPREAMPGAIN

**Description:** Reserved for internal use.

**Bit:** 23

**State:** 1

**Capability:** AC\_FEATURES\_DEFECT\_CORRECTION

**Description:** Reserved for internal use.

**Bit:** 24

**State:** 1

**Capability:** AC\_FEATURES\_STARTOFEXPOSURE\_EVENT

**Description:** Camera supports start of exposure events. See [SetDriverEvent](#).

**Bit:** 25

**State:** 1

**Capability:** AC\_FEATURES\_ENDOFEXPOSURE\_EVENT

**Description:** Camera supports start of exposure events. See [SetDriverEvent](#).

**Bit:** 26

**State:** 1

**Capability:** AC\_FEATURES\_CAMERALINK

**Description:** Cameralink output can be enabled\disabled. See [SetCameraLinkMode](#).

**Bit:** 27

**State:** 1

**Capability:** AC\_FEATURES\_FIFOFULL\_EVENT

**Description:** Camera supports FIFO full events. See [SetDriverEvent](#).

**Bit:** 28

**State:** 1

**Capability:** AC\_FEATURES\_SENSOR\_PORT\_CONFIGURATION

**Description:** Camera supports multiple sensor port outputs. See [SetSensorPortMode](#).

**Bit:** 29

**State:** 1

**Capability:** AC\_FEATURES\_SENSOR\_COMPENSATION

**Description:** Camera supports on-camera sensor compensation. See [EnableSensorCompensation](#).

**Bit:** 30

**State:** 1

**Capability:** AC\_FEATURES\_IRIG\_SUPPORT

**Description:** Camera supports external IRIG device. See [SetIRIGModulation](#).

**Bit:** 31

**State:** 1

**SDK Features Available - AndorCapabilities Member: ulFeatures2**

**Capability:** AC\_FEATURES2\_ESD\_EVENTS

**Description:** Camera supports detection of ESD events. See [SetESDEvent](#).

**Bit:** 0

**State:** 1

**GetCapabilities (PCI Card Capabilities)**

**PCI Card Capabilities - AndorCapabilities Member: ulPCICard**

**Description:** Maximum speed in Hz PCI controller card is capable of.

**GetCapabilities (Gain Features Available)**

**Gain Features Available - AndorCapabilities Member: uLEMGainCapability**

**Capability:** AC\_EMGAIN\_8BIT

**Description:**.8-bit DAC settable.

**Bit:** 0

**State:** 1

**Capability:** AC\_EMGAIN\_12BIT

**Description:**.12-bit DAC settable

**Bit:** 1

**State:** 1

**Capability:** AC\_EMGAIN\_LINEAR12

**Description:**.Gain setting represent a linear gain scale. 12-bit DAC used internally.

**Bit:** 2

**State:** 1

**Capability:** AC\_EMGAIN\_REAL12

**Description:**.Gain setting represents the real EM Gain value. 12-bit DAC used internally.

**Bit:** 3

**State:** 1

## GetControllerCardModel

**unsigned int WINAPI GetControllerCardModel (char\* controllerCardModel)**

**Description** This function will retrieve the type of PCI controller card included in your system. This function is not applicable for USB systems. The maximum number of characters that can be returned from this function is 10.

**Parameters** char\* controllerCardModel: A user allocated array of characters for storage of the controller card model.

**Return** unsigned int  
 DRV\_SUCCESS Name returned.  
 DRV\_NOT\_INITIALIZED System not initialized

**See also** [GetHeadModel](#), [GetCameraSerialNumber](#), [GetCameraInformation](#), [GetCapabilities](#)

## GetCountConvertWavelengthRange

**unsigned int WINAPI GetCountConvertWavelengthRange(float\* min\_wave, float\* max\_wave)**

**Description** This function returns the valid wavelength range available in Count Convert mode.

**Parameters** float\* min\_wave: minimum wavelength permitted.  
 float\* max\_wave: maximum wavelength permitted.

**Return** unsigned int  
 DRV\_SUCCESS Count Convert wavelength set.  
 DRV\_NOT\_INITIALIZED System not initialized.  
 DRV\_NOT\_SUPPORTED Count Convert not supported on this camera

**See also** [GetCapabilities](#), [SetCountConvertMode](#), [SetCountConvertWavelength](#)

## GetCurrentCamera

**unsigned int WINAPI GetCurrentCamera(long\* cameraHandle)**

**Description** When multiple Andor cameras are installed this function returns the handle of the currently selected one.

**Parameters** long\* cameraHandle: handle of the currently selected camera

**Return** unsigned int  
 DRV\_SUCCESS Camera handle returned.

**See also** [SetCurrentCamera](#), [GetAvailableCameras](#), [GetCameraHandle](#)

### GetCurrentPreAmpGain

**unsigned int WINAPI GetCurrentPreAmpGain(int\* index , char\* name, int len)**

**Description** This function will return the currently active pre amp gain index and a string with its description. The maximum number of characters needed to store the pre amp gain description is 30. The user has to specify the number of characters they wish to have returned to them from this function.

**Parameters** int\* index: current pre amp gain index  
char\* name: A user allocated array of characters for storage of the description.  
int len: The length of the user allocated character array.

**Return** unsigned int  
DRV\_SUCCESS Description returned.  
DRV\_NOT\_INITIALIZED System not initialized.  
DRV\_P1INVALID Invalid pointer (i.e. NULL).  
DRV\_NOT\_SUPPORTED Function not supported with this camera

**See also** [IsPreAmpGainAvailable](#), [GetNumberPreAmpGains](#), [SetPreAmpGain](#), [GetCapabilities](#)

### GetCYMGShift

**unsigned int WINAPI GetCYMGShift(int \* iXshift, int \* iYShift)**

**Description** THIS FUNCTION IS RESERVED.



## GetDDGExternalOutputEnabled

**unsigned int WINAPI GetDDGExternalOutputEnabled(at\_u32 Index, at\_u32 \* Enabled)**

**Description** This function gets the current state of a selected external output.

**Parameters** at\_u32 Index: index of external output.  
at\_u32 \* Enabled: current state of external output (0 – Off, 1 – On).

**Return** unsigned int

DRV_SUCCESS	State returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_NOT_SUPPORTED	External outputs not supported.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with card.
DRV_P1INVALID	Invalid external output index.
DRV_P2INVALID	Enabled has invalid memory address.

**See also** [GetCapabilities](#) [SetDDGExternalOutputEnabled](#)

**NOTE:** Available on USB iStar.

## GetDDGExternalOutputPolarity

**unsigned int WINAPI GetDDGExternalOutputPolarity(at\_u32 Index, at\_u32 \* Polarity)**

**Description** This function gets the current polarity of a selected external output.

**Parameters** at\_u32 Index: index of external output.  
at\_u32 \* Polarity: current polarity of external output (0 – Positive, 1 – Negative).

**Return** unsigned int

DRV_SUCCESS	Polarity returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_NOT_SUPPORTED	External outputs not supported.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with system.
DRV_P1INVALID	Invalid external output index.
DRV_P2INVALID	Polarity has invalid memory address.

**See also** [GetCapabilities](#) [GetDDGExternalOutputEnabled](#) [SetDDGExternalOutputPolarity](#)

**NOTE:** Available on USB iStar.

## GetDDGExternalOutputStepEnabled

**unsigned int WINAPI GetDDGExternalOutputStepEnabled(at\_u32 Index, at\_u32 \* Enabled)**

**Description** Each external output has the option to track the gate step applied to the gater. This function can be used to determine if this option is currently active.

**Parameters** at\_u32 Index: index of external output.  
at\_u32 \* Enabled: current state of external output track step (0 – Off, 1 – On).

**Return** unsigned int

DRV_SUCCESS	State returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_NOT_SUPPORTED	External outputs not supported.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with system.
DRV_P1INVALID	Invalid external output index.
DRV_P2INVALID	Enabled has invalid memory address.

**See also** [GetCapabilities](#) [GetDDGExternalOutputEnabled](#) [SetDDGExternalOutputStepEnabled](#)

**NOTE:** Available on USB iStar.

## GetDDGExternalOutputTime

**unsigned int WINAPI GetDDGExternalOutputTime(at\_u32 Index, at\_u64 \* Delay, at\_u64 \* Width)**

**Description** This function can be used to find the actual timings for a particular external output.

**Parameters** at\_u32 Index: index of external output.  
at\_u64 \* Delay: actual external output delay time in picoseconds.  
at\_u64 \* Width: actual external output width time in picoseconds.

**Return** unsigned int

DRV_SUCCESS	Timings returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_NOT_SUPPORTED	External outputs not supported.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with system.
DRV_P1INVALID	Invalid external output index.
DRV_P2INVALID	Delay has invalid memory address.
DRV_P3INVALID	Width has invalid memory address.

**See also** [GetCapabilities](#) [GetDDGExternalOutputEnabled](#) [SetDDGExternalOutputTime](#)

**NOTE:** Available in USB iStar.

## GetDDGStepCoefficients

**unsigned int WINAPI GetDDGStepCoefficients(at\_u32 mode, double \* p1, double \* p2)**

**Description** This function will return the coefficients for a particular gate step mode.

**Parameters** at\_u32 mode: the gate step mode.

Valid values:

0	constant.
1	exponential.
2	logarithmic.
3	linear.

**Return** unsigned int

DRV_SUCCESS	Gate step coefficients returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_NOT_SUPPORTED	Gate step not supported.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with system.
DRV_P1INVALID	Gate step mode invalid.
DRV_P2_INVALID	p1 has invalid memory address.
DRV_P3_INVALID	p2 has invalid memory address.

**See also** [StartAcquisition](#) [SetDDGStepMode](#) [SetDDGStepCoefficients](#) [SetDDGStepCoefficients](#)

## GetDDGStepMode

**unsigned int WINAPI GetDDGStepMode(at\_u32 \* mode)**

**Description** This function will return the current gate step mode.

**Parameters** at\_u32 \* mode: the gate step mode.

Valid values: 0 constant.  
1 exponential.  
2 logarithmic.  
3 linear.  
100 off.

**Return** unsigned int

DRV_SUCCESS	Gate step mode returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_NOT_SUPPORTED	Gate step not supported.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with system.
DRV_P1INVALID	mode has invalid memory address.

**See also** [StartAcquisition](#) [SetDDGStepMode](#) [SetDDGStepCoefficients](#) [GetDDGStepCoefficients](#)

## GetDDGGateTime

**unsigned int WINAPI GetDDGGateTime(at\_u64 \* Delay, at\_u64 \* Width)**

**Description** This function can be used to get the actual gate timings for a USB iStar.

**Parameters** at\_u64 \* Delay: gate delay time in picoseconds.  
at\_u64 \* Width: gate width time in picoseconds.

**Return** unsigned int

DRV_SUCCESS	Timings returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_NOT_SUPPORTED	USB iStar not supported.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with system.
DRV_P1INVALID	Delay has invalid memory address.
DRV_P2INVALID	Width has invalid memory address.

**See also** [GetCapabilities](#) [SetDDGGateTime](#)

## GetDDGInsertionDelay

**unsigned int WINAPI GetDDGInsertionDelay(int \* state)**

**Description** This function gets the current state of the insertion delay.  
**Parameters** int \* state: current state of the insertion delay option (0 – Normal, 1 – Ultra Fast).

**Return** unsigned int

DRV_SUCCESS	Insertion delay state returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_NOT_SUPPORTED	Insertion delay not supported.
DRV_ERROR_ACK	Unable to communicate with system.

**See also** [GetCapabilities](#) [SetDDGIntelligence](#) [SetDDGInsertionDelay](#)

## GetDDGIntelligence

**unsigned int WINAPI GetDDGIntelligence(int \* state)**

**Description** This function gets the current state of Intelligence.  
**Parameters** int \* state: current state of the Intelligence option (0 – Off, 1 – On).

**Return** unsigned int

DRV_SUCCESS	Intelligence state returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_NOT_SUPPORTED	Intelligence not supported.
DRV_ERROR_ACK	Unable to communicate with system.

**See also** [GetCapabilities](#) [SetDDGIntelligence](#) [SetDDGInsertionDelay](#)

## GetDDGIOC

**unsigned int WINAPI GetDDGIOC(int \* state)**

**Description** This function gets the current state of the integrate on chip (IOC) option.  
**Parameters** int \* state: current state of the IOC option (0 – Off, 1 – On).

**Return** unsigned int

DRV_SUCCESS	IOC state returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_NOT_SUPPORTED	IOC not supported.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with system.
DRV_P1INVALID	state has invalid memory address.

**See also** [GetCapabilities](#) [SetDDGIOC](#)

## GetDDGIOCFrequency

**unsigned int WINAPI GetDDGIOCFrequency(double\*frequency)**

<b>Description</b>	This function can be used to return the actual IOC frequency that will be triggered. It should only be called once all the conditions of the experiment have been defined.	
<b>Parameters</b>	double*frequency: the frequency of integrate on chip pulses triggered within the fire pulse.	
<b>Return</b>	unsigned int	
	DRV_SUCCESS	Number returned
	DRV_NOT_INITIALIZED	System not initialized
	DRV_ERROR_ACK	Unable to communicate with card
<b>See also</b>	<a href="#">GetCapabilities</a> <a href="#">SetDDGIOCFrequency</a> <a href="#">SetDDGIOCNumber</a> <a href="#">GetDDGIOCNumber</a> <a href="#">GetDDGIOCPulses</a> <a href="#">SetDDGIOC</a>	

## GetDDGIOCNumber

**unsigned int WINAPI GetDDGIOCNumber(unsigned long\* numberPulses)**

<b>Description</b>	This function can be used to return the actual number of pulses that will be triggered. It should only be called once all the conditions of the experiment have been defined.	
<b>Parameters</b>	unsigned long* numberPulses: the number of integrate on chip pulses triggered within the fire pulse.	
<b>Return</b>	unsigned int	
	DRV_SUCCESS	Number returned
	DRV_NOT_INITIALIZED	System not initialized
	DRV_ERROR_ACK	Unable to communicate with card
<b>See also</b>	<a href="#">GetCapabilities</a> <a href="#">SetDDGIOCFrequency</a> <a href="#">GetDDGIOCFrequency</a> <a href="#">SetDDGIOCNumber</a> <a href="#">GetDDGIOCPulses</a> <a href="#">SetDDGIOC</a>	

## GetDDGIOCNumberRequested

**unsigned int WINAPI GetDDGIOCNumberRequested(at\_u32 \* pulses)**

**Description** This function can be used to return the number of pulses that were requested by the user.

**Parameters** at\_u32 \* pulses: the number of integrate on chip pulses requested.

**Return**

unsigned int	
DRV_SUCCESS	Number returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_NOT_SUPPORTED	IOC not supported.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with system.
DRV_P1INVALID	pulses has invalid memory address.

**See also** [GetCapabilities](#) [SetDDGIOCNumber](#) [SetDDGIOC](#)

## GetDDGIOCPeriod

**unsigned int WINAPI GetDDGIOCPeriod(at\_u64 \* period)**

**Description** This function can be used to return the actual IOC period that will be triggered. It should only be called once all the conditions of the experiment have been defined.

**Parameters** at\_u64 \* period: the period of integrate on chip pulses triggered within the fire pulse.

**Return**

unsigned int	
DRV_SUCCESS	IOC period returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_NOT_SUPPORTED	IOC not supported.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with system.
DRV_P1INVALID	period has invalid memory address.

**See also** [GetCapabilities](#) [SetDDGIOC](#) [SetDDGIOCPeriod](#)

## GetDDGIOCPulses

**unsigned int WINAPI GetDDGIOCPulses(int\* pulses)**

**Description** This function can be used to calculate the number of pulses that will be triggered with the given exposure time, readout mode, acquisition mode and integrate on chip frequency. It should only be called once all the conditions of the experiment have been defined.

**Parameters** int\* pulses: the number of integrate on chip pulses triggered within the fire pulse.

**Return** unsigned int

DRV_SUCCESS	Number returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with card.

**See also** [GetCapabilities](#) [SetDDGIOCFrequency](#) [GetDDGIOCFrequency](#) [SetDDGIOCNumber](#) [GetDDGIOCNumber](#) [SetDDGIOC](#)

## GetDDGIOCTrigger

**unsigned int WINAPI GetDDGIOCTrigger(at\_u32 \* trigger)**

This function can be used to retrieve the active IOC trigger.

at\_u32\* trigger: active IOC trigger (0 – Fire pulse, 1 – External trigger).

unsigned int

DRV_SUCCESS	IOC trigger returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_NOT_SUPPORTED	IOC not supported.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with system.
DRV_P1INVALID	Invalid trigger.

[GetCapabilities](#) [SetDDGIOC](#) [SetDDGIOCTrigger](#) [SetTriggerMode](#)

## GetDDGLiteControlByte

**unsigned int WINAPI GetDDGLiteControlByte(AT\_DDGLiteChannelId channel, unsigned char \* control)**

**Description** THIS FUNCTION IS RESERVED.

## GetDDGLiteGlobalControlByte

**unsigned int WINAPI GetDDGLiteGlobalControlByte(unsigned char \* control)**

**Description** THIS FUNCTION IS RESERVED.

## GetDDGLiteInitialDelay

**unsigned int WINAPI GetDDGLiteInitialDelay(AT\_DDGLiteChannelId channel, float \* fDelay)**

**Description** THIS FUNCTION IS RESERVED.

## GetDDGLiteInterPulseDelay

**unsigned int WINAPI GetDDGLiteInterPulseDelay(AT\_DDGLiteChannelId channel, float \* fDelay)**

**Description** THIS FUNCTION IS RESERVED.



## GetDDGLitePulsesPerExposure

**unsigned int WINAPI GetDDGLitePulsesPerExposure(AT\_DDGLiteChannelId channel, at\_u32 \* ui32Pulses)**

**Description** THIS FUNCTION IS RESERVED.

## GetDDGLitePulseWidth

**unsigned int WINAPI GetDDGLitePulseWidth(AT\_DDGLiteChannelId channel, float \* fWidth)**

**Description** THIS FUNCTION IS RESERVED.

## GetDDGOpticalWidthEnabled

**unsigned int WINAPI GetDDGOpticalWidthEnabled(at\_u32 \* Enabled)**

**Description** This function can be used to check whether optical gate widths are being used.

**Parameters** at\_u32 \* Enabled: optical gate width option (0 – Off, 1 – On).

**Return** unsigned int

DRV_SUCCESS	State returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_NOT_SUPPORTED	Optical gate width not supported.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with system.
DRV_P1INVALID	Enabled has invalid memory address.

**See also** [GetCapabilities](#) [GetDDGTTLGateWidth](#)

## GetDDGPulse

**unsigned int WINAPI GetDDGPulse(double width, double resolution, double\* Delay, double\* Width)**

**Description** This function attempts to find a laser pulse in a user-defined region with a given resolution. The values returned will provide an estimation of the location of the pulse.

**Parameters**

- double width: the time in picoseconds of the region to be searched.
- double resolution: the minimum gate pulse used to locate the laser.
- double\* Delay: the approximate start of the laser pulse.
- double\* Width: the pulse width, which encapsulated the laser pulse.

**Return** unsigned int

DRV_SUCCESS	Location returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with card.

**NOTE: Available in iStar.**

## GetDDGTTLGateWidth

**unsigned int WINAPI GetDDGTTLGateWidth(at\_u64 opticalWidth, at\_u64 \* ttlWidth)**

**Description** This function can be used to get the TTL gate width which corresponds to a particular optical gate width.

**Parameters**

- at\_u64 opticalWidth: optical gate width in picoseconds.
- at\_u64 \* ttlWidth: TTL gate width in picoseconds.

**Return** unsigned int

DRV_SUCCESS	Timings returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_NOT_SUPPORTED	Optical gate width not supported.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with system.
DRV_P2_INVALID	ttlWidth has invalid memory address.

**See also** [GetCapabilities](#) [SetDDGOpticalWidthEnabled](#)

## GetDDGWidthStepCoefficients

**unsigned int WINAPI GetDDGWidthStepCoefficients(at\_u32 mode, double \* p1, double \* p2)**

**Description** This function will return the coefficients for a particular gate width step mode.

**Parameters** at\_u32 mode: the gate step mode.

Valid values: 0 constant.  
1 exponential.  
2 logarithmic.  
3 linear.

**Return** unsigned int

DRV\_SUCCESS Gate step coefficients returned.  
DRV\_NOT\_INITIALIZED System not initialized.  
DRV\_NOT\_SUPPORTED Gate step not supported.  
DRV\_ACQUIRING Acquisition in progress.  
DRV\_ERROR\_ACK Unable to communicate with system.  
DRV\_P1INVALID Gate step mode invalid.  
DRV\_P2\_INVALID p1 has invalid memory address.  
DRV\_P3\_INVALID p2 has invalid memory address.

**See also** [SetDDGWidthStepCoefficients](#) [SetDDGWidthStepMode](#) [GetDDGWidthStepMode](#)

## GetDDGWidthStepMode

**unsigned int WINAPI GetDDGWidthStepMode(at\_u32 \* mode)**

**Description** This function will return the current gate width step mode.

**Parameters** at\_u32 \* mode: the gate step mode.

Valid values: 0 constant.  
1 exponential.  
2 logarithmic.  
3 linear.  
100 off.

**Return** unsigned int

DRV\_SUCCESS Gate step mode returned.  
DRV\_NOT\_INITIALIZED System not initialized.  
DRV\_NOT\_SUPPORTED Gate step not supported.  
DRV\_ACQUIRING Acquisition in progress.  
DRV\_ERROR\_ACK Unable to communicate with system.  
DRV\_P1INVALID mode has invalid memory address.

**See also** [SetDDGWidthStepCoefficients](#) [SetDDGWidthStepMode](#) [GetDDGWidthStepCoefficients](#)

## GetDetector

**unsigned int WINAPI GetDetector(int\* xpixels, int\* ypixels)**

<b>Description</b>	This function returns the size of the detector in pixels. The horizontal axis is taken to be the axis parallel to the readout register.	
<b>Parameters</b>	int* xpixels: number of horizontal pixels. int* ypixels: number of vertical pixels.	
<b>Return</b>	unsigned int	
	DRV_SUCCESS	Detector size returned.
	DRV_NOT_INITIALIZED	System not initialized.

## GetDICameraInfo

**unsigned int WINAPI GetDICameraInfo (void \*info)**

<b>Description</b>	<b>THIS FUNCTION IS RESERVED.</b>
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## GetDualExposureTimes

**unsigned int WINAPI GetDualExposureTimes(float\* exposure1, float\* exposure2)**

<b>Description</b>	This function will return the current “valid” acquisition timing information for dual exposure mode. This mode is only available for certain sensors in run till abort mode, external trigger, full image.	
<b>Parameters</b>	float* exposure1: valid exposure time in seconds for each odd numbered frame. float* exposure2: valid exposure time in seconds for each even numbered frame.	
<b>Return</b>	unsigned int	
	DRV_SUCCESS	Parameters set.
	DRV_NOT_INITIALIZED	System not initialized. .
	DRV_NOT_SUPPORTED	Dual exposure mode not supported on this camera.
	DRV_NOT_AVAILABLE	Dual exposure mode not configured correctly.
	DRV_ACQUIRING	Acquisition in progress.
	DRV_P1INVALID	exposure1 has invalid memory address.
	DRV_P2INVALID	exposure2 has invalid memory address.
<b>See also</b>	<a href="#">GetCapabilities</a> , <a href="#">SetDualExposureMode</a> , <a href="#">SetDualExposureTimes</a>	

## GetEMAdvanced

## unsigned int WINAPI GetEMAdvanced(int \* state)

**Description** Returns the current Advanced gain setting.

**Parameters** Int\*state: current EM advanced gain setting

### Return

DRV_SUCCESS	Advanced state returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ERROR_ACK	Unable to communicate with card.
DRV_P1INVALID	state has invalid memory address.

## GetEMCCDGain

## unsigned int WINAPI GetEMCCDGain(int\* gain)

**Description** Returns the current gain setting. The meaning of the value returned depends on the EM Gain mode.

**Parameters** Int\*gain: current EM gain setting

### Return

DRV_SUCCESS	Gain returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ERROR_ACK	Unable to communicate with card.

## GetEMGainRange

## unsigned int WINAPI GetEMGainRange(int\* low, int\* high)

**Description** Returns the minimum and maximum values of the current selected EM Gain mode and temperature of the sensor.

**Parameters** int\* low: lowest gain setting  
int\* high: highest gain setting

### Return

DRV_SUCCESS	Gain range returned.
DRV_NOT_INITIALIZED	System not initialized.

## GetExternalTriggerTermination

## unsigned int WINAPI GetExternalTriggerTermination(at\_u32 \* Termination)

**Description** This function can be used to get the current external trigger termination mode.

**Parameters** at\_u32 \* Termination: trigger termination option.  
Valid values: 0 50 ohm.  
1 hi-Z.

**Return** unsigned int

DRV_SUCCESS	Termination returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_NOT_SUPPORTED	Trigger termination not supported.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with system.
DRV_P1INVALID	Termination has invalid memory address.

**See also** [GetCapabilities](#) [SetExternalTriggerTermination](#)

## GetFastestRecommendedVSSpeed

**unsigned int WINAPI GetFastestRecommendedVSSpeed (int\* index, float\* speed)**

**Description** As your Andor SDK system may be capable of operating at more than one vertical shift speed this function will return the fastest recommended speed available. The very high readout speeds, may require an increase in the amplitude of the Vertical Clock Voltage using [SetVSAmpitude](#). This function returns the fastest speed which does not require the Vertical Clock Voltage to be adjusted. The values returned are the vertical shift speed index and the actual speed in microseconds per pixel shift.

**Parameters** Int\* index: index of the fastest recommended vertical shift speed  
float\* speed: speed in microseconds per pixel shift.

**Return** unsigned int  
DRV\_SUCCESS Speed returned.  
DRV\_NOT\_INITIALIZED System not initialized.  
DRV\_ACQUIRING Acquisition in progress.

**See also** [GetVSSpeed](#), [GetNumberVSSpeeds](#), [SetVSSpeed](#)

## GetFIFOUsage

**unsigned int WINAPI GetFIFOUsage (int\* FIFOUsage)**

**Description** THIS FUNCTION IS RESERVED.

## GetFilterMode

**unsigned int WINAPI GetFilterMode(int\* mode)**

**Description** This function returns the current state of the cosmic ray filtering mode.

**Parameters** int\* mode: current state of filter  
0 OFF  
2 ON

**Return** unsigned int  
DRV\_SUCCESS Filter mode returned.  
DRV\_NOT\_INITIALIZED System not initialized.  
DRV\_ACQUIRING Acquisition in progress.

**See also** [SetFilterMode](#)



## GetFKExposureTime

**unsigned int WINAPI GetFKExposureTime(float\* time)**

**Description** This function will return the current “valid” exposure time for a fast kinetics acquisition. This function should be used after all the acquisitions settings have been set, i.e. [SetFastKinetics](#) and [SetFKVShiftSpeed](#). The value returned is the actual time used in subsequent acquisitions.

**Parameters** float\* time: valid exposure time in seconds

**Return** unsigned int

DRV_SUCCESS	Timing information returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_INVALID_MODE	Fast kinetics is not available.

**See also** [SetFastKinetics](#), [SetFKVShiftSpeed](#)

## GetFKVShiftSpeed

**unsigned int WINAPI GetFKVShiftSpeed(int index, int\* speed)**

**Description** **Deprecated see Note:**

As your Andor SDK system is capable of operating at more than one fast kinetics vertical shift speed this function will return the actual speeds available. The value returned is in microseconds per pixel shift.

**Parameters** int index: speed required

Valid values 0 to [GetNumberFKVShiftSpeeds\(\)](#)-1

int\* speed: speed in micro-seconds per pixel shift

**Return** unsigned int

DRV_SUCCESS	Speed returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_P1INVALID	Invalid index.

**See also** [GetNumberFKVShiftSpeeds](#), [SetFKVShiftSpeed](#)

**NOTE:** Deprecated by [GetFKVShiftSpeedF](#)



## GetFKVShiftSpeedF

**unsigned int WINAPI GetFKVShiftSpeedF(int index, float\* speed)**

**Description** As your Andor system is capable of operating at more than one fast kinetics vertical shift speed this function will return the actual speeds available. The value returned is in microseconds per pixel shift.

**Parameters** int index: speed required  
Valid values: 0 to [GetNumberFKVShiftSpeeds\(\)](#)-1  
float\* speed: speed in micro-seconds per pixel shift

**Return** unsigned int

DRV_SUCCESS	Speed returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_P1INVALID	Invalid index.

**See also** [GetNumberFKVShiftSpeeds](#), [SetFKVShiftSpeed](#)

**NOTE:** Only available if camera is Classic or iStar.

## GetFrontEndStatus

**unsigned int WINAPI GetFrontEndStatus(int \* status)**

**Description** This function will return if the Front End cooler has overheated.

**Parameters** int \* status: The status of the front end cooler  
0 Normal  
1 Tripped

**Return** unsigned int

DRV_SUCCESS	State returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_NOT_SUPPORTED	Front End cooler not supported.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with card.
DRV_P1INVALID	status has invalid memory address.

**See also** [SetFrontEndEvent](#)

## GetGateMode

**unsigned int WINAPI GetGateMode(int \* gatemode)**

**Description** Allows the user to get the current photocathode gating mode.

**Parameters** int \* gatemode: the gate mode.

Valid values:	0	Fire ANDed with the Gate input.
	1	Gating controlled from Fire pulse only.
	2	Gating controlled from SMB Gate input only.
	3	Gating ON continuously.
	4	Gating OFF continuously.
	5	Gate using DDG

**Return** unsigned int

DRV_SUCCESS	Gating mode accepted.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_I2CTIMEOUT	I <sup>2</sup> C command timed out.
DRV_I2CDEVNOTFOUND	I <sup>2</sup> C device not present.
DRV_ERROR_ACK	Unable to communicate with card.
DRV_P1INVALID	gatemode has invalid memory address.

**See also** [GetCapabilities](#) [SetGateMode](#) [SetGain](#)

## GetHardwareVersion

**unsigned int WINAPI GetHardwareVersion(unsigned int\* PCB, unsigned int\* Decode, unsigned int\* dummy1, unsigned int\* dummy2, unsigned int\* CameraFirmwareVersion, unsigned int\* CameraFirmwareBuild)**

**Description** This function returns the Hardware version information.

**Parameters** Unsigned int\* PCB: Plug-in card version  
 unsigned int\* Decode: Flex 10K file version  
 unsigned int\* dummy1  
 unsigned int\* dummy2  
 unsigned int\* CameraFirmwareVersion: Version number of camera firmware  
 unsigned int\* CameraFirmwareBuild: Build number of camera firmware

**Return** unsigned int

DRV_SUCCESS	Version information returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with card.

## GetHeadModel

## unsigned int WINAPI GetHeadModel(char\* name)

<b>Description</b>	This function will retrieve the type of CCD attached to your system.	
<b>Parameters</b>	char* name: A user allocated array of characters for storage of the Head Model. This should be declared as size MAX_PATH.	
<b>Return</b>	unsigned int	
	DRV_SUCCESS	Name returned.
	DRV_NOT_INITIALIZED	System not initialized.

## GetHorizontalSpeed

### unsigned int WINAPI GetHorizontalSpeed(int index, int\* speed)

<b>Description</b>	<b>Deprecated see Note:</b>	
	As your Andor system is capable of operating at more than one horizontal shift speed this function will return the actual speeds available. The value returned is in microseconds per pixel shift.	
<b>Parameters</b>	int index: speed required	
	Valid values: 0 to <b>NumberSpeeds</b> -1, where <b>NumberSpeeds</b> is the parameter returned by <a href="#">GetNumberHorizontalSpeeds</a> .	
	int* speed: speed in micro-seconds per pixel shift	
<b>Return</b>	unsigned int	
	DRV_SUCCESS	Speed returned.
	DRV_NOT_INITIALIZED	System not initialized.
	DRV_ACQUIRING	Acquisition in progress.
	DRV_P1INVALID	Invalid index.

**See also** [GetNumberHorizontalSpeeds](#), [SetHorizontalSpeed](#)

**NOTE:** Deprecated by [GetHSSpeed](#)

## GetHSSpeed

**unsigned int WINAPI GetHSSpeed(int channel, int typ, int index, float\* speed)**

**Description** As your Andor system is capable of operating at more than one horizontal shift speed this function will return the actual speeds available. The value returned is in MHz.

**Parameters**

int channel: the AD channel.

int typ: output amplification.

Valid values: 0 electron multiplication/Conventional(clara).  
1 conventional/Extended NIR Mode(clara).

int index: speed required

Valid values 0 to NumberSpeeds-1 where NumberSpeeds is value returned in first parameter after a call to [GetNumberHSSpeeds\(\)](#).

float\* speed: speed in in MHz.

**Return**

unsigned int	
DRV_SUCCESS	Speed returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_P1INVALID	Invalid channel.
DRV_P2INVALID	Invalid horizontal read mode
DRV_P3INVALID	Invalid index

**See also** [GetNumberHSSpeeds](#), [SetHSSpeed](#)

**NOTE:** The speed is returned in microseconds per pixel shift for iStar and Classic systems.

## GetHVflag

**unsigned int WINAPI GetHVflag (int\* bFlag)**

**Description** This function will retrieve the High Voltage flag from your USB iStar intensifier. A 0 value indicates that the high voltage is abnormal.

**Parameters** int\* bFlag: pointer to High Voltage flag.

**Return**

unsigned int	
DRV_SUCCESS	HV flag returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_NOT_AVAILABLE	Not a USB iStar.

**NOTE** Available only on USB iStar.

**unsigned int WINAPI GetID (int devNum, int\* id)**

**Description**      **THIS FUNCTION IS RESERVED.**

## GetImageFlip

**unsigned int WINAPI GetImageFlip(int\* iHFlip, int\* iVFlip)**

**Description**      This function will obtain whether the acquired data output is flipped in either the horizontal or vertical direction.

**Parameters**      int\* iHFlip: Gets horizontal flipping.  
int\* iVFlip: Gets vertical flipping.

1 – Flipping Enabled  
0 – Flipping Disabled

**Return**      unsigned int  
DRV\_SUCCESS      All parameters accepted.  
DRV\_NOT\_INITIALIZED      System not initialized.  
DRV\_P1INVALID      HFlip parameter invalid.  
DRV\_P2INVALID      VFlip parameter invalid

**See also**      [SetImageRotate](#) [SetImageFlip](#)

## GetImageRotate

**unsigned int WINAPI GetImageRotate(int\* iRotate)**

**Description**      This function will obtain whether the acquired data output is rotated in any direction.

**Parameters**      int\* iRotate: Rotation setting  
  
0 - No rotation  
1 - Rotate 90 degrees clockwise  
2 - Rotate 90 degrees anti-clockwise

**Return**      unsigned int  
DRV\_SUCCESS      All parameters accepted.  
DRV\_NOT\_INITIALIZED      System not initialized.  
DRV\_P1INVALID      Rotate parameter invalid.

**See also**      [SetImageFlip](#) [SetImageRotate](#)

### GetImages

**unsigned int WINAPI GetImages(long first, long last, at\_32\* arr, unsigned long size, long\* validfirst, long\* validlast)**

**Description** This function will update the data array with the specified series of images from the circular buffer. If the specified series is out of range (i.e. the images have been overwritten or have not yet been acquired then an error will be returned.

**Parameters**

- long first: index of first image in buffer to retrieve.
- long last: index of last image in buffer to retrieve.
- at\_32\* arr: pointer to data storage allocated by the user.
- unsigned long size: total number of pixels.
- long\* validfirst: index of the first valid image.
- long\* validlast: index of the last valid image.

**Return** unsigned int

DRV_SUCCESS	Images have been copied into array.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ERROR_ACK	Unable to communicate with card.
DRV_GENERAL_ERRORS	The series is out of range.
DRV_P3INVALID	Invalid pointer (i.e. NULL).
DRV_P4INVALID	Array size is incorrect.
DRV_NO_NEW_DATA	There is no new data yet.

**See also** [GetImages16](#), [GetNumberNewImages](#)

## GetImages16

**unsigned int WINAPI GetImages16(long first, long last, WORD\* arr, unsigned long size, long\* validfirst, long\* validlast)**

<b>Description</b>	16-bit version of the <a href="#">GetImages</a> function.	
<b>Parameters</b>	long first:	index of first image in buffer to retrieve.
	long last:	index of last image in buffer to retrieve.
	WORD* arr:	pointer to data storage allocated by the user.
	unsigned long size:	total number of pixels.
	long* validfirst:	index of the first valid image.
	long* validlast:	index of the last valid image.
<b>Return</b>	unsigned int	
	DRV_SUCCESS	Images have been copied into array.
	DRV_NOT_INITIALIZED	System not initialized.
	DRV_ERROR_ACK	Unable to communicate with card.
	DRV_GENERAL_ERRORS	The series is out of range.
	DRV_P3INVALID	Invalid pointer (i.e. NULL).
	DRV_P4INVALID	Array size is incorrect.
	DRV_NO_NEW_DATA	There is no new data yet.

**See also** [GetImages](#), [GetNumberNewImages](#)

## GetImagesPerDMA

**unsigned int WINAPI GetImagesPerDMA(unsigned long\* images)**

<b>Description</b>	This function will return the maximum number of images that can be transferred during a single DMA transaction.	
<b>Parameters</b>	unsigned long* images:	
<b>Return</b>	unsigned int	
	DRV_SUCCESS	

## GetIODirection

**unsigned int WINAPI GetIODirection(int index, int\* iDirection)**

**Description** Available in some systems are a number of IO's that can be configured to be inputs or outputs. This function gets the current state of a particular IO.

**Parameters** int index: IO index  
Valid values: 0 to [GetNumberIO\(\)](#) - 1  
int\* iDirection: current direction for this index.  
0: Output  
1: Input

**Return** unsigned int  
DRV\_SUCCESS IO direction returned.  
DRV\_NOT\_INITIALIZED System not initialized.  
DRV\_ACQUIRING Acquisition in progress.  
DRV\_P1INVALID Invalid index.  
DRV\_P2INVALID Invalid parameter.  
DRV\_NOT\_AVAILABLE Feature not available.

**See also** [GetNumberIO](#) [GetIOLevel](#) [SetIODirection](#) [SetIOLevel](#)

## GetIOLevel

**unsigned int WINAPI GetIOLevel(int index, int\* iLevel)**

**Description** Available in some systems are a number of IO's that can be configured to be inputs or outputs. This function gets the current state of a particular IO.

**Parameters** int index: IO index  
Valid values: 0 to [GetNumberIO\(\)](#) - 1  
int\* iLevel: current level for this index.  
0: Low  
1: High

**Return** unsigned int  
DRV\_SUCCESS IO level returned.  
DRV\_NOT\_INITIALIZED System not initialized.  
DRV\_ACQUIRING Acquisition in progress.  
DRV\_P1INVALID Invalid index.  
DRV\_P2INVALID Invalid parameter.  
DRV\_NOT\_AVAILABLE Feature not available.

**See also** [GetNumberIO](#) [GetIODirection](#) [SetIODirection](#) [SetIOLevel](#)



## GetIRIGData

**unsigned int WINAPI GetIRIGData (unsigned char\* \_uc\_irigData, unsigned int \_ui\_index)**

**Description** This function retrieves the IRIG data for the requested frame. The buffer will be populated with 128bits of information.

- The least significant 100 bits contains the IRIG time frame as received from the external IRIG device. This will be the most recent full time frame available when the start exposure event occurred.
- The next 8 bits indicate the bit position in the current IRIG time frame when the start exposure event occurred.
- The final 20 bits indicates how many 10nS clock periods have occurred since the start of the current bit period and the start exposure event.

**Parameters** unsigned char\* \_uc\_irigData: buffer that will be populated with the IRIG data, must be at least 16 bytes.

int \_ui\_index: frame for which IRIG data is required.

**Return** unsigned int

DRV\_SUCCESS IRIG data successfully retrieved.

DRV\_NOT\_INITIALIZED System not initialized.

DRV\_NOT\_SUPPORTED Feature not supported on this camera.

DRV\_P1INVALID Buffer is invalid.

DRV\_MSTIMINGS\_ERROR Requested frame isn't valid.

**See also** [GetCapabilities](#)

**NOTE** Not all cameras support this feature. To check if your camera supports this feature use the [GetCapabilities](#) function to check the ulFeature for AC\_FEATURES\_IRIG\_SUPPORT.

## GetIRQ

**unsigned int WINAPI GetIRQ (int\* IRQ)**

**Description** THIS FUNCTION IS RESERVED.

## GetKeepCleanTime

**unsigned int WINAPI GetKeepCleanTime(float\* KeepCleanTime)**

**Description** This function will return the time to perform a keep clean cycle. This function should be used after all the acquisitions settings have been set, e.g. SetExposureTime, SetKineticCycleTime and SetReadMode etc. The value returned is the actual times used in subsequent acquisitions.

**Parameters** float\* KeepCleanTime: valid readout time in seconds

**Return** unsigned int

DRV_SUCCESS	Timing information returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ERROR_CODES	Error communicating with camera.

**See also** [GetAcquisitionTimings](#) [GetReadOutTime](#)

**NOTES** **NOTE: Available on iDus, iXon, Luca & Newton.**

## GetMaximumBinning

**unsigned int WINAPI GetMaximumBinning (int ReadMode, int HorzVert, int\* MaxBinning)**

**Description** This function will return the maximum binning allowable in either the vertical or horizontal dimension for a particular readout mode.

**Parameters** int ReadMode: The readout mode for which to retrieve the maximum binning (see [SetReadMode](#) for possible values).  
int HorzVert: 0 to retrieve horizontal binning limit, 1 to retrieve limit in the vertical.  
int\* MaxBinning: Will contain the Maximum binning value on return.

**Return** unsigned int

DRV_SUCCESS	Maximum Binning returned
DRV_NOT_INITIALIZED	System not initialized
DRV_P1INVALID	Invalid Readmode
DRV_P2INVALID	HorzVert not equal to 0 or 1
DRV_P3INVALID	Invalid MaxBinning address (i.e. NULL)

**See also** [GetMinimumImageLength](#), [SetReadMode](#)

## GetMaximumExposure

**unsigned int WINAPI GetMaximumExposure (float\* MaxExp)**

**Description** This function will return the maximum Exposure Time in seconds that is settable by the [SetExposureTime](#) function.

**Parameters** Float int\* MaxExp: Will contain the Maximum exposure value on return.

**Return** unsigned int

DRV_SUCCESS	Maximum Exposure returned.
DRV_P1INVALID	Invalid MaxExp value (i.e. NULL)

**See also** [SetExposureTime](#)

## GetMaximumNumberRingExposureTimes

**unsigned int WINAPI GetMaximumNumberRingExposureTimes (int\* number)**

**Description** This function will return the maximum number of exposures that can be configured in the [SetRingExposureTimes](#) SDK function.

**Parameters** int\* number: Will contain the maximum number of exposures on return.

**Return** unsigned int

DRV_SUCCESS	Success
DRV_NOT_INITIALIZED	System not initialized
DRV_P1INVALID	Invalid number value (ie NULL)
DRV_NOTAVAILABLE	System does not support this option

**See also** [GetCapabilities](#), [GetNumberRingExposureTimes](#), [GetAdjustedRingExposureTimes](#), [GetRingExposureRange](#) [IsTriggerModeAvailable](#) [SetRingExposureTimes](#)

## GetMCPGain

**unsigned int WINAPI GetMCPGain (int\* gain)**

**Description** This function will retrieve the set value for the MCP Gain.

**Parameters** int\* gain: Returned gain value.

**Return** unsigned int

DRV_SUCCESS	Table returned
DRV_NOT_INITIALIZED	System not initialized
DRV_ACQUIRING	Acquisition in progress
DRV_P1INVALID	Invalid pointer (i.e. NULL)
DRV_NOT_AVAILABLE	Not a USB iStar

**See also** [SetMCPGain](#)

**NOTE** Available only on USB iStar.

This function previously returned a table of MCP gain values against

photoelectrons per count. This is now retrieved using GetMCPGainTable.

## GetMCPGainRange

**unsigned int WINAPI GetMCPGainRange(int\* iLow, int\* iHigh)**

**Description** Returns the minimum and maximum values of the [SetMCPGain](#) function.

**Parameters** int\* iLow: lowest gain setting  
int\* iHigh: highest gain setting

**Return**

DRV_SUCCESS	Gain range returned.
DRV_NOT_INITIALIZED	System not initialized.

**See also** [SetMCPGain](#)

**NOTE** Available only iStar.

## GetMCPGainTable

**unsigned int WINAPI GetMCPGainTable(int iNum, int \* piGain, float \* pfPhotoepc)**

**Description** THIS FUNCTION IS RESERVED.

## GetMCPVoltage

**unsigned int WINAPI GetMCPVoltage (int\* iVoltage)**

**Description** This function will retrieve the current Micro Channel Plate voltage.

**Parameters** int\* iVoltage: Will contain voltage on return. The unit is in Volts and should be between the range 600 – 1100 Volts.

**Return** unsigned int

DRV_SUCCESS	Voltage returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_NOT_AVAILABLE	Not a USB iStar.
DRV_GENERAL_ERRORS	EEPROM not valid

**See also** [GetMCPGain](#)

**NOTE** Available only on USB iStar.

## GetMetaDataInfo

**unsigned int WINAPI GetMetaDataInfo(SYSTEMTIME\* TimeOfStart ,float \*TimeFromStart, int index)**

**Description** This function will return the time of the initial frame and the time in milliseconds of further frames from this point.

**Parameters** SYSTEMTIME\* TimeOfStart: Structure with start time details.  
float \*TimeFromStart: time in milliseconds for a particular frame from time of start.  
int index: frame for which time is required.

**Return** unsigned int

DRV_SUCCESS	Timings returned
DRV_NOT_INITIALIZED	System not initialized
DRV_MSTIMINGS_ERROR	Invalid timing request

**See also** [SetMetaData](#)

## GetMinimumImageLength

**unsigned int WINAPI GetMinimumImageLength (int\* MinImageLength)**

**Description** This function will return the minimum number of pixels that can be read out from the chip at each exposure. This minimum value arises due the way in which the chip is read out and will limit the possible sub image dimensions and binning sizes that can be applied.

**Parameters** int\* MinImageLength: Will contain the minimum number of super pixels on return.

**Return** unsigned int

DRV_SUCCESS	Minimum Number of Pixels returned
DRV_NOT_INITIALIZED	System not initialized
DRV_P1INVALID	Invalid MinImageLength value (i.e. NULL)

**See also** [SetImage](#)

## GetMinimumNumberInSeries

**unsigned int WINAPI GetMinimumNumberInSeries(int \* number)**

**Description** THIS FUNCTION IS RESERVED.

## GetMostRecentColorImage16

**unsigned int WINAPI GetMostRecentColorImage16 (unsigned long size, int algorithm, WORD\* red, WORD\* green, WORD\* blue)**

**Description** For colour sensors only.

Color version of the [GetMostRecentImage16](#) function. The CCD is sensitive to Cyan, Yellow, Magenta and Green (CYMG). The Red, Green and Blue (RGB) are calculated and Data is stored in 3 planes/images, one for each basic color.

**Parameters**

unsigned long size: total number of pixels.

int algorithm: algorithm used to extract the RGB from the original CYMG CCD.

0: basic algorithm combining Cyan, Yellow and Magenta.

1: algorithm combining Cyan, Yellow, Magenta and Green.

WORD\* red: pointer to red data storage allocated by the user.

WORD\* green: pointer to red data storage allocated by the user.

WORD\* blue: pointer to red data storage allocated by the user.

**Return**

unsigned int

DRV\_SUCCESS Image RGB has been copied into arrays.

DRV\_NOT\_INITIALIZED System not initialized.

DRV\_ERROR\_ACK Unable to communicate with card.

DRV\_P1INVALID Arrays size is incorrect.

DRV\_P2INVALID Invalid algorithm.

DRV\_P3INVALID Invalid red pointer (i.e. NULL)..

DRV\_P4INVALID Invalid green pointer (i.e. NULL)..

DRV\_P5INVALID Invalid bluepointer (i.e. NULL)..

DRV\_NO\_NEW\_DATA There is no new data yet.

**See also**

[GetMostRecentImage16](#), [DemosaicImage](#), [WhiteBalance](#).

## GetMostRecentImage

**unsigned int WINAPI GetMostRecentImage(at\_32\* arr, unsigned long size)**

**Description** This function will update the data array with the most recently acquired image in any acquisition mode. The data are returned as long integers (32-bit signed integers). The "array" must be exactly the same size as the complete image.

**Parameters** long\* arr: pointer to data storage allocated by the user.  
unsigned long size: total number of pixels.

**Return** unsigned int

DRV_SUCCESS	Image has been copied into array.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ERROR_ACK	Unable to communicate with card.
DRV_P1INVALID	Invalid pointer (i.e. NULL).
DRV_P2INVALID	Array size is incorrect.
DRV_NO_NEW_DATA	There is no new data yet.

**See also** [GetMostRecentImage16](#), [GetOldestImage](#), [GetOldestImage16](#), [GetImages](#)

## GetMostRecentImage16

**unsigned int WINAPI GetMostRecentImage16(WORD\* arr, unsigned long size)**

**Description** 16-bit version of the GetMostRecentImage function.

**Parameters** WORD\* arr: pointer to data storage allocated by the user.  
unsigned long size: total number of pixels.

**Return** unsigned int

DRV_SUCCESS	Image has been copied into array.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ERROR_ACK	Unable to communicate with card.
DRV_P1INVALID	Invalid pointer (i.e. NULL).
DRV_P2INVALID	Array size is incorrect.
DRV_NO_NEW_DATA	There is no new data yet.

**See also** [GetMostRecentImage](#), [GetOldestImage16](#), [GetOldestImage](#), [GetImages](#)

## GetMSTimingsData

unsigned int WINAPI GetMSTimingsData(SYSTEMTIME \*TimeOfStart ,float \*pfDifferences, int inoOfimages)

**Description** THIS FUNCTION IS RESERVED.

## GetMSTimingsEnabled

unsigned int WINAPI GetMSTimingsEnabled(void)

**Description** THIS FUNCTION IS RESERVED.

## GetNewData

unsigned int WINAPI GetNewData(at\_32\* arr, unsigned long size)

**Description** **Deprecated see Note:**

This function will update the data array to hold data acquired so far. The data are returned as long integers (32-bit signed integers). The “array” must be large enough to hold the complete data set. When used in conjunction with the [SetDriverEvent](#) and GetAcquisitionProgress functions, the data from each scan in a kinetic series can be processed while the acquisition is taking place.

**Parameters** At\_\* array: pointer to data storage allocated by the user.  
unsigned long size: total number of pixels.

**Return** unsigned int

DRV_SUCCESS	Data copied.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ERROR_ACK	Unable to communicate with card.
DRV_P1INVALID	Invalid pointer (i.e. NULL).
DRV_P2INVALID	Array size is incorrect.
DRV_NO_NEW_DATA	There is no new data yet.

**See also** [SetDriverEvent](#), [GetAcquisitionProgress](#), [SetAcquisitionMode](#), [GetNewData8](#), [GetNewData16](#)

**NOTE:** Deprecated by the following functions:

- [GetImages](#)
- [GetMostRecentImage](#)
- [GetOldestImage](#)



## GetNewData16

unsigned int WINAPI GetNewData16(WORD\* arr, unsigned long size)

<b>Description</b>	<b>Deprecated see Note:</b> 16-bit version of the GetNewData function.	
<b>Parameters</b>	WORD* arr: pointer to data storage allocated by the user. unsigned long size: total number of pixels.	
<b>Return</b>	unsigned int	
	DRV_SUCCESS	Data copied.
	DRV_NOT_INITIALIZED	System not initialized.
	DRV_ERROR_ACK	Unable to communicate with card.
	DRV_P1INVALID	Invalid pointer (i.e. NULL).
	DRV_P2INVALID	Array size is incorrect.
	DRV_NO_NEW_DATA	There is no new data yet.

**NOTE: Deprecated by the following functions:**

- [GetImages](#)
- [GetMostRecentImage](#)
- [GetOldestImage](#)

## GetNewData8

unsigned int WINAPI GetNewData8(unsigned char\* arr, unsigned long size)

<b>Description</b>	<b>Deprecated see Note:</b> 8-bit version of the GetNewData function. This function will return the data in the lower 8 bits of the acquired data.	
<b>Parameters</b>	unsigned char* arr: pointer to data storage allocated by the user. unsigned long size: total number of pixels.	
<b>Return</b>	unsigned int	
	DRV_SUCCESS	Data copied.
	DRV_NOT_INITIALIZED	System not initialized.
	DRV_ERROR_ACK	Unable to communicate with card.
	DRV_P1INVALID	Invalid pointer (i.e. NULL).
	DRV_P2INVALID	Array size is incorrect.
	DRV_NO_NEW_DATA	There is no new data yet.

**NOTE: Deprecated by the following functions:**

- [GetImages](#)
- [GetMostRecentImage](#)
- [GetOldestImage](#)

## GetNewFloatData

unsigned int WINAPI GetNewFloatData(float\* arr, unsigned long size)

**Description** THIS FUNCTION IS RESERVED.

## GetNumberADChannels

unsigned int WINAPI GetNumberADChannels(int\* channels)

**Description** As your Andor SDK system may be capable of operating with more than one A-D converter, this function will tell you the number available.

**Parameters** int\* channels: number of allowed channels

**Return** unsigned int  
DRV\_SUCCESS Number of channels returned.

**See also** [SetADChannel](#)

## GetNumberAmp

unsigned int WINAPI GetNumberAmp(int\* amp)

**Description** As your Andor SDK system may be capable of operating with more than one output amplifier, this function will tell you the number available.

**Parameters** int\* amp: number of allowed channels

**Return** unsigned int  
DRV\_SUCCESS Number of output amplifiers returned.

**See also** [SetOutputAmplifier](#)

## GetNumberAvailableImages

unsigned int WINAPI GetNumberAvailableImages (at\_32\* first, at\_32\* last)

**Description** This function will return information on the number of available images in the circular buffer. This information can be used with [GetImages](#) to retrieve a series of images. If any images are overwritten in the circular buffer they no longer can be retrieved and the information returned will treat overwritten images as not available.

**Parameters** at\_32\* first: returns the index of the first available image in the circular buffer.  
at\_32\* last: returns the index of the last available image in the circular buffer.

**Return** unsigned int  
DRV\_SUCCESS Number of acquired images returned  
DRV\_NOT\_INITIALIZED System not initialized  
DRV\_ERROR\_ACK Unable to communicate with card  
DRV\_NO\_NEW\_DATA There is no new data yet

**See also** [GetImages](#), [GetImages16](#), [GetNumberNewImages](#).

unsigned int WINAPI GetNumberDevices (int\* numDevs)

**Description** THIS FUNCTION IS RESERVED.

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## GetNumberDDGExternalOutputs

unsigned int WINAPI GetNumberDDGExternalOutputs(at\_u32 \* Count)

**Description** This function gets the number of available external outputs.

**Parameters** at\_u32 \* Count: number of available external outputs.

**Return** unsigned int

DRV_SUCCESS	Number returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_NOT_SUPPORTED	External outputs not supported.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with system.
DRV_P1INVALID	Count has invalid memory address.

**See also** [GetCapabilities](#) [SetDDGExternalOutputEnabled](#)

**NOTE:** Available on USB iStar.

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## GetNumberFKVShiftSpeeds

unsigned int WINAPI GetNumberFKVShiftSpeeds(int\* number)

**Description** As your Andor SDK system is capable of operating at more than one fast kinetics vertical shift speed this function will return the actual number of speeds available.

**Parameters** int\* number: number of allowed speeds

**Return** unsigned int

DRV_SUCCESS	Number of speeds returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.

**See also** [GetFKVShiftSpeedF](#), [SetFKVShiftSpeed](#)

**NOTE:** Only available if camera is Classic or iStar.

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## GetNumberHorizontalSpeeds

**unsigned int WINAPI GetNumberHorizontalSpeeds(int\* number)**

**Description**      **Deprecated see Note:**

As your Andor SDK system is capable of operating at more than one horizontal shift speed this function will return the actual number of speeds available.

**Parameters**      int\* number: number of allowed horizontal speeds

**Return**      unsigned int

DRV\_SUCCESS      Number of speeds returned.

DRV\_NOT\_INITIALIZED      System not initialized.

DRV\_ACQUIRING      Acquisition in progress.

**See also**      [GetHorizontalSpeed](#), [SetHorizontalSpeed](#)

**NOTE: Deprecated by** [GetNumberHSSpeeds](#)

## GetNumberHSSpeeds

**unsigned int WINAPI GetNumberHSSpeeds(int channel, int typ, int\* speeds)**

**Description**      As your Andor SDK system is capable of operating at more than one horizontal shift speed this function will return the actual number of speeds available.

**Parameters**      int channel: the AD channel.

int typ: output amplification.

Valid values: 0      electron multiplication.

1      conventional.

int\* speeds: number of allowed horizontal speeds

**Return**      unsigned int

DRV\_SUCCESS      Number of speeds returned.

DRV\_NOT\_INITIALIZED      System not initialized.

DRV\_P1INVALID      Invalid channel.

DRV\_P2INVALID      Invalid horizontal read mode

**See also**      [GetHSSpeed](#), [SetHSSpeed](#), [GetNumberADChannels](#)

## GetNumberMissedExternalTriggers

unsigned int WINAPI GetNumberMissedExternalTriggers(unsigned int first, unsigned int last, WORD \* arr, unsigned int size)

**Description** THIS FUNCTION IS RESERVED.

## GetNumberNewImages

unsigned int WINAPI GetNumberNewImages(long\* first, long\* last)

**Description** This function will return information on the number of new images (i.e. images which have not yet been retrieved) in the circular buffer. This information can be used with [GetImages](#) to retrieve a series of the latest images. If any images are overwritten in the circular buffer they can no longer be retrieved and the information returned will treat overwritten images as having been retrieved.

**Parameters** long\* first: returns the index of the first available image in the circular buffer.  
long\* last: returns the index of the last available image in the circular buffer.

**Return** unsigned int

DRV_SUCCESS	Number of acquired images returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ERROR_ACK	Unable to communicate with card.
DRV_NO_NEW_DATA	There is no new data yet.

**See also** [GetImages](#), [GetImages16](#), [GetNumberAvailableImages](#)

Note: This index will increment as soon as a single accumulation has been completed within the current acquisition.

## GetNumberPhotonCountingDivisions

**unsigned int WINAPI GetNumberPhotonCountingDivisions(unsigned long \* noOfDivisions)**

**Description** Available in some systems is photon counting mode. This function gets the number of photon counting divisions available. The functions [SetPhotonCounting](#) and [SetPhotonCountingThreshold](#) can be used to specify which of these divisions is to be used.

**Parameters** unsigned long\* noOfDivisions: number of allowed photon counting divisions

**Return** unsigned int

DRV_SUCCESS	Number of photon counting divisions returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_P1INVALID	Invalid parameter.
DRV_NOT_AVAILABLE	Photon Counting not available

**See also** [SetPhotonCounting](#), [SetPhotonCountingThreshold](#), [GetCapabilities](#)

## GetNumberPreAmpGains

**unsigned int WINAPI GetNumberPreAmpGains(int\* noGains)**

**Description** Available in some systems are a number of pre amp gains that can be applied to the data as it is read out. This function gets the number of these pre amp gains available. The functions [GetPreAmpGain](#) and [SetPreAmpGain](#) can be used to specify which of these gains is to be used.

**Parameters** int\* noGains: number of allowed pre amp gains

**Return** unsigned int

DRV_SUCCESS	Number of pre amp gains returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.

**See also** [IsPreAmpGainAvailable](#), [GetPreAmpGain](#), [SetPreAmpGain](#), [GetCapabilities](#)

## GetNumberRingExposureTimes

**unsigned int WINAPI GetNumberRingExposureTimes (int \* ipnumTimes)**

**Description** Gets the number of exposures in the ring at this moment.

**Parameters** int \* ipnumTimes: Number of exposure times.

**Return** unsigned int

DRV_SUCCESS	Success
DRV_NOT_INITIALIZED	System not initialized

**See also** [SetRingExposureTimes](#)

## GetNumberIO

**unsigned int WINAPI GetNumberIO(int\* iNumber)**

**Description** Available in some systems are a number of IO's that can be configured to be inputs or outputs. This function gets the number of these IO's available. The functions GetIODirection, GetIOLevel, SetIODirection and SetIOLevel can be used to specify the configuration.

**Parameters** int\* iNumber: number of allowed IO's

**Return** unsigned int

DRV_SUCCESS	Number of IO's returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_P1INVALID	Invalid parameter.
DRV_NOT_AVAILABLE	Feature not available.

**See also** [GetIOLevel](#) [GetIODirection](#) [SetIODirection](#) [SetIOLevel](#)

## GetNumberVerticalSpeeds

**unsigned int WINAPI GetNumberVerticalSpeeds(int\* number)**

**Description**      **Deprecated see Note:**

As your Andor system may be capable of operating at more than one vertical shift speed this function will return the actual number of speeds available.

**Parameters**      int\* number: number of allowed vertical speeds

**Return**      unsigned int

DRV\_SUCCESS      Number of speeds returned.

DRV\_NOT\_INITIALIZED      System not initialized.

DRV\_ACQUIRING      Acquisition in progress.

**See also**      [GetVerticalSpeed](#), [SetVerticalSpeed](#)

**NOTE:** Deprecated by [GetNumberVSSpeeds](#)

## GetNumberVSAmplitudes

**unsigned int WINAPI GetNumberVSAmplitudes (int\* number)**

**Description**      This function will normally return the number of vertical clock voltage amplitues that the camera has.

**Parameters**      int \*number:

**Return**      unsigned int

DRV\_SUCCESS      Number returned

DRV\_NOT\_INITIALIZED      System not initialized

DRV\_NOT\_AVAILABLE      Your system does not support this feature

## GetNumberVSSpeeds

**unsigned int WINAPI GetNumberVSSpeeds(int\* speeds)**

**Description**      As your Andor system may be capable of operating at more than one vertical shift speed this function will return the actual number of speeds available.

**Parameters**      int\* speeds: number of allowed vertical speeds

**Return**      unsigned int

DRV\_SUCCESS      Number of speeds returned.

DRV\_NOT\_INITIALIZED      System not initialized.

DRV\_ACQUIRING      Acquisition in progress.

**See also**      [GetVSSpeed](#), [SetVSSpeed](#), [GetFastestRecommendedVSSpeed](#)



## GetOldestImage

**unsigned int WINAPI GetOldestImage(at\_32\* arr, unsigned long size)**

**Description** This function will update the data array with the oldest image in the circular buffer. Once the oldest image has been retrieved it no longer is available. The data are returned as long integers (32-bit signed integers). The "array" must be exactly the same size as the full image.

**Parameters** at\_32\* arr: pointer to data storage allocated by the user.  
unsigned long size: total number of pixels.

**Return** unsigned int

DRV_SUCCESS	Image has been copied into array.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ERROR_ACK	Unable to communicate with card.
DRV_P1INVALID	Invalid pointer (i.e. NULL).
DRV_P2INVALID	Array size is incorrect.
DRV_NO_NEW_DATA	There is no new data yet.

**See also** [GetOldestImage16](#), [GetMostRecentImage](#), [GetMostRecentImage16](#)

## GetOldestImage16

**unsigned int WINAPI GetOldestImage16(WORD\* arr, unsigned long size)**

**Description** 16-bit version of the GetOldestImage function.

**Parameters** WORD\* arr: pointer to data storage allocated by the user.  
unsigned long size: total number of pixels.

**Return** unsigned int

DRV_SUCCESS	Image has been copied into array.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ERROR_ACK	Unable to communicate with card.
DRV_P1INVALID	Invalid pointer (i.e. NULL).
DRV_P2INVALID	Array size is incorrect.
DRV_NO_NEW_DATA	There is no new data yet.

**See also** [GetOldestImage](#), [GetMostRecentImage16](#), [GetMostRecentImage](#)

## GetPhosphorStatus

**unsigned int WINAPI GetPhosphorStatus(int \* status)**

**Description** This function will return if the phosphor has saturated.

**Parameters** int \* status: The status of the phosphor

0 Normal

1 Saturated

**Return** unsigned int

DRV\_SUCCESS State returned.

DRV\_NOT\_INITIALIZED System not initialized.

DRV\_NOT\_SUPPORTED Phosphor status not supported.

DRV\_ACQUIRING Acquisition in progress.

DRV\_ERROR\_ACK Unable to communicate with system.

DRV\_P1INVALID status has invalid memory address.

**See also**

## GetPhysicalDMAAddress

**unsigned int WINAPI GetPhysicalDMAAddress (unsigned long\* Address1, unsigned long\* Address2)**

**Description** THIS FUNCTION IS RESERVED.

## GetPixelSize

**unsigned int WINAPI GetPixelSize(float\* xSize, float\* ySize)**

**Description** This function returns the dimension of the pixels in the detector in microns.

**Parameters** float\* xSize: width of pixel.

float\* ySize: height of pixel.

**Return** unsigned int

DRV\_SUCCESS Pixel size returned.

**unsigned int WINAPI GetPreAmpGain(int index, float\* gain)**

**Description** For those systems that provide a number of pre amp gains to apply to the data as it is read out; this function retrieves the amount of gain that is stored for a particular index. The number of gains available can be obtained by calling the [GetNumberPreAmpGains](#) function and a specific Gain can be selected using the function [SetPreAmpGain](#).

**Parameters** int index: gain index  
Valid values: 0 to [GetNumberPreAmpGains\(\)](#)-1  
float\* gain: gain factor for this index.

**Return** unsigned int  
DRV\_SUCCESS Gain returned.  
DRV\_NOT\_INITIALIZED System not initialized.  
DRV\_ACQUIRING Acquisition in progress.  
DRV\_P1INVALID Invalid index.

**See also** [IsPreAmpGainAvailable](#), [GetNumberPreAmpGains](#), [SetPreAmpGain](#), [GetCapabilities](#)

## GetPreAmpGainText

**unsigned int WINAPI GetPreAmpGainText (int index , char\* name, int len)**

**Description** This function will return a string with a pre amp gain description. The pre amp gain is selected using the index. The SDK has a string associated with each of its pre amp gains. The maximum number of characters needed to store the pre amp gain descriptions is 30. The user has to specify the number of characters they wish to have returned to them from this function.

**Parameters**

int index: gain index  
Valid values: 0 to [GetNumberPreAmpGains\(\)](#)-1

char\* name: A user allocated array of characters for storage of the description.

int len: The length of the user allocated character array.

**Return**

unsigned int	
DRV_SUCCESS	Description returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_P1INVALID	Invalid index.
DRV_P2INVALID	Array size is incorrect
DRV_NOT_SUPPORTED	Function not supported with this camera

**See also** [IsPreAmpGainAvailable](#), [GetNumberPreAmpGains](#), [SetPreAmpGain](#), [GetCapabilities](#)

## GetQE

**unsigned int WINAPI GetQE(char \* sensor, float wavelength, unsigned int mode, float \* QE)**

**Description** Returns the percentage QE for a particular head model at a user specified wavelength.

**Parameters**

char\* sensor: head model

float wavelength: wavelength at which QE is required

unsigned int mode: Clara mode (Normal (0) or Extended NIR (1)). 0 for all other systems

float\* QE: requested QE

**Return**

unsigned int	
DRV_SUCCESS	QE returned.
DRV_NOT_INITIALIZED	System not initialized.

**See also** [\\_GetHeadModel](#), [GetCapabilities](#)

## GetReadOutTime

**unsigned int WINAPI GetReadOutTime(float\* ReadoutTime)**

**Description** This function will return the time to readout data from a sensor. This function should be used after all the acquisitions settings have been set, e.g. SetExposureTime, SetKineticCycleTime and SetReadMode etc. The value returned is the actual times used in subsequent acquisitions.

**Parameters** float\* ReadoutTime: valid readout time in seconds

**Return** unsigned int

DRV_SUCCESS	Timing information returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ERROR_CODES	Error communicating with camera.

**See also** [GetAcquisitionTimings](#) [GetKeepCleanTime](#)

**NOTES** **NOTE: Available on iDus, iXon, Luca & Newton.**

## GetRegisterDump

**unsigned int WINAPI GetRegisterDump (int\* mode)**

**Description** **THIS FUNCTION IS RESERVED.**

## GetRelativeImageTimes

**unsigned int WINAPI GetRelativeImageTimes (unsigned int first, unsigned int last, at\_u64 \* arr, unsigned int size)**

**Description** This function will return an array of the start times in nanoseconds of a user defined number of frames relative to the initial frame.

**Parameters** unsigned int first: Index of first frame in array.  
 unsigned int last: Index of last frame in array.  
 at\_u64 \* arr: array of times in nanoseconds for each frame from time of start.  
 int index: number of frames for which start time is required.

**Return** unsigned int

DRV_SUCCESS	Timings returned
DRV_NOT_INITIALIZED	System not initialized
DRV_MSTIMINGS_ERROR	Invalid timing request

**See also** [GetCapabilities](#) [SetMetaData](#)

## GetRingExposureRange

**unsigned int WINAPI GetRingExposureRange (float \* fpMin, float \* fpMax)**

**Description** With the Ring Of Exposure feature there may be a case when not all exposures can be met. The ring of exposure feature will guarantee that the highest exposure will be met but this may mean that the lower exposures may not be. If the lower exposures are too low they will be increased to the lowest value possible. This function will return these upper and lower values.

**Parameters** float \* fpMin: Minimum exposure  
float \* fpMax: Maximum exposure.

**Return** unsigned int  
DRV\_SUCCESS Min and max returned  
DRV\_NOT\_INITIALIZED System not initialize  
DRV\_INVALID\_MODE Trigger mode is not available

**See also** [GetCapabilities](#), [GetNumberRingExposureTimes](#), [IsTriggerModeAvailable](#), [SetRingExposureTimes](#)

## GetSDK3Handle

**unsigned int WINAPI GetSDK3Handle(int \* Handle)**

**Description** THIS FUNCTION IS RESERVED.

## GetSensitivity

**unsigned int WINAPI GetSensitivity(int channel, int index, int amplifier, int pa, float\* sensitivity)**

**Description** This function returns the sensitivity for a particular speed.

**Parameters** int channel: AD channel index.  
int amplifier: Type of output amplifier.  
int index: Channel speed index.  
int pa: PreAmp gain index.  
float\* sensitivity: requested sensitivity.

**Return** unsigned int  
DRV\_SUCCESS Sensitivity returned.  
DRV\_NOT\_INITIALIZED System not initialized.  
DRV\_ACQUIRING Acquisition in progress.  
DRV\_P1INVALID Invalid channel.  
DRV\_P2INVALID Invalid amplifier.  
DRV\_P3INVALID Invalid speed index.  
DRV\_P4INVALID Invalid gain.

**See also** [GetCapabilities](#)

**NOTE:** Available only on iXon+ and Clara.

## GetShutterMinTimes

**unsigned int WINAPI GetShutterMinTimes(int \* minclosingtime, int \* minopeningtime);**

**Description** This function will return the minimum opening and closing times in milliseconds for the shutter on the current camera.

**Parameters** int\* minclosingtime: returns the minimum closing time in milliseconds that the shutter of the camera supports.  
int\* minopeningtime: returns the minimum opening time in milliseconds that the shutter of the camera supports.

**Return** unsigned int  
DRV\_SUCCESS Minimum times successfully returned.  
DRV\_NOT\_INITIALIZED System not initialized.  
DRV\_P1INVALID Parameter is NULL.  
DRV\_P2INVALID Parameter is NULL

## GetSizeOfCircularBuffer

**unsigned int WINAPI GetSizeOfCircularBuffer(long\* index)**

**Description** This function will return the maximum number of images the circular buffer can store based on the current acquisition settings.

**Parameters** long\* index: returns the maximum number of images the circular buffer can store.

**Return** unsigned int  
DRV\_SUCCESS Maximum number of images returned.  
DRV\_NOT\_INITIALIZED System not initialized.

## GetSlotBusDeviceFunction

**unsigned int WINAPI GetSlotBusDeviceFunction (DWORD \*dwSlot, DWORD \*dwBus, DWORD \*dwDevice, DWORD \*dwFunction)**

**Description** THIS FUNCTION IS RESERVED

### GetSoftwareVersion

**unsigned int WINAPI GetSoftwareVersion(unsigned int\* eprom, unsigned int\* cofFile, unsigned int\* vxdRev, unsigned int\* vxdVer, unsigned int\* dllRev, unsigned int\* dllVer)**

<b>Description</b>	This function returns the Software version information for the microprocessor code and the driver.	
<b>Parameters</b>	unsigned int* eprom: EPROM version unsigned int* cofFile: COF file version unsigned int *vxdRev: Driver revision number unsigned int *vxdVer: Driver version number unsigned int *dllRev: DLL revision number unsigned int *dllVer: DLL version number	
<b>Return</b>	unsigned int	
	DRV_SUCCESS	Version information returned.
	DRV_NOT_INITIALIZED	System not initialized.
	DRV_ACQUIRING	Acquisition in progress.
	DRV_ERROR_ACK	Unable to communicate with card.

### GetSpoolProgress

**unsigned int WINAPI GetSpoolProgress(long\* index)**

<b>Description</b>	<b>Deprecated see Note:</b>	
	This function will return information on the progress of the current spool operation. The value returned is the number of images that have been saved to disk during the current kinetic scan.	
<b>Parameters</b>	long* index: returns the number of files saved to disk in the current kinetic scan.	
<b>Return</b>	unsigned int	
	DRV_SUCCESS	Spool progress returned.
	DRV_NOT_INITIALIZED	System not initialized.

**See also** [SetSpool](#)

**NOTE:** Deprecated by [GetTotalNumberImagesAcquired](#)

### GetStartUpTime

**unsigned int WINAPI GetStartUpTime(float \* time)**

<b>Description</b>	<b>THIS FUNCTION IS RESERVED.</b>
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### unsigned int WINAPI GetStatus(int\* status)

**Description** This function will return the current status of the Andor SDK system. This function should be called before an acquisition is started to ensure that it is IDLE and during an acquisition to monitor the process.

**Parameters** int\* status: current status

DRV_IDLE	IDLE waiting on instructions.
DRV_TEMPCYCLE	Executing temperature cycle.
DRV_ACQUIRING	Acquisition in progress.
DRV_ACCUM_TIME_NOT_MET	Unable to meet Accumulate cycle time.
DRV_KINETIC_TIME_NOT_MET	Unable to meet Kinetic cycle time.
DRV_ERROR_ACK	Unable to communicate with card.
DRV_ACQ_BUFFER	Computer unable to read the data via the ISA slot at the required rate.
DRV_ACQ_DOWNFIFO_FULL	Computer unable to read data fast enough to stop camera memory going full.
DRV_SPOOLERROR	Overflow of the spool buffer.

**Return** unsigned int

DRV_SUCCESS	Status returned
DRV_NOT_INITIALIZED	System not initialized

**See also** [SetTemperature](#), [StartAcquisition](#)

**NOTE:** If the status is one of the following:

- DRV\_ACCUM\_TIME\_NOT\_MET
- DRV\_KINETIC\_TIME\_NOT\_MET
- DRV\_ERROR\_ACK
- DRV\_ACQ\_BUFFER
- DRV\_ACQ\_DOWNFIFO\_FULL

then the current acquisition will be aborted automatically.

**unsigned int WINAPI GetTECStatus(int \* status)****Description** This function will return if the TEC has overheated.**Parameters** int \* status: The status of the TEC

0 Normal

1 Tripped

**Return** unsigned int

DRV\_SUCCESS

State returned.

DRV\_NOT\_INITIALIZED

System not initialized.

DRV\_NOT\_SUPPORTED

TEC status not supported.

DRV\_ACQUIRING

Acquisition in progress.

DRV\_ERROR\_ACK

Unable to communicate with card.

DRV\_P1INVALID

status has invalid memory address.

**See also** [SetTECEvent](#)

## GetTemperature

**unsigned int WINAPI GetTemperature(int\* temperature)**

**Description** This function returns the temperature of the detector to the nearest degree. It also gives the status of cooling process.

**Parameters** int\* temperature: temperature of the detector

**Return** unsigned int

DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with card.
DRV_TEMP_OFF	Temperature is OFF.
DRV_TEMP_STABILIZED	Temperature has stabilized at set point.
DRV_TEMP_NOT_REACHED	Temperature has not reached set point.
DRV_TEMP_DRIFT	Temperature had stabilized but has since drifted
DRV_TEMP_NOT_STABILIZED	Temperature reached but not stabilized

**See also** [GetTemperatureF](#), [SetTemperature](#), [CoolerON](#), [CoolerOFF](#), [GetTemperatureRange](#)

## GetTemperatureF

**unsigned int WINAPI GetTemperatureF(float\* temperature)**

**Description** This function returns the temperature in degrees of the detector. It also gives the status of cooling process.

**Parameters** float\* temperature: temperature of the detector

**Return** unsigned int

DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with card.
DRV_TEMP_OFF	Temperature is OFF.
DRV_TEMP_STABILIZED	Temperature has stabilized at set point.
DRV_TEMP_NOT_REACHED	Temperature has not reached set point.
DRV_TEMP_DRIFT	Temperature had stabilised but has since drifted
DRV_TEMP_NOT_STABILIZED	Temperature reached but not stabilized

**See also** [GetTemperature](#), [SetTemperature](#), [CoolerON](#), [CoolerOFF](#), [GetTemperatureRange](#)

## GetTemperaturePrecision

**unsigned int WINAPI GetTemperaturePrecision(int\* precision)**

<b>Description</b>	This function returns the number of decimal places to which the sensor temperature can be returned.		
<b>Parameters</b>	int* precision: number of decimal places		
<b>Return</b>	unsigned int		
	DRV_SUCCESS	Temperature precision returned.	
	DRV_NOT_INITIALIZED	System not initialized.	
	DRV_ACQUIRING	Acquisition in progress.	
<b>See also</b>	<a href="#">GetTemperature</a> , <a href="#">GetTemperatureF</a> , <a href="#">SetTemperature</a> , <a href="#">CoolerON</a> , <a href="#">CoolerOFF</a>		
<b>Note</b>	Only available with iXon Ultra.		

## GetTemperatureRange

**unsigned int WINAPI GetTemperatureRange(int\* mintemp, int\* maxtemp)**

<b>Description</b>	This function returns the valid range of temperatures in centigrade to which the detector can be cooled.		
<b>Parameters</b>	int* mintemp: minimum temperature int* maxtemp: maximum temperature		
<b>Return</b>	unsigned int		
	DRV_SUCCESS		Temperature range returned.
	DRV_NOT_INITIALIZED		System not initialized.
	DRV_ACQUIRING		Acquisition in progress.
<b>See also</b>	<a href="#">GetTemperature</a> , <a href="#">GetTemperatureF</a> , <a href="#">SetTemperature</a> , <a href="#">CoolerON</a> , <a href="#">CoolerOFF</a>		

## GetTemperatureStatus

**unsigned int WINAPI GetTemperatureStatus (float \*SensorTemp, float \*TargetTemp, float \*AmbientTemp, float \*CoolerVolts)**

**Description** THIS FUNCTION IS RESERVED.

## GetTotalNumberImagesAcquired

**unsigned int WINAPI GetTotalNumberImagesAcquired(long\* index)**

<b>Description</b>	This function will return the total number of images acquired since the current acquisition started. If the camera is idle the value returned is the number of images acquired during the last acquisition.		
<b>Parameters</b>	long* index: returns the total number of images acquired since the acquisition started.		
<b>Return</b>	unsigned int		
	DRV_SUCCESS	Number of acquired images returned.	
	DRV_NOT_INITIALIZED	System not initialized.	

## GetTriggerLevelRange

**unsigned int WINAPI GetTriggerLevelRange(float \* minimum, float \* maximum)**

**Description** This function returns the valid range of triggers in volts which the system can use.

**Parameters** float \* minimum: minimum trigger voltage  
float \* maximum: maximum trigger voltage

**Return** unsigned int

DRV_SUCCESS	Levels returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_NOT_SUPPORTED	Trigger levels not supported.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with system.
DRV_P1INVALID	minimum has invalid memory address.
DRV_P2INVALID	maximum has invalid memory address.

**See also** [GetCapabilities](#) [SetTriggerLevel](#)

## GetUSBDeviceDetails

**unsigned int WINAPI GetUSBDeviceDetails(WORD \* VendorID, WORD \* ProductID, WORD \* FirmwareVersion, WORD \* SpecificationNumber)**

**Description** This function returns details for the active USB system.

**Parameters** WORD \* VendorID: USB camera vendor ID  
WORD \* ProductID: USB camera product ID  
WORD \* FirmwareVersion: USB camera firmware version  
WORD \* SpecificationNumber: USB camera specification number

**Return** unsigned int

DRV_SUCCESS	USB details returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_NOT_SUPPORTED	Not a USB system.

**See also** [GetCapabilities](#)

## GetVersionInfo

**unsigned int WINAPI GetVersionInfo (AT\_VersionInfo arr, char\* szVersionInfo, at\_u32 ui32BufferLen)**

**Description** This function retrieves version information about different aspects of the Andor system. The information is copied into a passed string buffer. Currently, the version of the SDK and the Device Driver (USB or PCI) is supported.

**Parameters** AT\_VersionInfo arr:

AT\_SDKVersion: requests the SDK version information

AT\_DeviceDriverVersion: requests the device driver version

char\* szVersionInfo: A user allocated array of characters for storage of the information

at\_u32 ui32BufferLen: The size of the passed character array, *versionInfo*.

**Return** unsigned int

DRV_SUCCESS	Information returned
DRV_NOT_INITIALIZED	System not initialized
DRV_P1INVALID	Invalid information type requested
DRV_P2INVALID	Storage array pointer is NULL
DRV_P3INVALID	Size of the storage array is zero

**See also** [GetHeadModel](#), [GetCameraSerialNumber](#), [GetCameraInformation](#), [GetCapabilities](#)

## GetVerticalSpeed

**unsigned int WINAPI GetVerticalSpeed(int index, int\* speed)**

**Description** **Deprecated see Note:**

As your Andor system may be capable of operating at more than one vertical shift speed this function will return the actual speeds available. The value returned is in microseconds per pixel shift.

**Parameters** int index: speed required

Valid values 0 to [GetNumberVerticalSpeeds\(\)](#)-1

int\* speed: speed in microseconds per pixel shift.

**Return** unsigned int

DRV_SUCCESS	Speed returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_P1INVALID	Invalid index.

**See also** [GetNumberVerticalSpeeds](#), [SetVerticalSpeed](#)

**NOTE:** Deprecated by [GetVSSpeed](#).

## GetVirtualDMAAddress

**unsigned int WINAPI GetVirtualDMAAddress(void\*\* Address1, void\*\* Address2)**

**Description** THIS FUNCTION IS RESERVED.

## GetVSAmplitudeFromString

**unsigned int WINAPI GetVSAmplitudeFromString(char\* text, int\* index)**

**Description** This Function is used to get the index of the Vertical Clock Amplitude that corresponds to the string passed in.

**Parameters** char\* text: String to test  
Valid values: "Normal" , "+1" , "+2" , "+3" , "+4"  
int\* index: Returns the Index of the VSAmplitude that matches string passed in

**Return** unsigned int  
DRV\_SUCCESS Vertical Clock Amplitude string Index returned  
DRV\_NOT\_INITIALIZED System not initialized.  
DRV\_P1INVALID Invalid text.  
DRV\_P2INVALID Invalid index pointer.

**See also** [GetVSAmplitudeString](#), [GetVSAmplitudeValue](#)

## GetVSAmplitudeString

**unsigned int WINAPI GetVSAmplitudeString(int index, char \* text)**

**Description** This Function is used to get the Vertical Clock Amplitude string that corresponds to the index passed in.

**Parameters** int index: Index of VS amplitude required  
Valid values 0 to [GetNumberVSAmplitudes\(\)](#)-1  
char\* text: Returns string value of the VS Amplitude found at the index supplied

**Return** unsigned int  
DRV\_SUCCESS Vertical Clock Amplitude string returned  
DRV\_NOT\_INITIALIZED System not initialized.  
DRV\_P1INVALID Invalid index.  
DRV\_P2INVALID Invalid text pointer.

**See also** [GetVSAmplitudeFromString](#), [GetVSAmplitudeValue](#)

## GetVSAmplitudeValue

**unsigned int WINAPI GetVSAmplitudeValue(int index, int \* value)**

<b>Description</b>	This Function is used to get the value of the Vertical Clock Amplitude found at the index passed in.	
<b>Parameters</b>	int index: Index of VS amplitude required	
	Valid values	0 to <a href="#">GetNumberVSAmplitudes()</a> -1
	int* value: Returns Value of Vertical Clock Amplitude that matches index passed in	
<b>Return</b>	unsigned int	
	DRV_SUCCESS	Vertical Clock Amplitude value returned
	DRV_NOT_INITIALIZED	System not initialized.
	DRV_P1INVALID	Invalid index.
	DRV_P2INVALID	Invalid value pointer.
<b>See also</b>	<a href="#">GetVSAmplitudeFromString</a> , <a href="#">GetVSAmplitudeString</a> ,	

## GetVSSpeed

**unsigned int WINAPI GetVSSpeed(int index, float\* speed)**

<b>Description</b>	As your Andor SDK system may be capable of operating at more than one vertical shift speed this function will return the actual speeds available. The value returned is in microseconds.	
<b>Parameters</b>	int index: speed required	
	Valid values	0 to <a href="#">GetNumberVSSpeeds()</a> -1
	float* speed: speed in microseconds per pixel shift.	
<b>Return</b>	unsigned int	
	DRV_SUCCESS	Speed returned.
	DRV_NOT_INITIALIZED	System not initialized.
	DRV_ACQUIRING	Acquisition in progress.
	DRV_P1INVALID	Invalid index.
<b>See also</b>	<a href="#">GetNumberVSSpeeds</a> , <a href="#">SetVSSpeed</a> , <a href="#">GetFastestRecommendedVSSpeed</a>	



## GPIBReceive

**unsigned int WINAPI GPIBReceive(int id, short address, char\* text, int size)**

**Description** This function reads data from a device until a byte is received with the EOI line asserted or until size bytes have been read.

**Parameters**  
 int id: The interface board number  
 short address: Address of device to send data  
 char\* text: The data to be sent  
 int size: Number of characters to read

**Return**  
 unsigned int  
 DRV\_SUCCESS Data received.  
 DRV\_P3INVALID Invalid pointer (e.g. NULL).  
 Other errors may be returned by the GPIB device.  
 Consult the help documentation supplied with these devices

**See also** [GPIBSend](#)

## GPIBSend

**unsigned int WINAPI GPIBSend(int id, short address, char\* text)**

**Description** This function initializes the GPIB by sending interface clear. Then the device described by address is put in a listen-active state. Finally the string of characters, text, is sent to the device with a newline character and with the EOI line asserted after the final character.

**Parameters**  
 int id: The interface board number  
 short address: Address of device to send data  
 char\* text: The data to be sent

**Return**  
 unsigned int  
 DRV\_SUCCESS Data sent.  
 DRV\_P3INVALID Invalid pointer (e.g. NULL).  
 The GPIB device may return other errors. Consult the help documentation supplied with these devices

**See also** [GPIBReceive](#)

## I2CBurstRead

**unsigned int WINAPI I2CBurstRead(BYTE i2cAddress, long nBytes, BYTE\* data)**

**Description** This function will read a specified number of bytes from a chosen device attached to the I<sup>2</sup>C data bus.

**Parameters** BYTE i2cAddress: The address of the device to read from.  
long nBytes: The number of bytes to read from the device.  
BYTE\* data: The data read from the device.

**Return** unsigned int

DRV_SUCCESS	Read successful.
DRV_VXDNOTINSTALLED	VxD not loaded.
DRV_INIERROR	Unable to load "DETECTOR.INI".
DRV_COERROR	Unable to load "*.COF".
DRV_FLEXERROR	Unable to load "*.RBF".
DRV_ERROR_ACK	Unable to communicate with card.
DRV_I2CDEVNOTFOUND	Could not find the specified device.
DRV_I2CTIMEOUT	Timed out reading from device.
DRV_UNKNOWN_FUNC	Unknown function, incorrect cof file.

**See also** [I2CBurstWrite](#), [I2CRead](#), [I2CWrite](#), [I2cReset](#)

## I2CBurstWrite

**unsigned int WINAPI I2CBurstWrite(BYTE i2cAddress, long nBytes, BYTE\* data)**

**Description** This function will write a specified number of bytes to a chosen device attached to the I<sup>2</sup>C data bus.

**Parameters** BYTE i2cAddress: The address of the device to write to.  
long nBytes: The number of bytes to write to the device.  
BYTE\* data: The data to write to the device.

**Return** unsigned int

DRV_SUCCESS	Write successful.
DRV_VXDNOTINSTALLED	VxD not loaded.
DRV_INIERROR	Unable to load "DETECTOR.INI".
DRV_COERROR	Unable to load "*.COF".
DRV_FLEXERROR	Unable to load "*.RBF".
DRV_ERROR_ACK	Unable to communicate with card.
DRV_I2CDEVNOTFOUND	Could not find the specified device.
DRV_I2CTIMEOUT	Timed out reading from device.
DRV_UNKNOWN_FUNC	Unknown function, incorrect cof file.

**See also** [I2CBurstRead](#), [I2CRead](#), [I2CWrite](#), [I2cReset](#)

## I2CRead

**unsigned int WINAPI I2CRead(BYTE deviceId, BYTE intAddress, BYTE\* pdata)**

**Description** This function will read a single byte from the chosen device.

**Parameters** BYTE deviceId: The device to read from.

BYTE intAddress: The internal address of the device to be read from.

BYTE\* pdata: The byte read from the device.

**Return** unsigned int

DRV_SUCCESS	Read successful.
DRV_VXDNOTINSTALLED	VxD not loaded.
DRV_INIERROR	Unable to load "DETECTOR.INI".
DRV_COFERROR	Unable to load "*.COF".
DRV_FLEXERROR	Unable to load "*.RBF".
DRV_ERROR_ACK	Unable to communicate with card.
DRV_I2CDEVNOTFOUND	Could not find the specified device.
DRV_I2CTIMEOUT	Timed out reading from device.
DRV_UNKNOWN_FUNC	Unknown function, incorrect cof file.

**See also** [I2CBurstWrite](#), [I2CBurstRead](#), [I2CWrite](#), [I2cReset](#)

## I2CReset

**unsigned int WINAPI I2CReset(void)**

**Description** This function will reset the I<sup>2</sup>C data bus.

**Parameters**

**Return** unsigned int

DRV_SUCCESS	Reset successful.
DRV_VXDNOTINSTALLED	VxD not loaded.
DRV_INIERROR	Unable to load "DETECTOR.INI".
DRV_COFERROR	Unable to load "*.COF".
DRV_FLEXERROR	Unable to load "*.RBF".
DRV_ERROR_ACK	Unable to communicate with card.
DRV_I2CTIMEOUT	Timed out reading from device.
DRV_UNKNOWN_FUNC	Unknown function, incorrect cof file.

**See also** [I2CBurstWrite](#), [I2CBurstRead](#), [I2CRead](#), [I2CWrite](#)

## I2CWrite

**unsigned int WINAPI I2CWrite(BYTE deviceId, BYTE intAddress, BYTE data)**

<b>Description</b>	This function will write a single byte to the chosen device.	
<b>Parameters</b>	BYTE deviceId:	The device to write to.
	BYTE intAddress:	The internal address of the device to write to.
	BYTE data:	The byte to be written to the device.
<b>Return</b>	unsigned int	
	DRV_SUCCESS	Write successful.
	DRV_VXDNOTINSTALLED	VxD not loaded.
	DRV_INIERROR	Unable to load "DETECTOR.INI".
	DRV_COFERROR	Unable to load "*.COF".
	DRV_FLEXERROR	Unable to load "*.RBF".
	DRV_ERROR_ACK	Unable to communicate with card.
	DRV_I2CDEVNOTFOUND	Could not find the specified device.
	DRV_I2CTIMEOUT	Timed out reading from device.
	DRV_UNKNOWN_FUNC	Unknown function, incorrect cof file.

**See also** [I2CBurstWrite](#), [I2CBurstRead](#), [I2CRead](#), [I2cReset](#)

## IdAndorDII

**unsigned int WINAPI IdAndorDII (void)**

**Description** **THIS FUNCTION IS RESERVED.**

## InAuxPort

**unsigned int WINAPI InAuxPort(int port, int\* state)**

<b>Description</b>	This function returns the state of the TTL Auxiliary Input Port on the Andor plug-in card.	
<b>Parameters</b>	int port:	Number of AUX in port on Andor card
		Valid Values 1 to 4
	int* state:	current state of port
<b>Return</b>		0 OFF/LOW
		all other ON/HIGH
	unsigned int	
	DRV_SUCCESS	AUX read.
	DRV_NOT_INITIALIZED	System not initialized.
	DRV_ACQUIRING	Acquisition in progress.
	DRV_VXDNOTINSTALLED	VxD not loaded.
	DRV_ERROR_ACK	Unable to communicate with card.
	DRV_P1INVALID	Invalid port id.

**See also** [OutAuxPort](#)

## Initialize

### unsigned int WINAPI Initialize(char\* dir)

**Description** This function will initialize the Andor SDK System. As part of the initialization procedure on some cameras (i.e. Classic, iStar and earlier iXion) the **DLL** will need access to a **DETECTOR.INI** which contains information relating to the detector head, number pixels, readout speeds etc. If your system has multiple cameras then see the section [Controlling multiple cameras](#)

**Parameters** char\* dir: Path to the directory containing the files

**Return** unsigned int

DRV_SUCCESS	Initialisation successful.
DRV_VXDNOTINSTALLED	VxD not loaded.
DRV_INIERROR	Unable to load "DETECTOR.INI".
DRV_COFERROR	Unable to load "*.COF".
DRV_FLEXERROR	Unable to load "*.RBF".
DRV_ERROR_ACK	Unable to communicate with card.
DRV_ERROR_FILELOAD	Unable to load "*.COF" or "*.RBF" files.
DRV_ERROR_PAGELOCK	Unable to acquire lock on requested memory.
DRV_USBERROR	Unable to detect USB device or not USB2.0.
DRV_ERROR_NOCAMERA	No camera found

**See also** [GetAvailableCameras](#), [SetCurrentCamera](#), [GetCurrentCamera](#)

## InitializeDevice

### unsigned int WINAPI InitializeDevice(char \* dir)

**Description** THIS FUNCTION IS RESERVED.

## IsCoolerOn

**unsigned int WINAPI IsCoolerOn (int\* iCoolerStatus)**

**Description** This function checks the status of the cooler.

**Parameters** int\* iCoolerStatus: 0: Cooler is OFF.  
1: Cooler is ON.

**Return** unsigned int  
 DRV\_SUCCESS Status returned.  
 DRV\_NOT\_INITIALIZED System not initialized  
 DRV\_P1INVALID Parameter is NULL

**See also** [CoolerON](#) [CoolerOFF](#)

## IsCountConvertModeAvailable

**unsigned int WINAPI IsCountConvertModeAvailable (int mode)**

**Description** This function checks if the hardware and current settings permit the use of the specified Count Convert mode.

**Parameters** int mode: Count Convert mode to be checked

**Return** unsigned int  
 DRV\_SUCCESS Count Convert mode available.  
 DRV\_NOT\_INITIALIZED System not initialized.  
 DRV\_NOT\_SUPPORTED Count Convert not supported on this camera  
 DRV\_INVALID\_COUNTCONVERT\_MODE Count Convert mode not available with current acquisition settings

**See also** [GetCapabilities](#), [SetCountConvertMode](#), [SetCountConvertWavelength](#)

## IsInternalMechanicalShutter

**unsigned int WINAPI IsInternalMechanicalShutter (int\* InternalShutter)**

**Description** This function checks if an iXon camera has a mechanical shutter installed.

**Parameters** int\* InternalShutter: 0: Mechanical shutter not installed.  
1: Mechanical shutter installed.

**Return** unsigned int  
 DRV\_SUCCESS Internal Shutter state returned  
 DRV\_NOT\_AVAILABLE Not an iXon camera.  
 DRV\_P1INVALID Parameter is NULL

**NOTE** Available only on iXon.

## IsAmplifierAvailable

**unsigned int WINAPI IsAmplifierAvailable(int iamp)**

**Description** This function checks if the hardware and current settings permit the use of the specified amplifier.

**Parameters** int iamp: amplifier to check.

**Return** unsigned int

DRV_SUCCESS	Amplifier available
DRV_NOT_INITIALIZED	System not initialized
DRV_INVALID_AMPLIFIER	Not a valid amplifier

**See also** [SetHSSpeed](#)

## IsReadoutFlippedByAmplifier

**unsigned int WINAPI IsReadoutFlippedByAmplifier(int \_i\_amplifier, int\* \_i\_flipped)**

**Description** On cameras with multiple amplifiers the frame readout may be flipped. This function can be used to determine if this is the case.

**Parameters** int \_i\_amplifier: amplifier to check.  
int\* \_i\_flipped: 0: Frame reads left to right.  
1: Frame reads right to left.

**Return** unsigned int

DRV_SUCCESS	Flipped status returned.
DRV_NOT_INITIALIZED	System not initialized.
DRV_INVALID_AMPLIFIER	Not a valid amplifier

**See also** [GetNumberAmp](#), [SetOutputAmplifier](#)

**NOTE: This will only affect cameras with EM gain capability.**

## IsPreAmpGainAvailable

**unsigned int WINAPI IsPreAmpGainAvailable(int channel, int amplifier, int index, int pa, int\* status)**

**Description** This function checks that the AD channel exists, and that the amplifier, speed and gain are available for the AD channel.

**Parameters** int channel: AD channel index.  
int amplifier: Type of output amplifier.  
int index: Channel speed index.  
int pa: PreAmp gain index.  
int\* status: 0: PreAmpGain not available.  
1: PreAmpGain Available.

**Return** unsigned int

DRV_SUCCESS	PreAmpGain status returned.
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DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_P1INVALID	Invalid channel.
DRV_P2INVALID	Invalid amplifier.
DRV_P3INVALID	Invalid speed index.
DRV_P4INVALID	Invalid gain.

**See also** [GetNumberPreAmpGains](#), [GetPreAmpGain](#), [SetPreAmpGain](#)

**NOTE:** Available only on iXon.

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## IsTriggerModeAvailable

**unsigned int WINAPI IsTriggerModeAvailable(int iTriggerMode)**

**Description** This function checks if the hardware and current settings permit the use of the specified trigger mode.

**Parameters** int iTriggerMode: Trigger mode to check.

**Return** unsigned int

DRV_SUCCESS	Trigger mode available
DRV_NOT_INITIALIZED	System not initialize
DRV_INVALID_MODE	Not a valid mode

**See also** [SetTriggerMode](#)

## Merge

**unsigned int WINAPI Merge(const at\_32\* arr, long nOrder, long nPoint, long nPixel, float\* coeff, long fit, long hbin, at\_32\* output, float\* start, float\* step)**

**Description** THIS FUNCTION IS RESERVED.

## OA\_AddMode

**unsigned int WINAPI OA\_AddMode (char\* ModeName, unsigned int ModeNameLen, char \* ModeDescription, unsigned int ModeDescriptionLen)**

<b>Description</b>	This function will add a mode name and description to memory. Note that this will not add the mode to file, a subsequent call to OA_WriteToFile must be made.	
<b>Parameters</b>	char* ModeName:	A name for the mode to be defined.
	unsigned int ModeNameLen:	Mode name string length.
	char* modeDescription:	A description of the user defined mode.
	unsigned int ModeDescriptionLen:	Mode Description string length.
<b>Return</b>	unsigned int	
	DRV_SUCCESS	All parameters accepted
	DRV_P1INVALID	Null mode name.
	DRV_P3INVALID	Null mode description.
	DRV_OA_INVALID_STRING_LENGTH	One or more parameters have an invalid length, i.e. > 255.
	DRV_OA_INVALID_NAMING	Mode and description have the same name, this is not valid.
	DRV_OA_MODE_BUFFER_FULL	Number of modes exceeds limit.
	DRV_OA_INVALID_CHARS_IN_NAME	Mode name and/or description contain invalid characters.
	DRV_OA_MODE_ALREADY_EXISTS	Mode name already exists in the file.
	DRV_OA_INVALID_CHARS_IN_NAME	Invalid charcters in Mode Name or Mode Description

**See also** [OA\\_DeleteMode](#), [OA\\_WriteToFile](#)

## OA\_DeleteMode

**unsigned int WINAPI OA\_DeleteMode (const char\* const ModeName, unsigned int ModeNameLen)**

<b>Description</b>	This function will remove a mode from memory. To permanently remove a mode from file, call OA_WriteToFile after OA_DeleteMode. The Preset file will not be affected.	
<b>Parameters</b>	const char* const ModeName:	The name of the mode to be removed.
	unsigned int ModeNameLen:	Mode name string length.
<b>Return</b>	unsigned int	All parameters accepted
	DRV_SUCCESS	Null mode name.
	DRV_P1INVALID	
	DRV_OA_INVALID_STRING_LENGTH	The mode name parameter has an invalid length, i.e. > 256.
		Mode does not exist.
	DRV_OA_MODE_DOES_NOT_EXIST	

**See also** [OA\\_AddMode](#), [OA\\_WriteToFile](#)

## OA\_EnableMode

**unsigned int WINAPI OA\_EnableMode (const char\* const ModeName)**

**Description** This function will set all the parameters associated with the specified mode to be used for all subsequent acquisitions. The mode specified by the user must be in either the Preset file or the User defined file.

**Parameters** const char\* const ModeName: The mode to be used for all subsequent acquisitions.

**Return** unsigned int

DRV_SUCCESS	All parameters accepted
DRV_P1INVALID	Null mode name.
DRV_OA_MODE_DOES_NOT_EXIST	Mode name does not exist.
DRV_OA_CAMERA_NOT_SUPPORTED	Camera not supported.

**See also** [OA\\_AddMode](#)

## OA\_GetFloat

**unsigned int WINAPI OA\_GetFloat (const char\* const ModeName, const char\* const ModeParam, float\* FloatValue)**

**Description** This function is used to get the values for floating point type acquisition parameters. Values are retrieved from memory for the specified mode name.

**Parameters** const char\* const ModeName: The name of the mode for which an acquisition parameter will be retrieved.

const char\* const ModeParam: The name of the acquisition parameter for which a value will be retrieved.

float\* FloatValue: The value of the acquisition parameter.

**Return** unsigned int

DRV_SUCCESS	All parameters accepted
DRV_P1INVALID	Null mode parameter.
DRV_P2INVALID	Null mode parameter.
DRV_P3INVALID	Null float value.

**See also** [OA\\_SetFloat](#)

## OA\_GetInt

**unsigned int WINAPI OA\_GetInt (const char\* const ModeName, const char\* const ModeParam, int\* IntValue)**

<b>Description</b>	This function is used to get the values for integer type acquisition parameters. Values are retrieved from memory for the specified mode name.	
<b>Parameters</b>	const char* const ModeName:	The name of the mode for which an acquisition parameter will be retrieved.
	const char* const ModeParam:	The name of the acquisition parameter for which a value will be retrieved.
	int* IntValue:	The buffer to return the value of the acquisition parameter.
<b>Return</b>	unsigned int	
	DRV_SUCCESS	All parameters accepted.
	DRV_P1INVALID	Null mode name.
	DRV_P2INVALID	Null mode parameter.
	DRV_P3INVALID	Null integer value.

**See also** [OA\\_SetInt](#)

## OA\_GetModeAcqParams

**unsigned int WINAPI OA\_GetModeAcqParams (const char\* const ModeName, char \* const ListOfParams)**

<b>Description</b>	This function will return all acquisition parameters associated with the specified mode. The mode specified by the user must be in either the Preset file or the User defined file. The user must allocate enough memory for all of the acquisition parameters.	
<b>Parameters</b>	const char* const ModeName:	The mode for which all acquisition parameters must be returned.
	char * const ListOfParams:	A user allocated array of characters for storage of the acquisition parameters. Parameters will be delimited by a ' '.
<b>Return</b>	unsigned int	
	DRV_SUCCESS	All parameters accepted.
	DRV_P1INVALID	Null mode name.
	DRV_P2INVALID	Null mode parameter.
	DRV_OA_NO_USER_DATA	No data for selected mode.

**See also** [OA\\_GetNumberOfAcqParams](#)

## OA\_GetNumberOfAcqParams

**unsigned int WINAPI OA\_GetNumberOfAcqParams (const char\* const ModeName, unsigned int\* const NumberOfParams)**

**Description** This function will return the parameters associated with a specified mode. The mode must be present in either the Preset file or the User defined file.

**Parameters**

const char* const ModeName	The mode to search for a list of acquisition parameters.
unsigned int* const NumberOfParams:	The number of acquisition parameters for the specified mode.

**Return**

unsigned int	
DRV_SUCCESS	All parameters accepted.
DRV_P1INVALID	Null mode name.
DRV_P2INVALID	Null number of parameters.
DRV_OA_NULL_ERROR	Invalid pointer.

**See also** [OA\\_GetModeAcqParams](#)

## OA\_GetNumberOfPreSetModes

**unsigned int WINAPI OA\_GetNumberOfPreSetModes (unsigned int\* const NumberOfModes)**

**Description** This function will return the number of modes defined in the Preset file. The Preset file must exist.

**Parameters**

unsigned int* const NumberOfModes:	The number of modes in the Andor file.
------------------------------------	--

**Return**

unsigned int	
DRV_SUCCESS	All parameters accepted.
DRV_P1INVALID	Null number of modes.
DRV_OA_NULL_ERROR	Invalid pointer.
DRV_OA_BUFFER_FULL	Number of modes exceeds limit.

**See also** [OA\\_GetPreSetModeNames](#)

## OA\_GetNumberOfUserModes

**unsigned int WINAPI OA\_GetNumberOfUserModes (unsigned int\* const NumberOfModes)**

**Description** This function will return the number of modes defined in the User file. The user defined file must exist.

**Parameters**

unsigned int* const NumberOfModes:	The number of modes in the user file.
------------------------------------	---------------------------------------

**Return**

unsigned int	
DRV_SUCCESS	All parameters accepted.
DRV_P1INVALID	Null number of modes.
DRV_OA_NULL_ERROR	Invalid pointer.
DRV_OA_BUFFER_FULL	Number of modes exceeds limit.

**See also** [OA\\_GetUserModeNames](#)

## OA\_GetPreSetModeNames

**unsigned int WINAPI OA\_GetPreSetModeNames (char \* ListOfModes)**

**Description** This function will return the available mode names from the Preset file. The mode and the Preset file must exist. The user must allocate enough memory for all of the acquisition parameters.

**Parameters** char \* ListOfModes: A user allocated array of characters for storage of the mode names. Mode names will be delimited by a ','.

**Return** unsigned int  
 DRV\_SUCCESS All parameters accepted.  
 DRV\_P1INVALID Null list of modes.  
 DRV\_OA\_NULL\_ERROR Invalid pointer.

**See also** [OA\\_GetNumberOfPreSetModes](#)

## OA\_GetString

**unsigned int WINAPI OA\_GetString (const char\* const ModeName, const char\* const ModeParam, char\* StringValue, const unsigned int StringLen)**

**Description** This function is used to get the values for string type acquisition parameters. Values are retrieved from memory for the specified mode name.

**Parameters** const char\* const ModeName: The name of the mode for which an acquisition parameter will be retrieved.  
 const char\* const ModeParam: The name of the acquisition parameter for which a value will be retrieved.  
 char\* StringValue: The buffer to return the value of the acquisition parameter.  
 const unsigned int StringLen: The length of the buffer.

**Return** unsigned int  
 DRV\_SUCCESS All parameters accepted.  
 DRV\_P1INVALID Null mode name.  
 DRV\_P2INVALID Null mode parameter.  
 DRV\_P3INVALID Null string value.  
 DRV\_P4INVALID Invalid string length

**See also** [OA\\_SetString](#)

## OA\_GetUserModeNames

**unsigned int WINAPI OA\_GetUserModeNames (char \* ListOfModes)**

**Description** This function will return the available mode names from a User defined file. The mode and the User defined file must exist. The user must allocate enough memory for all of the acquisition parameters.

**Parameters** char \* ListOfModes: A user allocated array of characters for storage of the mode names. Mode names will be delimited by a ','.

**Return** unsigned int  
 DRV\_SUCCESS All parameters accepted.  
 DRV\_P1INVALID Null list of modes.  
 DRV\_OA\_NULL\_ERROR Invalid pointer.

**See also** [OA\\_GetNumberOfUserModes](#)

## OA\_Initialize

**unsigned int WINAPI OA\_Initialize (const char \* const Filename, unsigned int FileNameLen)**

**Description** This function will initialise the OptAcquire settings from a Preset file and a User defined file if it exists.

**Parameters** char\* const Filename: The name of a user xml file. If the file exists then data will be read from the file. If the file does not exist the file name may be used when the user calls WriteToFile().  
 unsigned int FileNameLen: The length of the filename.

**Return** unsigned int  
 DRV\_SUCCESS All parameters accepted.  
 DRV\_P1INVALID Null filename.  
 DRV\_OA\_CAMERA\_NOT\_SUPPORTED Camera not supported.  
 DRV\_OA\_GET\_CAMERA\_ERROR Unable to retrieve information about the model of the Camera.  
 DRV\_OA\_INVALID\_STRING\_LENGTH The parameter has an invalid length, i.e. > 255.  
 DRV\_OA\_ANDOR\_FILE\_NOT\_LOADED Preset Andor file failed to load.  
 DRV\_OA\_USER\_FILE\_NOT\_LOADED Supplied User file failed to load.  
 DRV\_OA\_FILE\_ACCESS\_ERROR Failed to determine status of file.  
 DRV\_OA\_PRESET\_AND\_USER\_FILE\_NOT\_LOADED Failed to load Andor and User file.

**See also** [OA\\_WriteToFile](#)

## OA\_SetFloat

**unsigned int WINAPI OA\_SetFloat (const char\* const ModeName, const char \* ModeParam, const float FloatValue)**

<b>Description</b>	This function is used to set values for floating point type acquisition parameters where the new values are stored in memory. To commit changes to file call WriteToFile().	
<b>Parameters</b>	const char* const ModeName:	The name of the mode for which an acquisition parameter will be edited.
	const char * const ModeParam:	The name of the acquisition parameter to be edited.
<b>Return</b>	const float FloatValue:	The value to assign to the acquisition parameter.
	unsigned int	
	DRV_SUCCESS	All parameters accepted.
	DRV_P1INVALID	Null mode name.
	DRV_P2INVALID	Null mode parameter.
	DRV_OA_INVALID_STRING_LENGTH	One or more of the string parameters has an invalid length, i.e. > 255.
	DRV_OA_MODE_DOES_NOT_EXIST	The Mode does not exist.

**See also** [OA\\_GetFloat](#), [OA\\_EnableMode](#), [OA\\_WriteToFile](#)

## OA\_SetInt

**unsigned int WINAPI OA\_SetInt (const char\* const ModeName, const char\* ModeParam, const int IntValue)**

<b>Description</b>	This function is used to set values for integer type acquisition parameters where the new values are stored in memory. To commit changes to file call WriteToFile().	
<b>Parameters</b>	const char* const ModeName:	The name of the mode for which an acquisition parameter will be edited.
	const char* const ModeParam:	The name of the acquisition parameter to be edited.
<b>Return</b>	const int IntValue:	The value to assign to the acquisition parameter.
	unsigned int	
	DRV_SUCCESS	All parameters accepted.
	DRV_P1INVALID	Null mode name.
	DRV_P2INVALID	Null mode parameter.
	DRV_OA_INVALID_STRING_LENGTH	One or more of the string parameters has an invalid length, i.e. > 255.
	DRV_OA_MODE_DOES_NOT_EXIST	The Mode does not exist.

**See also** [OA\\_GetInt](#), [OA\\_EnableMode](#), [OA\\_WriteToFile](#)



## OA\_SetString

**unsigned int WINAPI OA\_SetString (const char\* const ModeName, const char\* ModeParam, char\* StringValue, const unsigned int StringLen)**

<b>Description</b>	This function is used to set values for string type acquisition parameters where the new values are stored in memory. To commit changes to file call WriteToFile().	
<b>Parameters</b>	const char* const ModeName: The name of the mode for which an acquisition parameter is to be edited. const char* const ModeParam: The name of the acquisition parameter to be edited. char* StringValue: The value to assign to the acquisition parameter. const unsigned int StringLen: The length of the input string.	
<b>Return</b>	unsigned int	
	DRV_SUCCESS	All parameters accepted.
	DRV_P1INVALID	Null mode name.
	DRV_P2INVALID	Null mode parameter.
	DRV_P3INVALID	Null string value.
	DRV_P4INVALID	Invalid string length
	DRV_OA_INVALID_STRING_LENGTH	One or more of the string parameters has an invalid length, i.e. > 255.
	DRV_OA_MODE_DOES_NOT_EXIST	The Mode does not exist.

**See also** [OA\\_GetString](#), [OA\\_EnableMode](#), [OA\\_WriteToFile](#)

## OA\_WriteToFile

**unsigned int WINAPI OA\_WriteToFile (const char \* const FileName , unsigned int FileNameLen)**

<b>Description</b>	This function will write a User defined list of modes to the User file. The Preset file will not be affected.	
<b>Parameters</b>	const char* const FileName: The name of the file to be written to. unsigned int FileNameLen: File name string length.	
<b>Return</b>	unsigned int	
	DRV_SUCCESS	All parameters accepted.
	DRV_P1INVALID	Null filename
	DRV_OA_INVALID_STRING_LENGTH	One or more of the string parameters has an invalid length, i.e. > 255.
	DRV_OA_INVALID_FILE	Data cannot be written to the Preset Andor file.
	DRV_ERROR_FILESAVE	Failed to save data to file.
	DRV_OA_FILE_HAS_BEEN_MODIFIED	File to be written to has been modified since last write, local copy of file may not be the same.
	DRV_OA_INVALID_CHARS_IN_NAME	File name contains invalid characters.

**See also** [OA\\_AddMode](#), [OA\\_DeleteMode](#)

**unsigned int WINAPI OutAuxPort(int port, int state)**

**Description** This function sets the TTL Auxiliary Output port (P) on the Andor plug-in card to either ON/HIGH or OFF/LOW.

**Parameters** int port: Number of AUX out port on Andor card  
Valid Values 1 to 4  
int state: state to put port in  
0 OFF/LOW  
all others ON/HIGH

**Return** unsigned int  
DRV\_SUCCESS AUX port set.  
DRV\_NOT\_INITIALIZED System not initialized.  
DRV\_ACQUIRING Acquisition in progress.  
DRV\_VXDNOTINSTALLED VxD not loaded.  
DRV\_ERROR\_ACK Unable to communicate with card.  
DRV\_P1INVALID Invalid port id.

**See also** [InAuxPort](#)

### unsigned int WINAPI PrepareAcquisition(void)

**Description** This function reads the current acquisition setup and allocates and configures any memory that will be used during the acquisition. The function call is not required as it will be called automatically by the [StartAcquisition](#) function if it has not already been called externally.

However for long kinetic series acquisitions the time to allocate and configure any memory can be quite long which can result in a long delay between calling [StartAcquisition](#) and the acquisition actually commencing. For iDus, there is an additional delay caused by the camera being set-up with any new acquisition parameters. Calling [PrepareAcquisition](#) first will reduce this delay in the [StartAcquisition](#) call.

**Parameters** NONE

**Return** unsigned int

DRV_SUCCESS	Acquisition prepared.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_VXDNOTINSTALLED	VxD not loaded.
DRV_ERROR_ACK	Unable to communicate with card.
DRV_INIERROR	Error reading "DETECTOR.INI".
DRV_ACQERROR	Acquisition settings invalid.
DRV_ERROR_PAGELOCK	Unable to allocate memory.
DRV_INVALID_FILTER	Filter not available for current acquisition.
DRV_IOCERROR	Integrate On Chip setup error.
DRV_BINNING_ERROR	Range not multiple of horizontal binning.
DRV_SPOOLSETUPERROR	Error with spool settings.

**See also** [StartAcquisition](#), [FreeInternalMemory](#),

## PostProcessCountConvert

**unsigned int WINAPI PostProcessCountConvert(at\_32 \* InputImage, at\_32 \* OutputImage, int OutputBufferSize, int NumImages, int Baseline, int Mode, int EmGain, float QE, float Sensitivity, int Height, int Width)**

**Description** This function will convert the input image data to either Photons or Electrons based on the mode selected by the user. The input data should be in counts.

**Parameters**

at32* InputImage:	The input image data to be processed.
at32* OutputImage:	The output buffer to return the processed image.
int OutputBufferSize:	The size of the output buffer.
int NumImages:	The number of images if a kinetic series is supplied as the input data.
int Baseline:	The baseline associated with the image.
int Mode:	The mode to use to process the data. Valid options are: 1 – Convert to Electrons 2 – Convert to Photons
int EmGain:	The gain level of the input image.
float QE:	The Quantum Efficiency of the sensor.
float Sensitivity:	The Sensitivity value used to acquire the image.
int Height:	The height of the image.
int Width:	The width of the image.

**Return**

unsigned int	
DRV_SUCCESS	Acquisition prepared.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_P1INVALID	Invalid pointer (i.e. NULL).
DRV_P2INVALID	Invalid pointer (i.e. NULL).
DRV_P4INVALID	Number of images less than zero.
DRV_P5INVALID	Baseline less than zero.
DRV_P6INVALID	Invalid count convert mode.
DRV_P7INVALID	EMGain less than zero.
DRV_P8INVALID	QE less than zero.
DRV_P9INVALID	Sensitivity less than zero.
DRV_P10INVALID	Height less than zero.
DRV_P11INVALID	Width less than zero.
DRV_ERROR_BUFFSIZE	Output buffer size too small.

**See also**

## PostProcessDataAveraging

**unsigned int WINAPI PostProcessDataAveraging(at\_32 \* pInputImage, at\_32 \* pOutputImage, int iOutputBufferSize, int iNumImages, int iAveragingFilterMode, int iHeight, int iWidth, int iFrameCount, int iAveragingFactor)**

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Description	THIS FUNCTION IS RESERVED.
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## PostProcessNoiseFilter

**unsigned int WINAPI PostProcessNoiseFilter(at\_32 \* InputImage, at\_32 \* OutputImage, int OutputBufferSize, int Baseline, int Mode, float Threshold, int Height, int Width)**

<b>Description</b>	This function will apply a filter to the input image and return the processed image in the output buffer. The filter applied is chosen by the user by setting Mode to a permitted value.	
<b>Parameters</b>	at32* InputImage:	The input image data to be processed.
	at32* OutputImage:	The output buffer to return the processed image.
	int OutputBufferSize:	The size of the output buffer.
	int Baseline:	The baseline associated with the image.
	int Mode:	The mode to use to process the data. Valid options are: 1 – Use Median Filter. 2 – Use Level Above Filter. 3 – Use Interquartile Range Filter. 4 – Use Noise Threshold Filter.
	float Threshold:	This is the Threshold multiplier for the Median, Interquartile and Noise Threshold filters. For the Level Above filter this is Threshold count above the baseline.
	int Height:	The height of the image.
<b>Return</b>	int Width:	The width of the image.
	unsigned int	
	DRV_SUCCESS	Acquisition prepared.
	DRV_NOT_SUPPORTED	Camera does not support Noise filter processing.
	DRV_NOT_INITIALIZED	System not initialized.
	DRV_ACQUIRING	Acquisition in progress.
	DRV_P1INVALID	Invalid pointer (i.e. NULL).
	DRV_P2INVALID	Invalid pointer (i.e. NULL).
	DRV_P4INVALID	Baseline less than zero.
	DRV_P5INVALID	Invalid Filter mode.
	DRV_P6INVALID	Threshold value not valid for selected mode.
	DRV_P7INVALID	Height less than zero.
	DRV_P8INVALID	Width less than zero.
	DRV_ERROR_BUFFSIZE	Output buffer size too small.

**See also**

## PostProcessPhotonCounting

**unsigned int WINAPI PostProcessPhotonCounting(at\_32 \* InputImage, at\_32 \* OutputImage, int OutputBufferSize, int NumImages, int NumFrames, int NumberOfThresholds, float \* Threshold, int Height, int Width)**

<b>Description</b>	This function will convert the input image data to photons and return the processed image in the output buffer.	
<b>Parameters</b>	at32* InputImage:	The input image data to be processed.
	at32* OutputImage:	The output buffer to return the processed image.
	int OutputBufferSize:	The size of the output buffer.
	int NumImages:	The number of images if a kinetic series is supplied as the input data.
	int NumFrames:	The number of frames per output image.
	int NumberOfThresholds:	The number of thresholds provided by the user.
	float * Threshold:	The Thresholds used to define a photon.
	int Height:	The height of the image.
	int Width:	The width of the image.
<b>Return</b>	unsigned int	
	DRV_SUCCESS	Acquisition prepared.
	DRV_NOT_INITIALIZED	System not initialized.
	DRV_ACQUIRING	Acquisition in progress.
	DRV_P1INVALID	Invalid pointer (i.e. NULL).
	DRV_P2INVALID	Invalid pointer (i.e. NULL).
	DRV_P4INVALID	Number of images less than zero.
	DRV_P5INVALID	Invalid Number of Frames requested.
	DRV_P6INVALID	Invalid number of thresholds.
	DRV_P7INVALID	Invalid pointer (i.e. NULL).
	DRV_P8INVALID	Height less than zero.
	DRV_P9INVALID	Width less than zero.
	DRV_ERROR_BUFFSIZE	Output buffer size too small.

### See also

## SaveAsBmp

**unsigned int WINAPI SaveAsBmp(char\* path, char\* palette, long ymin, long ymax)**

**Description** This function saves the last acquisition as a bitmap file, which can be loaded into an imaging package. The palette parameter specifies the location of a **.PAL** file, which describes the colors to use in the bitmap. This file consists of **256 lines** of **ASCII text**; each line containing three numbers separated by spaces indicating the red, green and blue component of the respective color value.

The **ymin** and **ymax** parameters indicate which data values will map to the first and last colors in the palette:

- All data values below or equal to ymin will be colored with the first color.
- All values above or equal to ymax will be colored with the last color
- All other palette colors will be scaled across values between these limits.

**Parameters** char\* path: The filename of the bitmap.  
char\* palette: The filename of a palette file (.PAL) for applying color to the bitmap.  
long ymin, long ymax: Range of data values that palette will be scaled across. If set to 0, 0 the palette will scale across the full range of values.

**Return** unsigned int

DRV_SUCCESS	Data successfully saved as bitmap.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with card.
DRV_P1INVALID	Path invalid.
DRV_ERROR_PAGELOCK	File too large to be generated in memory.

**See also** [SaveAsSif](#) [SaveAsEDF](#) [SaveAsFITS](#) [SaveAsRaw](#) [SaveAsSPC](#) [SaveAsTiff](#)

**NOTE:** If the last acquisition was in **Kinetic Series mode**, each image will be saved in a separate **Bitmap file**. The filename specified will have an index number appended to it, indicating the position in the series.



## SaveAsCalibratedSif

**unsigned int WINAPI SaveAsCalibratedSif(char\* path, int data\_type, int unit, float\* coeff, float rayleighWave)**

**Description** This function will save the data from the last acquisition into a file. User text can be added to sif files using the [SaveAsCommentedSif](#) and [SetSifComment](#) functions.

**Parameters**

char\* path: pointer to a filename specified by the user.

int data\_type: the label that will be applied to the x-axis when displayed.

int unit: unit to be used for x-axis when displayed.

float\* coeff: the 4 calibration constants for the x-axis for a third order polynomial of the form

$$Cal = coeff[0] + coeff[1]*P + coeff[2]*P*P + coeff[3]*P*P*P$$

where P is the pixel number, starting from 1.

float rayleighWave: Rayleigh wavelength required for a Raman Shift calibration.

Data Type	Units
1 = Pixel	1 = pixels
2 = Wavelength	1 = nm; 2 = um; 3 = cm-1, 4 = eV
3 = Raman Shift	1 = cm-1
4 = Position	1 = um; 2 = mm; 3 cm; 4 = ui(nches), 5 in(ches)
5 = Time	1 = ms; 2 = secs

**Return**

unsigned int	
DRV_SUCCESS	Data saved.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with card.
DRV_P1INVALID	Invalid filename.
DRV_P2INVALID	Invalid data type.
DRV_P3INVALID	Invalid units.

**See also** [SetSifComment](#) [SaveAsSif](#) [SaveAsCommentedSif](#) [SaveAsEDF](#) [SaveAsFITS](#) [SaveAsRaw](#) [SaveAsSPC](#) [SaveAsTiff](#) [SaveAsBmp](#)

## SaveAsCommentedSif

**unsigned int WINAPI SaveAsCommentedSif(char\* path, char\* comment)**

**Description** This function will save the data from the last acquisition into a file. The comment text will be added to the user text portion of the Sif file.

**Parameters** char\* path: pointer to a filename specified by the user.  
char\* comment: comment text to add to the sif file

**Return** unsigned int

DRV_SUCCESS	Data saved.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with card.
DRV_P1INVALID	Invalid filename.

**See also** [SetSifComment](#) [SaveAsSif](#) [SaveAsEDF](#) [SaveAsFITS](#) [SaveAsRaw](#) [SaveAsSPC](#) [SaveAsTiff](#) [SaveAsBmp](#)

**NOTE:** The comment used in SIF files created with this function is discarded once the call completes, i.e. future calls to [SaveAsSif](#) will not use this comment. To set a persistent comment use the [SetSifComment](#) function.

## SaveAsEDF

**unsigned int WINAPI SaveAsEDF (char\* szPath, int iMode)**

**Description** This function saves the last acquisition in the European Synchrotron Radiation Facility Data Format (\*.edf).

**Parameters** char\* szPath: the filename to save too.  
int iMode: option to save to multiple files.  
Valid values: 0 Save to 1 file  
1 Save kinetic series to multiple files

**Return** unsigned int

DRV_SUCCESS	Data successfully saved.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with card.
DRV_P1INVALID	Path invalid.
DRV_P2INVALID	Invalid mode
DRV_ERROR_PAGELOCK	File too large to be generated in memory.

**See also** [SaveAsSif](#) [SaveAsFITS](#) [SaveAsRaw](#) [SaveAsSPC](#) [SaveAsTiff](#) [SaveAsBmp](#)

## SaveAsFITS

### unsigned int WINAPI SaveAsFITS(char\* szFileTitle, int typ)

**Description** This function saves the last acquisition in the FITS (Flexible Image Transport System) Data Format (\*.fits) endorsed by NASA.

**Parameters** char\* szFileTitle: the filename to save too.

int typ:

Valid values: 0 Unsigned 16

1 Unsigned 32

2 Signed 16

3 Signed 32

4 Float

**Return** unsigned int

DRV\_SUCCESS Data successfully saved.

DRV\_NOT\_INITIALIZED System not initialized.

DRV\_ACQUIRING Acquisition in progress.

DRV\_ERROR\_ACK Unable to communicate with card.

DRV\_P1INVALID Path invalid.

DRV\_P2INVALID Invalid mode

DRV\_ERROR\_PAGELOCK File too large to be generated in memory.

**See also** [SaveAsSif](#) [SaveAsEDF](#) [SaveAsRaw](#) [SaveAsSPC](#) [SaveAsTiff](#) [SaveAsBmp](#)

## SaveAsRaw

### unsigned int WINAPI SaveAsRaw(char\* szFileTitle, int typ)

**Description** This function saves the last acquisition as a raw data file.

**Parameters** char\* szFileTitle: the filename to save too.

int typ:

Valid values: 1 Signed 16

2 Signed 32

3 Float

**Return** unsigned int

DRV\_SUCCESS Data successfully saved.

DRV\_NOT\_INITIALIZED System not initialized.

DRV\_ACQUIRING Acquisition in progress.

DRV\_ERROR\_ACK Unable to communicate with card.

DRV\_P1INVALID Path invalid.

DRV\_P2INVALID Invalid mode

DRV\_ERROR\_PAGELOCK File too large to be generated in memory

**See also** [SaveAsSif](#) [SaveAsEDF](#) [SaveAsFITS](#) [SaveAsSPC](#) [SaveAsTiff](#) [SaveAsBmp](#)

## SaveAsSif

**unsigned int WINAPI SaveAsSif(char\* path)**

**Description** This function will save the data from the last acquisition into a file, which can be read in by the main application. User text can be added to sif files using the [SaveAsCommentedSif](#) and [SetSifComment](#) functions.

**Parameters** char\* path: pointer to a filename specified by the user.

**Return** unsigned int

DRV_SUCCESS	Data saved.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with card.
DRV_P1INVALID	Invalid filename.
DRV_ERROR_PAGELOCK	File too large to be generated in memory.

**See also** [SaveAsEDF](#) [SaveAsFITS](#) [SaveAsRaw](#) [SaveAsSPC](#) [SaveAsTiff](#) [SaveAsBmp](#) [SetSifComment](#), [SaveAsCommentedSif](#)

### unsigned int WINAPI SaveAsSPC (char\* path)

**Description** This function saves the last acquisition in the GRAMS .spc file format

**Parameters** char\* path: the filename to save too.

**Return** unsigned int

DRV_SUCCESS	Data successfully saved.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with card.
DRV_P1INVALID	Path invalid.
DRV_ERROR_PAGELOCK	File too large to be generated in memory.

**See also** [SaveAsSif](#) [SaveAsEDF](#) [SaveAsFITS](#) [SaveAsRaw](#) [SaveAsTiff](#) [SaveAsBmp](#)

## SaveAsTiff

### unsigned int WINAPI SaveAsTiff(char\* path, char\* palette, int position, int typ)

**Description** This function saves the last acquisition as a tiff file, which can be loaded into an imaging package. The palette parameter specifies the location of a .PAL file, which describes the colors to use in the tiff. This file consists of **256 lines of ASCII text**; each line containing three numbers separated by spaces indicating the red, green and blue component of the respective color value.

The parameter position can be changed to export different scans in a kinetic series. If the acquisition is any other mode, position should be set to 1. The parameter typ can be set to 0, 1 or 2 which correspond to 8-bit, 16-bit and color, respectively

**Parameters** char\* path: The filename of the tiff.  
char\* palette: The filename of a palette file (.PAL) for applying color to the tiff.  
int position: The number in the series, should be 1 for a single scan.  
int typ: The type of tiff file to create.

**Return** unsigned int

DRV_SUCCESS	Data successfully saved as tiff.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with card.
DRV_P1INVALID	Path invalid.
DRV_P2INVALID	Invalid palette file
DRV_P3INVALID	position out of range
DRV_P4INVALID	type not valid
DRV_ERROR_PAGELOCK	File too large to be generated in memory.

**See also** [SaveAsSif](#) [SaveAsEDF](#) [SaveAsFITS](#) [SaveAsRaw](#) [SaveAsSPC](#) [SaveAsBmp](#) [SaveAsTiffEx](#)

## SaveAsTiffEx

**unsigned int WINAPI SaveAsTiffEx(char\* path, char\* palette, int position, int typ, int mode)**

**Description** This function saves the last acquisition as a tiff file, which can be loaded into an imaging package. This is an extended version of the [SaveAsTiff](#) function. The palette parameter specifies the location of a .PAL file, which describes the colors to use in the tiff. This file consists of 256 lines of ASCII text; each line containing three numbers separated by spaces indicating the red, green and blue component of the respective color value. The parameter position can be changed to export different scans in a kinetic series. If the acquisition is any other mode, position should be set to 1. The parameter typ can be set to 0, 1 or 2 which correspond to 8-bit, 16-bit and color, respectively. The mode parameter specifies the mode of output. Data can be output scaled from the min and max count values across the entire range of values (mode 0) or can remain unchanged (mode 1). Of course if the count value is higher or lower than the output data range then even in mode 1 data will be scaled.

**Parameters**

char\* path: The filename of the tiff.

char\* palette: The filename of a palette file (.PAL) for applying color to the tiff.

int position: The number in the series, should be 1 for a single scan.

int typ: The type of tiff file to create.

int mode: The output mode

**Return**

unsigned int	
DRV_SUCCESS	Data successfully saved as tiff
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with card.
DRV_P1INVALID	Path invalid.
DRV_P2INVALID	Invalid palette file
DRV_P3INVALID	position out of range
DRV_P4INVALID	type not valid
DRV_P5INVALID	mode not valid
DRV_ERROR_PAGELOCK	File too large to be generated in memory

**See also** [SaveAsSif](#) [SaveAsEDF](#) [SaveAsFITS](#) [SaveAsRaw](#) [SaveAsSPC](#) [SaveAsTiff](#) [SaveAsBmp](#)

## SaveEEPROMToFile

unsigned int WINAPI SaveEEPROMToFile(char \*cFileName)

**Description** THIS FUNCTION IS RESERVED.

## SaveToClipboard

unsigned int WINAPI SaveToClipboard(char\* palette)

**Description** THIS FUNCTION IS RESERVED.

## SelectDevice

unsigned int WINAPI SelectDevice(int devNum)

**Description** THIS FUNCTION IS RESERVED.

## SelectSensorPort

unsigned int WINAPI SelectSensorPort (int port)

**Description** This function selects which of the available sensor output ports will be used to acquire the image data. This feature is only supported when "SinglePortMode" has been selected ([SetSensorPortMode](#)).

**Parameters** int port: the port selected.

Valid values:

- |   |              |
|---|--------------|
| 0 | Bottom Left  |
| 1 | Bottom Right |
| 2 | Top Left     |
| 3 | Top Right    |

**Return** unsigned int

- |                     |  |
|---------------------|--|
| DRV_SUCCESS         | Port successfully selected.  |
| DRV_NOT_INITIALIZED | System not initialized.  |
| DRV_ACQUIRING       | Acquisition in progress.   |
| DRV_NOT_SUPPORTED   | Feature not supported on this camera or "SinglePortMode" hasn't been selected. |
| DRV_P1INVALID       | Requested port isn't valid.  |

**See also** [SetSensorPortMode](#), [GetCapabilities](#)

**NOTE** Not all cameras support this feature. To check if your camera supports this feature use the [GetCapabilities](#) function to check the ulFeature for AC\_FEATURES\_SENSOR\_PORT\_CONFIGURATION.

### SendSoftwareTrigger

**unsigned int WINAPI SendSoftwareTrigger ()**

**Description** This function sends an event to the camera to take an acquisition when in [Software Trigger](#) mode. Not all cameras have this mode available to them. To check if your camera can operate in this mode check the [GetCapabilities](#) function for the Trigger Mode AC\_TRIGGERMODE\_CONTINUOUS. If this mode is physically possible and other settings are suitable ([IsTriggerModeAvailable](#)) and the camera is acquiring then this command will take an acquisition.

**Parameters** NONE

**Return** unsigned int

DRV_SUCCESS	Trigger sent
DRV_NOT_INITIALIZED	System not initialized
DRV_INVALID_MODE	Not in SoftwareTrigger mode
DRV_IDLE	Not Acquiring
DRV_ERROR_CODES	Error communicating with camera
DRV_ERROR_ACK	Previous acquisition not complete

**See also** [GetCapabilities](#), [IsTriggerModeAvailable](#), [SetAcquisitionMode](#), [SetReadMode](#), [SetTriggerMode](#)

**NOTES** The settings of the camera must be as follows:

**ReadOut mode is full image**

**RunMode is Run Till Abort**

**TriggerMode is 10**



## SetAccumulationCycleTime

**unsigned int WINAPI SetAccumulationCycleTime(float time)**

**Description** This function will set the accumulation cycle time to the nearest valid value not less than the given value. The actual cycle time used is obtained by [GetAcquisitionTimings](#). Please refer to [SECTION 5 – ACQUISITION MODES](#) for further information.

**Parameters** float time: the accumulation cycle time in seconds.

**Return** unsigned int

DRV_SUCCESS	Cycle time accepted.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_P1INVALID	Exposure time invalid.

**See also** [SetNumberAccumulations](#), [GetAcquisitionTimings](#)

## SetAcqStatusEvent

**unsigned int WINAPI SetAcqStatusEvent(HANDLE statusEvent)**

**Description** This function passes a Win32 Event handle to the driver via which the driver can inform the user software that the camera has started exposing or that the camera has finished exposing. To determine what event has actually occurred call the [GetCameraEventStatus](#) function. This may give the user software an opportunity to perform other actions that will not affect the readout of the current acquisition. The [SetPCIMode](#) function must be called to enable/disable the events from the driver.

**Parameters** HANDLE statusEvent: Win32 event handle.

**Return** unsigned int

DRV_SUCCESS	Mode set
DRV_NOT_INITIALIZED	System not initialized
DRV_NOT_SUPPORTED	Function not supported for operating system

**See also** [GetCameraEventStatus](#) [SetPCIMode](#)

**NOTE** This is only available with the CCI23 PCI card.

## SetAcquisitionMode

**unsigned int WINAPI SetAcquisitionMode(int mode)**

**Description** This function will set the acquisition mode to be used on the next [StartAcquisition](#).

**Parameters** int mode: the acquisition mode.

Valid values:

- |   |                |
|---|----------------|
| 1 | Single Scan    |
| 2 | Accumulate     |
| 3 | Kinetics       |
| 4 | Fast Kinetics  |
| 5 | Run till abort |

**Return** unsigned int

- |                     |                           |
|---------------------|---------------------------|
| DRV_SUCCESS         | Acquisition mode set.     |
| DRV_NOT_INITIALIZED | System not initialized.   |
| DRV_ACQUIRING       | Acquisition in progress.  |
| DRV_P1INVALID       | Acquisition Mode invalid. |

**See also** [StartAcquisition](#)

**NOTE:** In Mode 5 the system uses a “Run Till Abort” acquisition mode. In Mode 5 only, the camera continually acquires data until the [AbortAcquisition](#) function is called. By using the [SetDriverEvent](#) function you will be notified as each acquisition is completed.

## SetAcquisitionType

**unsigned int WINAPI SetAcquisitionType(int typ)**

**Description** THIS FUNCTION IS RESERVED.

## SetADChannel

**unsigned int WINAPI SetADChannel(int channel)**

**Description** This function will set the AD channel to one of the possible A-Ds of the system. This AD channel will be used for all subsequent operations performed by the system.

**Parameters** int index: the channel to be used  
Valid values: 0 to [GetNumberADChannels](#)-1

**Return** unsigned int

- |               |                         |
|---------------|-------------------------|
| DRV_SUCCESS   | AD channel set.         |
| DRV_P1INVALID | Index is out off range. |

**See also** [GetNumberADChannels](#)

### SetAdvancedTriggerModeState

**unsigned int WINAPI SetAdvancedTriggerModeState (int iState)**

**Description** This function will set the state for the [iCam](#) functionality that some cameras are capable of. There may be some cases where we wish to prevent the software using the new functionality and just do it the way it was previously done.

**Parameters** int iState:  
  
0: turn off iCam  
1: Enable iCam.

**Return** unsigned int  
DRV\_SUCCESS State set  
DRV\_NOT\_INITIALIZED System not initialized  
DRV\_P1INVALID state invalid

**See also** [iCam](#)

**NOTE** By default the advanced trigger functionality is enabled.

## SetBackground

unsigned int WINAPI SetBackground(at\_32\* arr, unsigned long size)

**Description** THIS FUNCTION IS RESERVED.

## SetBaselineClamp

unsigned int WINAPI SetBaselineClamp(int state)

**Description** This function turns on and off the baseline clamp functionality. With this feature enabled the baseline level of each scan in a kinetic series will be more consistent across the sequence.

**Parameters** int state: Enables/Disables Baseline clamp functionality

1 – Enable Baseline Clamp

0 – Disable Baseline Clamp

**Return** unsigned int

DRV_SUCCESS	Parameters set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_NOT_SUPPORTED	Baseline Clamp not supported on this camera
DRV_P1INVALID	State parameter was not zero or one.

## SetBaselineOffset

unsigned int WINAPI SetBaselineOffset(int offset)

**Description** This function allows the user to move the baseline level by the amount selected. For example “+100” will add approximately 100 counts to the default baseline value. The value entered should be a multiple of 100 between -1000 and +1000 inclusively.

**Parameters** Int offset: Amount to offset baseline by

**Return** unsigned int

DRV_SUCCESS	Parameters set
DRV_NOT_INITIALIZED	System not initialized
DRV_NOT_AVAILABLE	Baseline Clamp not available for this camera
DRV_ACQUIRING	Acquisition in progress
DRV_P1INVALID	Offset out of range

**NOTE** Only available on iXon range

### SetCameraLinkMode

**unsigned int WINAPI SetCameraLinkMode (int mode)**

**Description** This function allows the user to enable or disable the Camera Link functionality for the camera. Enabling this functionality will start to stream all acquired data through the camera link interface.

**Parameters** int mode: Enables/Disables Camera Link mode

1 – Enable Camera Link

0 – Disable Camera Link

**Return** unsigned int

DRV_SUCCESS	Parameters set
DRV_NOT_INITIALIZED	System not initialized
DRV_ACQUIRING	Acquisition in progress
DRV_NOT_SUPPORTED	Camera Link not supported by this Camera
DRV_P1INVALID	Mode was not zero or one.

**NOTE** Only available with iXon Ultra.

## SetCameraStatusEnable

### unsigned int WINAPI SetCameraStatusEnable(DWORD Enable)

<b>Description</b>	Use this function to Mask out certain types of acquisition status events. The default is to notify on every type of event but this may cause missed events if different types of event occur very close together. The bits in the mask correspond to the following event types:  0 – Fire pulse down event  1 – Fire pulse up event  Set the corresponding bit to 0 to disable the event type and 1 to enable the event type.
<b>Parameters</b>	DWORD Enable: bitmask with bits set for those events about which you wish to be notified.
<b>Return</b>	unsigned int  DRV_SUCCESS                      Mask Set. DRV_VXDNOTINSTALLED      Device Driver not installed.
<b>See also</b>	<a href="#">SetAcqStatusEvent</a> <a href="#">SetPCIMode</a>
<b>NOTE</b>	Only available with PCI systems using the CCI-23 controller card  Fire pulse up event not available on USB systems.

## SetChargeShifting

### unsigned int WINAPI SetChargeShifting (unsigned int numRows, unsigned int numRepeats)

<b>Description</b>	Use this function in External Charge Shifting trigger mode to configure how many rows to shift and how many times for each frame of data. The number of repeats must be a multiple of 2.
<b>Parameters</b>	Unsigned int numRows: number of rows to shift after each external trigger Unsigned int numRepeats: number of times to shift rows
<b>Return</b>	unsigned int  DRV_SUCCESS                      Success DRV_NOT_INITIALIZED      System not initialized. DRV_NOT_SUPPORTED      Trigger mode not supported. DRV_ACQUIRING              Acquisition in progress. DRV_P1INVALID              Number of rows invalid. DRV_P2INVALID              Number of repeats invalid.
<b>See also</b>	<a href="#">SetTriggerMode</a> <a href="#">GetCapabilities</a>
<b>NOTE</b>	Only available with certain iKon-M systems.

**unsigned int WINAPI SetComplexImage(int numAreas, int\* areas)**

**Description** This is a function that allows the setting up of random tracks with more options than the [SetRandomTracks](#) function.

The minimum number of tracks is 1. The maximum number of tracks is the number of vertical pixels.

There is a further limit to the number of tracks that can be set due to memory constraints in the camera. It is not a fixed number but depends upon the combinations of the tracks. For example, 20 tracks of different heights will take up more memory than 20 tracks of the same height.

If attempting to set a series of random tracks and the return code equals DRV\_RANDOM\_TRACK\_ERROR, change the makeup of the tracks to have more repeating heights and gaps so less memory is needed.

Each track must be defined by a group of six integers.

- The top and bottom positions of the tracks.
- The left and right positions for the area of interest within each track
- The horizontal and vertical binning for each track.

The positions of the tracks are validated to ensure that the tracks are in increasing order.

The left and right positions for each track must be the same.

For iXon the range is between 8 and CCD width, inclusive

For idus the range must be between 257 and CCD width, inclusive.

Horizontal binning must be an integer between 1 and 64 inclusive, for iXon.

Horizontal binning is not implemented for iDus and must be set to 1.

Vertical binning is used in the following way. A track of:

1 10 1 1024 1 2

is actually implemented as 5 tracks of height 2. . Note that a vertical binning of 1 will have the effect of vertically binning the entire track; otherwise vertical binning will operate as normal.

1 2 1 1024 1 1

3 4 1 1024 1 1

5 6 1 1024 1 1

7 8 1 1024 1 1

9 10 1 1024 1 1

**Parameters** int numAreas:

int \* areas:

**Return** Unsigned int

DRV\_SUCCESS

Success

DRV\_NOT\_INITIALIZED

System not initialized.

DRV\_ACQUIRING

Acquisition in progress.

DRV\_P1INVALID

Number of tracks invalid.

DRV\_P2INVALID

Track positions invalid.

DRV\_ERROR\_FILELOAD

Serious internal error

DRV\_RANDOM\_TRACK\_ERROR

Invalid combination of tracks, out of memory or mode not available.

**See also** [SetRandomTracks](#)

**NOTE** Only available with iXon+ and USB cameras.

### SetCoolerMode

**unsigned int WINAPI SetCoolerMode(int mode)**

**Description** This function determines whether the cooler is switched off when the camera is shut down.

**Parameters** int mode:

1 – Temperature is maintained on ShutDown

0 – Returns to ambient temperature on ShutDown

**Return** unsigned int

DRV\_SUCCESS Parameters set.

DRV\_NOT\_INITIALIZED System not initialized.

DRV\_ACQUIRING Acquisition in progress.

DRV\_P1INVALID State parameter was not zero or one.

DRV\_NOT\_SUPPORTED Camera does not support

**NOTE: Mode 0 not available on Luca R cameras – always cooled to -20.**



## SetCountConvertMode

**unsigned int WINAPI SetCountConvertMode(int mode)**

**Description** This function configures the Count Convert mode.

**Parameters** int mode:  
 0 – Data in Counts  
 1 – Data in Electrons  
 2 – Data in Photons

**Return** unsigned int  
 DRV\_SUCCESS Count Convert mode set.  
 DRV\_NOT\_INITIALIZED System not initialized.  
 DRV\_ACQUIRING Acquisition in progress.  
 DRV\_NOT\_SUPPORTED Count Convert not available for this camera  
 DRV\_NOT\_AVAILABLE Count Convert mode not available with current settings  
 DRV\_P1INVALID Mode parameter was out of range.

**See also** [GetCapabilities](#), [SetCountConvertWavelength](#)

**NOTE:** Only available on Clara, iXon 3 and iXon Ultra.

Modes 1 and 2 are only available when:

- Baseline Clamp active
- Isolated crop mode off
- EM gain must be greater than or equal to 10 and the lowest pre-amp not be selected
- For Clara systems the extended infra red mode can not be used

## SetCountConvertWavelength

**unsigned int WINAPI SetCountConvertWavelength(float wavelength)**

**Description** This function configures the wavelength used in Count Convert mode.

**Parameters** float wavelength: wavelength used to determine QE

**Return** unsigned int  
 DRV\_SUCCESS Count Convert wavelength set.  
 DRV\_NOT\_INITIALIZED System not initialized.  
 DRV\_ACQUIRING Acquisition in progress.  
 DRV\_NOT\_AVAILABLE Count Convert not available for this camera  
 DRV\_P1INVALID Wavelength value was out of range.

**See also** [GetCapabilities](#), [SetCountConvertMode](#)

## SetCropMode

**unsigned int WINAPI SetCropMode (int active, int cropHeight, int reserved)**

**Description** This function effectively reduces the height of the CCD by excluding some rows to achieve higher frame rates. This is currently only available on Newton cameras when the selected read mode is Full Vertical Binning. The cropHeight is the number of active rows measured from the bottom of the CCD.

Note: it is important to ensure that no light falls on the excluded region otherwise the acquired data will be corrupted.

**Parameters**

int active: 1 - Crop mode is ON  
0 – Crop mode is OFF

int cropHeight: The selected crop height. This value must be between 1 and the CCD height

int reserved: This value should be set to 0.

**Return** unsigned int

DRV_SUCCESS	Parameters set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_P1INVALID	Active parameter is not zero or one.
DRV_P2INVALID	Cropheight parameter is less than one or greater than the CCD height.
DRV_P3INVALID	Reserved parameter is not equal to zero.
DRV_NOT_SUPPORTED	Either the camera is not a Newton or the read mode is not Full Vertical Binning.

**See also** [GetDetector](#) [SetIsolatedCropMode](#)

**NOTE : Available on Newton**

## SetCurrentCamera

**unsigned int WINAPI SetCurrentCamera(long cameraHandle)**

**Description** When multiple Andor cameras are installed this function allows the user to select which camera is currently active. Once a camera has been selected the other functions can be called as normal but they will only apply to the selected camera. If only 1 camera is installed calling this function is not required since that camera will be selected by default.

**Parameters** long cameraHandle: Selects the active camera

**Return** unsigned int

DRV_SUCCESS	Camera successfully selected.
DRV_P1INVALID	Invalid camera handle.

**SEE ALSO :** [GetCurrentCamera](#), [GetAvailableCameras](#), [GetCameraHandle](#)

## SetCustomTrackHBin

**unsigned int WINAPI SetCustomTrackHBin(int bin)**

**Description** This function sets the horizontal binning value to be used when the [readout mode](#) is set to [Random Track](#).

**Parameters** Int bin: Binning size.

**Return** unsigned int

DRV_SUCCESS	Binning set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_P1INVALID	Invalid binning size.

**See also** [SetReadMode](#)

**NOTE:** For iDus, it is recommended that you set horizontal binning to 1

## SetDACOutputScale

**unsigned int WINAPI SetDACOutputScale(int scale)**

**Description** Clara offers 2 configurable precision 16-bit DAC outputs. This function should be used to select the active one.

**Parameters** int scale: 5 or 10 volt DAC range (1/2).

**Return** unsigned int

DRV_SUCCESS	DAC Scale option accepted.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_NOT_AVAILABLE	Feature not available
DRV_P1INVALID	DAC Scale value invalid.

**See also** [SetDACOutput](#)

**NOTE: Only available on Andor Clara**

## SetDACOutput

**unsigned int WINAPI SetDACOutput(int option, int resolution, int value)**

**Description** Clara offers 2 configurable precision 16-bit DAC outputs. This function should be used to set the required voltage.

**Parameters** int option: DAC Output DAC Pin 1 or 2 (1/2).  
int resolution: resolution of DAC can be set from 2 to 16-bit in steps of 2  
int value: requested DAC value (for particular resolution)

**Return** unsigned int

DRV_SUCCESS	DAC Scale option accepted.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_NOT_AVAILABLE	Feature not available.
DRV_P1INVALID	DAC range value invalid.
DRV_P2INVALID	Resolution unavailable.
DRV_P3INVALID	Requested value not within DAC range.

**See also** [SetDACOutputScale](#)

**NOTE: Only available on Andor Clara**

## SetDataType

unsigned int WINAPI SetDataType (int typ)

**Description** THIS FUNCTION IS RESERVED.

## SetDDGAddress

unsigned int WINAPI SetDDGAddress(BYTE t0, BYTE t1, BYTE t2, BYTE t3, BYTE address)

**Description** THIS FUNCTION IS RESERVED.

## SetDDGExternalOutputEnabled

unsigned int WINAPI SetDDGExternalOutputEnabled(at\_u32 Index, at\_u32 Enabled)

**Description** This function sets the state of a selected external output.

**Parameters** at\_u32 Index: index of external output.  
at\_u32 Enabled: state of external output (0 – Off, 1 – On).

**Return** unsigned int

DRV_SUCCESS	State set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_NOT_SUPPORTED	External outputs not supported.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with system.
DRV_P1INVALID	Invalid external output index.
DRV_P2INVALID	Invalid state.

**See also** [GetCapabilities](#) [GetDDGExternalOutputEnabled](#)

**NOTE:** Available on USB iStar.

## SetDDGExternalOutputPolarity

**unsigned int WINAPI SetDDGExternalOutputPolarity(at\_u32 Index, at\_u32 Polarity)**

**Description** This function sets the polarity of a selected external output.

**Parameters** at\_u32 Index: index of external output.  
at\_u32 Polarity: polarity of external output (0 – Positive, 1 – Negative).

**Return** unsigned int

DRV_SUCCESS	Polarity set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_NOT_SUPPORTED	External outputs not supported.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with system.
DRV_P1INVALID	Invalid external output index.
DRV_P2INVALID	Invalid state.

**See also** [GetCapabilities](#) [GetDDGExternalOutputEnabled](#) [GetDDGExternalOutputPolarity](#)

**NOTE:** Available on USB iStar.

## SetDDGExternalOutputStepEnabled

**unsigned int WINAPI SetDDGExternalOutputStepEnabled(at\_u32 Index, at\_u32 Enabled)**

**Description** Each external output has the option to track the gate step applied to the gater. This function can be used to set the state of this option.

**Parameters** at\_u32 Index: index of external output.  
at\_u32 Enabled: state of external output track step (0 – Off, 1 – On).

**Return** unsigned int

DRV_SUCCESS	State set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_NOT_SUPPORTED	External outputs not supported.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with system.
DRV_P1INVALID	Invalid external output index.
DRV_P2INVALID	Invalid state.

**See also** [GetCapabilities](#) [GetDDGExternalOutputEnabled](#) [GetDDGExternalOutputStepEnabled](#)

**NOTE:** Available on USB iStar.

## SetDDGExternalOutputTime

**unsigned int WINAPI SetDDGExternalOutputTime(at\_u32 Index, at\_u64 Delay, at\_u64 Width)**

**Description** This function can be used to set the timings for a particular external output.

**Parameters** at\_u32 Index: index of external output.  
at\_u64 Delay: external output delay time in picoseconds.  
at\_u64 Width: external output width time in picoseconds.

**Return** unsigned int

DRV_SUCCESS	Timings set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_NOT_SUPPORTED	External outputs not supported.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with card.
DRV_P1INVALID	Invalid external output index.
DRV_P2INVALID	Invalid delay.
DRV_P3INVALID	Invalid width.

**See also** [GetCapabilities](#) [GetDDGExternalOutputEnabled](#) [GetDDGExternalOutputTime](#)

**NOTE:** Available in USB iStar.

## SetDDGGain

**unsigned int WINAPI SetDDGGain(int gain)**

**Description** Deprecated for [SetMCPGain](#).

## SetDDGGateStep

**unsigned int WINAPI SetDDGGateStep(double step)**

**Description** This function will set a constant value for the gate step in a kinetic series. The lowest available resolution is 25 picoseconds and the maximum permitted value is 25 seconds.

**Parameters** double step: gate step in picoseconds.

**Return** unsigned int

DRV_SUCCESS	Gate step set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with card.
DRV_P1INVALID	Gate step invalid.

**See also** [SetDDGTimes](#), [SetDDGVariableGateStep](#)

**NOTE:** Available on iStar.





## SetDDGGateTime

**unsigned int WINAPI SetDDGGateTime(at\_u64 Delay, at\_u64 Width)**

**Description** This function can be used to set the gate timings for a USB iStar.

**Parameters** at\_u64 Delay: gate delay time in picoseconds.  
at\_u64 Width: gate width time in picoseconds.

**Return** unsigned int

DRV_SUCCESS	Timings set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_NOT_SUPPORTED	USB iStar not supported.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with system.
DRV_P1INVALID	Invalid delay.
DRV_P2INVALID	Invalid width.

**See also** [GetCapabilities](#) [GetDDGGateTime](#)

## SetDDGInsertionDelay

**unsigned int WINAPI SetDDGInsertionDelay(int state)**

**Description** This function controls the length of the insertion delay.

**Parameters** int state: NORMAL/FAST switch for insertion delay.

Valid values: 0 to set normal insertion delay.  
1 to set fast insertion delay.

**Return** unsigned int

DRV_SUCCESS	Value for delay accepted.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_I2CTIMEOUT	I2C command timed out.
DRV_I2CDEVNOTFOUND	I2C device not present.
DRV_ERROR_ACK	Unable to communicate with system.

**See also** [GetCapabilities](#) [SetDDGIntelligate](#)

## SetDDGIntelligate

### unsigned int WINAPI SetDDGIntelligate(int state)

**Description** This function controls the MCP gating. Not available when the fast insertion delay option is selected.

**Parameters** int state: ON/OFF switch for the MCP gating.  
Valid values: 0 to switch MCP gating OFF.  
1 to switch MCP gating ON.

**Return** unsigned int

DRV_SUCCESS	Intelligate option accepted.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_I2CTIMEOUT	I2C command timed out.
DRV_I2CDEVNOTFOUND	I2C device not present.
DRV_ERROR_ACK	Unable to communicate with system.

**See also** [GetCapabilities](#) [SetDDGInsertionDelay](#)

## SetDDGIOC

### unsigned int WINAPI SetDDGIOC(int state)

**Description** This function activates the integrate on chip (IOC) option.

**Parameters** int integrate: ON/OFF switch for the IOC option.  
Valid values: 0 to switch IOC OFF.  
1 to switch IOC ON.

**Return** unsigned int

DRV_SUCCESS	IOC option accepted.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_NOT_SUPPORTED	IOC not supported.
DRV_ERROR_ACK	Unable to communicate with system.

**See also** [GetCapabilities](#) [SetDDGIOCFrequency](#) [GetDDGIOCFrequency](#) [SetDDGIOCNumber](#) [GetDDGIOCNumber](#) [GetDDGIOCPulses](#)

**unsigned int WINAPI SetDDGIOCFrequency(double frequency)**

**Description** This function sets the frequency of the integrate on chip option. It should be called once the conditions of the experiment have been setup in order for correct operation. The frequency should be limited to 5000Hz when Intelligate is activated to prevent damage to the head and 50000Hz otherwise to prevent the gater from overheating. The recommended order is

...

**Experiment setup (exposure time, readout mode, gate parameters, ...)**

...

[SetDDGIOCFrequency](#) (x)

[SetDDGIOC](#)(true)

[GetDDGIOCPulses](#)(y)

[StartAcquisition](#)()

**Parameters** double frequency: frequency of IOC option in Hz.

**Return** unsigned int

DRV\_SUCCESS Value for frequency accepted.

DRV\_NOT\_INITIALIZED System not initialized.

DRV\_ACQUIRING Acquisition in progress.

DRV\_NOT\_SUPPORTED IOC not supported.

DRV\_ERROR\_ACK Unable to communicate with card.

**See also** [GetDDGIOCFrequency](#) [SetDDGIOCNumber](#) [GetDDGIOCNumber](#) [GetDDGIOCPulses](#) [SetDDGIOC](#)

## SetDDGIOCNumber

**unsigned int WINAPI SetDDGIOCNumber(unsigned long numberPulses)**

**Description** This function allows the user to limit the number of pulses used in the integrate on chip option at a given frequency. It should be called once the conditions of the experiment have been setup in order for correct operation.

**Parameters** unsigned long numberPulses: the number of integrate on chip pulses triggered within the fire pulse.

**Return** unsigned int

DRV_SUCCESS	Value for IOC number accepted
DRV_NOT_INITIALIZED	System not initialized
DRV_ACQUIRING	Acquisition in progress
DRV_NOT_SUPPORTED	IOC not supported
DRV_ERROR_ACK	Unable to communicate with card

**See also** [SetDDGIOCFrequency](#) [GetDDGIOCFrequency](#) [GetDDGIOCNumber](#) [GetDDGIOCPulses](#) [SetDDGIOC](#)

## SetDDGIOCPeriod

**unsigned int WINAPI SetDDGIOCPeriod(at\_u64 period)**

**Description** This function can be used to set the IOC period that will be triggered. It should only be called once all the conditions of the experiment have been defined.

**Parameters** at\_u64 period: the period of integrate on chip pulses triggered within the fire pulse.

<b>Return</b>	unsigned int
DRV_SUCCESS	IOC period set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_NOT_SUPPORTED	IOC not supported.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with system.
DRV_P1INVALID	Invalid period.

**See also** [GetCapabilities](#) [SetDDGIOC](#) [GetDDGIOCPeriod](#)

## SetDDGIOCTrigger

**unsigned int WINAPI SetDDGIOCTrigger(at\_u32 trigger)**

This function can be used to select whether to trigger the IOC pulse train with either the rising edge of the fire pulse or an externally supplied trigger.

at\_u32 trigger: IOC trigger option.

Valid values:   0       fire pulse.  
                  1       external trigger.

unsigned int

DRV_SUCCESS	IOC trigger set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_NOT_SUPPORTED	IOC not supported.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with system.
DRV_P1INVALID	Invalid trigger.

[GetCapabilities](#) [GetDDGIOCTrigger](#) [SetDDGIOC](#) [SetTriggerMode](#)

## SetDDGLiteControlByte

**unsigned int WINAPI SetDDGLiteControlByte(AT\_DDGLiteChannelId channel, unsigned char control)**

**Description      THIS FUNCTION IS RESERVED.**

## SetDDGLiteGlobalControlByte

**unsigned int WINAPI SetDDGLiteGlobalControlByte(unsigned char control)**

**Description      THIS FUNCTION IS RESERVED.**

## SetDDGLiteInitialDelay

**unsigned int WINAPI SetDDGLiteInitialDelay(AT\_DDGLiteChannelId channel, float fDelay)**

**Description      THIS FUNCTION IS RESERVED.**

## SetDDGLiteInterPulseDelay

**unsigned int WINAPI SetDDGLiteInterPulseDelay(AT\_DDGLiteChannelId channel, float fDelay)**

**Description      THIS FUNCTION IS RESERVED.**

## SetDDGLitePulsesPerExposure

**unsigned int WINAPI SetDDGLitePulsesPerExposure(AT\_DDGLiteChannelId channel, at\_u32 ui32Pulses)**

**Description      THIS FUNCTION IS RESERVED.**

## SetDDGLitePulseWidth

**unsigned int WINAPI SetDDGLitePulseWidth(AT\_DDGLiteChannelId channel, float fWidth)**

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Description	THIS FUNCTION IS RESERVED.
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## SetDDGOpticalWidthEnabled

**unsigned int WINAPI SetDDGOpticalWidthEnabled(at\_u32 Enabled)**

**Description** This function can be used to configure a system to use optical gate width.

**Parameters** at\_u32 Enabled: optical gate width option (0 – Off, 1 – On).

**Return** unsigned int

DRV_SUCCESS	State set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_NOT_SUPPORTED	Optical gate width not supported.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with system.
DRV_P1INVALID	Invalid state.

**See also** [GetCapabilities](#) [GetDDGTTLGateWidth](#) [GetDDGOpticalWidthEnabled](#)

## SetDDGStepCoefficients

**unsigned int WINAPI SetDDGStepCoefficients(at\_u32 mode, double p1, double p2)**

**Description** This function will configure the coefficients used in a kinetic series with gate step active. The lowest available resolution is 25 picoseconds and the maximum permitted value is 25 seconds for a PCI iStar.

The lowest available resolution is 10 picoseconds and the maximum permitted value is 10 seconds for a USB iStar.

**Parameters** at\_u32mode: the gate step mode.

Valid values:	0	constant ( $p1 \cdot (n-1)$ ).
	1	exponential ( $p1 \cdot \exp(p2 \cdot n)$ ).
	2	logarithmic ( $p1 \cdot \log(p2 \cdot n)$ ).
	3	linear ( $p1 + p2 \cdot n$ ).

$n = 1, 2, \dots$ , number in kinetic series

**Return** unsigned int

DRV_SUCCESS	Gate step mode coefficients set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with system.
DRV_P1INVALID	Gate step mode invalid.

**See also** [StartAcquisition](#) [SetDDGStepMode](#) [GetDDGStepMode](#) [GetDDGStepCoefficients](#)

**NOTE:** Available on iStar and USB iStar.

## SetDDGStepMode

**unsigned int WINAPI SetDDGStepMode(at\_u32 mode)**

**Description** This function will set the current gate step mode.

**Parameters** at\_u32 mode: the gate step mode.

Valid values:

0	constant.
1	exponential.
2	logarithmic.
3	linear.
100	off.

**Return** unsigned int

DRV_SUCCESS	Gate step mode set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_NOT_SUPPORTED	Gate step not supported.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with system.
DRV_P1INVALID	Invalid gate step mode.

**See also** [StartAcquisition](#) [GetDDGStepMode](#) [SetDDGStepCoefficients](#) [GetDDGStepCoefficients](#)

## SetDDGTimes

**unsigned int WINAPI SetDDGTimes(double t0, double t1, double t2)**

**Description** This function sets the properties of the gate pulse. t0 has a resolution of 16 nanoseconds whilst t1 and t2 have a resolution of 25 picoseconds.

**Parameters**

double t0: output A delay in nanoseconds.

double t1: gate delay in picoseconds.

double t2: pulse width in picoseconds.

**Return** unsigned int

DRV_SUCCESS	Values for gate pulse accepted.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_I2CTIMEOUT	I2C command timed out.
DRV_I2CDEVNOTFOUND	I2C device not present.
DRV_ERROR_ACK	Unable to communicate with card.
DRV_P1INVALID	Invalid output A delay.
DRV_P2INVALID	Invalid gate delay.
DRV_P3INVALID	Invalid pulse width.

**See also** [SetDDGGateStep](#)

**NOTE:** Available on iStar.



## SetDDGTriggerMode

**unsigned int WINAPI SetDDGTriggerMode(int mode)**

**Description** This function will set the trigger mode of the internal delay generator to either Internal or External

**Parameters** int mode: trigger mode  
Valid values:

0	Internal
1	External

**Return** unsigned int

DRV_SUCCESS	Trigger mode set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with card.
DRV_P1INVALID	Trigger mode invalid.

**NOTE: Available on iStar.**

## SetDDGVariableGateStep

**unsigned int WINAPI SetDDGVariableGateStep(int mode, double p1, double p2)**

**Description** This function will set a varying value for the gate step in a kinetic series. The lowest available resolution is 25 picoseconds and the maximum permitted value is 25 seconds.

**Parameters** int mode: the gate step mode.  
Valid values:

1	Exponential ( $p1 \cdot \exp(p2 \cdot n)$ )
2	Logarithmic ( $p1 \cdot \log(p2 \cdot n)$ )
3	Linear ( $p1 + p2 \cdot n$ )

$n = 1, 2, \dots$ , number in kinetic series

**Return** unsigned int

DRV_SUCCESS	Gate step mode set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with card.
DRV_P1INVALID	Gate step mode invalid.

**See also** [StartAcquisition](#)

**NOTE: Available on iStar.**

## SetDDGWidthStepCoefficients

**unsigned int WINAPI SetDDGWidthStepCoefficients(at\_u32 mode, double p1, double p2)**

**Description** This function will configure the coefficients used in a kinetic series with gate width step active. The lowest available resolution is 25 picoseconds and the maximum permitted value is 25 seconds for a PCI iStar.

The lowest available resolution is 10 picoseconds and the maximum permitted value is 10 seconds for a USB iStar.

**Parameters** at\_u32mode: the gate step mode.

Valid values:

0	constant ( $p1 \cdot (n-1)$ ).
1	exponential ( $p1 \cdot \exp(p2 \cdot n)$ ).
2	logarithmic ( $p1 \cdot \log(p2 \cdot n)$ ).
3	linear ( $p1 + p2 \cdot n$ ).

$n = 1, 2, \dots$ , number in kinetic series

**Return** unsigned int

DRV_SUCCESS	Gate step mode coefficients set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_P1INVALID	Gate step mode invalid.

**See also** [SetDDGWidthStepMode](#) [GetDDGWidthStepMode](#) [GetDDGWidthStepCoefficients](#)

## SetDDGWidthStepMode

**unsigned int WINAPI SetDDGWidthStepMode(at\_u32 mode)**

**Description** This function will set the current gate width step mode.

**Parameters** at\_u32 mode: the gate step mode.

Valid values:

0	constant.
1	exponential.
2	logarithmic.
3	linear.
100	off.

**Return** unsigned int

DRV_SUCCESS	Gate step mode set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_NOT_SUPPORTED	Gate step not supported.
DRV_ACQUIRING	Acquisition in progress.
DRV_P1INVALID	Invalid gate step mode.

**See also** [SetDDGWidthStepCoefficients](#) [GetDDGWidthStepMode](#) [GetDDGWidthStepCoefficients](#)

### SetDelayGenerator

**unsigned int WINAPI SetDelayGenerator(int board, short address, int typ)**

**Description** This function sets parameters to control the delay generator through the GPIB card in your computer.

**Parameters** int board: The GPIB board number of the card used to interface with the Delay Generator.  
short address: The number that allows the GPIB board to identify and send commands to the delay generator.  
Int typ: The type of your Delay Generator.

**Return** unsigned int

DRV_SUCCESS	Delay Generator set up.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ERROR_ACK	Unable to communicate with card.
DRV_ACQUIRING	Acquisition in progress.
DRV_P1INVALID	GPIB board invalid.
DRV_P2INVALID	GPIB address invalid
DRV_P3INVALID	Delay generator type invalid.

**See also** [SetGate](#)

**NOTE:** Available on ICCD.

**unsigned int WINAPI SetDMAParameters(int MaxImagesPerDMA, float SecondsPerDMA)**

**Description** In order to facilitate high image readout rates the controller card may wait for multiple images to be acquired before notifying the SDK that new data is available. Without this facility, there is a chance that hardware interrupts may be lost as the operating system does not have enough time to respond to each interrupt. The drawback to this is that you will not get the data for an image until all images for that interrupt have been acquired.

There are 3 settings involved in determining how many images will be acquired for each notification (DMA Interrupt) of the controller card and they are as follows:

1. The size of the DMA buffer gives an upper limit on the number of images that can be stored within it and is usually set to the size of one full image when installing the software. This will usually mean that if you acquire full frames there will never be more than one image per DMA.
2. A second setting that is used is the minimum amount of time (SecondsPerDMA) that should expire between interrupts. This can be used to give an indication of the responsiveness of the operating system to interrupts. Decreasing this value will allow more interrupts per second and should only be done for faster pcs. The default value is 0.03s (30ms), finding the optimal value for your pc can only be done through experimentation.
3. The third setting is an override to the number of images calculated using the previous settings. If the number of images per dma is calculated to be greater than MaxImagesPerDMA then it will be reduced to MaxImagesPerDMA. This can be used to, for example, ensure that there is never more than 1 image per DMA by setting MaxImagesPerDMA to 1. Setting MaxImagesPerDMA to zero removes this limit. Care should be taken when modifying these parameters as missed interrupts may prevent the acquisition from completing.

**Parameters** int MaxImagesPerDMA: Override to the number of images per DMA if the calculated value is higher than this. (Default=0, ie. no override)  
float SecondsPerDMA: Minimum amount of time to elapse between interrupts. (Default=0.03s)

**Return** unsigned int  
DRV\_SUCCESS DMA Parameters setup successfully.  
DRV\_NOT\_INITIALIZED System not initialized.  
DRV\_P1INVALID MaxImagesPerDMA invalid  
DRV\_P2INVALID SecondsPerDMA invalid

### unsigned int WINAPI SetDriverEvent(HANDLE driverEvent)

**Description** This function passes a Win32 Event handle to the SDK via which the the user software can be informed that something has occurred. For example the SDK can “set” the event when an acquisition has completed thus relieving the user code of having to continually pole to check on the status of the acquisition.

The event will be “set” under the follow conditions:

- 1) Acquisition completed or aborted.
- 2) As each scan during an acquisition is completed.
- 3) Temperature as stabilized, drifted from stabilization or could not be reached.

When an event is triggered the user software can then use other SDK functions to determine what actually happened.

Condition 1 and 2 can be tested via [GetStatus](#) function, while condition 3 checked via [GetTemperature](#) function.

You must reset the event after it has been handled in order to receive additional triggers.

Before deleting the event you must call SetDriverEvent with NULL as the parameter.

**Parameters** HANDLE driverEvent: Win32 event handle.

**Return** unsigned int

DRV_SUCCESS	Event set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_NOT_SUPPORTED	Function not supported for operating system

**See also** [GetStatus](#) [GetTemperature](#) [GetAcquisitionProgress](#)

**NOTE:** Not all programming environments allow the use of multiple threads and WIN32 events.

## SetDualExposureMode

**unsigned int WINAPI SetDualExposureMode(int mode)**

**Description** This function turns on and off the option to acquire 2 frames for each external trigger pulse. This mode is only available for certain sensors in run till abort mode, external trigger, full image.

**Parameters** int state: Enables/Disables dual exposure mode  
 1 – Enable mode  
 0 – Disable mode

**Return** unsigned int

DRV_SUCCESS	Parameters set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_NOT_SUPPORTED	Dual exposure mode not supported on this camera.
DRV_ACQUIRING	Acquisition in progress.
DRV_P1INVALID	Mode parameter was not zero or one.

**See also** [GetCapabilities](#), [SetDualExposureTimes](#), [GetDualExposureTimes](#)

## SetDualExposureTimes

**unsigned int WINAPI SetDualExposureTimes(float exposure1, float exposure2)**

**Description** This function configures the two exposure times used in dual exposure mode. This mode is only available for certain sensors in run till abort mode, external trigger, full image.

**Parameters** float exposure1: the exposure time in seconds for each odd numbered frame.  
 float exposure2: the exposure time in seconds for each even numbered frame.

**Return** unsigned int

DRV_SUCCESS	Parameters set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_NOT_SUPPORTED	Dual exposure mode not supported on this camera.
DRV_ACQUIRING	Acquisition in progress.
DRV_P1INVALID	First exposure out of range.
DRV_P2INVALID	Second exposure out of range.

**See also** [GetCapabilities](#), [SetDualExposureMode](#), [GetDualExposureTimes](#)

## SetEMAdvanced

### unsigned int WINAPI SetEMAdvanced(int state)

**Description** This function turns on and off access to higher EM gain levels within the SDK. Typically, optimal signal to noise ratio and dynamic range is achieved between x1 to x300 EM Gain. Higher gains of > x300 are recommended for single photon counting only. Before using higher levels, you should ensure that light levels do not exceed the regime of tens of photons per pixel, otherwise accelerated ageing of the sensor can occur.

**Parameters** int state: Enables/Disables access to higher EM gain levels  
 1 – Enable access  
 0 – Disable access

**Return** unsigned int

DRV_SUCCESS	Parameters set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_NOT_AVAILABLE	Advanced EM gain not available for this camera.
DRV_ACQUIRING.	Acquisition in progress.
DRV_P1INVALID	State parameter was not zero or one.

**See also** [GetCapabilities](#), [GetEMCCDGain](#), [SetEMCCDGain](#), [SetEMGainMode](#)

## SetEMCCDGain

### unsigned int WINAPI SetEMCCDGain(int gain)

**Description** Allows the user to change the gain value. The valid range for the gain depends on what gain mode the camera is operating in. See [SetEMGainMode](#) to set the mode and [GetEMGainRange](#) to get the valid range to work with. To access higher gain values (>x300) see [SetEMAdvanced](#).

**Parameters** int gain: amount of gain applied.

**Return** unsigned int

DRV_SUCCESS	Value for gain accepted.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_I2CTIMEOUT	I2C command timed out.
DRV_I2CDEVNOTFOUND	I2C device not present.
DRV_ERROR_ACK	Unable to communicate with card.
DRV_P1INVALID	Gain value invalid.

**See also** [GetEMCCDGain](#) [SetEMGainMode](#) [GetEMGainRange](#) [SetEMAdvanced](#)

**NOTE:** Only available on EMCCD sensor systems.

## SetEMClockCompensation

**unsigned int WINAPI SetEMClockCompensation(int EMClockCompensationFlag)**

**Description** THIS FUNCTION IS RESERVED.

## SetEMGainMode

**unsigned int WINAPI SetEMGainMode(int mode)**

**Description** Set the EM Gain mode to one of the following possible settings.  
 Mode 0: The EM Gain is controlled by DAC settings in the range 0-255. Default mode.  
 1: The EM Gain is controlled by DAC settings in the range 0-4095.  
 2: Linear mode.  
 3: Real EM gain  
 To access higher gain values (if available) it is necessary to enable advanced EM gain, see [SetEMAdvanced](#).

**Parameters** int mode: EM Gain mode.

### Return

DRV_SUCCESS	Mode set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_P1INVALID	EM Gain mode invalid.

## SetESDEvent

**unsigned int WINAPI SetESDEvent (HANDLE Event)**

**Description** This function passes a Win32 Event handle to the driver via which the driver can inform the user software that an ESD event has occurred.

**Parameters** HANDLE Event: Win32 event handle.

**Return** unsigned int

DRV_SUCCESS	Event set
DRV_NOT_INITIALIZED	System not initialized
DRV_NOT_AVAILABLE	Function not supported for operating system

**See also** [GetCapabilities](#)



## SetExposureTime

**unsigned int WINAPI SetExposureTime(float time)**

**Description** This function will set the exposure time to the nearest valid value not less than the given value. The actual exposure time used is obtained by [GetAcquisitionTimings](#). . Please refer to [SECTION 5 – ACQUISITION MODES](#) for further information.

**Parameters** float time: the exposure time in seconds.

**Return** unsigned int

DRV_SUCCESS	Exposure time accepted.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_P1INVALID	Exposure Time invalid.

**See also** [GetAcquisitionTimings](#)

**NOTE:** For Classics, if the current acquisition mode is Single-Track, Multi-Track or Image then this function will actually set the Shutter Time. The actual exposure time used is obtained from the [GetAcquisitionTimings](#) function.

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## SetExternalTriggerTermination

**unsigned int WINAPI SetExternalTriggerTermination(at\_u32 Termination)**

**Description** This function can be used to set the external trigger termination mode.

**Parameters** at\_u32 Termination: trigger termination option.

Valid values: 0 50 ohm.  
1 hi-Z.

**Return** unsigned int

DRV_SUCCESS	Termination set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_NOT_SUPPORTED	Trigger termination not supported.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with system.
DRV_P1INVALID	Invalid termination.

**See also** [GetCapabilities](#) [GetExternalTriggerTermination](#)

## SetFanMode

**unsigned int WINAPI SetFanMode(int mode)**

**Description** Allows the user to control the mode of the camera fan. If the system is cooled, the fan should only be turned off for short periods of time. During this time the body of the camera will warm up which could compromise cooling capabilities.

If the camera body reaches too high a temperature, depends on camera, the buzzer will sound. If this happens, turn off the external power supply and allow the system to stabilize before continuing.

**Parameters** int mode: fan on full (0)

fan on low (1)

fan off (2)

**Return** unsigned int

DRV_SUCCESS	Value for mode accepted.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_I2CTIMEOUT	I <sup>2</sup> C command timed out.
DRV_I2CDEVNOTFOUND	I <sup>2</sup> C device not present.
DRV_ERROR_ACK	Unable to communicate with card.
DRV_P1INVALID	Mode value invalid.

**See also** [GetCapabilities](#)

## SetFastKinetics

**unsigned int WINAPI SetFastKinetics(int exposedRows int seriesLength, float time, int mode, int hbin, int vbin)**

**Description** This function will set the parameters to be used when taking a fast kinetics acquisition.

**Parameters**

- int exposedRows: sub-area height in rows.
- int seriesLength: number in series.
- float time: exposure time in seconds.
- int mode: binning mode (0 – FVB , 4 – Image).
- int hbin: horizontal binning.
- int vbin: vertical binning (only used when in image mode).

**Return**

unsigned int	
DRV_SUCCESS	All parameters accepted.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_P1INVALID	Invalid height.
DRV_P2INVALID	Invalid number in series.
DRV_P3INVALID	Exposure time must be greater than 0.
DRV_P4INVALID	Mode must be equal to 0 or 4.
DRV_P5INVALID	Horizontal binning.
DRV_P6INVALID	Vertical binning.

**See also** [SetFKVShiftSpeed](#) [SetFastKineticsEx](#)

**NOTE: For classic cameras the vertical and horizontal binning must be 1**  
**For non classic cameras it is recommended that you use SetFastKineticsEx**

## SetFastKineticsEx

**unsigned int WINAPI SetFastKineticsEx(int exposedRows, int seriesLength, float time, int mode, int hbin, int vbin, int offset)**

**Description** This function is the same as [SetFastKinetics](#) with the addition of an Offset parameter, which will inform the SDK of the first row to be used.

**Parameters**

- int exposedRows: sub-area height in rows.
- int seriesLength: number in series.
- float time: exposure time in seconds.
- int mode: binning mode (0 – FVB , 4 – Image).
- int hbin: horizontal binning.
- int vbin: vertical binning (only used when in image mode).
- Int offset: offset of first row to be used in Fast Kinetics from the bottom of the CCD.

**Return** unsigned int

DRV_SUCCESS	All parameters accepted.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_P1INVALID	Invalid height.
DRV_P2INVALID	Invalid number in series.
DRV_P3INVALID	Exposure time must be greater than 0.
DRV_P4INVALID	Mode must be equal to 0 or 4.
DRV_P5INVALID	Horizontal binning.
DRV_P6INVALID	Vertical binning.
DRV_P7INVALID	Offset not within CCD limits

**See also** [SetFKVShiftSpeed](#) [SetFastKinetics](#)

**NOTE:** For classic cameras the offset must be 0 and the vertical and horizontal binning must be 1  
For iDus, it is recommended that you set horizontal binning to 1

## SetFastKineticsStorageMode

**unsigned int WINAPI SetFastKineticsStorageMode(int mode)**

**Description** Allows the user to increase the number of frames which can be acquired in fast kinetics mode when using vertical binning. When 'binning in storage area' is selected the offset cannot be adjusted from the bottom of the sensor and the maximum signal level will be reduced.

**Parameters** int mode: vertically bin in readout register (0)  
vertically bin in storage area (1)

**Return** unsigned int

DRV_SUCCESS	Value for mode accepted.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_NOT_SUPPORTED	Feature not supported.
DRV_P1INVALID	Mode value invalid.

**See also** [GetCapabilities](#)

## SetFastKineticsTimeScanMode

**unsigned int WINAPI SetFastKineticsTimeScanMode(int exposedRows, int seriesLength, int mode)**

**Description** When triggered, the camera starts shifting collected data until *exposedRows* of data are collected. There is no dwell time between row shifts. After the data is collected the entire *Sensor Width* x *exposedRows* image is readout and available. This is repeated *seriesLength* times. The data can be accumulated or presented as a series.

**Parameters** int exposedRows: sub-area height in rows.  
int seriesLength: number in series.  
int mode: Off (0), Accumulate (1), Series (2)

**Return** unsigned int

DRV_SUCCESS	Value for mode accepted.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_NOT_SUPPORTED	Feature not supported.
DRV_P1INVALID	Invalid height.
DRV_P2INVALID	Invalid number in series.
DRV_P3INVALID	Mode must be equal to 0, 1 or 2.

**See also** [GetCapabilities](#)

## SetFastExtTrigger

**unsigned int WINAPI SetFastExtTrigger(int mode)**

**Description** This function will enable fast external triggering. When fast external triggering is enabled the system will NOT wait until a “Keep Clean” cycle has been completed before accepting the next trigger. This setting will only have an effect if the trigger mode has been set to External via [SetTriggerMode](#).

**Parameters** int mode:

0	Disabled
1	Enabled

**Return** unsigned int  
 DRV\_SUCCESS Parameters accepted.

**See also** [SetTriggerMode](#)

## SetFilterMode

**unsigned int WINAPI SetFilterMode(int mode)**

**Description** This function will set the state of the cosmic ray filter mode for future acquisitions. If the filter mode is on, consecutive scans in an accumulation will be compared and any cosmic ray-like features that are only present in one scan will be replaced with a scaled version of the corresponding pixel value in the correct scan.

**Parameters** int mode: current state of filter

0	OFF
2	ON

**Return** unsigned int

DRV_SUCCESS	Filter mode set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_P1INVALID	Mode is out off range.

**See also** [GetFilterMode](#)

## SetFilterParameters

**unsigned int WINAPI SetFilterParameters (int width, float sensitivity, int range, float accept, int smooth, int noise)**

**Description** THIS FUNCTION IS RESERVED.

## SetFKVShiftSpeed

**unsigned int WINAPI SetFKVShiftSpeed(int index)**

**Description** This function will set the fast kinetics vertical shift speed to one of the possible speeds of the system. It will be used for subsequent acquisitions.

**Parameters** int index: the speed to be used  
Valid values 0 to [GetNumberFKVShiftSpeeds](#)-1

**Return** unsigned int  
 DRV\_SUCCESS Fast kinetics vertical shift speed set.  
 DRV\_NOT\_INITIALIZED System not initialized.  
 DRV\_ACQUIRING Acquisition in progress.  
 DRV\_P1INVALID Index is out off range.

**See also** [GetNumberFKVShiftSpeeds](#), [GetFKVShiftSpeedF](#)

**NOTE:** Only available if camera is Classic or iStar.

## SetFPDP

**unsigned int WINAPI SetFPDP(int state)**

**Description** THIS FUNCTION IS RESERVED.

## SetFrameTransferMode

**unsigned int WINAPI SetFrameTransferMode (int mode)**

**Description** This function will set whether an acquisition will readout in Frame Transfer Mode. If the [acquisition mode](#) is Single Scan or Fast Kinetics this call will have no affect.

**Parameters** int mode: mode  
 0 OFF  
 1 ON

**Return** unsigned int  
 DRV\_SUCCESS Frame transfer mode set.  
 DRV\_NOT\_INITIALIZED System not initialized.  
 DRV\_ACQUIRING Acquisition in progress.  
 DRV\_P1INVALID Invalid parameter.

**See also** [SetAcquisitionMode](#)

**NOTE:** Only available if CCD is a Frame Transfer chip.

## SetFrontEndEvent

### unsigned int WINAPI SetFrontEndEvent (HANDLE Event)

**Description** This function passes a Win32 Event handle to the driver via which the driver can inform the user software that the Front End cooler has overheated or returned to a normal state. To determine what event has actually occurred call the [GetFrontEndStatus](#) function. This may give the user software an opportunity to perform other actions that will not affect the readout of the current acquisition.

**Parameters** HANDLE Event: Win32 event handle.

**Return** unsigned int

DRV_SUCCESS	Event set
DRV_NOT_INITIALIZED	System not initialized
DRV_NOT_AVAILABLE	Function not supported for operating system

**See also** [GetFrontEndStatus](#)

## SetFullImage

### unsigned int WINAPI SetFullImage(int hbin, int vbin)

**Description** **Deprecated see Note:**

This function will set the horizontal and vertical binning to be used when taking a full resolution image.

**Parameters** int hbin: number of pixels to bin horizontally  
int vbin: number of pixels to bin vertically

**Return** unsigned int

DRV_SUCCESS	Binning parameters accepted
DRV_NOT_INITIALIZED	System not initialized
DRV_ACQUIRING	Acquisition in progress
DRV_P1INVALID	Horizontal binning parameter invalid
DRV_P2INVALID	Vertical binning parameter invalid

**See also** [SetReadMode](#)

**NOTE:** Deprecated by [SetImage](#)



### SetFVBHBin

**unsigned int WINAPI SetFVBHBin(int bin)**

**Description** This function sets the horizontal binning used when acquiring in Full Vertical Binned read mode.

**Parameters** Int bin: Binning size.

**Return** unsigned int

DRV_SUCCESS	Binning set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_P1INVALID	Invalid binning size.

**See also** [SetReadMode](#)

**NOTE:** 1) If the detector width is not a multiple of the binning DRV\_BINNING\_ERROR will be returned from PrepareAcquisition and/or StartAcquisition

2) For iDus, it is recommended that you set horizontal binning to 1

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## SetGain

**unsigned int WINAPI SetGain(int gain)**

**Description**      Deprecated for [SetMCPGain](#).

## SetGate

**unsigned int WINAPI SetGate(float delay, float width, float step)**

**Description**      This function sets the Gater parameters for an ICCD system. The image intensifier of the Andor ICCD acts as a shutter on nanosecond time-scales using a process known as gating.

**Parameters**      float delay: Sets the delay( $\geq 0$ ) between the T0 and C outputs on the SRS box to delay nanoseconds.  
float width: Sets the width( $\geq 0$ ) of the gate in nanoseconds  
float step: Sets the amount( $\neq 0$ , in nanoseconds) by which the gate position is moved in time after each scan in a kinetic series.

**Return**      unsigned int

DRV_SUCCESS	Gater parameters set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ERROR_ACK	Unable to communicate with card.
DRV_ACQUIRING	Acquisition in progress.
DRV_GPIBERROR	Error communicating with GPIB card.
DRV_P1INVALID	Invalid delay
DRV_P2INVALID	Invalid width.
DRV_P3INVALID	Invalid step.

**See also**      [SetDelayGenerator](#)

**NOTE: Available on ICCD.**

**unsigned int WINAPI SetGateMode(int gatemode)**

**Description** Allows the user to control the photocathode gating mode.

**Parameters** int gatemode: the gate mode.

Valid values:

0	Fire ANDed with the Gate input.
1	Gating controlled from Fire pulse only.
2	Gating controlled from SMB Gate input only.
3	Gating ON continuously.
4	Gating OFF continuously.
5	Gate using DDG

**Return** unsigned int

DRV_SUCCESS	Gating mode accepted.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_I2CTIMEOUT	I <sup>2</sup> C command timed out.
DRV_I2CDEVNOTFOUND	I <sup>2</sup> C device not present.
DRV_ERROR_ACK	Unable to communicate with card.
DRV_P1INVALID	Gating mode invalid.

**See also** [GetCapabilities](#), [SetMCPGain](#), [SetGain](#), [SetMCPGating](#)

## SetHighCapacity

**unsigned int WINAPI SetHighCapacity(int state)**

**Description** This function switches between high sensitivity and high capacity functionality. With high capacity enabled the output amplifier is switched to a mode of operation which reduces the responsivity thus allowing the reading of larger charge packets during binning operations.

**Parameters** int state: Enables/Disables High Capacity functionality  
 1 – Enable High Capacity (Disable High Sensitivity)  
 0 – Disable High Capacity (Enable High Sensitivity)

**Return** unsigned int  
 DRV\_SUCCESS Parameters set.  
 DRV\_NOT\_INITIALIZED System not initialized.  
 DRV\_ACQUIRING Acquisition in progress.  
 DRV\_P1INVALID State parameter was not zero or one.

**See also** [GetCapabilities](#)

## SetHorizontalSpeed

**unsigned int WINAPI SetHorizontalSpeed(int index)**

**Description** **Deprecated see Note:**

This function will set the horizontal speed to one of the possible speeds of the system. It will be used for subsequent acquisitions.

**Parameters** int index: the horizontal speed to be used  
 Valid values 0 to [GetNumberHorizontalSpeeds](#)-1

**Return** unsigned int  
 DRV\_SUCCESS Horizontal speed set.  
 DRV\_NOT\_INITIALIZED System not initialized.  
 DRV\_ACQUIRING Acquisition in progress.  
 DRV\_P1INVALID Index is out off range.

**See also** [GetNumberHorizontalSpeeds](#), [GetHorizontalSpeed](#)

**NOTE:** Deprecated by [SetHSSpeed](#)

## SetHSSpeed

**unsigned int WINAPI SetHSSpeed(int typ, int index)**

**Description** This function will set the speed at which the pixels are shifted into the output node during the readout phase of an acquisition. Typically your camera will be capable of operating at several horizontal shift speeds. To get the actual speed that an index corresponds to use the [GetHSSpeed](#) function.

**Parameters** int typ: output amplification.  
Valid values: 0 electron multiplication/Conventional(clara).  
1 conventional/Extended NIR mode(clara).  
int index: the horizontal speed to be used  
Valid values 0 to [GetNumberHSSpeeds\(\)](#)-1

**Return** unsigned int  
DRV\_SUCCESS Horizontal speed set.  
DRV\_NOT\_INITIALIZED System not initialized.  
DRV\_ACQUIRING Acquisition in progress.  
DRV\_P1INVALID Mode is invalid.  
DRV\_P2INVALID Index is out off range.

**See also** [GetNumberHSSpeeds](#), [GetHSSpeed](#) [GetNumberAmp](#)

## SetImage

**unsigned int WINAPI SetImage(int hbin, int vbin, int hstart, int hend, int vstart, int vend)**

**Description** This function will set the horizontal and vertical binning to be used when taking a full resolution image.

**Parameters**

- int hbin: number of pixels to bin horizontally.
- int vbin: number of pixels to bin vertically.
- int hstart: Start column (inclusive).
- int hend: End column (inclusive).
- int vstart: Start row (inclusive).
- int vend: End row (inclusive).

**Return**

unsigned int	
DRV_SUCCESS	All parameters accepted.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_P1INVALID	Binning parameters invalid.
DRV_P2INVALID	Binning parameters invalid.
DRV_P3INVALID	Sub-area co-ordinate is invalid.
DRV_P4INVALID	Sub-area co-ordinate is invalid.
DRV_P5INVALID	Sub-area co-ordinate is invalid.
DRV_P6INVALID	Sub-area co-ordinate is invalid.

**See also** [SetReadMode](#)

**NOTE:** For iDus, it is recommended that you set horizontal binning to 1

## SetImageFlip

**unsigned int WINAPI SetImageFlip(int iHFlip, int iVFlip)**

**Description** This function will cause data output from the SDK to be flipped on one or both axes. This flip is not done in the camera, it occurs after the data is retrieved and will increase processing overhead. If flipping could be implemented by the user more efficiently then use of this function is not recommended. E.g writing to file or displaying on screen.

**Parameters** int iHFlip: Sets horizontal flipping.  
int iVFlip: Sets vertical flipping..

1 - Enables Flipping  
0 - Disables Flipping

If this function is used in conjunction with the [SetImageRotate](#) function the rotation will occur before the flip regardless of which order the functions are called.

**Return** unsigned int

DRV_SUCCESS	All parameters accepted.
DRV_NOT_INITIALIZED	System not initialized.
DRV_P1INVALID	HFlip parameter invalid.
DRV_P2INVALID	VFlip parameter invalid

**See also** [SetImageRotate](#)

## SetImageRotate

**unsigned int WINAPI SetImageRotate(int iRotate)**

**Description** This function will cause data output from the SDK to be rotated on one or both axes. This rotate is not done in the camera, it occurs after the data is retrieved and will increase processing overhead. If the rotation could be implemented by the user more efficiently then use of this function is not recommended. E.g writing to file or displaying on screen.

**Parameters** int iRotate: Rotation setting

- 0 - No rotation
- 1 - Rotate 90 degrees clockwise
- 2 - Rotate 90 degrees anti-clockwise

If this function is used in conjunction with the [SetImageFlip](#) function the rotation will occur before the flip regardless of which order the functions are called.

180 degree rotation can be achieved using the SetImageFlip function by selecting both horizontal and vertical flipping.

**Return** unsigned int

DRV_SUCCESS	All parameters accepted.
DRV_NOT_INITIALIZED	System not initialized.
DRV_P1INVALID	Rotate parameter invalid.

**See also** [SetImageFlip](#)



### unsigned int WINAPI SetIRIGModulation (char mode)

**Description** This function allows the camera to be configured to expect the IRIG modulation type produced by the external IRIG device.

**Parameters** char mode: mode.  
0 unmodulated  
1 modulated

**Return** unsigned int

DRV_SUCCESS	Mode successfully selected.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_NOT_SUPPORTED	Feature not supported on this camera.
DRV_P1INVALID	Requested mode isn't valid.

**See also** [GetCapabilities](#), [GetIRIGData](#)

**NOTE** Not all cameras support this feature. To check if your camera supports this feature use the [GetCapabilities](#) function to check the ulFeature for AC\_FEATURES\_IRIG\_SUPPORT.

## SetIsolatedCropMode

**unsigned int WINAPI SetIsolatedCropMode(int active, int cropheight, int cropwidth, int vbin, int hbin)**

**Description** This function effectively reduces the dimensions of the CCD by excluding some rows or columns to achieve higher throughput. In isolated crop mode iXon, Newton and iKon cameras can operate in either Full Vertical Binning or Imaging read modes. iDus can operate in Full Vertical Binning read mode only.

**Note: It is important to ensure that no light falls on the excluded region otherwise the acquired data will be corrupted.**

**Parameters**

int active: 1 – Crop mode is ON.  
0 – Crop mode is OFF.

int cropheight: The selected crop height. This value must be between 1 and the CCD height.

int cropwidth: The selected crop width. This value must be between 1 and the CCD width.

int vbin: The selected vertical binning.

int hbin: The selected horizontal binning.

**Return**

unsigned int	
DRV_SUCCESS	Parameters set
DRV_NOT_INITIALIZED	System not initialized
DRV_ACQUIRING	Acquisition in progress
DRV_P1INVALID	active parameter was not zero or one
DRV_P2INVALID	Invalid crop height
DRV_P3INVALID	Invalid crop width
DRV_P4INVALID	Invalid vertical binning
DRV_P5INVALID	Invalid horizontal binning
DRV_NOT_SUPPORTED	Either the camera does not support isolated Crop mode or the read mode is invalid

**See also** [GetDetector](#) [SetReadMode](#)

**NOTE:** For iDus, it is recommended that you set horizontal binning to 1

## SetIsolatedCropModeEx

**unsigned int WINAPI SetIsolatedCropModeEx(int active, int cropheight, int cropwidth, int vbin, int hbin, int croleft, int cropbottom)**

**Description** This function effectively reduces the dimensions of the CCD by excluding some rows or columns to achieve higher throughput. This feature is currently only available for iXon Ultra and can only be used in Image readout mode with the EM output amplifier.

**Note: It is important to ensure that no light falls on the excluded region otherwise the acquired data will be corrupted.**

The following centralized regions of interest are recommended to be used with this mode to achieve the fastest possible frame rates. The table below shows the optimally positioned ROI coordinates recommended to be used with this mode on the iXon Ultra 897 camera:

ROI	Crop Left Start Position	Crop Right Position	Crop Bottom Start Position	Crop Top Position
32 x 32	241	272	240	271
64 x 64	219	282	224	287
96 x 96	209	304	208	303
128 x 128	189	316	192	319
192 x 192	157	348	160	351
256 x 256	123	378	128	383
496 x 4	8	503	254	257
496 x 8	8	503	252	259
496 x 16	8	503	249	262

The optimally positioned ROI coordinates recommended to be used with this mode on the iXon Ultra 888 camera are:

ROI	Crop Left Start Position	Crop Right Position	Crop Bottom Start Position	Crop Top Position
32 x 32	487	518	496	527
64 x 64	476	539	480	543
128 x 128	433	560	448	575
256 x 256	369	624	384	639
512 x 512	241	752	256	767
1024 x 4	1	1024	510	513
1024 x 8	1	1024	508	515
1024 x 16	1	1024	504	519
1024 x 32	1	1024	496	527

**Parameters**

int active: 1 – Crop mode is ON.  
0 – Crop mode is OFF.

int cropheight: The selected crop height. This value must be between 1 and the CCD height.

int cropwidth: The selected crop width. This value must be between 1 and the CCD width.

int vbin: The selected vertical binning.

int hbin: The selected horizontal binning.

int cropleft: The selected crop left start position

int cropbottom: The selected crop bottom start position

**Return**

unsigned int

DRV_SUCCESS	Parameters set
DRV_NOT_INITIALIZED	System not initialized
DRV_ACQUIRING	Acquisition in progress
DRV_P1INVALID	active parameter was not zero or one
DRV_P2INVALID	Invalid crop height
DRV_P3INVALID	Invalid crop width
DRV_P4INVALID	Invalid vertical binning
DRV_P5INVALID	Invalid horizontal binning
DRV_P6INVALID	Invalid crop left start position
DRV_P7INVALID	Invalid crop bottom start position
DRV_NOT_SUPPORTED	The camera does not support isolated crop mode
DRV_NOT_AVAILABLE	Invalid read mode

**See also** [GetDetector SetReadMode](#)

## SetIsolatedCropModeType

**unsigned int WINAPI SetIsolatedCropModeType(int mode)**

**Description** This function determines the method by which data is transferred in isolated crop mode. The default method is High Speed where multiple frames may be stored in the storage area of the sensor before they are read out. In Low Latency mode, each cropped frame is read out as it happens.

**Parameters** int mode: 0 – High Speed.  
1 – Low Latency.

**Return** unsigned int

DRV_SUCCESS	Parameter set
DRV_NOT_INITIALIZED	System not initialized
DRV_ACQUIRING	Acquisition in progress
DRV_P1INVALID	mode parameter was not zero or one
DRV_NOT_SUPPORTED	Either the camera does not support isolated Crop mode or the read mode is invalid

**See also** [GetDetector](#) [SetIsolatedCropMode](#) [GetCapabilities](#)

## SetKineticCycleTime

**unsigned int WINAPI SetKineticCycleTime(float time)**

**Description** This function will set the kinetic cycle time to the nearest valid value not less than the given value. The actual time used is obtained by [GetAcquisitionTimings](#). . Please refer to [SECTION 5 – ACQUISITION MODES](#) for further information.

**Parameters** float time: the kinetic cycle time in seconds.

**Return** unsigned int

DRV_SUCCESS	Cycle time accepted.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_P1INVALID	Time invalid.

**See also** [SetNumberKinetics](#)

## SetMCPGain

**unsigned int WINAPI SetMCPGain(int gain)**

**Description** Allows the user to control the voltage across the microchannel plate. Increasing the gain increases the voltage and so amplifies the signal. The gain range can be returned using [GetMCPGainRange](#).

**Parameters** int gain: amount of gain applied.

**Return** unsigned int

DRV_SUCCESS	Value for gain accepted.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_I2CTIMEOUT	I2C command timed out.
DRV_I2CDEVNOTFOUND	I2C device not present.
DRV_ERROR_ACK	Unable to communicate with device.
DRV_P1INVALID	Gain value invalid.

**See also** [GetMCPGainRange](#), [SetGateMode](#), [SetMCPGating](#)

**NOTE:** Available on iStar.

## SetMCPGating

**unsigned int WINAPI SetMCPGating(int gating)**

<b>Description</b>	This function controls the MCP gating.	
<b>Parameters</b>	int gating: ON/OFF switch for the MCP gating.	
	Valid values:	0 to switch MCP gating OFF.
		1 to switch MCP gating ON.
<b>Return</b>	unsigned int	
	DRV_SUCCESS	Value for gating accepted.
	DRV_NOT_INITIALIZED	System not initialized.
	DRV_ACQUIRING	Acquisition in progress.
	DRV_I2CTIMEOUT	I <sup>2</sup> C command timed out.
	DRV_I2CDEVNOTFOUND	I <sup>2</sup> C device not present.
	DRV_ERROR_ACK	Unable to communicate with card.
	DRV_P1INVALID	Value for gating invalid.

**See also** [SetMCPGain](#), [SetGain](#), [SetGateMode](#)

**NOTE:** Available on some ICCD models.

## SetMessageWindow

**unsigned int WINAPI SetMessageWindow (HWND wnd)**

<b>Description</b>	This function is reserved.
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## SetMetaData

**unsigned int WINAPI SetMetaData(int state)**

<b>Description</b>	This function activates the meta data option.	
<b>Parameters</b>	int state: ON/OFF switch for the meta data option.	
	Valid values:	0 to switch meta data OFF.
		1 to switch meta data ON.
<b>Return</b>	unsigned int	
	DRV_SUCCESS	Meta data option accepted.
	DRV_NOT_INITIALIZED	System not initialized.
	DRV_ACQUIRING	Acquisition in progress.
	DRV_P1INVALID	Invalid state.
	DRV_NOT_AVAILABLE	Feature not available.

**See also** [GetMetaDataInfo](#)

**unsigned int WINAPI SetMultiTrack(int number, int height, int offset, int\* bottom, int\* gap)**

**Description** This function will set the multi-Track parameters. The tracks are automatically spread evenly over the detector. Validation of the parameters is carried out in the following order:

- Number of tracks,
- Track height
- Offset.

The first pixels row of the first track is returned via 'bottom'.

The number of rows between each track is returned via 'gap'.

**Parameters**

int number: number tracks

Valid values 1 to number of vertical pixels

int height: height of each track

Valid values >0 (maximum depends on number of tracks)

int offset: vertical displacement of tracks

Valid values depend on number of tracks and track height

int\* bottom: first pixels row of the first track

int\* gap: number of rows between each track (could be 0)

**Return**

unsigned int

DRV\_SUCCESS Parameters set.

DRV\_NOT\_INITIALIZED System not initialized.

DRV\_ACQUIRING Acquisition in progress.

DRV\_P1INVALID Number of tracks invalid.

DRV\_P2INVALID Track height invalid.

DRV\_P3INVALID Offset invalid.

**See also**

[SetReadMode](#), [StartAcquisition](#) [SetRandomTracks](#)



## SetMultiTrackHBin

**unsigned int WINAPI SetMultiTrackHBin(int bin)**

**Description** This function sets the horizontal binning used when acquiring in Multi-Track read mode.

**Parameters** int bin: Binning size.

**Return** unsigned int

DRV_SUCCESS	Binning set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_P1INVALID	Invalid binning size.

**See also** [SetReadMode](#) [SetMultiTrack](#)

**NOTE:** 1) If the multitrack range is not a multiple of the binning DRV\_BINNING\_ERROR will be returned from PrepareAcquisition and/or StartAcquisition

2) For iDus, it is recommended that you set horizontal binning to 1

## SetMultiTrackHRange

**unsigned int WINAPI SetMultiTrackHRange (int iStart, int iEnd)**

**Description** This function sets the horizontal range used when acquiring in Multi Track read mode.

**Parameters** int iStart: First horizontal pixel in multi track mode.

int iEnd: Last horizontal pixel in multi track mode.

**Return** unsigned int

DRV_SUCCESS	Range set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_NOT_AVAILABLE	Feature not available for this camera.
DRV_ACQUIRING	Acquisition in progress.
DRV_P1INVALID	Invalid start position.
DRV_P2INVALID	Invalid end position.

**See also** [SetReadMode](#) [SetMultiTrack](#)

## SetMultiTrackScan

**unsigned int WINAPI SetMultiTrackScan(int trackHeight, int numberTracks, int iSIHStart, int iSIHEnd, int trackHBinning, int trackVBinning, int trackGap, int trackOffset, int trackSkip, int numberSubFrames);**

**Description** THIS FUNCTION IS RESERVED.

## SetNextAddress

**unsigned int WINAPI SetNextAddress(at\_32\* data, long lowAdd, long highAdd, long len, long physical)**

**Description** THIS FUNCTION IS RESERVED.

## SetNextAddress16

**unsigned int WINAPI SetNextAddress16(at\_32\* data, long lowAdd, long highAdd, long len, long physical)**

**Description** THIS FUNCTION IS RESERVED.

## SetNumberAccumulations

**unsigned int WINAPI SetNumberAccumulations(int number)**

**Description** This function will set the number of scans accumulated in memory. This will only take effect if the acquisition mode is either Accumulate or Kinetic Series.

**Parameters** int number: number of scans to accumulate

**Return** unsigned int

DRV_SUCCESS	Accumulations set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_P1INVALID	Number of accumulates.

**See also** [GetAcquisitionTimings](#), [SetAccumulationCycleTime](#), [SetAcquisitionMode](#), [SetExposureTime](#), [SetKineticCycleTime](#), [SetNumberKinetics](#)

## SetNumberKinetics

**unsigned int WINAPI SetNumberKinetics(int number)**

**Description** This function will set the number of scans (possibly accumulated scans) to be taken during a single acquisition sequence. This will only take effect if the acquisition mode is Kinetic Series.

**Parameters** int number: number of scans to store

**Return** unsigned int

DRV_SUCCESS	Series length set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_P1INVALID	Number in series invalid.

**See also** [GetAcquisitionTimings](#), [SetAccumulationCycleTime](#), [SetAcquisitionMode](#), [SetExposureTime](#), [SetKineticCycleTime](#)

## SetNumberPrescans

**unsigned int WINAPI SetNumberPrescans(int iNumber)**

**Description** This function will set the number of scans acquired before data is to be retrieved. This will only take effect if the acquisition mode is Kinetic Series.

**Parameters** int iNumber: number of scans to ignore

**Return** unsigned int

DRV_SUCCESS	Prescans set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_P1INVALID	Number of prescans invalid.

**See also** [GetAcquisitionTimings](#), [SetAcquisitionMode](#), [SetKineticCycleTime](#), [SetNumberKinetics](#)

## SetOutputAmplifier

**unsigned int WINAPI SetOutputAmplifier(int typ)**

**Description** Some EMCCD systems have the capability to use a second output amplifier. This function will set the type of output amplifier to be used when reading data from the head for these systems.

**Parameters** int typ: the type of output amplifier.

0 – Standard EMCCD gain register (default)/Conventional(clara).

1 – Conventional CCD register/Extended NIR mode(clara).

**Return** unsigned int

DRV_SUCCESS	Series length set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_P1INVALID	Output amplifier type invalid.

### NOTE:

1. Available in Clara, iXon & Newton.
2. If the current camera HSSpeed is not available when the amplifier is set then it will default to the maximum HSSpeed that is.

### SetOverlapMode

**unsigned int WINAPI SetOverlapMode (int mode)**

**Description** This function will set whether an acquisition will readout in Overlap Mode. If the [acquisition mode](#) is Single Scan or Fast Kinetics this call will have no affect.

**Parameters** int mode: mode

0 OFF

1 ON

**Return** unsigned int

DRV\_SUCCESS Overlap mode set.

DRV\_NOT\_INITIALIZED System not initialized.

DRV\_ACQUIRING Acquisition in progress.

DRV\_P1INVALID Invalid parameter.

**See also** [SetAcquisitionMode](#)

**NOTE:** Only available if CCD is an Overlap sensor.

## SetPCIMode

**unsigned int WINAPI SetPCIMode(int mode, int value)**

**Description** With the CCI23 card, events can be sent when the camera is starting to expose and when it has finished exposing. This function will control whether those events happen or not.

**Parameters** int mode: currently must be set to 1  
int value: 0 to disable the events, 1 to enable

**Return** unsigned int

DRV_SUCCESS	Acquisition mode set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_P1INVALID	Acquisition Mode invalid

**See also** [SetAcqStatusEvent](#) [SetCameraStatusEnable](#)

**NOTE** This is only supported by the CCI23 card. The software must register its event via the [SetAcqStatusEvent](#). To specify which event the software is interested in use the [SetCameraStatusEnable](#).

## SetPhosphorEvent

**unsigned int WINAPI SetPhosphorEvent (HANDLE Event)**

**Description** This function passes a Win32 Event handle to the driver via which the driver can inform the user software that the phosphor has saturated or returned to a normal state. To determine what event has actually occurred call the [GetPhosphorStatus](#) function. This may give the user software an opportunity to perform other actions that will not affect the readout of the current acquisition.

**Parameters** HANDLE Event: Win32 event handle.

**Return** unsigned int

DRV_SUCCESS	Event set
DRV_NOT_INITIALIZED	System not initialized
DRV_NOT_AVAILABLE	Function not supported for operating system

**See also** [GetPhosphorStatus](#)

## SetPhotonCounting

### unsigned int WINAPI SetPhotonCounting(int state)

<b>Description</b>	This function activates the photon counting option.	
<b>Parameters</b>	int state: ON/OFF switch for the photon counting option.	
	Valid values:	0 to switch photon counting OFF.
		1 to switch photon counting ON.
<b>Return</b>	unsigned int	
	DRV_SUCCESS	photon counting option accepted.
	DRV_NOT_INITIALIZED	System not initialized.
	DRV_ACQUIRING	Acquisition in progress.
	DRV_ERROR_ACK	Unable to communicate with card.
<b>See also</b>	<a href="#">SetPhotonCountingThreshold</a>	

## SetPhotonCountingDivisions

### unsigned int WINAPI SetPhotonCountingDivisions(unsigned long noOfDivisions, long\* divisions)

<b>Description</b>	This function sets the thresholds for the photon counting option.	
<b>Parameters</b>	unsigned long noOfDivisions: number of thresholds to be used.	
	long* divisions: threshold levels.	
<b>Return</b>	unsigned int	
	DRV_SUCCESS	Thresholds accepted.
	DRV_P1INVALID	Number of thresholds outside valid range
	DRV_P2INVALID	Thresholds outside valid range
	DRV_NOT_INITIALIZED	System not initialized.
	DRV_ACQUIRING	Acquisition in progress.
	DRV_ERROR_ACK	Unable to communicate with card.
	DRV_NOT_SUPPORTED	Feature not supported.
<b>See also</b>	<a href="#">SetPhotonCounting</a> , <a href="#">GetNumberPhotonCountingDivisions</a>	

## SetPhotonCountingThreshold

**unsigned int WINAPI SetPhotonCountingThreshold(long min, long max)**

**Description** This function sets the minimum and maximum threshold for the photon counting option.

**Parameters** long min: minimum threshold in counts for photon counting.  
long max: maximum threshold in counts for photon counting

**Return** unsigned int

DRV_SUCCESS	Thresholds accepted.
DRV_P1INVALID	Minimum threshold outside valid range (1-65535)
DRV_P2INVALID	Maximum threshold outside valid range
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with card.

**See also** [SetPhotonCounting](#)

## SetPixelFormat

**unsigned int WINAPI SetPixelFormat(int bitdepth, int colormode)**

**Description** THIS FUNCTION IS RESERVED.

## SetPreAmpGain

**unsigned int WINAPI SetPreAmpGain(int index)**

**Description** This function will set the pre amp gain to be used for subsequent acquisitions. The actual gain factor that will be applied can be found through a call to the [GetPreAmpGain](#) function.

The number of Pre Amp Gains available is found by calling the [GetNumberPreAmpGains](#) function.

**Parameters** int index: index pre amp gain table  
Valid values 0 to [GetNumberPreAmpGains](#)-1

**Return** unsigned int

DRV_SUCCESS	Pre amp gain set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_P1INVALID	Index out of range.

**See also** [IsPreAmpGainAvailable](#), [GetNumberPreAmpGains](#), [GetPreAmpGain](#)

**NOTE:** Available on iDus, iXon & Newton.

**unsigned int WINAPI SetRandomTracks(int numTracks, int\* areas)**

**Description** This function will set the Random-Track parameters. The positions of the tracks are validated to ensure that the tracks are in increasing order and do not overlap. The horizontal binning is set via the [SetCustomTrackHBin](#) function. The vertical binning is set to the height of each track.

Some cameras need to have at least 1 row in between specified tracks. Ixon+ and the USB cameras allow tracks with no gaps in between.

**Example:**

Tracks specified as 20 30 31 40 tells the SDK that the first track starts at row 20 in the CCD and finishes at row 30. The next track starts at row 31 (no gap between tracks) and ends at row 40.

**Parameters** int numTracks: number tracks  
Valid values 1 to number of vertical pixels/2  
int\* areas: pointer to an array of track positions. The array has the form  
bottom1, top1, bottom2, top2 ..... bottomN, topN

**Return** unsigned int  
DRV\_SUCCESS Parameters set.  
DRV\_NOT\_INITIALIZED System not initialized.  
DRV\_ACQUIRING Acquisition in progress.  
DRV\_P1INVALID Number of tracks invalid.  
DRV\_P2INVALID Track positions invalid.  
DRV\_RANDOM\_TRACK\_ERROR Invalid combination of tracks, out of memory or mode not available.

**See also** [SetCustomTrackHBin](#), [SetReadMode](#), [StartAcquisition](#), [SetComplexImage](#)



## SetReadMode

**unsigned int WINAPI SetReadMode(int mode)**

**Description** This function will set the readout mode to be used on the subsequent acquisitions.

**Parameters** int mode: readout mode

Valid values:

0	Full Vertical Binning
1	Multi-Track
2	Random-Track
3	Single-Track
4	Image

**Return** unsigned int

DRV_SUCCESS	Readout mode set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_P1INVALID	Invalid readout mode passed.

**See also** [GetAcquisitionTimings](#), [SetAccumulationCycleTime](#), [SetAcquisitionMode](#), [SetExposureTime](#), [SetKineticCycleTime](#), [SetNumberAccumulations](#), [SetNumberKinetics](#)

## SetReadoutRegisterPacking

**unsigned int WINAPI SetReadoutRegisterPacking (int mode)**

**Description** This function will configure whether data is packed into the readout register to improve frame rates for sub-images.

**Note:** It is important to ensure that no light falls outside of the sub-image area otherwise the acquired data will be corrupted. Only currently available on iXon+ and iXon3.

**Parameters** int mode: register readout mode

Valid values:

0	Packing Off
1	Packing On

**Return** unsigned int

DRV_SUCCESS	Readout mode set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_P1INVALID	Invalid readout mode passed.

**See also** [GetAcquisitionTimings](#), [SetAccumulationCycleTime](#), [SetAcquisitionMode](#), [SetExposureTime](#), [SetKineticCycleTime](#), [SetNumberAccumulations](#), [SetNumberKinetics](#)

## SetRegisterDump

**unsigned int WINAPI SetRegisterDump(int mode)**

**Description** THIS FUNCTION IS RESERVED.

### SetRingExposureTimes

**unsigned int WINAPI SetRingExposureTimes(int numTimes, float\* times)**

**Description** This function will send up an array of exposure times to the camera if the hardware supports the feature. See [GetCapabilities](#). Each acquisition will then use the next exposure in the ring looping round to the start again when the end is reached. There can be a maximum of 16 exposures.

**Parameters** int numTimes: The number of exposures  
float \* times: A predeclared pointer to an array of numTimes floats

**Return** Unsigned int

DRV_SUCCESS	Success
DRV_NOT_INITIALIZED	System not initialized
DRV_INVALID_MODE	This mode is not available.
DRV_P1INVALID	Must be between 1 and 16 exposures inclusive
DRV_P2INVALID	The exposures times are invalid.
DRV_NOTAVAILABLE	System does not support this option

**See also** [GetCapabilities](#), [GetNumberRingExposureTimes](#), [GetAdjustedRingExposureTimes](#), [GetRingExposureRange](#) [IsTriggerModeAvailable](#)

**unsigned int WINAPI SetSaturationEvent(HANDLE saturationEvent)**

**Description** This is only supported with the CCI-23 PCI card. USB cameras do not have this feature.

This function passes a Win32 Event handle to the driver via which the driver can inform the main software that an acquisition has saturated the sensor to a potentially damaging level. You must reset the event after it has been handled in order to receive additional triggers. Before deleting the event you must call SetEvent with NULL as the parameter.

**Parameters** HANDLE saturationEvent: Win32 event handle.

**Return** unsigned int

DRV_SUCCESS	Acquisition mode set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_NOT_SUPPORTED	Function not supported for operating system

**See also** [SetDriverEvent](#)

**NOTE** The programmer must reset the event after it has been handled in order to receive additional triggers, unless the event has been created with auto-reset, e.g. event = CreateEvent(NULL, FALSE, FALSE, NULL). Also, NOT all programming environments allow the use of multiple threads and Win32 events.

Only supported with the CCI-23 card.

USB cameras do not have this feature.

**unsigned int WINAPI SetSensorPortMode (int mode)**

**Description** This function selects the sensor port mode which will be used to acquire the image data.  
“Single Port Mode” - Acquires all the image data via the selected single sensor port ([SelectSensorPort](#)).

“All Ports Mode” - Acquires the image data simultaneously from all the available ports.

**Parameters** int mode: the port mode selected.

Valid values:

0	Single Port
1	All Ports

**Return** unsigned int

DRV_SUCCESS	Port mode successfully selected.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_NOT_SUPPORTED	Feature not supported on this camera.
DRV_P1INVALID	Requested port mode isn't valid.

**See also** [SelectSensorPort](#), [GetCapabilities](#)

**NOTE** Not all cameras support this feature. To check if your camera supports this feature use the [GetCapabilities](#) function to check the ulFeature for AC\_FEATURES\_SENSOR\_PORT\_CONFIGURATION.

**unsigned int WINAPI SetShutter(int typ, int mode, int closingtime, int openingtime)**

**Description** This function controls the behaviour of the shutter.

The typ parameter allows the user to control the TTL signal output to an external shutter.

The mode parameter configures whether the shutter opens & closes automatically (controlled by the camera) or is permanently open or permanently closed.

The opening and closing time specify the time required to open and close the shutter (this information is required for calculating acquisition timings – see [SHUTTER TRANSFER TIME](#)).

**Parameters**

int typ:

0	Output TTL low signal to open shutter
1	Output TTL high signal to open shutter

int mode:

0	Fully Auto
1	Permanently Open
2	Permanently Closed
4	Open for FVB series
5	Open for any series

int closingtime: Time shutter takes to close (milliseconds)

int openingtime: Time shutter takes to open (milliseconds)

**Return** unsigned int

DRV_SUCCESS	Shutter set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with card.
DRV_NOT_SUPPORTED	Camera does not support shutter control.
DRV_P1INVALID	Invalid TTL type.
DRV_P2INVALID	Invalid mode.
DRV_P3INVALID	Invalid time to open.
DRV_P4INVALID	Invalid time to close.

### NOTE

1. The opening and closing time can be different.
2. For cameras capable of controlling the internal and external shutter independently (capability AC\_FEATURES\_SHUTTEREX) you MUST use [SetShutterEx](#).
3. Cameras with an internal shutter (use function [IsInternalMechanicalShutter](#) to test) but no independent shutter control (capability AC\_FEATURES\_SHUTTEREX) will always output a “HIGH to open” TTL signal through the external shutter port.

## SetShutterEx

**unsigned int WINAPI SetShutterEx(int typ, int mode, int closingtime, int openingtime, int extmode)**

**Description** This function expands the control offered by [SetShutter](#) to allow an external shutter and internal shutter to be controlled independently (only available on some cameras – please consult your Camera User Guide). The typ parameter allows the user to control the TTL signal output to an external shutter. The opening and closing times specify the length of time required to open and close the shutter (this information is required for calculating acquisition timings – see [SHUTTER TRANSFER TIME](#)).

The mode and extmode parameters control the behaviour of the internal and external shutters. To have an **external** shutter open and close automatically in an experiment, set the mode parameter to “Open” and set the **extmode** parameter to “Auto”. To have an **internal** shutter open and close automatically in an experiment, set the **extmode** parameter to “Open” and set the **mode** parameter to “Auto”.

To not use any shutter in the experiment, set both shutter modes to permanently open.

**Parameters**

Int typ:

0	Output TTL low signal to open shutter
1	Output TTL high signal to open shutter

int mode:

0	Fully Auto
1	Permanently Open
2	Permanently Closed
4	Open for FVB series
5	Open for any series

int closingtime: time shutter takes to close (milliseconds)

int openingtime: Time shutter takes to open (milliseconds)

int mode:

0	Fully Auto
1	Permanently Open
2	Permanently Closed
4	Open for FVB series
5	Open for any series

**Return** Unsigned int

DRV_SUCCESS	Shutter set.
DRV_NOT_INITIALIZED	System not initialized
DRV_ACQUIRING	Acquisition in progress
DRV_ERROR_ACK	Unable to communicate with card.
DRV_NOT_SUPPORTED	Camera does not support shutter control.
DRV_P1INVALID	Invalid TTL type.
DRV_P2INVALID	Invalid internal mode
DRV_P3INVALID	Invalid time to open.
DRV_P4INVALID	Invalid time to close

DRV\_P5INVALID

Invalid external mode

## NOTE

1. The opening and closing time can be different.
2. For cameras capable of controlling the internal and external shutter independently (capability AC\_FEATURES\_SHUTTEREX) you MUST use [SetShutterEx](#).
3. For cameras with an internal shutter (use function [IsInternalMechanicalShutter](#) to test) but no independent shutter control (capability AC\_FEATURES\_SHUTTEREX), the external shutter will always behave like the internal shutter and the externalMode parameter is meaningless.
4. For cameras with a limit to how fast the internal shutter can run, the external shutter will also have this limit applied if the internal shutter isn't set to either Permanently Open or Permanently Closed.

## SetShutters

unsigned int WINAPI SetShutters(int typ, int mode, int closingtime, int openingtime, int exttype, int extmode, int dummy1, int dummy2)

**Description** THIS FUNCTION IS RESERVED.

## SetSifComment

unsigned int WINAPI SetSifComment(char\* comment)

**Description** This function will set the user text that will be added to any sif files created with the [SaveAsSif](#) function. The stored comment can be cleared by passing NULL or an empty text string.

**Parameters** char\* comment: The comment to add to new sif files.

**Return** unsigned int  
DRV\_SUCCESS Sif comment set.

**See also** [SaveAsSif](#) [SaveAsCommentedSif](#)

**NOTE:** To add a comment to a SIF file that will not be used in any future SIF files that are saved, use the function [SaveAsCommentedSif](#).

## SetSingleTrack

unsigned int WINAPI SetSingleTrack(int centre, int height)

**Description** This function will set the single track parameters. The parameters are validated in the following order: centre row and then track height.

**Parameters** int centre: centre row of track  
Valid range 1 to number of vertical pixels.  
int height: height of track  
Valid range > 1 (maximum value depends on centre row and number of vertical pixels).

**Return** unsigned int  
DRV\_SUCCESS Parameters set.  
DRV\_NOT\_INITIALIZED System not initialized.  
DRV\_ACQUIRING Acquisition in progress.

DRV\_P1INVALID

Center row invalid.

DRV\_P2INVALID

Track height invalid.

**See also**[SetReadMode](#)



### SetSingleTrackHBin

**unsigned int WINAPI SetSingleTrackHBin(int bin)**

**Description** This function sets the horizontal binning used when acquiring in Single Track read mode.

**Parameters** Int bin: Binning size.

**Return** unsigned int

DRV_SUCCESS	Binning set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_P1INVALID	Invalid binning size.

**See also** [SetReadMode](#)

**NOTE:** 1) If the detector width is not a multiple of the binning DRV\_BINNING\_ERROR will be returned from PrepareAcquisition and/or StartAcquisition

2) For iDus, it is recommended that you set horizontal binning to 1

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**unsigned int WINAPI SetSpool(int active, int method, char\* path, int framebuffersize)**

<b>Description</b>	<p>This function will enable and disable the spooling of acquired data to the hard disk or to the RAM.</p> <p>With spooling method 0, each scan in the series will be saved to a separate file composed of a sequence of 32-bit integers.</p> <p>With spooling method 1 the type of data in the output files depends on what type of acquisition is taking place (see below).</p> <p>Spooling method 2 writes out the data to file as 16-bit integers.</p> <p>Spooling method 3 creates a directory structure for storing images where multiple images may appear in each file within the directory structure and the files may be spread across multiple directories. Like method 1 the data type of the image pixels depends on whether accumulate mode is being used.</p> <p>Method 4 Creates a RAM disk for storing images so you should ensure that there is enough free RAM to store the full acquisition.</p> <p>Methods 5, 6 and 7 can be used to directly spool out to a particular file type, either FITS, SIF or TIFF respectively. In the case of FITS and TIFF the data will be written out as 16-bit values.</p> <p>Method 8 is similar to method 3, however the data is first compressed before writing to disk. In some circumstances this may improve the maximum rate of writing images to disk, however as the compression can be very CPU intensive this option may not be suitable on slower processors.</p> <p>The data is stored in row order starting with the row nearest the readout register. With the exception of methods 5, 6 and 7, the data acquired during a spooled acquisition can be retrieved through the normal functions. This is a change to previous versions; it is no longer necessary to load the data from disk from your own application.</p>
<b>Parameters</b>	<p>int active: Enable/disable spooling Valid values:</p> <ul style="list-style-type: none"> <li>0        Disable spooling.</li> <li>1        Enable spooling.</li> </ul> <p>int method: Indicates the format of the files written to disk Valid values:</p> <ul style="list-style-type: none"> <li>0.       Files contain sequence of 32-bit integers</li> <li>1        Format of data in files depends on whether multiple accumulations are being taken for each scan. Format will be 32-bit integer if data is being accumulated each scan; otherwise the format will be 16-bit integer.</li> <li>2.       Files contain sequence of 16-bit integers.</li> <li>3.       Multiple directory structure with multiple images per file and multiple files per directory.</li> <li>4.       Spool to RAM disk.</li> <li>5.       Spool to 16-bit Fits File.</li> <li>6.       Spool to Andor Sif format.</li> <li>7.       Spool to 16-bit Tiff File.</li> <li>8.       Similar to method 3 but with data compression.</li> </ul> <p>char* path: String containing the filename stem. May also contain the path to the directory into which the files are to be stored.</p> <p>int framebuffersize: This sets the size of an internal circular buffer used as temporary storage. The value is the total number images the buffer can hold, not the size in bytes. Typical value would be 10. This value would be increased in situations where the computer is not able to spool the data to disk at the required rate.</p>

<b>Return</b>	unsigned int	
	DRV_SUCCESS	Parameters set.
	DRV_NOT_INITIALIZED	System not initialized.
	DRV_ACQUIRING	Acquisition in progress.

See also [GetSpoolProgress](#)

**NOTE:** Spooled images will not be post processed, i.e. flipped or rotated.

## SetSpoolThreadCount

unsigned int WINAPI SetSpoolThreadCount(int count)

**Description** This function sets the number of parallel threads used for writing data to disk when spooling is enabled. Increasing this to a value greater than the default of 1, can sometimes improve the data rate to the hard disk particularly with Solid State hard disks. In other cases increasing this value may actually reduce the rate at which data is written to disk.

**Parameters** int count: The number of threads to use.

<b>Return</b>	unsigned int	
	DRV_SUCCESS	Thread count is set.
	DRV_NOT_INITIALIZED	System not initialized.
	DRV_ACQUIRING	Acquisition in progress.
	DRV_P1INVALID	Invalid thread count.

See also [SetSpool](#)

**NOTE:** This feature is currently only available when using the Neo camera.

## SetStorageMode

unsigned int WINAPI SetStorageMode(long mode)

**Description** THIS FUNCTION IS RESERVED.

## SetTECEvent

### unsigned int WINAPI SetTECEvent (HANDLE Event)

**Description** This function passes a Win32 Event handle to the driver via which the driver can inform the user software that the TEC has overheated or returned to a normal state. To determine what event has actually occurred call the [GetTECStatus](#) function. This may give the user software an opportunity to perform other actions that will not affect the readout of the current acquisition.

**Parameters** HANDLE Event: Win32 event handle.

**Return** unsigned int

DRV_SUCCESS	Event set
DRV_NOT_INITIALIZED	System not initialized
DRV_NOT_AVAILABLE	Function not supported for operating system

**See also** [GetTECStatus](#)

## SetTemperature

### unsigned int WINAPI SetTemperature(int temperature)

**Description** This function will set the desired temperature of the detector. To turn the cooling ON and OFF use the [CoolerON](#) and [CoolerOFF](#) function respectively.

**Parameters** int temperature: the temperature in Centigrade.  
Valid range is given by [GetTemperatureRange](#)

**Return** unsigned int

DRV_SUCCESS	Temperature set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with card.
DRV_P1INVALID	Temperature invalid.
DRV_NOT_SUPPORTED	The camera does not support setting the temperature.

**See also** [CoolerOFF](#), [CoolerON](#), [GetTemperature](#), [GetTemperatureF](#), [GetTemperatureRange](#)

**NOTE:** Not available on Luca R cameras – automatically cooled to -20.

## SetTemperatureEvent

### unsigned int WINAPI SetTemperatureEvent(HANDLE temperatureEvent)

**Description** THIS FUNCTION IS RESERVED.

## SetTriggerInvert

**unsigned int WINAPI SetTriggerInvert(int mode)**

**Description** This function will set whether an acquisition will be triggered on a rising or falling edge external trigger.

**Parameters** int mode: trigger mode

Valid values:

- 0. Rising Edge
- 1. Falling Edge

**Return** unsigned int

DRV_SUCCESS	Trigger mode set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_P1INVALID	Trigger mode invalid.
DRV_NOT_AVAILABLE	Feature not available.

**See also** [Trigger Modes](#) [SetTriggerMode](#) [SetFastExtTrigger](#)

## SetTriggerLevel

**unsigned int WINAPI SetTriggerLevel(float level)**

**Description** This function sets the trigger voltage which the system will use.

**Parameters** float level: trigger voltage

**Return** unsigned int

DRV_SUCCESS	Level set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_NOT_SUPPORTED	Trigger levels not supported.
DRV_ACQUIRING	Acquisition in progress.
DRV_ERROR_ACK	Unable to communicate with system.
DRV_P1INVALID	Trigger level invalid.

**See also** [GetCapabilities](#) [GetTriggerLevelRange](#)

**unsigned int WINAPI SetTriggerMode(int mode)**

**Description** This function will set the trigger mode that the camera will operate in.

**Parameters** int mode: trigger mode

Valid values:

- 0. Internal
- 1. External
- 6. External Start
- 7. External Exposure (Bulb)
- 9. External FVB EM (only valid for EM Newton models in FVB mode)
- 10. Software Trigger
- 12. External Charge Shifting

**Return** unsigned int

DRV\_SUCCESS Trigger mode set.

DRV\_NOT\_INITIALIZED System not initialized.

DRV\_ACQUIRING Acquisition in progress.

DRV\_P1INVALID Trigger mode invalid.

**See also** [Trigger Modes](#) [SetFastExtTrigger](#)

## SetIODirection

**unsigned int WINAPI SetIODirection(int index, int iDirection)**

**Description** Available in some systems are a number of IO's that can be configured to be inputs or outputs. This function sets the current state of a particular IO.

**Parameters** int index: IO index  
Valid values: 0 to [GetNumberIO\(\)](#) - 1  
int iDirection: requested direction for this index.  
0: Output  
1: Input

**Return** unsigned int  
DRV\_SUCCESS IO direction set.  
DRV\_NOT\_INITIALIZED System not initialized.  
DRV\_ACQUIRING Acquisition in progress.  
DRV\_P1INVALID Invalid index.  
DRV\_P2INVALID Invalid direction.  
DRV\_NOT\_AVAILABLE Feature not available.

**See also** [GetNumberIO](#) [GetIOLevel](#) [GetIODirection](#) [SetIOLevel](#)

## SetIOLevel

**unsigned int WINAPI SetIOLevel(int index, int iLevel)**

**Description** Available in some systems are a number of IO's that can be configured to be inputs or outputs. This function sets the current state of a particular IO.

**Parameters** int index: IO index  
Valid values: 0 to [GetNumberIO\(\)](#) - 1  
int iLevel: current level for this index.  
0: Low  
1: High

**Return** unsigned int  
DRV\_SUCCESS IO level set.  
DRV\_NOT\_INITIALIZED System not initialized.  
DRV\_ACQUIRING Acquisition in progress.  
DRV\_P1INVALID Invalid index.  
DRV\_P2INVALID Invalid level.  
DRV\_NOT\_AVAILABLE Feature not available.

**See also** [GetNumberIO](#) [GetIOLevel](#) [GetIODirection](#) [SetIODirection](#)

**SetUserEvent**

**unsigned int WINAPI SetUserEvent(HANDLE userEvent)**

**Description**      **THIS FUNCTION IS RESERVED.**

**SetUSGenomics**

**unsigned int WINAPI SetUSGenomics(long width, long height)**

**Description**      **THIS FUNCTION IS RESERVED.**

**SetVerticalRowBuffer**

**unsigned int WINAPI SetVerticalRowBuffer(int rows)**

**Description**      **THIS FUNCTION IS RESERVED.**



## SetVerticalSpeed

unsigned int WINAPI SetVerticalSpeed(int index)

<b>Description</b>	<b>Deprecated see Note:</b> This function will set the vertical speed to be used for subsequent acquisitions	
<b>Parameters</b>	int index: index into the vertical speed table Valid values    0 to <a href="#">GetNumberVerticalSpeeds</a> -1	
<b>Return</b>	unsigned int <div> <div>DRV_SUCCESS</div> <div>Vertical speed set.</div> </div> <div> <div>DRV_NOT_INITIALIZED</div> <div>System not initialized.</div> </div> <div> <div>DRV_ACQUIRING</div> <div>Acquisition in progress.</div> </div> <div> <div>DRV_P1INVALID</div> <div>Index out of range.</div> </div>	

**See also**    [GetNumberVerticalSpeeds](#), [GetVerticalSpeed](#)

**NOTE:** Deprecated by [SetVSSpeed](#).

## SetVirtualChip

unsigned int WINAPI SetVirtualChip(int state)

<b>Description</b>	<b>THIS FUNCTION IS RESERVED.</b>
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### unsigned int WINAPI SetVSAmpitude(int state)

**Description** If you choose a high readout speed (a low readout time), then you should also consider increasing the amplitude of the Vertical Clock Voltage.

There are five levels of amplitude available for you to choose from:

- **Normal**
- **+1**
- **+2**
- **+3**
- **+4**

Exercise caution when increasing the amplitude of the vertical clock voltage, since higher clocking voltages may result in increased clock-induced charge (noise) in your signal. In general, only the very highest vertical clocking speeds are likely to benefit from an increased vertical clock voltage amplitude.

**Parameters** int state: desired Vertical Clock Voltage Amplitude

Valid values:

0 - Normal

1->4 – Increasing Clock voltage Amplitude

**Return** unsigned int

DRV_SUCCESS	Amplitude set.
DRV_NOT_INITIALIZED	System not initialized.
DRV_NOT_AVAILABLE	Your system does not support this feature
DRV_ACQUIRING	Acquisition in progress.
DRV_P1INVALID	Invalid amplitude parameter.

**NOTE:** Available in iXon, iKon and Newton – full range of amplitude levels is not available on all compatible cameras.

## SetVSSpeed

**unsigned int WINAPI SetVSSpeed(int index)**

**Description** This function will set the vertical speed to be used for subsequent acquisitions

**Parameters** int index: index into the vertical speed table

Valid values 0 to [GetNumberVSSpeeds](#)-1

**Return** unsigned int

DRV\_SUCCESS Vertical speed set.

DRV\_NOT\_INITIALIZED System not initialized.

DRV\_ACQUIRING Acquisition in progress.

DRV\_P1INVALID Index out of range.

**See also** [GetNumberVSSpeeds](#), [GetVSSpeed](#), [GetFastestRecommendedVSSpeed](#)

## ShutDown

**unsigned int WINAPI ShutDown(void)**

**Description** This function will close the AndorMCD system down.

**Parameters** NONE

**Return** unsigned int

DRV\_SUCCESS System shut down.

**See also** [CoolerOFF](#), [CoolerON](#), [SetTemperature](#), [GetTemperature](#)

### NOTE:

1. For Classic & ICCD systems, the temperature of the detector should be above -20°C before shutting down the system.
2. When dynamically loading a DLL which is statically linked to the SDK library, ShutDown MUST be called before unloading.

**unsigned int WINAPI StartAcquisition(void)**

**Description** This function starts an acquisition. The status of the acquisition can be monitored via [GetStatus\(\)](#).

**Parameters** NONE

**Return** unsigned int

DRV_SUCCESS	Acquisition started.
DRV_NOT_INITIALIZED	System not initialized.
DRV_ACQUIRING	Acquisition in progress.
DRV_VXDNOTINSTALLED	VxD not loaded.
DRV_ERROR_ACK	Unable to communicate with card.
DRV_INIERROR	Error reading "DETECTOR.INI".
DRV_ACQERROR	Acquisition settings invalid.
DRV_ERROR_PAGELOCK	Unable to allocate memory.
DRV_INVALID_FILTER	Filter not available for current acquisition.
DRV_BINNING_ERROR	Range not multiple of horizontal binning.
DRV_SPOOLSETUPERROR	Error with spool settings.

**See also** [GetStatus](#), [GetAcquisitionTimings](#), [SetAccumulationCycleTime](#), [SetAcquisitionMode](#), [SetExposureTime](#), [SetHSSpeed](#), [SetKineticCycleTime](#), [SetMultiTrack](#), [SetNumberAccumulations](#), [SetNumberKinetics](#), [SetReadMode](#), [SetSingleTrack](#), [SetTriggerMode](#), [SetVSSpeed](#)

### UnMapPhysicalAddress

unsigned int WINAPI UnMapPhysicalAddress(void)

**Description** THIS FUNCTION IS RESERVED.

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### UpdateDDGTimings

unsigned int WINAPI UpdateDDGTimings(void)

**Description** This function can be used to update the gate timings and external output timings during an externally triggered kinetic series. It is only available when integrate on chip is active and gate step is not being used.

**Parameters** NONE

**Return** unsigned int  
DRV\_SUCCESS  
DRV\_NOT\_INITIALIZED  
DRV\_ERROR\_ACK  
DRV\_NOT\_AVAILABLE  
DRV\_NOT\_SUPPORTED

**See also** [GetCapabilities](#) [SetDDGExternalOutputTime](#) [SetDDGGateTime](#)

**NOTE:** Available in USB iStar.

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## WaitForAcquisition

### unsigned int WINAPI WaitForAcquisition(void)

**Description** WaitForAcquisition can be called after an acquisition is started using [StartAcquisition](#) to put the calling thread to sleep until an Acquisition Event occurs. This can be used as a simple alternative to the functionality provided by the [SetDriverEvent](#) function, as all Event creation and handling is performed internally by the SDK library.

Like the [SetDriverEvent](#) functionality it will use less processor resources than continuously polling with the [GetStatus](#) function. If you wish to restart the calling thread without waiting for an Acquisition event, call the function [CancelWait](#).

An Acquisition Event occurs each time a new image is acquired during an Accumulation, Kinetic Series or Run-Till-Abort acquisition or at the end of a Single Scan Acquisition.

If a second event occurs before the first one has been acknowledged, the first one will be ignored. Care should be taken in this case, as you may have to use [CancelWait](#) to exit the function.

**Parameters** NONE

**Return** unsigned int

DRV_SUCCESS	Acquisition Event occurred
DRV_NOT_INITIALIZED	System not initialized.
DRV_NO_NEW_DATA	Non-Acquisition Event occurred.(e.g. <a href="#">CancelWait</a> () called)

**See also** [StartAcquisition](#), [CancelWait](#)

## WaitForAcquisitionByHandle

### unsigned int WINAPI WaitForAcquisitionByHandle(long cameraHandle)

**Description** Whilst using multiple cameras WaitForAcquisitionByHandle can be called after an acquisition is started using [StartAcquisition](#) to put the calling thread to sleep until an Acquisition Event occurs. This can be used as a simple alternative to the functionality provided by the [SetDriverEvent](#) function, as all Event creation and handling is performed internally by the SDK library. Like the [SetDriverEvent](#) functionality it will use less processor resources than continuously polling with the [GetStatus](#) function. If you wish to restart the calling thread without waiting for an Acquisition event, call the function [CancelWait](#). An Acquisition Event occurs each time a new image is acquired during an Accumulation, Kinetic Series or Run-Till-Abort acquisition or at the end of a Single Scan Acquisition.

**Parameters** Long cameraHandle: handle of camera to put into wait state.

**Return** unsigned int

DRV_SUCCESS	Acquisition Event occurred.
DRV_P1INVALID	Handle not valid.
DRV_NO_NEW_DATA	Non-Acquisition Event occurred.(eg <a href="#">CancelWait</a> () called)

**See also**

[CancelWait](#), [GetCameraHandle](#), [StartAcquisition](#), [WaitForAcquisition](#),  
[WaitForAcquisitionTimeOut](#), [WaitForAcquisitionByHandleTimeOut](#).

---

### WaitForAcquisitionByHandleTimeOut

**unsigned int WINAPI WaitForAcquisitionByHandleTimeOut (long cameraHandle, int iTimeOutMs)**

**Description** Whilst using multiple cameras WaitForAcquisitionByHandle can be called after an acquisition is started using [StartAcquisition](#) to put the calling thread to sleep until an Acquisition Event occurs. This can be used as a simple alternative to the functionality provided by the [SetDriverEvent](#) function, as all Event creation and handling is performed internally by the SDK library. Like the [SetDriverEvent](#) functionality it will use less processor resources than continuously polling with the [GetStatus](#) function. If you wish to restart the calling thread without waiting for an Acquisition event, call the function [CancelWait](#). An Acquisition Event occurs each time a new image is acquired during an Accumulation, Kinetic Series or Run-Till-Abort acquisition or at the end of a Single Scan Acquisition. If an Acquisition Event does not occur within \_TimeOutMs milliseconds, [WaitForAcquisitionTimeOut](#) returns DRV\_NO\_NEW\_DATA

**Parameters** Long cameraHandle: handle of camera to put into wait state.  
int iTimeOutMs: Time before returning DRV\_NO\_NEW\_DATA if no Acquisition Event occurs.

**Return** unsigned int  
DRV\_SUCCESS Acquisition Event occurred.  
DRV\_P1INVALID Handle not valid.  
DRV\_NO\_NEW\_DATA Non-Acquisition Event occurred.(eg [CancelWait](#) () called, time out)

**See also** [CancelWait](#), [GetCameraHandle](#), [StartAcquisition](#), [WaitForAcquisition](#), [WaitForAcquisitionByHandle](#), [WaitForAcquisitionTimeOut](#).



### WaitForAcquisitionTimeOut

unsigned int WINAPI WaitForAcquisitionTimeOut (int iTimeOutMs)

**Description** WaitForAcquisitionTimeOut can be called after an acquisition is started using [StartAcquisition](#) to put the calling thread to sleep until an Acquisition Event occurs. This can be used as a simple alternative to the functionality provided by the [SetDriverEvent](#) function, as all Event creation and handling is performed internally by the SDK library. Like the [SetDriverEvent](#) functionality it will use less processor resources than continuously polling with the [GetStatus](#) function. If you wish to restart the calling thread without waiting for an Acquisition event, call the function [CancelWait](#). An Acquisition Event occurs each time a new image is acquired during an Accumulation, Kinetic Series or Run-Till-Abort acquisition or at the end of a Single Scan Acquisition. If an Acquisition Event does not occur within \_TimeOutMs milliseconds, [WaitForAcquisitionTimeOut](#) returns DRV\_NO\_NEW\_DATA

**Parameters** int iTimeOutMs: Time before returning DRV\_NO\_NEW\_DATA if no Acquisition Event occurs.

**Return**

DRV_SUCCESS	Acquisition Event occurred.
DRV_NO_NEW_DATA	Non-Acquisition Event occurred.(eg <a href="#">CancelWait</a> () called, time out)

**See also** [CancelWait](#), [StartAcquisition](#), [WaitForAcquisition](#), [WaitForAcquisitionByHandle](#), [WaitForAcquisitionByHandleTimeOut](#).

## WhiteBalance

**unsigned int WINAPI WhiteBalance (WORD\* wRed, WORD\* wGreen, WORD\* wBlue, float \* fRelR, float \* fRelB, WhiteBalanceInfo \* info)**

### Description For colour sensors only

Calculates the red and blue relative to green factors to white balance a colour image using the parameters stored in info.

Before passing the address of an WhiteBalanceInfo structure to the function the iSize member of the structure should be set to the size of the structure. In C++ this can be done with the line:

```
info->iSize = sizeof(WhiteBalanceInfo);
```

Below is the WhiteBalanceInfo structure definition and a description of its members:

```
typedef struct WHITEBALANCEINFO {
    int iSize; // Structure size.
    int iX; // Number of X pixels. Must be >2.
    int iY; // Number of Y pixels. Must be >2.
    int iAlgorithm; // Algorithm to used to calculate white balance.
    int iROI_left; // Region Of Interest from which white balance is calculated
    int iROI_right; // Region Of Interest from which white balance is calculated
    int iROI_top; // Region Of Interest from which white balance is calculated
    int iROI_bottom; // Region Of Interest from which white balance is calculated
} WhiteBalanceInfo;
```

iX and iY are the image dimensions. The number of elements of the input, red, green and blue arrays are iX x iY.

iAlgorithm sets the algorithm to use. The function sums all the colour values per each colour field within the Region Of Interest (ROI) and calculates the relative to green values as: 0)  $\_fRelR = \text{GreenSum} / \text{RedSum}$  and  $\_fRelB = \text{GreenSum} / \text{BlueSum}$ ; 1)  $\_fRelR = 2/3 \text{ GreenSum} / \text{RedSum}$  and  $\_fRelB = 2/3 \text{ GreenSum} / \text{BlueSum}$ , giving more importance to the green field.

iROI\_left, iROI\_right, iROI\_top and iROI\_bottom define the ROI with the constraints:  $0 \leq iROI\_left < iROI\_right \leq iX$  and  $0 \leq iROI\_bottom < iROI\_top \leq iY$

### Parameters

WORD\* wRed: pointer to red field.  
 WORD\* wGreen: pointer to green field.  
 WORD\* wBlue: pointer to blue field.  
 float\* fRelR: pointer to the relative to green red factor.  
 float\* fRelB: pointer to the relative to green blue factor.  
 WhiteBalanceInfo\* info: pointer to white balance information structure

### Return

unsigned int	
SUCCESS	White balance calculated.
DRV_P1INVALID	Invalid pointer (i.e. NULL).
DRV_P2INVALID	Invalid pointer (i.e. NULL).
DRV_P3INVALID	Invalid pointer (i.e. NULL).
DRV_P4INVALID	Invalid pointer (i.e. NULL).
DRV_P5INVALID	Invalid pointer (i.e. NULL).
DRV_P6INVALID	One or more parameters in info is out of range
DRV_DIVIDE_BY_ZERO_ERROR	The sum of the green field within the ROI is zero. $\_fRelR$ and $\_fRelB$ are set to 1

**See also** [DemosaicImage](#), [GetMostRecentColorImage16](#)

## SECTION 12 - ERROR CODES

CODE	ERROR	CODE	ERROR
DRV_ERROR_CODES	20001	DRV_DRIVER_ERRORS	20065
DRV_SUCCESS	20002	DRV_P1INVALID	20066
DRV_VXDNOTINSTALLED	20003	DRV_P2INVALID	20067
DRV_ERROR_SCAN	20004	DRV_P3INVALID	20068
DRV_ERROR_CHECK_SUM	20005	DRV_P4INVALID	20069
DRV_ERROR_FILELOAD	20006	DRV_INIERROR	20070
DRV_UNKNOWN_FUNCTION	20007	DRV_COFERROR	20071
DRV_ERROR_VXD_INIT	20008	DRV_ACQUIRING	20072
DRV_ERROR_ADDRESS	20009	DRV_IDLE	20073
DRV_ERROR_PAGELOCK	20010	DRV_TEMPCYCLE	20074
DRV_ERROR_PAGE_UNLOCK	20011	DRV_NOT_INITIALIZED	20075
DRV_ERROR_BOARDTEST	20012	DRV_P5INVALID	20076
DRV_ERROR_ACK	20013	DRV_P6INVALID	20077
DRV_ERROR_UP_FIFO	20014	DRV_INVALID_MODE	20078
DRV_ERROR_PATTERN	20015	DRV_INVALID_FILTER	20079
DRV_ACQUISITION_ERRORS	20017	DRV_I2CERRORS	20080
DRV_ACQ_BUFFER	20018	DRV_DRV_I2CDEVNOTFOUND	20081
DRV_ACQ_DOWNFIFO_FULL	20019	DRV_I2CTIMEOUT	20082
DRV_PROC_UNKNOWN_INSTRUCTION	20020	DRV_P7INVALID	20083
DRV_ILLEGAL_OP_CODE	20021	DRV_USBERROR	20089
DRV_KINETIC_TIME_NOT_MET	20022	DRV_IOCERROR	20090
DRV_ACCUM_TIME_NOT_MET	20023	DRV_VRMVERSIONERROR	20091
DRV_NO_NEW_DATA	20024	DRV_USB_INTERRUPT_ENDPOINT_ERROR	20093
PCI_DMA_FAIL	20025	DRV_RANDOM_TRACK_ERROR	20094
DRV_SPOOLERROR	20026	DRV_INVALID_TRIGGER_MODE	20095
DRV_SPOOLSETUPERROR	20027	DRV_LOAD_FIRMWARE_ERROR	20096
SATURATED	20029	DRV_DIVIDE_BY_ZERO_ERROR	20097
DRV_TEMPERATURE_CODES	20033	DRV_INVALID_RINGEXPOSURES	20098
DRV_TEMPERATURE_OFF	20034	DRV_BINNING_ERROR	20099
DRV_TEMP_NOT_STABILIZED	20035	DRV_ERROR_NOCAMERA	20990
DRV_TEMPERATURE_STABILIZED	20036	DRV_NOT_SUPPORTED	20991
DRV_TEMPERATURE_NOT_REACHED	20037	DRV_NOT_AVAILABLE	20992
DRV_TEMPERATURE_OUT_RANGE	20038	DRV_ERROR_MAP	20115
DRV_TEMPERATURE_NOT_SUPPORTED	20039	DRV_ERROR_UNMAP	20116
DRV_TEMPERATURE_DRIFT	20040	DRV_ERROR_MDL	20117
DRV_GENERAL_ERRORS	20049	DRV_ERROR_UNMDL	20118
DRV_INVALID_AUX	20050	DRV_ERROR_BUFFSIZE	20119
DRV_COF_NOTLOADED	20051	DRV_ERROR_NOHANDLE	20121
DRV_FPGAPROG	20052	DRV_GATING_NOT_AVAILABLE	20130
DRV_FLEXERROR	20053	DRV_FPGA_VOLTAGE_ERROR	20131
DRV_GPIBERROR	20054	DRV_BINNING_ERROR	20099
ERROR_DMA_UPLOAD	20055	DRV_INVALID_AMPLIFIER	20100
DRV_DATATYPE	20064	DRV_INVALID_COUNTCONVERT_MODE	20101

### SECTION 13 - DETECTOR.INI

#### DETECTOR.INI EXPLAINED

All systems shipped from Andor contain a configuration file called "**Detector.ini**". This file is used to configure both the Andor software and hardware for the system. It contains information regarding the CCD chip, A/Ds and cooling capabilities.

The file contains four sections. The start of each section is denoted by **[name]**, where *name* is the name of the section. The following two sections are common to all **detector.ini** files:

- **[System]**
- **[Cooling]**

The names of the remaining sections are given by entries in the **[System]** section.

### [SYSTEM]

This section has 3 entries that describe the controller, head models and the mode for operation. Each entry is described in more detail below:

- **Controller:** gives the section name where the controller (plug-in card) details can be found. Further details on this section are given below.
- **Head:** gives the section name where the detector head details can be found. Further details on this section are given below.
- **Operation:** this item related to the overall system type, i.e. whether the system is a PDA, CCD ICCD or InGaAs. This item has the effect of changing the “Acquisition” dialog within the software so that only those options relating to the system type are displayed.

Possible values are as follows:

- 2 for PDA
- 3 for InGaAs
- 4 for CCD
- 5 for ICCD

### EXAMPLE:

[System]

Controller=CC-010

Head=DV437

Operation=4

### [COOLING]

This section does not contain a fixed number of entries. However, each entry has the same basic structure and purpose. The purpose being to tell the software the range of temperatures to offer the user and the range of temperature over which the system can measure. The structure of each item is:

**Itemname =a,b,c,d**

itemname

**a**

**b**

**c**

**d**

Example:

### [Cooling]

**Single=28,-30,28,-100**

**Three=20,-60,28,-100**

**Vacuum=20,-100,28,-100**

### [DETECTOR]

This section details the detector head. It is the most complex section in the file and contains 10 or more items.

#### Format

##### **Format = x,y**

Gives the active pixel dimensions as x, y. x is the number of pixels along the readout register axis. y is the number of pixel perpendicular to the readout axis.

#### DummyPixels

##### **DummyPixels = a, b, c, d**

Gives the number of columns and row that are present on the device but do not respond to light. The dummy columns are a combination of dark columns, which run the full height of the sensor, and dummy pixels in the shift register, where:

- a**        **number of dummy columns at non-amplifier end**
- b**        **number of dummy columns at amplifier end**
- c**        **number of dummy rows at top of CCD**
- d**        **number of dummy rows at bottom of CCD**

#### DataHShiftSpeed

##### **DataHShiftSpeed = a, b, c, d, e**

Lists the speeds at which the charge can be moved in the shift register. This is also equivalent to the digitization speed in microseconds. Where:

- a**        **default speed**
- b, c, d, e**   **allowed speeds fastest first**

#### DataVShiftSpeed

##### **DataVShiftSpeed = a, b, c, d, e**

This lists the speeds, in microseconds, at which the CCD rows can be vertically shifted. These speeds are used during CCD readout. Where:

- a**        **default speed**
- b, c, d, e**   **allowed speeds fastest first**

### DummyHShiftSpeed

**DummyHShiftSpeed = a, b, c, d, e**

This lists the speeds, in microseconds, at which the charge can be moved in the shift register. These speeds are used when the charge been shifted in the amplifier does not need to be digitized. This allows faster keep clean cycles and faster readout when pixel skipping is implemented. Where:

**a**                **default speed**

**b, c, d, e**    **allowed speeds fastest first**

### DummyVShiftSpeed

**DummyVShiftSpeed = a, b, c, d, e**

This lists the speeds, in microseconds, at which the CCD rows can be vertically shifted. These speeds are used during CCD keep cleans. Where:

**a**                **default speed**

**b, c, d, e**    **allowed speeds fastest first**

### VerticalHorizontalTime

**VerticalHorizontalTime = a,b,c,d,e**

This lists the time, in microseconds, which must be taken into account when timing calculations are been done. Where:

**a**                **default speed**

**b, c, d, e**    **allowed speeds fastest first**

### CodeFile

**CodeFile = filename.ext**

This gives the file name of the micro-code uploaded to the microprocessor on the plug-in card. This field is typically **PCI\_29k.COF** for standard systems and **PCI29K.COF** for **I<sup>2</sup>C** compatible cards.



**FlexFile****FlexFile = *filename.ext***

This gives the file name of the logic uploaded to the Field Programmable Gate Array on the plug-in card. (This field is only used by the PCI version of the system.) This field is typically PCI\_FPGA.RBF for standard systems and PCIIFPGA.RBF for I<sup>2</sup>C compatible cards.

**Cooling****Cooling = *type***

This gives the type of cooling. The type relates back to the cooling section.

**Type****Type = *type***

This value specifies whether the head contains a Standard (0) or a Frame Transfer (1) CCD. The default is Standard.

**FKVerticalShiftSpeed****FKVerticalShiftSpeed = *speed***

This specifies the "Fast Kinetics" vertical shift speed.

**Gain****Gain = *a***

This specifies whether the system has software controllable Gain/Mode settings.

0 = Not software selectable.

1 = Software selectable.

**PhotonCountingCCD****PhotonCountingCCD = *a***

This specifies whether the system contains a L3 Vision sensor from Marconi

0 = Standard CCD

1 = L3 Vision sensor

### EMCCDRegisterSize

**EMCCDRegisterSize = a**

This specifies the length on the electron multiplying register in L3 Vision CCD

### iStar

**iStar = a**

This specifies whether the system is an iStar or a standard ICCD

0 = Standard ICCD

1 = iStar

### SlowVerticalSpeedFactor

**SlowVerticalSpeedFactor = a**

This specifies the factor by which the vertical shifted has been slowed. This is used for those CCD's that are not capable at running at 16us. The only possible value is 7.

### HELLFunction

**HELLFunction = file**

The file specified contains the instructions required to perform readout of an iXon CCD. It is specific to each type of CCD.

### HELLLoop1

**HELLLoop1 = file**

The file specified contains generic instructions for readout of an iXon CCD and as such is not specific to a particular CCD.

### ADChannels

**ADChannels = a{,b}**

This line indicates the types of ADChannels available for use and the default selection. a is the default type and is followed by a list of all possible types.

### AD2DataHSSpeed

**AD2DataHSSpeed = default, min, max**

This line specifies the possible horizontal readout speeds. min and max specify the range of readout times available in microseconds.

## AD2DumpHSSpeed

**AD2DumpHSSpeed = default, min, max**

This is similar to AD2DataHSSpeed but specifies the readout speeds available when performing a dump (i.e. discarding) of data from the CCD.

## AD2BinHSSpeed

**AD2BinHSSpeed = default, min, max**

This is similar to AD2DataHSSpeed but specifies the readout speeds available when binning (i.e. summing values from blocks of neighbouring pixels) data from the CCD.

## AD2Pipeline

**AD2Pipeline = a, b, c:** See PipeLine in the controller section

## iXon

**Ixon = a**

Specifies whether the CCD is an iXon camera; if so the line will read 'Ixon=1'. If this line is missing the CCD is not an iXon.

### EXAMPLE DETECTOR.INI FILES

#### DH220

```
[DH220]
Format=1024,1
DummyPixels=0,0,0,0
DataHShiftSpeed=16,1,2,16,32
DataVShiftSpeed=16,16,0,0,0
DummyHShiftSpeed=16,1,2,16,32
DummyVShiftSpeed=16,16,0,0,0
VerticalHorizontalTime=16,16,0,0,0
CodeFile=Instapda.cof
Pixel=25.0,2500.0
Cooling=Single
```

#### DV420

```
[DV420]
Format=1024,256
DummyPixels=8,8,0,0
DataHShiftSpeed=16,1,2,16,32
DataVShiftSpeed=16,16,0,0,0
DummyHShiftSpeed=16,1,2,16,32
DummyVShiftSpeed=16,16,0,0,0
VerticalHorizontalTime=16,16,0,0,0
CodeFile=Pci_29k.cof
FlexFile = pci_fpga.rbf
Pixel=25.0,25.0
```

Cooling=Vacuum  
FKVerticalShiftSpeed=16.0e-6

DV437

[DV437]  
Format=512,512  
DummyPixels=24,24,16,528  
DataHShiftSpeed=16,1,2,16,32  
DataVShiftSpeed=16,16,0,0,0  
DummyHShiftSpeed=16,1,2,16,32  
DummyVShiftSpeed=16,16,0,0,0  
VerticalHorizontalTime=16,16,0,0,0  
Pixel=13.0,13.0  
Cooling=Vacuum  
CodeFile=pci\_29k.cof  
FlexFile=pci\_fpga.rbf  
Type=1

### [CONTROLLER]

This section details the controller card.

#### ReadOutSpeeds

**ReadOutSpeeds = a,b,c,d-**

Lists the readout speeds available on the specified plug-in card. These values are used in conjunction with the values specified in the head section to generate the final list of available speeds.

#### PipeLine

**PipeLine=a,b,c,d,e,f,g,h**

This lists the pipeline depth that must be used the microprocessor to synchronize the reading of the AD with the digitization process. The actual value used is based on a number of factors and is beyond this discussion.

#### Type

**Type=a**

This specifies whether the plug-in card is ISA or PCI compatible.

#### Example:

[CC-010]

ReadOutSpeeds=1,2,16,32

PipeLine=2,1,1,1,0,0,0,0

Type=PCI

### SECTION 14 – License Agreements

#### FITSIO

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