Integrating the Automation Technology C4

Version 1.5 from 12/05/2015

Overview

This document aims to give recommendations towards the setup of Automation Technology C4 cameras on a general basis, while also addressing commonly asked questions regarding the installation itself or certain features of the device. As most of the information contained herein has been of practical interest in the past, it has been verified to work accordingly.

Please note that the document is intended as supplementary to the documentation already provided by Automation Technology. If in doubt, the manufacturer should be considered as the authoritative source of information.

STEMMER ®
IMAGING

Content

1 Basic configuration

1.1 Software packages

The C4 camera can be configured in several ways. However the easiest way is to use the camera manufacturers configuration utility.

Generally, there's no limitation towards the imaging SDK used, unless it lacks proper support for the two industry standards *GigEVision* and *GenICam*.

As *Stemmer Imaging* has no indication about the practical compliance of other SDK products regarding the before mentioned standards, we recommend using our AIA-certified *Common Vision Blox (CVB)* implementation, which has been proven to be highly reliable. For this reason, we will mention *CVB* in the following, while there is of course the possibility of using other SDK products instead.

The stages of image acquisition and image processing can of course also be handled by distinct SDKs. That way, a *GigEVision/GenICam* capable SDK can be utilized for the acquisition task, while the images are directly handed to another processing SDK in the next step.

Please note that the C4 devices, the CX-Explorer software as well as *CVB* are still subject to continuous development, as the technologies around them still evolve. We recommend using the most current software available if you start out with integrating the camera. Don't hesitate to approach us if you have any questions regarding this topic.

1.1.1 CX-Explorer

The CX-Explorer is a graphical application to configure C4 sensors, developed by the camera manufacturer Automation Technology (AT). As the C4 is *GigEVision/GenICam* compliant, it can theoretically be configured by any application supporting these industry standards. However, the CX-Explorer has special views and functionality tailored for exactly this type of camera.

This makes it very handy for configuring an initial setup, quickly change configurations and looking at the practical consequences of differences in parameter sets.

Since the CX-Explorer is using the *GigEVision* Transport Layer developed by *Stemmer Imaging*, at least the runtime setup of *Common Vision Blox* has to be installed to run it properly.

The CX-Explorer is a proprietary application, whose license has to be purchased once for any numbers of installations and updates at the time of this writing.

1.1.2 Common Vision Blox

Common Vision Blox is an image processing SDK, developed by *Stemmer Imaging*, which provides a variety of tools specialized on industrial vision applications. It has support for a considerable number of popular programming languages, e.g. C++, C#.Net, VB.Net, Delphi7, BorlandC++.

Its architecture is based on a layered model: At the base, there's a low-level part entirely dedicated to the integration of imaging hardware and basic data acquisition tasks. This is the *CVB Image Manager*. A level above are the *CVB Tools*, a collection of specialized algorithms for the majority of image processing tasks currently conceivable. Both layers can be used individually.

The *CVB Image Manager* features a complete implementation of the *GigEVision* protocol. Furthermore, it comes with a *GenICam* API that's particularly easy to handle. These two building blocks are already sufficient to develop *a GigEVision* application and to communicate programmatically with a *GenICam* device.

To support our customers optimally in developing their applications, a *CameraSuite* license is included with every *GigEVision* camera bought at *Stemmer Imaging*. *CameraSuite* is a license that allows the usage of any *Image Manager* functionality as long as the camera is connected via Ethernet.

1.2 Networking

It is crucial to correctly set up a number of networking parameters when using the C4 (and *GigEVision* cameras in general), in order to guarantee the expected performance.

Please note that network interface card has to be Gigabit Ethernet capable. Otherwise, the data rate will be inferior and images will show defects in triangulation mode; we discourage using onboard-interfaces and recommend Intel PRO/1000 models due to reliability reasons. As for the wiring, please use shielded Ethernet cables (at least CAT5E).

Note that the maximum cable length depends on the wire quality and cable routing. An error free transmission can be expected for less than 30 meters in the absence of excess electro-magnetic interference (EMI) noise. The nominal length of 100 meters however usually requires also high quality cabling.

1.2.1 Network interface configuration

These parameters are accessible via the network interface configuration utility on the host machine. Please keep the following general things in mind:

- Firewalls and VPN drivers are also hooked in below the socket layer, thus they can potentially interfere with other filter drivers. Please shut them down for the NIC in question.

- Any other services on the network card take resources. To operate a *GigEVision* device, nothing beyond the *siFilterDriver* and *TCP/IP* v4 is necessary. If possible, any other services, clients or protocols should be deactivated.

- Windows supports up to 14 filter driver instances, of which 8 are activated by default in the system registry. Even if a number of filter drivers below the maximum is installed, new drivers might not work due to the fact that some filter drivers are not visible to the user. If in doubt, please increase the registry variable *HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Network\MaxNumFilters*.

For the configuration of the network card itself, these parameters are of importance:

Jumbo Frames: 9014 Byte (alternatively 9000 Byte or 8192 Byte)

Interrupt Moderation Rate: Extreme

Receive Descriptors: 2048

Transmit Descriptors: 2048

The network interface on the host machine can be either configured with a static IP address or by "Dynamic Configuration". This generally follows the same procedure as the camera address assignment (see below).

1.2.2 Camera address assignment

There are several modes of negotiating a network address and range between a camera and the host machine. Whether a static assignment or DHCP (see below) is to be used can be chosen individually.

Upon delivery, the C4 cameras are factory preset with "Static IP" enabled, and DHCP disabled. The statically assigned IP is 169.254.64.2 with a netmask of 255.255.0.0, ie. /16 in CIDR notation. Note that choosing this address from the LLA range is intentional.

Static address assignment

If the camera has a static address assigned, it will stop at this stage. Static addresses must be explicitly assigned by a user via the GenICam grid or an API.

For in case connecting to a camera is not possible anymore due to a misconfiguration of either host or camera, the *Advanced Mode* within the *CVB Management Console* provides a possibility to force a temporary IP address on the camera. This way, it is accessible again and allows to change the values in question.

Dynamic Host Configuration Protocol (DHCP)

If the camera does not detect a static setting, it tries to query a DHCP server on the network. This is a broadcast message, which is answered by an adequately configured server on the network, which then provides the camera with an IP address.

Link Local Addressing (LLA)

In general, if no answer from a DHCP server is reaching the camera for 60 seconds, it ceases querying and configures its interface via the LLA approach. This includes choosing a random address from the 169.254.0.0/16 subnet range, checking its availability via an Address Resolution Protocol (ARP) query and assigning it to itself.

As LLA is the factory state of the C4 sensor, the camera should initially be directly connected to an ethernet interface which is set to dynamic configuration. After a maximum of 60 seconds the interface configures a LLA address and is able to initiate a connection to the camera.

1.2.3 Camera network efficiency parameters

Please change the following parameters via the *GenICam* Grid, which is accessible through the *AT CX-Explorer* or *CVB Management Console*. To obtain access you have to enter the *Guru* visibility mode.

Packet size and Interpacket delay are implemented as volatile values in the camera to prevent connectivity problems due to a saved configuration. They are both lost at power-off.

It is necessary to set the below parameters after every reboot of the camera. This can be either accomplished automatically by the *CVB* driver (see below), programmatically with the *GenApi* or manually via the *GenICam* Grid.

Inter-Packet delay: 2000 (increase in case of corrupted frames, lower if data rate is insufficient)

Packet size: 8192 Byte (dedicated NIC)

1.2.4 CVB GenICam driver configuration

The *CVB GenICam* driver can be configured to propagate the above settings to the device at driver loading time. There are also capabilities to determine these parameters automatically by querying the device. We however recommend to set them statically in case of non-default configurations.

Additionally, the driver provides some more parameters, which don't affect the camera operation. Most importantly for the C4, the incoming image color mode must be set.

To modify the respective values, open the file *GenICam.ini*, which is to be found in the *D*rivers directory of your *CVB* installation.

Color mode	Raw
Packet size	8192
Interpacket delay:	Default value is sufficient for standard use cases, but can be reduced.

Interpacket delay is usually specified in *GenICam* TimestampCounterTicks, which commonly differs between camera models. As these differences would be misleading when operating with different C4 models, AT decided to base the tick on a 100 MHz clock. Thus one tick is 10 ns.

1.2.5 Further documentation

There is additional information available regarding networking topics, which might be of interest to some users.

The *CVB* setup comes with an extensive user guide on *GenICam* (GenICam_CVB_UserGuide.chm). This document is located within the *CVB* root directory in the Doc/Hardware folder.

For persons interested in the *GenICam* standard itself, the EMVA *GenICam* standardization group offers documents on its webpage at http://www.genicam.org.

Further information on *GigE Vision* is available at the AIA site at http://www.machinevisiononline.org.

1.3 Triggering

1.3.1 Electrical issues

Trigger inputs

Profile triggering of the C4 device can be performed via the RS-422 encoder interface or opto-coupled inputs IN1 and IN2 on the I/O panel (TTL, 5 or 24 V). Frame trigger signals can exclusively be fed over inputs IN1 or IN2.

Please note that this implicitly prevents using an external frame trigger when the profile/line trigger is input on the digital I/Os. If both trigger types should be provided externally, a rotary encoder is necessary.

To fully exploit the available capabilities of the C4, a 24 V quadruple encoder is recommended, i.e. providing two pairs of differential outputs, signalling forward and backward movement. However, a single RS-422 pair can be used as well. The shield of the encoder should be connected to the input ground clamp.

Maximum input trigger frequency

The maximum frequency the input opto-coupler can handle for RS-422 as well as TTL and 24 V DC is 5 Mbps. Please be aware that incoming profile trigger signals can be divided internally. The divider field has a size of 32 bit.

TTL or 24 V DC trigger signals must be connected to digital input IN1 and IN2 instead of the RS-422 clamp row.

RS-422 encoder triggering

The trigger occurs on every edge of the RS-422 encoder signal, both on rising and falling edges.

The trigger frequency can be reduced by means of a trigger divider (32 bit), e.g. a value of trigger divider equal to 2 means that every second edge will be used to generate a profile / line trigger. This is done by loading the value of trigger divider into an internal counter of the camera after starting the frame acquisition. For every incoming edge of the RS-422 encoder pulse, the internal counter is decreased by 1. As soon as the internal counter reaches zero, a profile/line trigger is generated.

The RS-422 encoder triggering can be bi-directional or direction. In the latter case the triggering direction can be defined. If the RS-422 pulse direction "runs" in the opposite direction against the defined triggering direction, the internal counter is increased by 1. This functionality (supported by firmware 1.3.0 and later) guarantees that only one profile/line trigger can be generated per encoder position.

When using the Start/Stop sequencer mode, the trigger divisor can be configured to be loaded automatically after each Start signal. Furthermore, firmware 1.3.0 and later features an encoder coordinate counter, which counts all incoming encoder pulses, and is thus providing information about the current position of transport system.

Multiple RS-422 consumers

There are cases, in which a single source RS-422 signal has to be propagated to drive more than one camera. However, RS-422 is designed for point-to-point communications only. Any soundly manufactured RS-422 consumer employs input termination to stabilize the signal level (C4: 100 Ω, rated at 25 mA at 2.5 V).

A simple cabling solution might work for e.g. two devices, but will already lead to signal degradation due to the dual termination, which halves the signal level. A daisy-chain approach might yield better results than a Y-cable from a reflection point of view. Depending on the devices driven, this can work. But as it is outside of any specification, practical validation is essential. Removal of termination resistors is strongly discouraged, as this will seriously impair the signal reception properties.

There is still an alternative solution with cabling only, for a dual camera setup: The first camera is fed by the encoder signal and yields an "IntegrationActive" signal on its output. This output is connected to the input of the second camera, using the TTL input as a line trigger.

Though cabling solutions are possible, we do not recommend them. We strongly suggest the use of RS-422 splitter devices in those cases, as offered by e.g. http://www.motrona.com. This is the most clean and reliable way to distribute RS-422 signals to several consumers.

1.3.2 GenICam

Triggering frames (sequencing)

There are a number of different modes to control the capturing of height image frames. The signal responsible to trigger the integration of a single "line" can originate from the camera or an external source and will not be subject to this discussion. It is assumed that either one of them is present.

The number of height images to acquire can be either defined statically or set dynamically.

Static count

A static number of images implicitly predefines the point where the acquisition ends. Therefore it doesn't make sense to supply more than one external signal (the one that starts the acquisition).

Two camera parameters influence the number of height images to be captured. These are listed below the "Acquisition Control" section.

Acquisition Mode: Defines the automatic stop of the frame acquisition without an external

                              hardware signal. Choices are *Continuous*, *Single Frame*, *Multiple Frame*

Acquisition Frame Count: Number of frames to capture in Multiple Frame Mode

It is obvious that only the last two acquisition modes are useful in this context. Note that *Single Frame* and *Multiple Frame* with *Acquisition Frame Count* equal to 1 yield the same result, though internally they work differently. Please use the former version if you intend to take only one height frame per trigger. The second variant is intended for semi-dynamic changes of image numbers by software.

Dynamic count

In case the number of images depends on external conditions (eg. potentially varying size of an object), a dynamic acquisition mode should be preferred. For those modes, the parameter *Acquisition Mode* (see above) should be set to *Continuous*.

Sequencer modes

The sequencer modes are used to synchronize the start of a frame acquisition - and optionally stop the acquisition - by an external hardware signal. For this purpose, the opto-coupled digital inputs on the C4 I/O breakout board are utilised, which can be fed by either TTL or 24 V DC.

The following is an overview over the *Sequencer Modes* ("Trigger Controls") available. Not all of them are suitable for both types of acquisition. To trigger images, the following values for parameter can be selected:

- *Start/Stop over camera input 1/2*

  A signal is expected on camera input 1, starting the continuous acquisition of frames, while a signal on input 2 will stop the acquisition. Both inputs trigger on detection of a rising edge (TTL).

  Upon reception of the stop signal, the current frame is completed before sent to the host.

  When a fixed number of images is given, the acquisition stops after that number of images, even when no stop signal is sensed.

- *Trigger one frame over camera input 1*

  A start signal is expected on camera input 1, triggering exactly one frame to be acquired. The input triggers on detection of a rising edge (TTL). This mode is equivalent with all other sequencing modes in combination with *Acquisition Mode: Single Frame* (see below).

- *Gate over camera input 1*

  After a HIGH level has been detected on input 1, images are continuously acquired until the voltage level is going back to LOW.

  When detecting the LOW level, the current frame is completed before sent to the host.

  When a fixed number of images is given, the acquisition stops after that number of images, even when no stop signal is sensed.

- *Start/Stop with instant transmission over camera input 1/2*

  A signal is expected on camera input 1, starting the continuous acquisition of frames, while a signal on input 2 will stop the acquisition. Both inputs trigger on detection of a rising edge (TTL).

  Upon reception of the stop signal, the current frame is immediately sent to the host. The frame will have the same size as its predecessors; invalid lines are however filled with random content. The actual number of valid lines can be determined either via Chunk data or the "sizey" parameter.

  When a fixed number of images is given, the acquisition stops after that number of images, even when no stop signal is sensed.

2 An exemplary setup

The configuration of a C4 device is accomplished in two roughly distinct stages. While the first one deals mainly with physical configuration, the second one is entirely dedicated to the camera software settings.

2.1 Components

The first stage comprises the setup steps like choosing a triangulation angle, assembling the components, positioning the sensor and the laser, focusing the lens and finally, getting an optimal laser line interpretation on the sensor.

1. **Choosing a triangulation geometry**

    The foremost question on any laser triangulation task is the geometric configuration of laser and camera. Depending on their orientation, certain advantages for a particular type of inspection can be exploited, usually at the expense of some less important property. The possible choices regarding the triangulation angle are discussed in the C4 hardware manual. In practice, the most common setup is a 30° angle between camera and laser, where the laser is orientated perpendicular to the object plane.
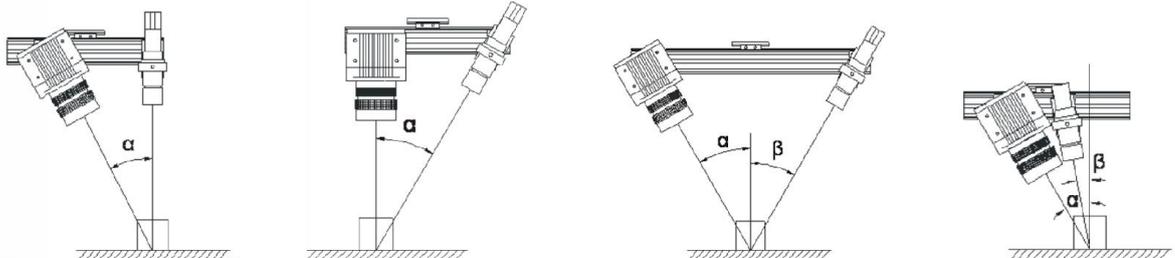
Commonly used triangulation geometries

2. Mounting

The main components should be firmly mounted with correct angle and distance. Refer to the laser manual, respectively the lens specification for correct focal lengths.

To prevent excessive sensor temperatures, affixing the sensor on a heat-conductive mount is recommended.

3. Starting the CX-Explorer

Now both laser and camera should be powered up. When connected accordingly, it should be possible to access the camera in the AT CX-Explorer. The camera will come up with factory defaults, which is "Image Mode" in full frame configuration. In case the laser is driven from the camera rear plug, it must be activated by setting the appropriate features in the *GenICam* Grid ("Camera I/O"). If the "Grab" button on top is selected, a continuous image of the laser line should be visible.

4. Aligning and focussing the laser

The laser line ideally runs horizontally in about the vertical centre of the sensor, which minimizes lens distortion. Usage of laser protection goggles is recommended when working with lasers of class 2 and 3. This has the additional advantage of being able to focus the line while having visual control.

Alternatively, the laser can also be focused by looking at the sensor histogram available in the CX-Explorer. Please remember to activate 16 bit mode to obtain a well resolved histogram.
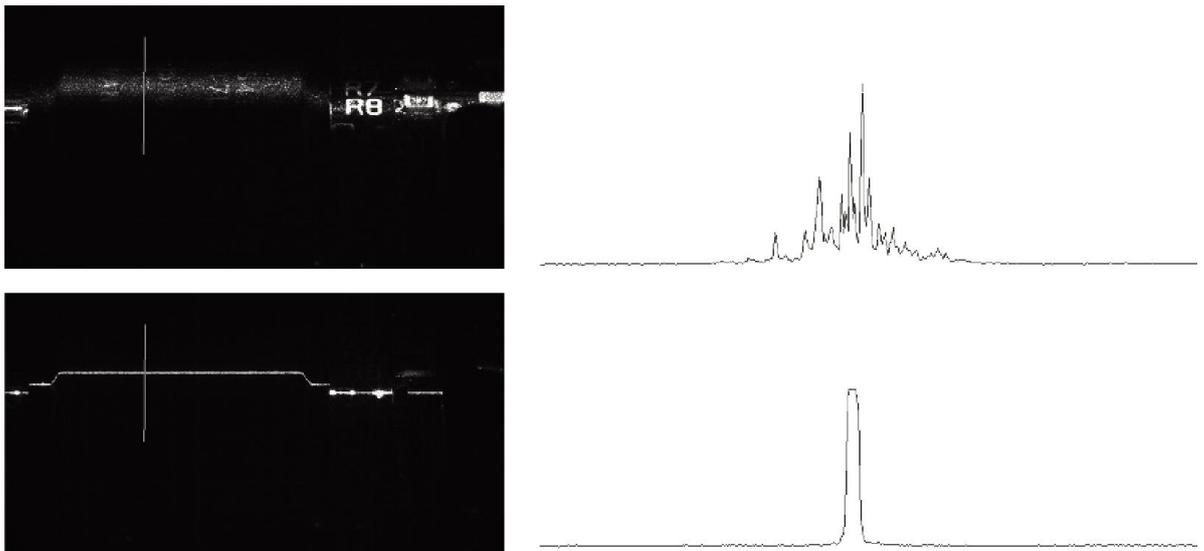
Laser line sharpness with vertical histogram (defocussed in the first image, focussed in the second one)

5. **Optical filters and Scheimpflug adapter**

There are two common optical options to improve the image quality in a triangulation setup. If neither is relevant for the application, this paragraph can be skipped.

The most simple one is to use a band pass filter to decrease the influence of ambient light. This is relatively effective due to the near-monochromatic properties of laser illuminations used for triangulation. If you intend to use lenses with small F-values (< 25 mm), note that blue shift can occur at the corners of the lens. It might then be necessary to place the lens on top of the filter instead vice versa. Please contact us in case you're unsure if you're affected.

However, ambient white light sources usually still emit a certain amount of light within the wavelength in question. The effect of this stray illumination must be countered by closing the aperture as much as possible or by protecting the whole installation from exterior light sources. It goes without saying that the maximum possible aperture reduction is proportional to the laser's intensity. Thus the mentioned effect is decreasing with using higher laser intensities.

Another measure to get an improved (i.e. sharper) line representation on the sensor is using a so-called Scheimpflug adapter. Any lens has a distinct plane where the optical imaging is optimal, depending on its focal length. Thus the imaging of object becomes gradually less sharp below and above that plane.

As inspection objects commonly have features of different height, the laser line can only be imaged optimally at one height level, while the sharpness of the remainder is more or less satisfactory.

Usage of a Scheimpflug adapter (also known as Tilt-Shift objective) counters this behaviour by tilting the lens plane relative to the sensor plane in a certain angle, which leads to a maximum sharpness in the plane of the laser sheet. The Scheimpflug angle can only be calculated if the triangulation angle and horizontal distance between laser and camera are known.
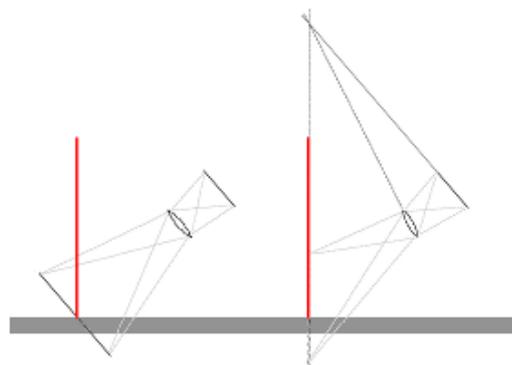

Normal camera lense setup (left), Scheimpflug arrangement (right)

6. Basic camera alignment

To adjust the camera optics, the aperture should be opened to a maximum first. This aids in focussing the object plane, since differences in sharpness are much more visible. When the image is sharp at the imaging area, the focus ring is best affixed by using the screw within the ring.

Now the aperture must be reduced: First, to gain a better depth of field (in case no Scheimpflug adapter is used), secondly to narrow down the Gaussian of the laser profile and remove unwanted artefacts caused by exterior lighting.

Nothing except the laser line should be visible at this point. Whether enough intensity is received by the sensor can be easily checked with the above mentioned profile mode provided by the CX-Explorer.
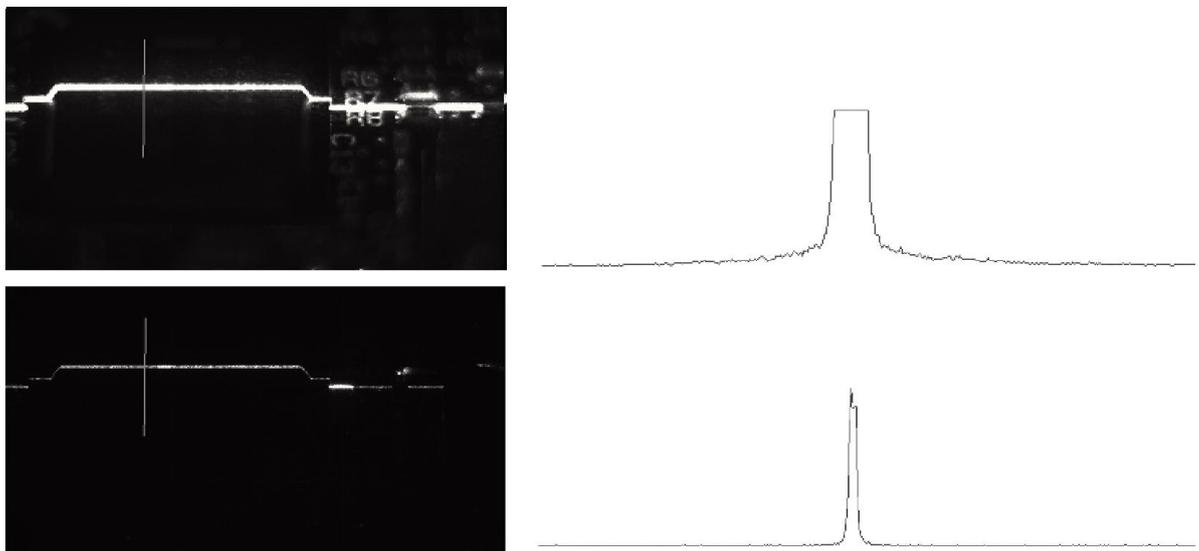

Lens aperture with vertical histogram (wide open in the first image, reduced in the second one)
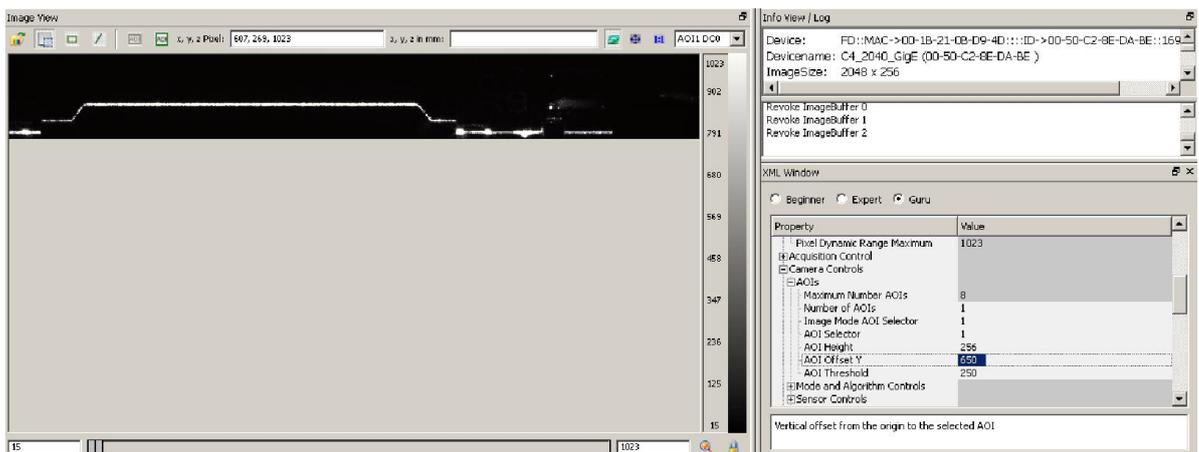
7. AOI selection

As a last step, the number of pixels to read out should be reduced by choosing an appropriate Area Of Interest (AOI). This is important, since the readout time is linearly related to the size of this area. To do so, start the acquisition and move a sample object under the laser line. Then pick the rectangle tool from the top toolbar of CX-Explorer and select an area that fits the size of the object to capture. Stop acquiring images and click the AOI button on top. Now the AOI is set and will be applied automatically the next time an image is acquired.
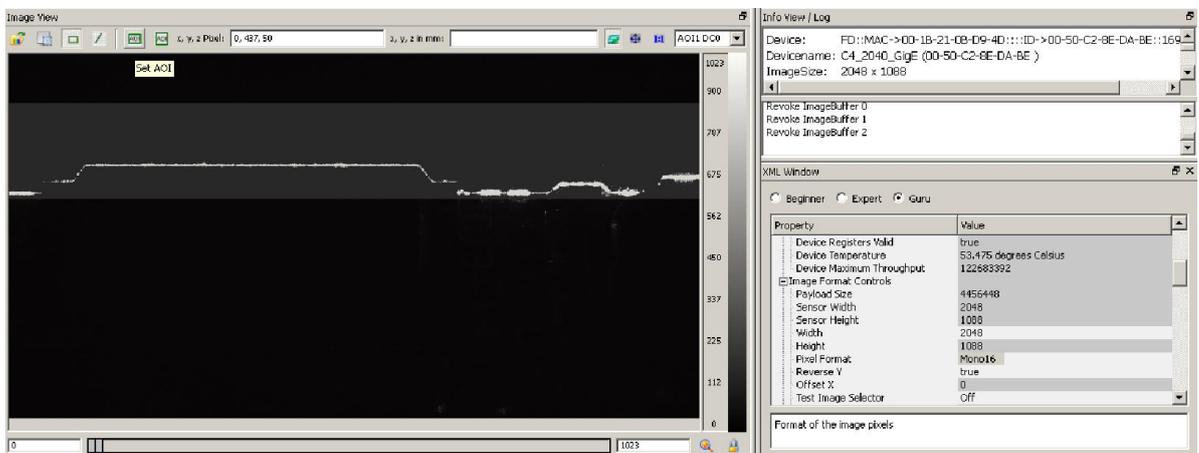
CX-Explorer AOI Selection

CX-Explorer with selected AOI set

With the above provisions put in effect, the primary setup stage can be considered finished.

2.2 Data acquisition

For the second stage, all hardware related setup is assumed to be done. The subsequent steps deal with the most important actions to transmit a 2.5D height map from the device.

1. **Choosing a triangulation mode**

   The triangulation mode specifies how the centre of the laser line is determined. All three modes are equally fast, thus the one that best suits the application should be selected.

   The Maximum algorithm (MAX) determines the pixel yielding the highest intensity and assumes this as the lines central position. It does not provide any subpixeling, but can be nevertheless useful for inspecting objects with volume scatter.

   Of higher precision is the Threshold algorithm (TRSH), which returns the left and right intersection of threshold value and intensity profile as well as the mean value between those. Consequently, the centre is determined with one subpixel of accuracy.

   For the majority of applications, the Centre Of Gravity (COG) mode is the algorithm of choice. It is the most robust and resilient algorithm and provides up to 6 subpixels. When using the COG approach, the laser line width should cover at least 4 sensor pixels to allow for a meaningful detection.

   For any new application where the optimal mode is not already known in advance, we highly recommend to try this algorithm first.

2. **Changing the acquisition speed**

   At this point, the image rate is still configured to the speed used with "Image mode". To change this, have a look at the "Sensor Controls" section of the GenICam Grid. It denotes the readout time (depending on the AOI) as well as the integration time (application dependent). The maximum of both is the minimum sensor frame interval time that can be selected.

   In free-running mode, its inverse gives exactly the acquired frames per second (FPS). In triggered mode, it determines the least valid delta for incoming trigger signals. Trigger pulses that are received faster are going to be discarded.

   As the FPS rate is usually also responsible for the correct X/Y resolution, this tends to be a value that only can be modified if the speed of the relative movement is changed as well. To keep a correct image ratio, it is advisable to set the conveyor speed and "Sensor Frame Interval" first and afterwards adjust the integration time.

3. Setting miscellaneous data related options

Additionally, the following configuration nodes can be of importance and should be at least reviewed. Please refer to the product manual for a more in-detail treatment of the parameters.

- Mode and Algorithm Controls

"Valid Minimum Width" and "Subpixel Bits of COG Output" can give a more precise result (assuming COG mode). While the first is useful to tag small noisy spots as invalid ("Position validation at the end of Gauss scan") when set to 1 or 2, the second increases the resolution of height values.

- Sensor Controls

"Multiple Slope Mode" can enhance the output quality for optically heterogenic material. It performs a reset of saturated pixels at predefined intervals, which result in improved image dynamics in the sensor frame. For the height domain, this means a generally smoother distribution of height values and better adaption to sudden changes in optical surface behaviour.

- Data Output Channels

The selected output channels (DC's) determine different evaluation modes (i.e. algorithms) runing on the sensor image. While DC0 always transmits the image reflecting the sum of intensities, DC2 produces the height image. The semantics of DC1 is different depending on the triangulation mode and flags chosen.

4 Miscellaneous information

4.1 Operational specifications

4.1.1 Heat dissipation

The C4 has a fan mounted on its housing, which is connected to the laser output of the camera. The use of this fan is not mandatory. However if not used, there must be some other method of conveying the heat produced, eg. passive cooling by properly mounting the device. There are two primary reasons to keep attention on the camera temperature, which is ideally around 45° C:

- Integrated circuits are increasingly affected by noise with rising temperatures. With imaging sensors, this leads to a decrease of image quality. Visible noise has been observed with this sensor from about 49° C upwards.

- As a commonly known rule of thumb, the life expectancy of most electrical components decreases by 50% for every 10° C.

The MTBF (mean time between failures) of C4 cameras is 100000 hours operating at 20°C ambient temperature.

4.1.2 Flash memory wear

The flash memory used to save configurations on the camera within "User Sets", is guaranteed to handle a least 100.000 write-cycles.

4.1.3 Power supply

The power input of the I/O box is highly tolerant to voltage variations. The voltage can vary between 10-24 V DC, while a +-/ 10% variation is still acceptable. The I/O box is fused with 2 A.

4.2 Known limitations

4.2.1 Working temperature

Reception of corrupted frames is possible when the camera is not yet at its operating temperature (ie. roughly 40° to 45° C). This problem only occurs when image acquisition is immediately started after powering up the device.

Since the camera's temperature also rises when no images are taken, it is sufficient to foresee a short amount of time after power-on to reach operating temperature. The current temperature can be queried via GenICam. Please note that this normally doesn't apply to cameras that have only been disconnected for a couple of seconds (eg. cold reboot).

4.2.2 Laser power

When powering the camera with less than 24 V, the laser output voltage might not reach the required 5 V. This prevents some devices (e.g. the Z-Laser ZM18 series lasers) to work properly.

4.3 Firmware updates

4.3.1 Reasons

All C4 devices shipped by *Stemmer Imaging* are using the latest firmware version available at the time of delivery.

In particular cases though, it might make sense to conduct a firmware update for a given C4 camera later on. Reasons can be functionality upgrades, mitigation of erroneous behaviour or streamlining all devices in an engine to the same version.

Updating firmware is not possible in all cases, as this mainly depends on the hardware revision of the camera. Please ask us before planning an update. It is furthermore critical that updates take place in a particular order, i.e. do not skip intermediate versions.

C4 firmware is generally field upgradable by a simple process. *Stemmer Imaging* also offers carrying out firmware updates as a service. Though this service is free of charge in case of faulty behaviour, note that upgrading for other reasons is chargeable. If a customer decides to perform an update on his own, *Stemmer Imaging* can take no liability whatsoever that the device works correctly after the update.

In some cases firmware upgrades are only available for a fee.

4.3.2 Update process

Before updating, please backup all configuration data on the device. A firmware update usually erases all memory on the device, thus deleting configurations and User Sets. The *AT CX-Explorer* as well as The *CVB Management Console* offers saving and loading configurations to or from files.

It is necessary to properly configure the device with *CVB* first. This means that the *GenICam* nodemap can be accessed either by means of the *CVB Management Console* or the *GEV Config Manager*.

Please do not proceed beyond this step if the above provisions are not met.

The update package comes as a compressed archive, containing all necessary binaries and scripts, as well as a documentation. It is highly recommended to read the pdf before starting.

After the update (and a reboot of the camera), backup configurations can be replayed again. Please note that in some rare cases, a configuration cannot be completely played back due to changes in the XML accessibility structure and must be adapted manually.

4.4 Frequently asked questions

Q: Are C4 devices based on the Pleora GigEVision modules?

A: No, AT has developed their own solution for GigEVision.

Q: How long does it take to transmit a profile to an application?

A: Processing time between acquisition of a frame and queuing of a profile in the C4 is < 10 microseconds. Additionally, a GigE Jumbo Packet takes about 72 microseconds transmission time from sender to the host. The time for packet re-assembly is depending on the GigEVision implementation and the image data properties, but can be assumed to be below the TX time.

5 Contact and feedback

5.1 Problem resolution

In case your components yield erroneous behaviour, we ask you to check the following things before reporting an error to us:

Signal quality

Often, signals degrade through ESD noise nearby, defective cables, signal converter, etc. Please measure your trigger signals with an oscilloscope to ensure the I/O device receives clean signals.

Power supply

If you use a laboratory power supply, please assure that you allow enough current to be drawn by the device.

Z-Laser laser cable configuration

If you have a Z-Laser device including a laser cable with 4 open wires instead of a specially confectioned cable (direct camera to laser connection), make sure your analog and TTL potentials are defined. Otherwise the laser might not work as expected.

5.2 Support

We hope that these notes were useful for you and look forward to your feedback. In case of further questions, please do not hesitate to contact our technical support.

Additional information as well as frequently asked questions and a lot of valuable details regarding image processing, can also be found on our website.

In Germany, Switzerland and Austria:

Phone:	+49 89 80902-200
E-Mail:	support@stemmer-imaging.de
Web:	www.stemmer-imaging.de (menu *Service -> FAQ*)

In Great Britain:

Phone:	+44 1252 780069
E-Mail:	support@stemmer-imaging.co.uk
Web:	www.stemmer-imaging.co.uk (menu *Support -> FAQ*)

In France:

Phone:	+33 1 45069560
E-Mail:	support@stemmer-imaging.fr
Web:	www.stemmer-imaging.fr (menu *Support -> FAQ*)

Yours sincerely - STEMMER IMAGING Technical Team