

Manual

AOS High Speed Cameras

X-PRI / S-PRI
X-MOTION / S-MOTION
X-VIT / S-VIT
X-EMA
Q-PRI / Q-VIT / Q-EM



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Please also refer to your AOS Technologies representative in your area.

List of manual revisions

Rev	Date	Release notes
1.0		Manual
2.00	9.10.2006	Manual, addition with X-PRI
2.01 X-EMA special	19.10.2007	Manual, changes for X-EMA
2.10	26.02.2008	Manual, additions for SDI interface
2.11	30.05.2008	Manual, IRIG-B specifications added
2.12	10.11.2009	Manual, information on S-Series cameras
2.1.4	12.10.2011	Manual, information Q-series

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Congratulations! With purchase of an AOS Technologies AG high speed camera system you have acquired a versatile, reliable product allowing you to record high speed sequences in a very convenient way. The advanced and self contained digital camera system provides a maximum in user friendliness and assists you in getting the results while others try.

Introduction

CONGRATULATIONS! By purchasing an AOS High Speed Camera high-speed digital imaging system, you have acquired a versatile, future oriented, self-contained digital camera system. AOS Technologies AG has combined advanced camera features with easy to use software to create a solution for your high-speed recording needs. The intent of this manual is to provide the information required for a smooth operation of AOS High Speed Camera

General description of AOS High Speed Camera

AOS High Speed Camera is a high-speed camera capable of record and store data in it's built in camera memory. The rechargeable battery allows operation of up to 30 minutes in recording mode and allows data buffering of up to 1h depending on mode of operation.

Unpacking / Check of completeness

Unpack your camera from its transport box and check if all accessories are complete

Standard scope of delivery is:

Qty	Description
1	AOS High Speed Camera
1	Power/Trigger cable 0.5m
1	Power Supply incl. Power cable for EU- and US-mains plugs
1	CAT6 Data cable 5.0m
1	CD with AOS High Speed Camera operation Software and Camera manual (pdf file)

Standard scope of delivery may vary from model, territory and distributor.

1 Connecting the camera to a PC

Prior the first use of your new AOS high speed camera, certain steps need to be followed for a successful start.

1.1.1 Visual inspection

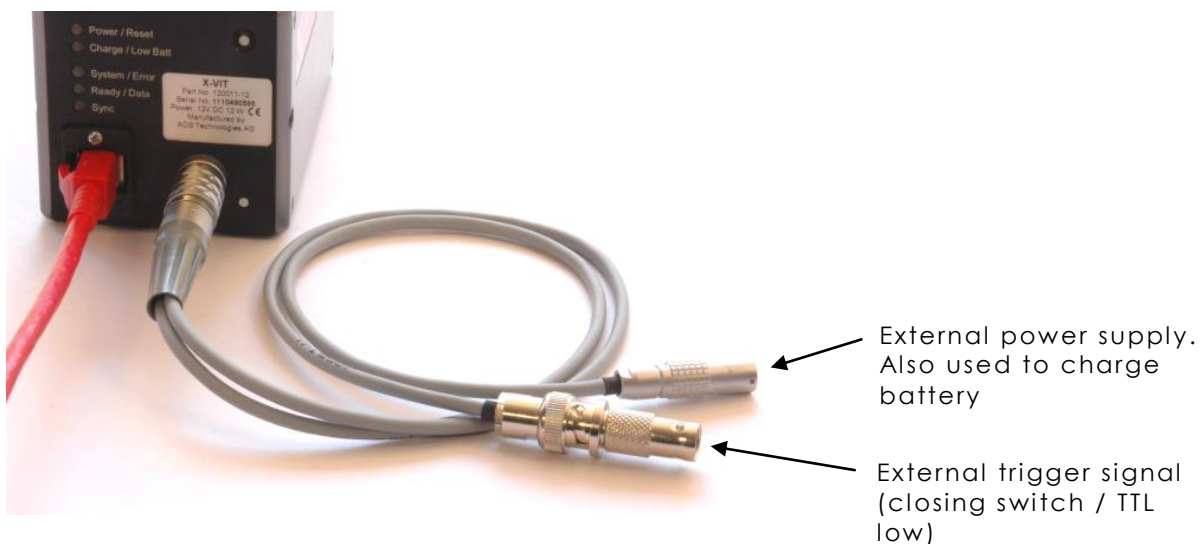
Unpack the camera and visual inspection. Check for any visible damages.

1.1.2 Battery charging

Your AOS high speed camera features a built-in, re-chargeable battery. Prior its first use, as well as prior of any recording session, make sure the battery is fully charged. This is also recommended if you have your high speed camera always connected to power as the built-in battery will protect the image memory against power failures and power losses.

Connect your AOS high speed camera to power following these steps:

- switch off your camera
- connect the Power/Trigger cable (included with each camera) to the cameras I/O connector at the rear
- connect the 2-pin LEMO connector of the Power/Trigger cable to the DC-Adapter (included with each camera)
- Connect the DC-Adapter to mains (100...240VAC)
- Check if the cameras "Charge" LED lights up in green
- Charging time is approx. 4 hours (if battery is fully discharged)



The input range of AOS High Speed Camera is 8 to 16VDC (24 to 36VDC is optional). If applying more than 16VDC (36VDC for X-EMA) serious damages of the camera results. Such damages are not covered by the warranty.

1.1.3 Switching-on and -off procedure

1- Switching on (standard) when camera is switched off

- press "Power" push button shortly
- wait until startup sequence has been completed ("System" LED comes to a rest)

2- Switching on (overwriting changed setup, start with factory presets)

- press "Power" push button for more then 4 sec
- release button and wait until startup sequence has been completed ("System" LED comes to a rest)

3- Switching off (standard) when camera is switched on

- press "Power" push button shortly
- "Power / Reset" LED will indicate the shutdown sequence

4- Switching off (enforced shutdown) when camera is switched on

- press "Power" push button for more then 4 sec
- Camera shuts down without the normal procedure. This is only necessary and recommended if the camera does not react on the standard switching off procedure (see par. 3) or is in a "freak" position (i.e. all LED's blinking)



Note that in case you switch off any S-Series, O-series or X-series camera it is imminent to have the camera unpowered for min 30 sec. before switch on again. When switching on the camera within 30 sec after power down some setting may not be deleted due to camera internal power management reasons.



Note: When it is necessary to reset the camera, hold the reset button pressed for a minimum of 1 sec. Otherwise faulty settings may be loaded.

1.1.4 Connecting the camera to a PC

Your AOS camera does not need a special or dedicated control device, often called "camera controller" or similar. With its standard Gigabit Ethernet data interface, your camera can be simply connected to any standard PC (Laptop or Desktop) or Ethernet-based LAN data network.

Follow the following steps to connect the camera to your PC

- install the included camera control SW (AOS Imaging Studio)
- Switch your camera on (see 1.1.3)
- connect the included CAT6 data cable to the camera and to the appropriate port on your PC

S-Q-X-VIT / S-Q-X-EMA

These rugged high speed cameras offer a special data connector to securely lock the data cable to the camera. Although standard CAT6 cables can be used too, a secure cable lock is achieved by using the included data cable with its cable lock.

**S-X-MOTION / S-Q-X-PRI
S-X-Motion**

These non-ruggedized high speed cameras offer a standard data connector to accept standard CAT6 Ethernet data cables.

2 Installation of the Control Software and Camera drivers

Please refer to the "AOS Imaging Studio Manual" and "Installation guide", also to be found on the included CD

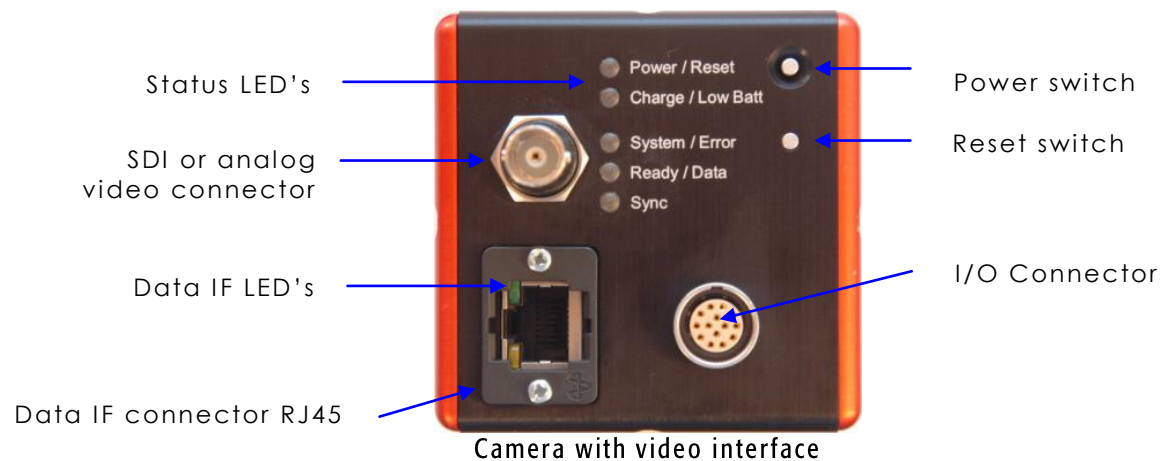
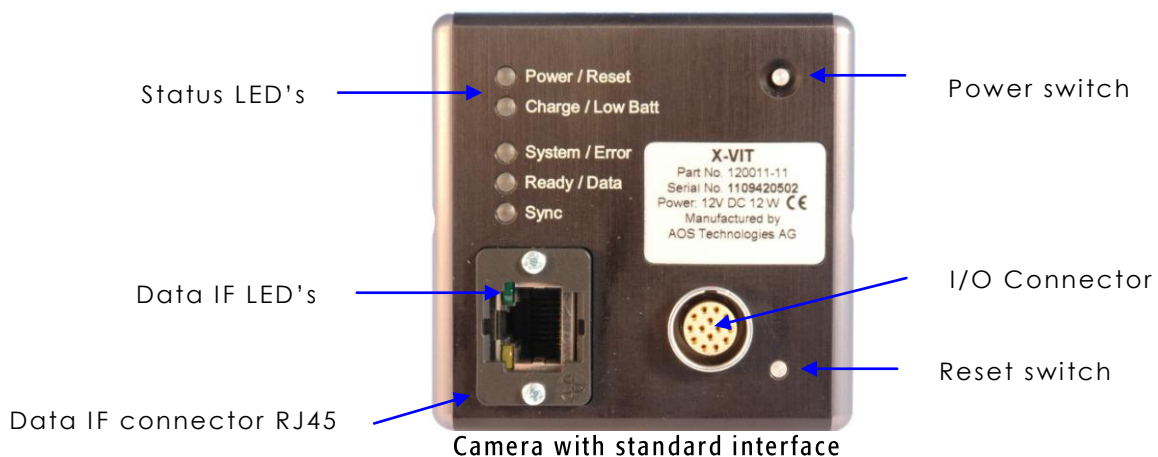
3 Operation of the High Speed Camera

The operation is primarily done by using the included AOS Imaging Studio camera control software. Therefore all functions and instructions how to operate the camera can be found in the "AOS Imaging Studio Manual" (to be found as a pdf file on the included CD).

Please follow the manual carefully to execute all operations.

In case of uncertainties or questions, please do not hesitate to contact your AOS distributor or our support engineers.

3.1.1 The camera rear panel



3.1.2 The camera front panel

The "Ready / Data" status LED duplicates the same LED on the camera back panel (see 3.1.3 for explanation)

Your high speed camera has been carefully adjusted for accurate back focus alignment to make sure your lenses can be precisely focused all the way between close up and infinity.

However, if you use special (close up) optics or any non-standard lens, it might be necessary to re-adjust the backfocus by following these steps:



Adjusting the backfocus:






- loosen Allen screws to free focus ring on both sides of the camera
- set lens to infinity and its iris to maximum (lowest f-stop number, i.e. 1.4)
- aim at an object near the horizon
- adjust focus ring until distant object is in focus
- set lens to 2m
- aim at an object in exactly 2m distance (newspaper on a wall)
- adjust focus ring until object is in focus
- repeat steps 1 and 2 until close and distant objects can be focused correctly

3.1.3 Status LED's

Your high speed camera has a number of Status LED's on its back panel to indicate operation modes and error codes. The LED's indicate

- operation mode
- battery status
- power status
- data transfer information
- error codes

Explanation	
	LED off
	LED permanently green
	LED permanently red
	LED flickering green
	LED flickering red
	LED flickering green and red

Power / Reset LED	Remarks
	Camera switched off
	Camera on (normal mode) Camera has been switched on normally by the power push button
	Camera on (Factory reset mode) Power push button has been pressed for 4 secs. Camera starts in the Factory Reset Mode and resets all parameters to Factory Default values before camera switches off
	Camera is switching off (Power off mode) Camera has been switched off by the power push button. Camera operating system shuts down.
	Camera reset (Reset mode) Camera has been reset. Operating system starts. Image data remain unchanged. When the reset mode is completed, camera changes to normal mode

Charge / Low Batt LED	Remarks
<input type="radio"/> Battery is fully charged	
<input checked="" type="radio"/> Battery is charging	
<input checked="" type="radio"/> Low battery capacity	Battery needs to be charged immediately

System Error LED	Remarks
<input type="radio"/> Booting error	Switch off camera (power switch) or reset camera (reset switch). If camera does not start, contact your AOS partner
<input checked="" type="radio"/> Start up sequence	Camera will be in normal mode within seconds
<input checked="" type="radio"/> Start up sequence completed (normal mode)	
<input checked="" type="radio"/> Camera error	Switch off camera (power switch) or reset camera (reset switch). If camera does not start, contact your AOS partner

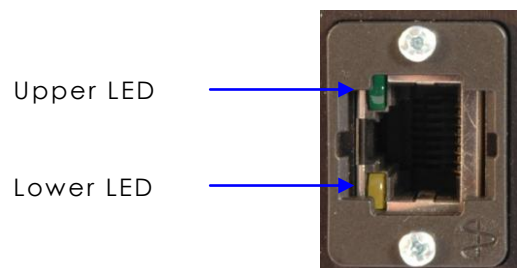


Note: When it is necessary to reset the camera, hold the reset button pressed for a minimum of 1 sec. Otherwise faulty settings may be loaded.

Ready / Data LED	Remarks
<input type="radio"/> Normal mode	
<input checked="" type="radio"/> Camera ready	Camera is ready to record
<input checked="" type="radio"/> Pre-trigger buffer gets filled with image data	Camera records and fills image data in ring buffer
<input checked="" type="radio"/> Camera in pre-trigger mode	Camera is waiting to receive the trigger signal to start recording
<input checked="" type="radio"/> Camera triggered	Camera continues recording until image memory is full
<input checked="" type="radio"/> Image data download	Image data is being downloaded to PC or internal CF memory
<input checked="" type="radio"/> Download completed	Download of image data completed. Next recording can be started

Sync LED	Remarks
<input type="radio"/> No external sync	
<input checked="" type="radio"/> External sync signal received	External sync signal controls the image clock
<input checked="" type="radio"/> Sync error	Sync error: actual frame rate is lower than the external clock. Check camera settings

3.1.4 Data Interface LED (part of Ethernet Connector)



Upper LED:

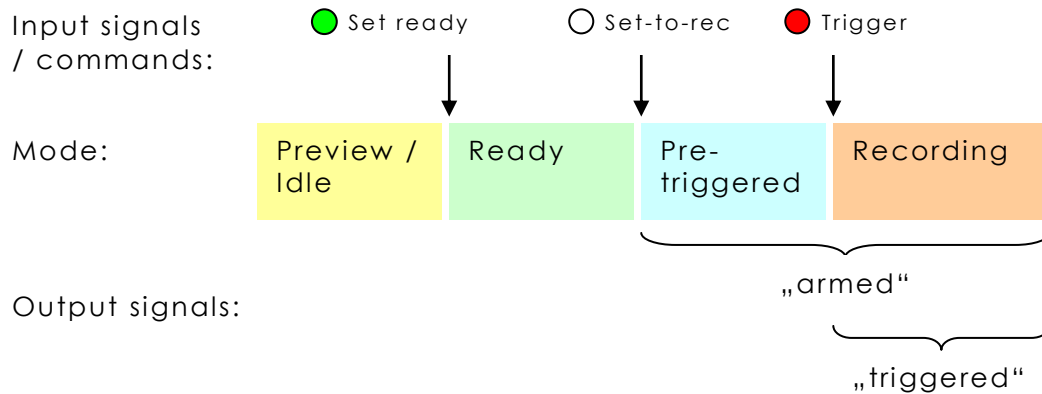
Sync LED	Remarks
<input type="radio"/>	No link established
<input checked="" type="radio"/>	Link established
<input checked="" type="radio"/>	Transferring data

Lower LED:

Sync LED	Remarks
<input type="radio"/>	Transfer speed: 10/100 Mbits/sec
<input checked="" type="radio"/>	Transfer speed: 1000 Mbits/sec

4 Operation Modes

AOS High Speed Camera basically has 5 operation modes that allow an efficient power management. Understanding the functionality of the camera is essential for best operation of the camera.



4.1.1 Sleep mode

In the sleep mode the camera internally shuts down all tasks not required for data security, communication and battery charging. Recording in the camera buffer are retained and may be accessed again. Lowest power consumption assures data security in the RAM buffers for up to 1 hour. By receiving a command the camera goes automatically into READY mode.



The duration of how long data are retained in RAM memory of the camera is depending on the capacity of the built in battery. The battery assures 1 hour of data security under standard conditions. Battery time is affected by temperature, age of battery and humidity that can result in a substantial reduction of the time which data can be retained in the RAM.

4.1.2 Ready mode

In this mode the camera runs at full speed but having the sensor only active for preview modes. In this mode the camera is being parameterized and setting of the scene is performed. By clicking the green button the camera goes into the READY mode. If in the option "Skip Set-to-rec" is selected the camera goes directly into recording mode as selected. A message will appear to acknowledge the overwriting of the buffer.

4.1.3 Pre-triggering mode

When a pre-trigger time is selected the camera may go from READY mode into PRE-TRIGGERED mode by either clicking on the white button icon on the screen or by using the external connector to supply a PRE-TRIGGERING signal from an external source. Once in PRE-TRIGGERED mode the amber and red light on the back of the camera start flashing.



When you put the camera into PRE-TRIGGERED mode via the PC, be sure you have not disconnected the Ethernet link. The Ethernet link may be disconnected **after** the camera is in PRE-TRIGGERED mode.

4.1.4 Armed mode – Skip „Set-to-rec“

If in the camera control software the option “Skip Set-to-rec” is selected the camera goes directly into the RECORDING mode as selected. For data security a message will appear to acknowledge the overwriting of the buffer.

4.1.5 Recording mode

In this mode the camera finishes the ongoing recording and then awaits access (reconnection of the Ethernet link). The camera automatically goes into a power save mode after the recording.



As long as unsaved data is in the camera (no access via Ethernet after a recording) the red LED is constantly on. After accessing the camera via Ethernet this LED goes out.

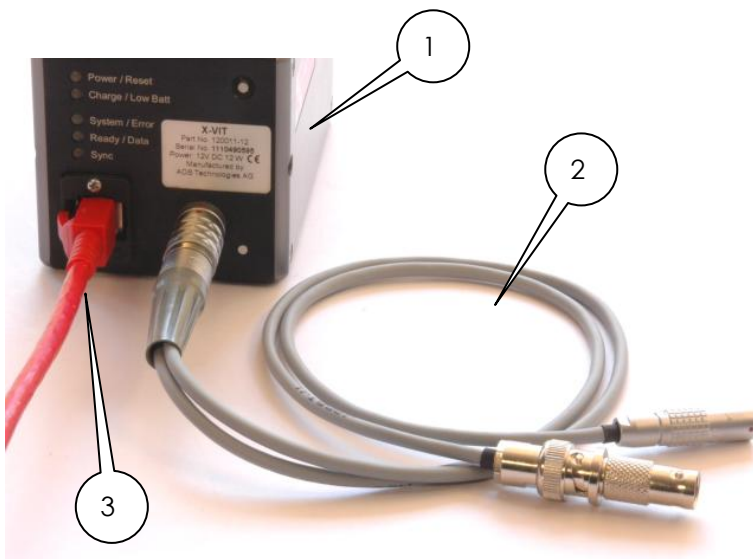
5 System setup

Your AOS highspeed camera with its standard Gigabit Ethernet Data interface can be used in many different configurations, depending on the application you have.

5.1.1 Scope of supply

Your AOS high speed camera is delivered with the following:

- high speed camera (1)
- power supply 12VDC or 24VDC for X-EMA (not shown)
- Power / Trigger Adapter cable 0.5m (2)
- Ethernet data cable (3)



Add-Ons

Add-ons are extension modules especially designed for your AOS high speed camera and will extend the functionality of your camera for your specific applications.

Some add-ons have to be purchased with the camera (i.e. the CF interface), others may be purchased at any time (i.e. Firm- and Software add-ons). Please contact your distributor for more information.

5.1.2 CF interface

The widely used non-volatile Compact Flash memory cards – as used in digicams and other products – offer a most convenient way to have your image data downloaded from the camera memory. Instead of downloading the image data via the Gigabit Ethernet data interface to your PC's harddisk, the image data gets downloaded to the CF memory card inserted into your camera.



As the CF interface includes also hardware inside the camera (easily to be identified by the "slot" on the left camera side plate), this add-on has to be either ordered together with the camera, or your camera has to be returned to AOS for a factory modification.

5.1.3 SDI or analog video interface

The AOS High Speed cameras are available with a video output as an option. This video output is either available in digital SDI or analog CVBS format and must be ordered together with the camera. The specification of the video output is as follows:

SDI (Serial Digital Interface)

Standard Definition Video (SDTV) – 625 or 525 lines

Coding according ITU-R BT.601-6 (4:2:2 YcbCr component video)

625 lines video (SDTV 576i)

Active resolution: 720x576

Image frequency: 25Hz (50Hz interlaced)

525 lines video (SDTV 480i)

Active resolution: 720x480

Image frequency: 29.97Hz (59.94Hz interlaced)

Analog CVBS (Composite Video Baseband Signal)

NTSC-M (525 lines / 60Hz)

PAL-B/D/G/H/I (625 lines / 50Hz)



Limitations

The maximal resolution supported on the NTSC-M video standard is limited to 1280x960 in Imaging Studio. Higher vertical resolution leads to image distortion and artifacts.



The SDI and Analog CVBS Video output is dedicated as an adjustment aid for an external monitor for setting up the aperture and focus of the camera lens.

The image quality of the SDI and Analog CVBS Video output is not equal to the quality of the digital image displayed in Imaging Studio.

5.1.4 I/O Channels

Each AOS High Speed Camera features digital I/O-Channels to either accept external signals (i.e. positioning switch) or to provide a digital output signal (i.e. "trigger out").



The AOS High Speed Camera S-PRI & X-PRI offer 1 digital I/O-channel as a standard. With "Option 4", 3 additional channels can be added (making a total of 4 channels).

6 Multi camera setups

The GigE data interface of the AOS high speed cameras, together with the AOS Imaging Studio software, allows connecting and using more than one high speed camera to one control PC.



Camera models S-PRI / X-PRI are by definition "one-camera-systems", meaning one camera runs on one PC. With "Option 5", any S-PRI / X-PRI can be upgraded to a multi-camera system, similar to S-MOTION / X-MOTION S-VIT/ X-VIT and X-EMA.

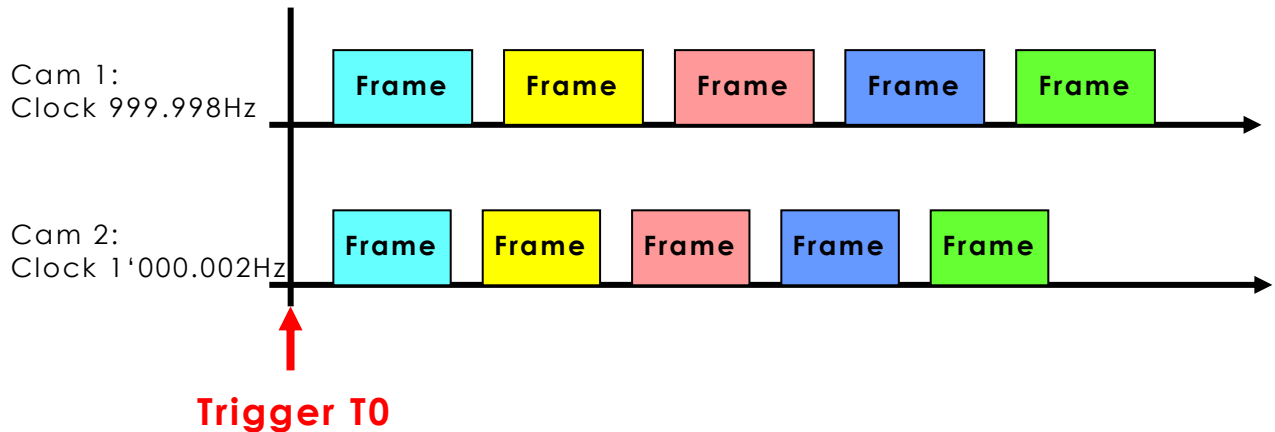
6.1.1 Multi camera systems without frame synchronization

If cameras have to, or can, be operated independently (without frame synchronization), the cameras can simply be connected using their GigE data interface and CAT6 cables. To bridge longer distances, commercially available GigE network components like Bridges, Hubs and Routers can be used.

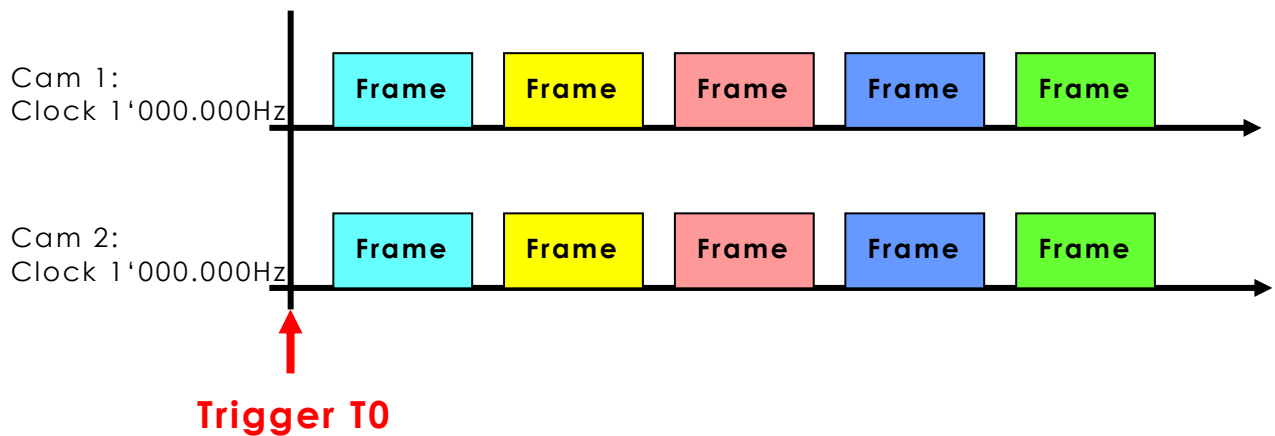
The trigger signal has to be provided to each individual camera using 2-wire trigger cables and / or AOS trigger cables.

6.1.2 Frame synchronisation

For accurate motion analysis, cameras have to be synchronized to make sure each frame starts at the very same time to avoid time slip:

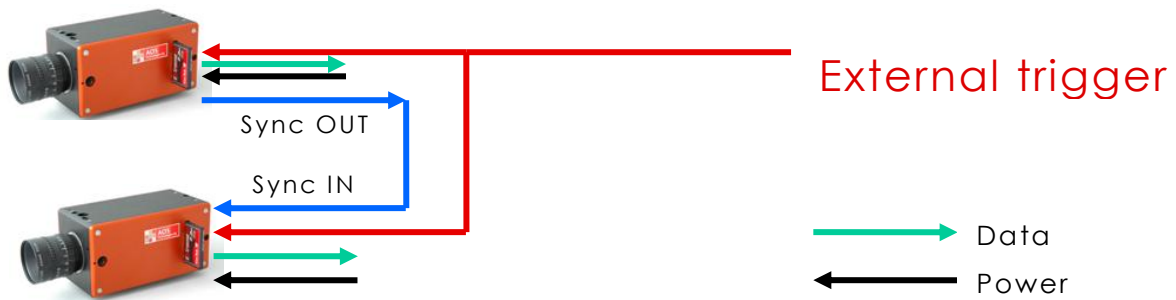


Time slip due to failing synchronization



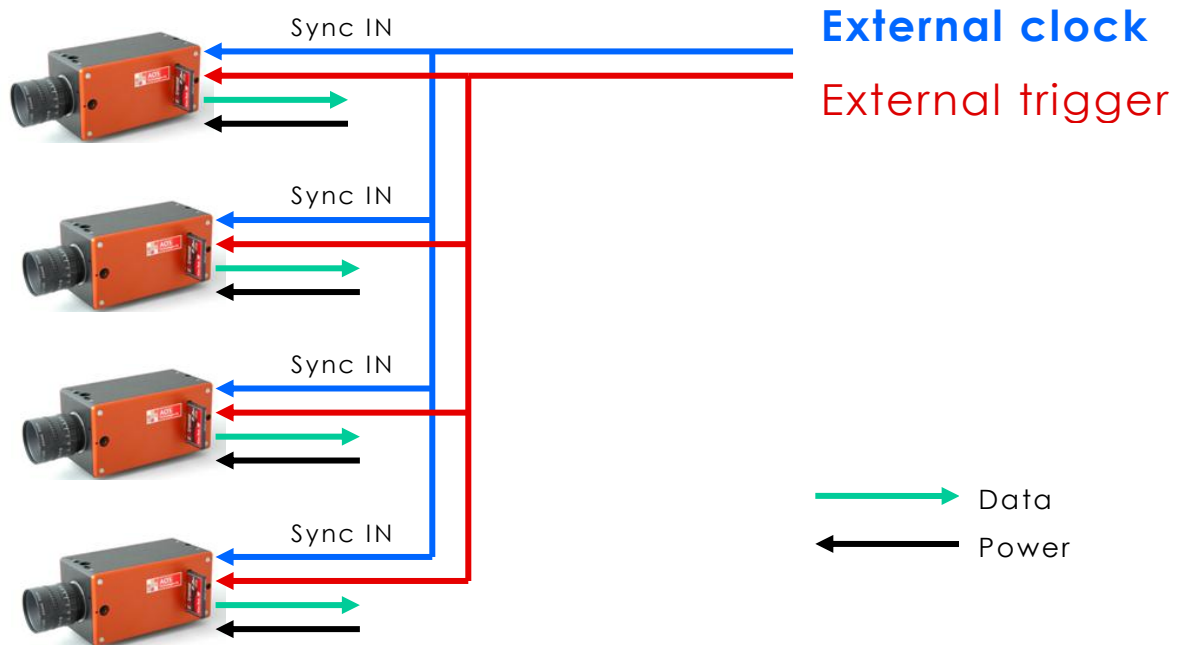
Phase lock frame synchronization

6.1.3 Multi camera systems with frame synchronization (version 1)



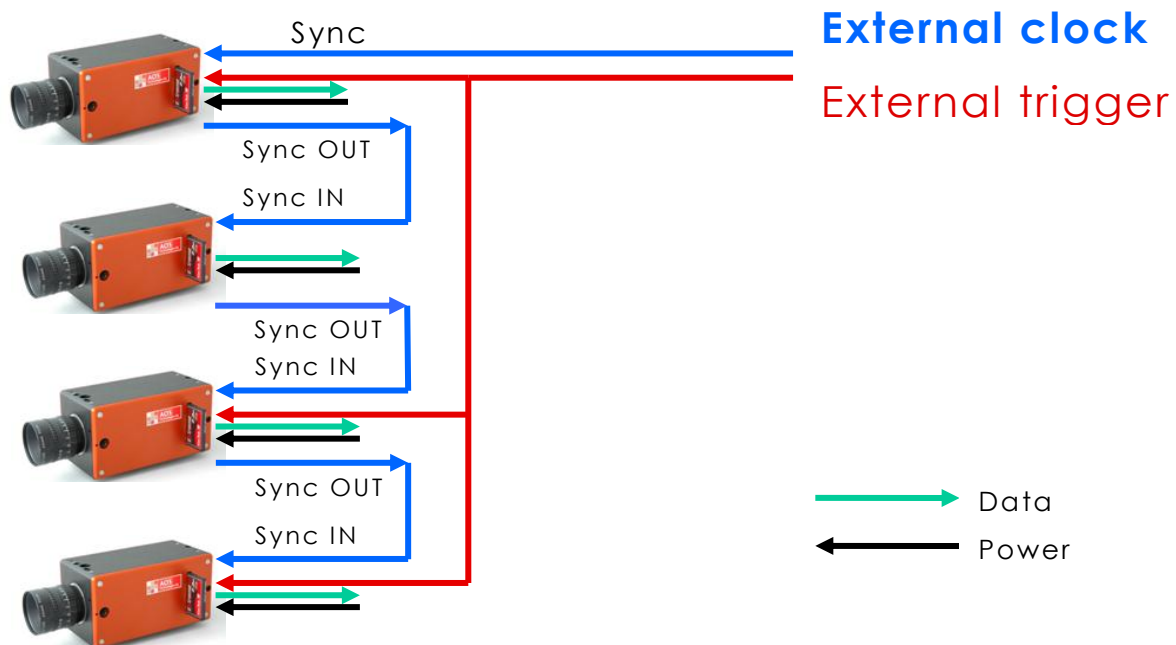
- the camera from which the Sync Out signal is used acts as the MASTER, while the camera which receives the sync signal on its Sync IN line, works as the SLAVE
- each camera can have a different setup (resolution, frame rate, trigger setting etc.)
- the MASTER controls the frame rate of all following SLAVE cameras. SLAVE cameras run on the same or a lower frame rate than the MASTER camera
- Example:
 - MASTER = 1'000 fps
 - SLAVE = 500 fps (setting), runs actually on 500fps ("Sync" LED will be red to indicate a sync error on the SLAVE camera)

6.1.4 Multi camera systems with frame synchronization (version 2)



- The external clock can have any frequency, also uneven frame rates like 637Hz
- each camera can have a different frame rate setting. However, the actual frame rate is given by the external clock
- Example:
 - External clock = 637 Hz
 - Setting cam 1 = 1'000fps / 512 lines -> runs actual on 637 fps / 512 lines
 - Setting cam 2 = 500 fps / 1'024 lines -> runs actual on **500 fps** / 1'024 lines
 "Sync" LED will be red to indicate a sync error of cam 2
 - Setting cam 3 = 1'000fps / 512 lines -> runs actual on 637 fps / 512 lines
 - Setting cam 4 = 1'000fps / 512 lines -> runs actual on 637 fps / 512 lines

6.1.5 Multi camera systems with frame synchronization (version 3)



- The external clock can have any frequency, also uneven frame rates like 637Hz
- each camera can have a different frame rate setting. However, the actual frame rate is given by the external clock resp. the camera providing the Sync IN signal
- Example:
 - External clock = 637 Hz
 - Setting cam 1 = 1'000fps / 512 lines -> runs actual on 637 fps / 512 lines
 - Setting cam 2 = 500 fps / 1'024 lines -> runs actual on **500 fps** / 1'024 lines
 - "Sync" LED will be red to indicate a sync error of cam 2
 - Setting cam 3 = 1'000fps / 512 lines -> runs actual on **500 fps** / 512 lines
 - Setting cam 4 = 1'000fps / 512 lines -> runs actual on **500 fps** / 512 lines



Due to the fact the camera providing the Sync signal to all following camera can overrule their setting, this system setup ("daisy chain") has to be used with greatest care to avoid sequences at wrong settings



If cameras have to, or can, be operated independently (without frame synchronization), the cameras can simply be connected using their GigE data interface and CAT6 cables. To bridge longer distances, commercially available GigE network components like Bridges, Hubs and Routers can be used.

The trigger signal has to be provided to each individual camera using 2-wire trigger cables and / or AOS trigger cables.

7 Maintenance

Unlike film-based cameras, your AOS highspeed camera is a fully electronic device with no mechanical parts prone to wear and tear. Maintenance is therefore reduced to the absolute minimum. However, following these steps will not only extend your cameras lifetime, but will also offer a troublefree operation.

7.1.1 Lenses

For the lenses please refer to the lens manufacturer its recommendation.

7.1.2 Battery

The battery is of a metal hybrid type and automatically recharges by the built-in charging circuit of the AOS High Speed Camera.



Replacement of batteries is allowed only by AOS trained and certified service centers. Not following this guideline voids the warranty of the camera and neither the manufacturer nor their distributors are liable for a further smooth operation of the camera.

Color cameras only

7.1.3 Cleaning the AOS High Speed Camera Infrared filter

Your AOS High Speed Camera (color versions only) does have an optical filter to block infrared light from entering the camera in the optical path. Dust and dirt on this filter may be best removed by using either a non oil based dust off air spray or some optical cleaning tissues. Sticky dirt and fingerprints may be removed using medical alcohol.



Removing particles (e.g. sand) by improper devices may result in scratches on your filter. Such scratches do influence the overall image quality.



Infrared light is a part of the visible light and not blocking it may result in false color in the actual image. However for applications where light is critical (e.g. bore scopes) one may remove the IR filter. This is especially true when using a monochrome version of the camera.

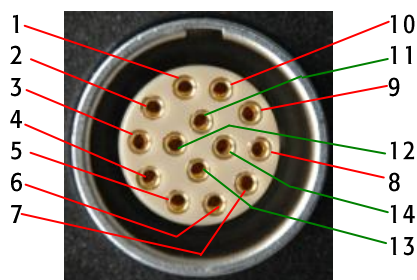
8 Troubleshooting

Despite all quality procedures in design development and production there can be errors in the software. The known bugs are listed in the release notes of the specific software release.

9 Appendices

Description of external input and output signals

9.1.1 Pinout I/O Connector



Camera: View on connector



Cable side: Front view

Pinout

Pin	I/O	S-Q-X- cameras	S-Q-X-EMA	SDI camera	Signal	Function
1	-	GND	GND	GND	Ground	Ground
2	Input	V In	V In	V In	VDC	Supply voltage
3	Input	Remote On	Remote On	Remote On	TTL	Switching on the camera
4	Input	Sync In	Sync In	Sync In	TTL	Frame sync input
5	Output	Sync Out	Sync Out	Sync Out	TTL	Frame sync output
6	Input	Set-to-Rec	Set-to-Rec	Set-to-Rec	TTL	Setting camera to rec mode
7	Input	Trigger	Trigger	Trigger	TTL	Triggering the camera
8	Output	Strobe	Strobe	Strobe	TTL	Strobe out for strobe lights
9	Output	Armed	Armed	Armed	TTL	Indicates rec mode
10	Output	Triggered	Triggered	Triggered	TTL	Indicates cameras has triggered
11	In- or Output	Status 1	Status 1	Status 1	TTL	In- or output channel 1
12	In- or Output	Status 2	GND	Status 2 or GND	TTL	In- or output channel 2 or Ground
13	In- or Output	Status 3	GND	Status 3 or GND or IRIG-B	TTL /IRIG-B	In- or output channel 3 or Ground or IRIG-B return (SDI version)
14	In- or Output	Status 4	IRIG-B input	Status 4 or IRIG-B input	TTL /IRIG-B	In- or output channel 4 or IRIG-B time input

Definitions:

TTL = 3.3...5V (max. 24 V or max. 36V for 24VDC camera types)

V In = 12VDC (9...16VDC) or 28VDC (24...36VDC)

IRIG-B : IRIG-B 122 amplitude modulated, amplitude $4V_{pp}$, DC: 0V, SNR: 60dB, Z_{in} : 600Ohm

Please inquire with your AOS distributors for available I/O-cables and other devices to connect external signal from and to the camera.

In case you plan to make your own I/O-cable, the following connectors (male type) fit your AOS high speed cameras:

LEMO: Type FGG.2B.314.CLAD82Z (www.lemo.com)
 ODU: Type S22LOC-P14MFGO-8200 (www.odu.de)

Connectors are available from your AOS distributor or from the manufacturers of the connectors.

Specifications

Software:	“Point and click” environment for Windows 2000 / XP Pro / Vista / Win 7-32 / Win7-64.
Computer requirements:	Minimum Pentium Core Duo, 2GHz with MMX, 1024x768 display, 2GB RAM, 60GB Hard Drive, GigE Data Interface
File Formats:	AVI, AOS RAW, MPEG, BMP, JPEG, PNG, TIFF
CMOS Sensor Resolution:	X-Series cameras: 1280x1024 Pixels, each pixel 12 microns square. (10-bit) at 500 fps S-Series cameras: 1280x1024 Pixels, each pixel 14 microns square. (10-bit) at 500 fps S-Series cameras: 1696x1710 Pixels, each pixel 8 microns square. (8-bit) at 500 fps
Record Rates:	Up to 16'500fps by reducing the resolution (S-PRI) Up to 100'000fps by reducing resolution (S-MOTION) Up to 100'000fps by reducing resolution (Q-series) Up to 32'000fps by reducing resolution (X-VIT / X-Motion / X-EMA) Up to 4'000fps by reducing resolution (X-PRI)
Exposure Rates:	Global Electronic Shutter with exposure times from 4 microsecond to 1/frame rate in increments of 1 microsecond.
Recording Modes:	Circular Buffer: Records images into circular buffer until triggered, then a user-selectable number of post-trigger frames (from 0 to the total number of pages in buffer –1) are recorded. Record on Trigger: The trigger position is selectable to any number between 0 and the page capacity –1.
Frame Storage:	1.3 gigabytes of memory 2.6 gigabytes of memory 5.2 gigabytes of memory 10.4 gigabytes of memory
Playback Rates:	depending on PC speed.
Trigger:	TTL (5V-tolerant) compatible signal; User-selectable polarity., switch closing or opening contact
Lenses:	Standard C-mount (1” format)
External Connections:	LEMO 14-pin Connector for I/O signals. RJ45 connector for Gigabit Ethernet Data signals. BNC connector for SDI or analog video output (Video output version only).
Size:	122 x 71 x 71mm (without any options) 129 x 71 x 71mm (with Video module) 137 x 71 x 71mm (with CF Interface) 144 x 71 x 71mm (with CF Interface and SDI module)
Weight:	Camera Head approx: 0.8 kg – 1.0 kg depending on configuration

Power:	9...16VDC (external power supply) 24...36VDC for 24 VDC versions (external power supply) Power consumption: 15W (without data link),20W power consumption (with data link)
Operating temperature:	S- & X-PRI / S- & X-MOTION / Q-PRI: 0...+40° C S- & X-VIT / Q-VIT: -15...+45° C, S-EM / X-EMA / Q-EM: -40...+50° C (according MIL 810)
Storage temperature:	All cameras: -40...+70° C
Humidity:	Operational: max. 80%, non-condensing, at 45° C (113° F) for 8 hours. Non-operational: max. 40%, non-condensing, at 70° C (158° F) for 48 hours.
Shock:	100 g peak sinusoid pulse with 15 ms pulse width (S-Q-X-VIT / S-Q-X-EMA only)

Limited Liability

LIMITED WARRANTY (For New Products)

AOS Technologies AG, a Swiss Corporation ("AOS") warrants each product manufactured by it ("the product") to be free from defects in material and workmanship for one (1) year from the date of shipment of such Product. The benefits of this limited warranty extend only to the Purchaser.

The warranty will become void and AOS shall have no obligation pursuant to it if (i) the Product has been modified or repaired in any manner not previously authorized by AOS in writing; (ii) the identification markings on the Product have been removed, defaced, or altered; (iii) the Product was subject to accident, abuse, or improper use; (iv) the Product was not installed or configured as specified in the accompanying instructions, or (v) the Product was subjected to operating conditions more severe than those specified in the accompanying instructions.

Assuming the Purchase is eligible to utilize this warranty, then, in the event that the product should prove defective, the Purchaser must (a) notify AOS in writing promptly upon discovery of the defects with a detailed description of such defects, (b) obtain a Return Materials Authorization ("RMA") Number from AOS, which AOS agrees to provide promptly upon request, and (c) return the Product to AOS (together with both proof of purchase and the name and mailing address of the Purchaser) properly packaged to avoid further damage, addressed to "AOS, Täfernstrasse 20, CH-5405, Baden-Daettwil, Switzerland, with transportation and other applicable charges prepaid by the Purchaser.

The liability of AOS under the foregoing warranty is limited, at AOS Technologies option, solely to repair or replacement with an equivalent Product (which may include a refurbished or previously-owned Product), within a reasonable time from the receipt of the Product by AOS. All repaired or replaced Products shall be warranted for the remainder of the original warranty period or, if longer, for three (3) months from shipment back to the purchaser.

OTHER THAN THE LIMITED WARRANTY SET FORTH ABOVE, AOS TECHNOLOGIES MAKES NO OTHER WARRANTY OR CONDITION, EXPRESS OR IMPLIED, WITH RESPECT TO THE PRODUCT. No AOS Technologies dealer, agent, or employee is authorized to make any modification, extension, or addition to this warranty. Unless unenforceable or unlawful under applicable law, AOS TECHNOLOGIES DISCLAIMS ALL IMPLIED WARRANTIES AND CONDITIONS, INCLUDING ANY IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY, NON-INFRINGEMENT, AND FITNESS FOR A PARTICULAR PURPOSE, AND THE LIABILITY OF AOS, IF ANY, FOR DAMAGES RELATING TO OR RESULTING FROM ANY PRODUCT OR ITS USE, WHETHER ALLEGEDLY DEFECTIVE OR OTHERWISE (INCLUDING WITHOUT LIMITATION A CLAIM FOR LOSS OF USE OR LOSS OF DATA) SHALL UNDER ANY TORT, CONTRACT, OR OTHER LEGAL THEORY BE LIMITED TO THE ACTUAL PRICE PAID FOR SUCH PRODUCT AND SHALL IN NO EVENT INCLUDE INCIDENTAL, CONSEQUENTIAL, SPECIAL OR INDIRECT DAMAGES OF ANY KIND, EVEN IF AOS IS AWARE OF THE POSSIBILITY OF SUCH DAMAGES.

10 Options and Accessories

There are several options not part of the standard system configuration but are supplied as accessories.

10.1.1 Pigtail cable AOS part# 2200116



To connect I/O-signals from and to the camera by BNC connectors. Standard connectors are

- Power
- Trigger IN
- Synch IN (Input, TTL)
- Synch OUT (Output, TTL)
- Strobe (Output, TTL)
- Event Marker 1 (Output, TTL)
- Event Marker 2 (Output, TTL)

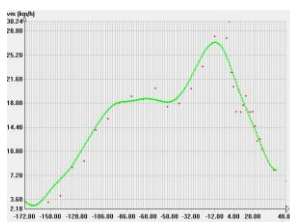
Custom functions available on request

10.1.2 I/O Breakout Box



To connect all I/O-signals from and to the camera by BNC connectors. Two toggle switches allow a manual trigger of the camera.

10.1.3 Motion Analysis



It is often required to not only have a qualitative analysis but a quantitative analysis of high-speed events. AOS supplies an entry-level motion analysis software that allows easy automatic tracking of object points. The built in comprehensive analysis tools allow to extract data such as velocity, acceleration relative measurements etc. The native data format of AOS High Speed Camera is supported (.raw). Contact us or your nearest distributor for any further information.



Please contact your AOS distributor for a complete catalogue with all accessories, circuits etc.



In case we do not have that particular accessory available as a standard product, we will also provide custom-made accessories like cables, breakout boxes, data interfaces (i.e. Fibre-Optic data interfaces), trigger circuits etc.