CHRONOS 1.4

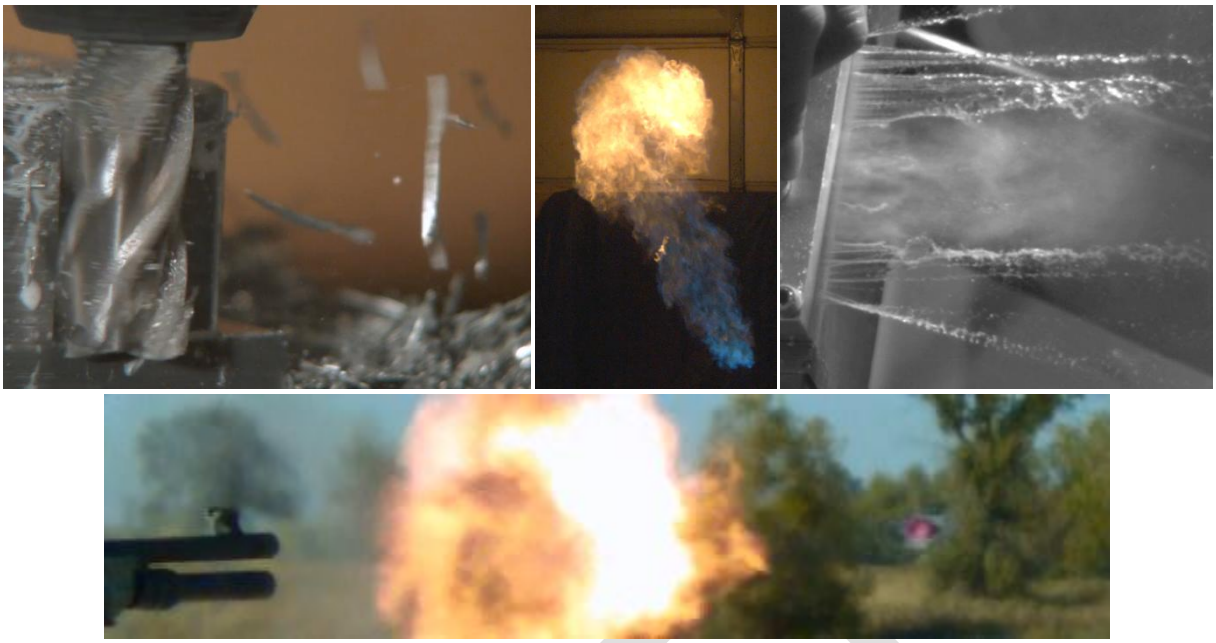
High-Speed Camera

User Manual

for

Software v0.1

Document Rev 1 DRAFT - NOT FINAL



Thank you for choosing the Chronos 1.4 high speed camera!

DRAFT

Getting Support 4
Quick Start 4
Unboxing 4
Set up 5
Powering up, charging, and powering down 5
Taking Shots 5
Playback 5
Saving 6
Shooting Tips 6
Hardware Reference 7
Hardware Overview 7
Lenses 9
IR Filter 10
Trigger IO 10
Storage devices 10
Software Reference 11
Menu/screen overview 11
Setting resolution and frame rate 14
Black Calibration 15
Triggering 15
Synchronizing to external sources 15
Setting IO functionality 15
Recording 15
Playback 15
Saving 15
Maintenance and care 16
Optics 16
Camera body 16
Screen 16
Storage/Shipping 16
Specifications 17
Mechanical drawing 18

DRAFT

Getting Support

You can contact Kron Technologies for support setting up and using your Chronos 1.4 camera.

The User Forum is a great way to share questions with other Chronos users, as well as get support directly from Kron Technologies staff. The answer to your question may already be there, use the search function on the forum to search for keywords relating to your question or issue.

User Forum:	forum.krontech.ca
Email:	support@krontech.ca

Quick Start

So you just got a cool new high-speed camera. Now what? This Quick Start guide gives you a crash course to get you up and running with your new camera.

IMPORTANT - The camera ships with a CS-C adapter ring installed, as well as a dust cap. Be sure not to accidentally remove the CS-C adapter when removing the cap. The CS-C ring is shown below.

Figure 1 - CS-C adapter

Unboxing

Unpack the camera and accessories, and check that all ordered accessories are included. Notify Kron Technologies immediately if anything is missing or damaged.

What's included?

The following items are included as standard with all cameras:

- Chronos 1.4 camera
- EN-EL4a battery
- 19V 40W AC adapter
- AC power cord (plug depends on region)
- CS-C adapter ring (installed on camera)
- C mount body cap (installed on camera)
- 2mm Allen wrench
- User guide

Lenses and other accessories may also be included if ordered. Check your invoice or sales receipt to know exactly what should be included.

DRAFT

Set up

- Insert the battery into the camera's battery compartment. To open the door, push the latch towards the back of the camera (LCD side) with your fingernail, and pull up.
- Close the battery door, ensuring the latch is pushed back while closing. Release the latch when the door is nearly flat against the case, and firmly push the door closed until the latch clicks in fully
- Remove the body cap and install the lens by screwing it onto the mount. For the Computar 12.5-75mm zoom lens, the CS-C adapter needs to be left on. If you're using another lens, check which type it is to determine whether or not the CS-C adapter is needed
- Store the lens and body caps in a safe place. Make sure not to forget where you left them

Powering up, charging, and powering down

It's recommended to fully charge a new battery before running the camera on battery power. Let the battery charge at least until 80% (LED flashes green/orange). This should take less than 2 hours.

- Plug the AC adapter into mains power and into the camera. The LED on the top of the camera should illuminate to indicate external power is present.
- The camera behaves just like your laptop, it charges whenever plugged in, and you can use it while charging. The battery does not need to be installed to run the camera on external power.
- Press and release the power button to power up the camera. It will take approximately 30 seconds to boot up and show the menu and image
- To power down the camera, press the power button for one second, then release. A minimum press of 0.5 seconds is required to avoid accidental shut down. Don't continue to hold the button; holding it for four seconds or more forces a hard power down. Just like your computer, the camera needs to shut down properly to avoid potential problems with the operating system. Don't force a hard power down unless the camera is unresponsive and will not power down normally.

Taking Shots

1. Power up the camera
2. Set resolution in Record Settings - Camera powers up at 1280x1024
   Tip - Don't be afraid to turn the resolution down to get a higher frame rate. Frame rate is resolution too - temporal resolution. Horizontal resolution below 336 pixels doesn't increase speed.
3. (*Optional*) - For best quality, do a Black Calibration (Black Cal). Close the iris or cap the lens, then tap Black Cal. Only required once after changing resolutions.
4. (*Optional*, for color cameras) - Set white balance. Place a white card at the center of the frame and tap White Balance.
5. Frame and focus. For best sharpness, use an iris of F/2 or above.
6. Press record or click the red record button to start recording
7. Stop the camera after the event occurs, using either the red button on the camera, the Stop button on the menu, or the optional remote trigger switch.

Playback

1. Tap Play to go to playback mode
2. Use the slider, jog wheel or forward/backwards play buttons to review the video. Click in and hold the jog wheel clicked while turning to go fast (40x faster than non-clicked).

DRAFT

Saving

1. Ensure an SD card is in the camera. You MUST use a Class 10 or faster SD card from a reputable manufacturer, otherwise frames may be dropped during save. The card must be formatted FAT32.
2. (*Optional, highly recommended*) - Use Mark In and Mark Out to select a region to save. Position playback where you'd like saving to start and tap Mark In. Repeat using Mark Out for the location you'd like saving to end. Saving the entire buffer can take a long time, especially at low resolutions.
3. Press Save and wait for save to complete
4. If the video is extremely valuable (unable or expensive to recreate the shot), remove the SD card and use a PC to check that the video saved properly without dropped frames. This is especially important when using a new brand of SD card for the first time.

Shooting Tips

[Basic crash course on how to use a fully manual camera]

DRAFT

Hardware Reference

Hardware Overview

Back/Top

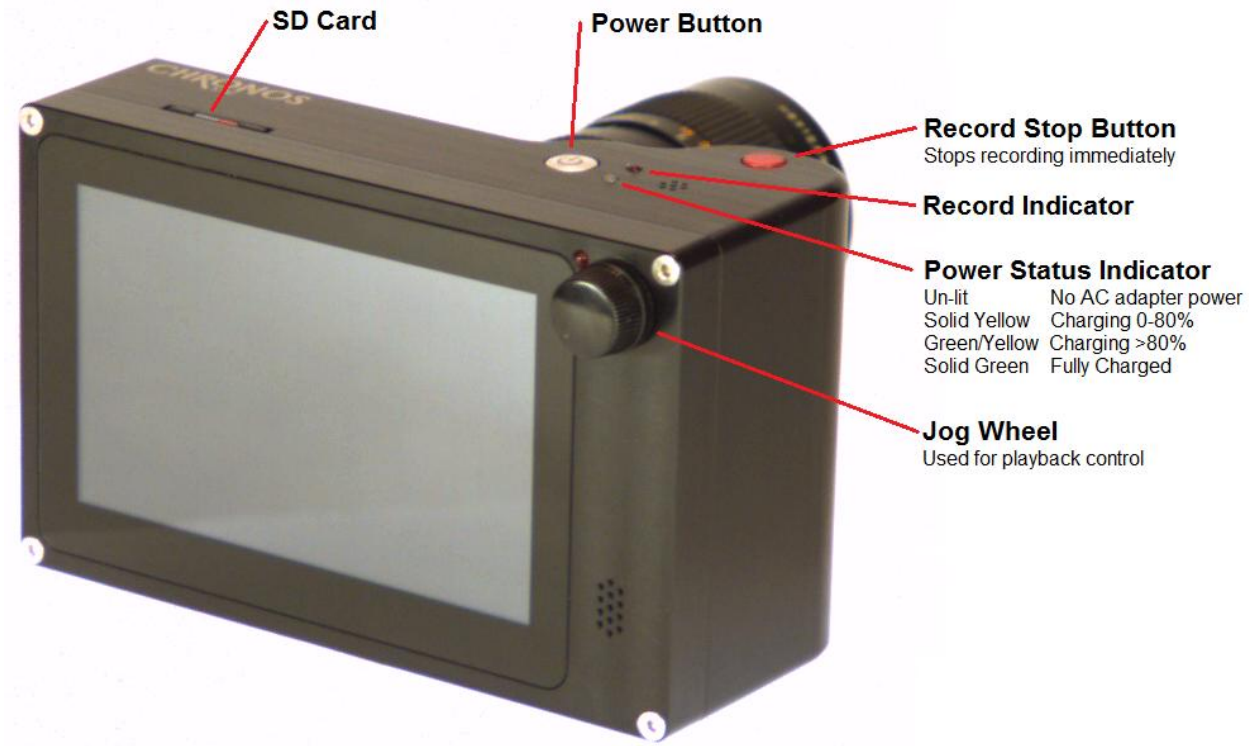


Figure 2 - Overview of camera (Back)

SD Card Slot

Use a **Class 10 or faster** card only

Power button

Click to turn on camera.

To shut down the camera, press the button for 1 second then release. Presses less than 0.5s will be ignored to reduce the chance of accidentally turning off the camera.

Holding for 4 seconds forces a hard power down. *Do this only if the camera software has crashed and won't respond.* Like a PC, the camera needs to shut down properly or file system damage may occur, requiring a reflash of the OS SD card.

Shutter Button

Starts and stops recording

Record Indicator

Illuminates to indicate the camera is currently recording

Power Status Indicator

Indicates the presences of AC power and charge status of the battery

LED	Indication
Un-lit	No AC power connected
Solid Yellow	Charging, state of charge 0-80%
Green/Yellow alternating	Charging, state of charge > 80%
Green	AC connected, charge complete or no battery present

Jog Wheel

Used for playback control. Moves playback 1 frame per detent (rotational click). Press and hold dial clicked in to move fast (40 frames per detent)

Front/Side Connectors

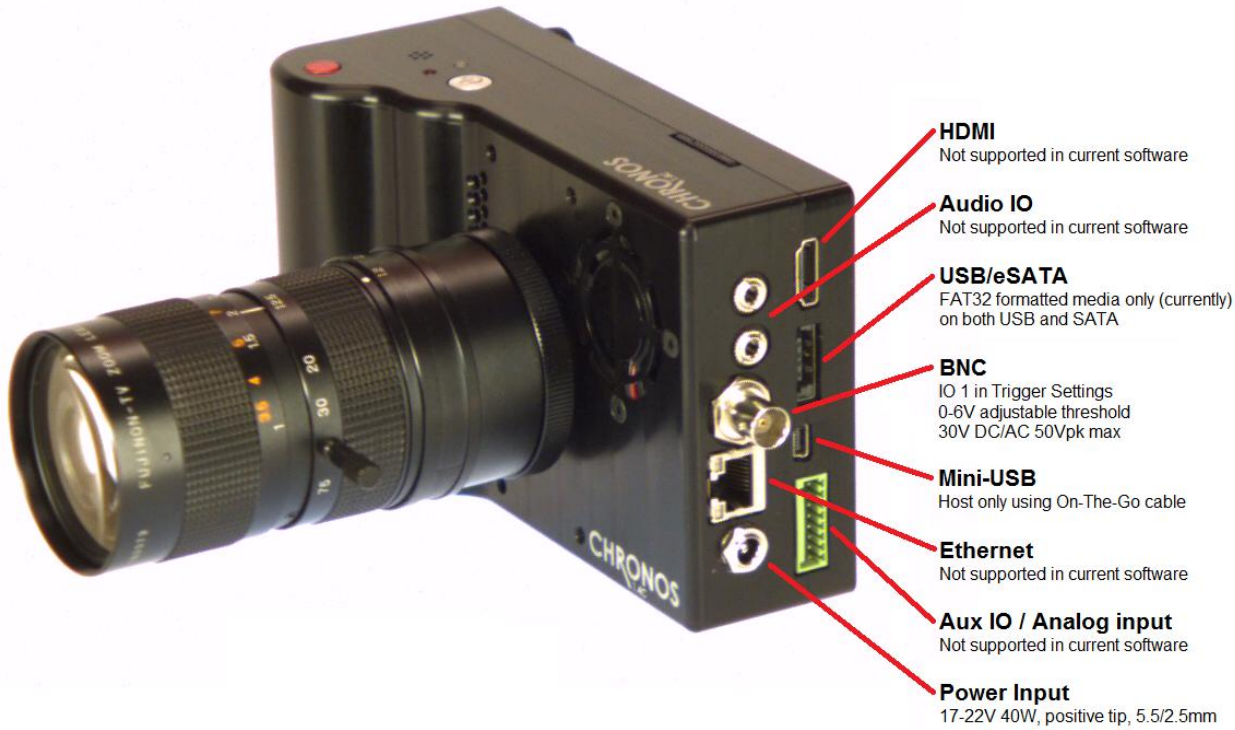


Figure 3 - Overview of camera (Front)

Power Input

17-21V DC 40W, 5.5/2.5mm barrel jack, positive tip

USB/eSATA

This port accepts both USB type A and eSATA devices. USB mass storage devices such as flash drives and hard drives can be connected to this port.

Mini USB OTG

USB mass storage devices such as flash drives and hard drives can be connected using a Mini-B OTG cable.

Aux IO

Trigger and Analog inputs. Only trigger inputs are supported in the current software.

Pinout:

[Top of camera]

Pin	Function
1	Analog In 1
2	Common
3	Analog In 2
4	Common
5	Trigger IO 2
6	Common
7	Isolated Trigger Input 3 (+)
8	Isolated Trigger Input 3 (-)

[Bottom of camera]

All Common pins are internally connected together and to the camera's power input ground and chassis ground. The included AC adapter internally connects common to mains earth ground as well.

Ethernet

Not supported in current software

HDMI

Not supported in current software

Audio IO

Not supported in current software

Lenses

Lens Mount

Chronos 1.4 is natively a CS-mount camera. C-mount lenses can be used with the included adapter. Other lens types such as F, EF, and PL can be used with an appropriate adapter to convert them to C mount.

Common lenses available for the camera are listed below, along with the adapter required to use them

Lens	Lens mount	Adapter required
Computar 12.5-75mm f/1.2 Zoom	C	CS - C
Computar 12mm f/1.4 Prime	C	CS - C
6-60mm f/1.7 Zoom	CS	None
2.8-12mm f/1.4 Zoom	CS	None
Fujian 25mm f/1.4	C	CS - C
Fujian 35mm f/1.7	C	CS - C
Microscope lens	C	CS - C

Table 1 - Lenses, mounts and adapter requirements

Lens Selection

Lenses vary in their image circle, that is, how large an image sensor they can cover. Chronos 1.4 uses a 2/3" image sensor (actual sensor dimensions are 8.45 x 6.76mm) . Lenses designed for smaller sensors can be used, however the

image will not cover the entire sensor. This is called vignetting and is visible as a black ring around the outside of the image frame.

IR Filter

Todo

Removing the IR filter

Todo

Trigger IO

Two trigger IO and one isolated trigger input are available on the camera.

Trigger IO 1/2

These non-isolated IOs are referenced to the camera's power and chassis ground, and can provide either input functionality with selectable threshold (0-6.6V) or 5V TTL level output. These IOs are protected against damage when connected to voltages of 30V DC/AC RMS and +/- 50V peak.

The 20mA output drive is suitable to directly drive terminated coaxial cable, and will produce 1V into 50Ω, with rise and fall times time of (typically) 10ns or faster. Unterminated operation will result in a much slower fall time.

[Schematic of Trigger IO 1/2]

Trigger In 3

This input is isolated input via an optocoupler. A logic low input is a voltage from -30 to 1V, and a high level input is a voltage of 3 to 30V. Voltages between these ranges (1 to 3V) are undefined. This input has built-in 1.2kΩ resistors to correctly drive the optocoupler, and is protected from differential voltages up to 30V DC/RMS AC and +/- 50V peak.

Trigger In 3 is rated for SELV (safety extra low voltage) circuits only, up to a maximum common mode voltage of 60V above ground.

DANGER: The isolated input is not rated for safety isolation. Never use any of these inputs to connect directly to mains-referenced circuits. If triggering from AC mains is needed, external isolation is required.

[Schematic of Trigger In 3]

Storage devices

All storage devices must be formatted FAT32. No other filesystems have been tested, but EXT2, EXT3 and EXT4 may work. NTFS and exFAT support are planned for release in future software updates.

SD cards are recommended as storage devices rather than USB drives. Use only Class 10 or faster SD cards to ensure successful saving without dropped frames. Saving to USB is functional, however **many USB flash drives are not fast enough to save video without dropping frames**. USB external hard drives typically work well.

When using a new storage device, always test it by making and saving a recording then playing it back on a PC. Problems typically show up as jumpiness or dropped frames.

DRAFT

Software Reference

Menu/screen overview

Main window

[Screenshot of main screen]

Button	Function
Record Settings	Shows the record settings window, which allows adjustment of resolution, frame rate, analog gain (ISO), and exposure.
Trigger Settings	Shows the Trigger Settings window, which allows selection of trigger/sync IO signals and trigger delay
Black Cal	Performs a black level calibration. This increases image quality by ensuring that blacks appear black on the image. Each resolution has a separate black calibration. No light must hit the image sensor while this button is tapped.
White Balance (color cameras only)	Sets the white balance reference. The camera will sample the center of the image and adjust the white balance so that center point is white. You must place a white card covering the center of the image before activating White Balance.
Focus Peaking	Enables/disables focus peaking, which highlights sharp edges with a (by default) Cyan color. This is used to make adjusting focus very easy. The sensitivity is adjustable from the Util menu.
Record (or Stop)	Starts and stops recording. Same as pressing the red Shutter Button
Util	Shows the utility menu, which contains various functions such as clock, software update, and focus peaking/zebra controls.

Record Settings page

[Screenshot of record settings page]

Control	Function
Resolution	Sets the record resolution, or ROI (Region of Interest) on the camera's image sensor. Adjustable in multiples of 16 pixels horizontally, 2 pixels vertically
Offset	Adjusts the position of the top left of the ROI as an offset from the top left of the image sensor When Center is checked, Offset is set automatically and cannot be adjusted. Adjustable in multiples of 16 pixels horizontally, 2 pixels vertically.
Center	When checked, the ROI is centered in the sensor full resolution
Frame Rate	Sets the frame rate. Can be set as frame rate (FPS) or period (Sec) which is 1/FPS. Setting one will automatically update the other. Can be set to maximum by pressing Max
Exposure	Sets the exposure (shutter speed) in seconds. Range is 1us up to slightly less than 1/FPS. Can be set to maximum by pressing Max.
Analog Gain	Adjusts the analog gain (ISO setting). A higher gain results in increased sensitivity (less lighting required), but increased image noise. For the best image quality, use the lowest gain possible and increase light level or aperture if more light is required.

Gain	Color ISO	Mono ISO
0dB (1x)	320	740
6dB (2x)	640	1480

	12dB (4x) 1280 2960 **18dB (8x)** 2560 5920 **24dB (16x)** 5120 11840
Common Resolutions	Allows selection of commonly used resolutions from a list.
ROI Display	Shows the size and position of the ROI in relation to the sensor's full resolution. The outer box represents the sensor's 1280x1024 resolution, and the inner box represents the ROI.
Max Rate display	Shows the maximum frame rate and minimum period for the current resolution setting.
OK button	Applies changes and closes window
Cancel button	Discards changes and closes window

Trigger/IO Settings page

[Screenshot of trigger/IO settings page]

Control	Function
Trigger Input radio button	Sets function of IO to trigger input, allowing that input to be used to trigger the camera to stop recording
Button/Indicator radio button	Future option for trigger button with record LED over single wire. Not supported in current software.
Frame Sync Output radio button	Sets IO function as frame sync output. Output will be active when shutter is open. Can be inverted with Invert checkbox under Frame Sync Output radio button.
Invert (Trigger Input)	Inverts the input level, trigger input will be sensitive to low level instead of high when checked.
Debounce	Enables a 10ms debounce on the input. The input is sampled at a period of 10ms, and an input is not taken as active unless measured active on two simultaneous samples. This is recommended when using a button or switch on the input to avoid glitches due to contact bounce.
Pullup checkboxes	Enables 1 or 20mA pullup on trigger input when checked.
None radio button	Disables IO
Threshold	Sets the input threshold voltage (in volts) for the IO. Range is 0 to 6.6V
Trigger In (Input 3) checkbox	Enables input 3 for trigger input
Input Status	Shows the current level of the 3 inputs after optional inversions are applied
Trigger Delay	Specifies the delay in frames from trigger input becoming active to record stop
Apply button	Applies IO settings but leaves window open
OK button	Applies IO settings and closes window
Cancel button	Discards changes and closes window

Playback Mode

[Screenshot of playback window]

Control	Function
Playback Slider	Scroll bar controls playback position over the entire recording. The bottom is the beginning of the buffer, the top is the end.
Jogwheel (physical dial)	Turn to control playback. Clockwise moves playback forward one frame per detent, or 40 frames per detent when clicked down and held while turning.
Play forward/reverse	Plays back video in forward or reverse, at speed specified by Play Rate control
Play Rate	Up/down arrow buttons increase or decrease playback rate when play buttons are pressed. Range: 4.6 to 960fps. This control does **NOT** affect the playback rate of saved video.
Frame/Mark indicators	Shows the current frame, number of frames recorded, and the current mark in and mark out frame positions
Mark In/Mark Out buttons	Sets the mark in or mark out position to the current frame
Settings button	Shows the Save Settings window
Save button	Starts saving the video between the mark in and mark out points
Close button	Returns to live video mode. This does not erase the recording; it will remain until a new recording is started

Save Settings

Control	Function
Bits per pixel	Primary quality control for saved video. Resolution- and Frame rate-independent control of video bitrate. This sets the number of bits per pixel of encoded output video
Resultant bitrate	Shows the bitrate and frame rate calculated from the bits per pixel setting
Playback Framerate	Sets the frame rate for saved video files. This is currently limited to integers (whole numbers), so rates such as 59.94fps are not currently supported. These rates can be achieved by reinterpreting the frame rate in your video editor.
h264 profile	Sets the h264 encoding level.
h264 Level	Sets the H264 encoding Level.
Save Location	Selects the storage device for saved video. This list automatically refreshes, it may take several seconds for newly inserted devices to appear
Filename	Sets the filename for saved video, on the device selected in Save Location. Leaving this field blank results in autoname, resulting in files named vid_<date and time>.mp4
Safely Remove	Ejects the selected storage device, allowing you to safely remove it from the system.
Close button	Returns to Playback window (Settings are applied automatically as they are changed)

Util page

[Screenshot of Util window]

Control	Function
Eject buttons	Ejects the selected storage device, allowing you to safely remove it from the system. Wait for the confirmation dialog to appear before removing the device.
Clock Setting	Allows you to adjust the camera's date and clock. Tap on the box until a cursor is visible, then

	you can use the arrow keys to select and adjust values, or type in numerical values
Set New Time button	Applies the current time in the clock adjustment box to the camera's clock
Focus Peaking Enable checkbox	Enables or disables focus peaking function which highlights sharp edges
Focus peaking sensitivity radio buttons	These radio buttons select how sensitive the focus peaking algorithm is. Increased sensitivity will lead to more noise, but will pick up dark edges better. Lower sensitivity will allow more accurate focusing on bright edges
Focus peaking color dropdown	Selects the color used to highlight edges
Enable Zebras checkbox	Enables or disables the overexposure indicator which shows a rolling zebra line pattern on areas of the image that are clipped
Apply Software Update button	Applies a software update from a USB drive. Follow instructions provided with the software update
Backup Calibration Data button	Saves the camera's factory calibration data to a USB drive. It is recommended to do this and keep a copy in case the camera's OS SD card becomes corrupt and needs to be reflashed.
Restore Calibration data button	Restores the camera's factory calibration data from a USB drive.
Kickstarter Backers tab	Lists all of the Chronos 1.4 Kickstarter project backers
Close button	Returns to the Main window (Settings are applied automatically as they are changed)

Setting resolution and frame rate

Chronos 1.4 allows you to trade image resolution for frame rate. In many applications, temporal resolution (frame rate) is far more important than spatial resolution (image resolution). Don't be afraid to turn the resolution down!

Frame rates can be set on the record settings page. This page is shown below:

[Picture of record settings page]

The image resolution can be adjusted in two ways. Common preset resolutions are available from the drop down menu on the bottom left. There are also direct controls of resolution at the top right. Resolution can be adjusted in increments of 16 pixels horizontally and 2 pixels vertically. Tap on the text box to enter a resolution using the keyboard, or use the up/down buttons to adjust in minimum increments. As the resolution is changed, the Region of Interest (ROI) display shows the resulting image size within the full 1280x1024 image sensor resolution. The maximum frame rate and minimum frame period is displayed under the ROI display.

Once the desired resolution is set, the frame rate can be adjusted anywhere from 0.025fps up to the maximum displayed under the ROI display. The Max buttons will set the resolution and exposure to their respective maximum values for the current resolution.

Custom resolution calibration

When using resolutions other than those shown in the Common Resolutions dropdown box, it is very important to do a black calibration, as only the Common Resolutions are black calibrated at the factory. When a new (never before used

on this camera) resolution is selected, a basic black calibration is done with the shutter at minimum. This allows a reasonable image display for immediate use, but a full black calibration is required for best quality.

Black Calibration

For best image quality, the camera automatically subtracts a black reference image from all normal images during operation. This corrects for pixel offsets that occur on the camera's image sensor. This black reference is updated by doing a black calibration.

Black calibration is separate for each resolution and gain setting, ie. a black calibration done at 1280x1024 0dB gain does not apply to 1280x1024 6dB gain.

For best image quality, perform a black calibration:

- After changing the resolution, frame rate or shutter speed
- After the camera's temperature has changed significantly
- After the camera has reached a stable temperature

It is recommended to let the camera reach normal operating temperature before performing a black cal. Let the camera run for about 15 minutes to reach normal operating temperature.

Performing Black Cal

Perform the black cal by either closing the iris fully, or (if the lens doesn't have an iris that can be fully closed) putting the lens cap on. Once all light is completely blocked from entering the image sensor, tap the black cal button on the main screen. The record LED will flash for a short period as the camera records the black reference frames. The black reference will then be calculated by averaging 16 frames. This process takes some time, up to about 25 seconds depending on resolution. This will be sped up greatly in a future software update.

Once the record light has flashed and is out, you can safely open the iris or remove the lens cap, as the black reference frames are fully captured. You can continue setting up your shot (such as focus) while the black cal is being computed.

Once the black cal is done, the message will go away and the camera is ready to use. The black cal is persistent across restarts and will be remembered the next time you use the same resolution.

Triggering

Synchronizing to external sources

Setting IO functionality

Recording

Playback

Saving

DRAFT

Maintenance and care

Optics

- Keep the optical area clean when changing lenses by keeping the body and lens mount caps on when the lens is separated from the camera
- If the lens or sensor/IR filter is dusty, remove the dust with air using clean, dry compressed air, dusting gas, or a dusting squeeze bulb.
- If the above is not able to remove the dust, use a brush or lens pen.
- If there is dust under the IR filter, you can remove the filter for cleaning. See Removing the IR filter.

Camera body

- Do not expose the camera to moisture, rain, or excessively dusty environments, contamination may enter the camera and cause damage.
- The camera body can be cleaned with a lint-free cloth, and optionally a small amount of rubbing alcohol. Do not use excessive liquids as they may enter the camera body.

Screen

The touchscreen surface is glass. Don't strike it with hard objects or put excessive pressure on the screen, or the glass may break.

- The screen should be cleaned with a soft lint-free or microfiber cloth.
- A small amount of glass cleaner or rubbing alcohol may be applied to the cloth if required. Don't use excessive amounts, and don't spray glass cleaner directly on the camera.

Storage/Shipping

- Store the camera in a cool, dry, and clean location.
- When shipping the camera, it's recommended to put it in a plastic bag with desiccant to avoid problems with condensation during temperature changes.
- If the camera will be stored for more than a few weeks, charge or discharge the battery to approximately 40% charge, then turn off the camera and remove the battery. This will minimize battery capacity degradation during storage
- Always remove the battery for shipping to avoid the possibility of the camera turning on in-transit.

DRAFT

Specifications

Camera	*Imaging*	1280x1024 1057fps, see resolution table for details
	Memory	8GB or 16GB
	Record time	4 seconds (8GB), 8 seconds (16GB)
	Lens mount	CS mount, C mount with included adapter
	Backfocus	Field adjustable
	IR Filter	650nm, user removable, 15 x 15 x 1.1mm
	Display	5" 800x480 capacitive touchscreen
	Enclosure	Anodized CNC machined aluminum
	Cooling	Active cooling, variable-speed fan
	Dimensions	155mm x 96mm x 67.3mm (6.11" x 3.78" x 2.65") without lens
	Weight	1.06kg (2.34 lbs) without lens
Video formats	*H.264*	Industry-standard mp4 files at bitrates up to 60Mbps
	*cinemaDNG Raw**	Standard Adobe cinemaDNG raw files
Image Sensor	*Resolution*	1280x1024 @ 1057fps
	Speed	1.4Gpx/s - Full throughput down to 336 pixel image width
	Dimensions	8.45 x 6.76mm
	Pixel pitch	6.6um
	Sensitivity (ISO)	Color - ISO 320 to 5 120 Mono - ISO 740 to 11 840
	Shutter	Electronic global shutter, 1/fps to 2us (1/500 000 s)
	Dynamic range	56.7 dB
	Bit depth	12-bit
Battery	*Type*	EN-EL4a
	Runtime	1.5 hours recording
	Charge time	2 hours (0-80%) with in-camera charger
IO	*Power Input*	17-21V 40W 5.5/2.5mm barrel jack, positive tip
	*Network**	Gigabit Ethernet
	Trigger	Two Trigger inputs/frame strobe outputs (BNC and Aux) Adjustable input threshold 0 to 6.6V Electrically isolated trigger input (Aux connector)
	*Audio**	Microphone/Line input, headphone output
	*Video**	HDMI output, video or video+menus
	USB	Two USB host ports (one on mini-B via USB OTG cable)
	SATA	eSATA 3G
	*Analog input**	1MSa/s 12-bit, 200kHz bandwidth, +/- 1V full scale
Trigger modes	*Normal triggered*	Camera records until a defined delay after a trigger
	Triggered start	Camera starts recording a defined delay after a trigger
Trigger Sources	*Electrical*	0-6.6V threshold, optional button debounce and pullup
	*Audio**	Trigger on loud sounds
	*Acceleration**	Trigger on camera motion, tilt or shock
	*Image**	Trigger on image changes

DRAFT

Recording modes	*Normal*	Records into the circular buffer. Once a trigger occurs, video can be reviewed and saved
	*Segmented**	RAM is divided into segments, each recording as in the Normal mode above. Number of segments is user selectable.
	*Continuous**	Video is saved continuously at up to 60fps to mp4 files on removable storage. Operates like a normal video camera.
	*Run-n-Gun**	Bursts of video are saved to RAM while holding down the shutter button. Video is saved to storage devices automatically. More bursts can be captured simultaneously while video is saving.
	*Gated burst**	Frames are captured while trigger is active
	*Normal + continuous**	High-speed video is recorded to the RAM buffer while simultaneously 60fps videos is saved to removable storage
Shutter timing	*Normal*	Frame rate and exposure time are controlled by camera
	*Edge triggered**	A single frame is captured on each rising or falling edge of an external input. Exposure is controlled by camera
	*Shutter gating**	Image sensor shutter is directly controlled by an external input, exposing while the input is active
Assistive	*Focus Peaking*	Highlights sharp edges to aid focusing
	Zebras	Rolling diagonal lines indicate clipped (overexposed) areas
	Focus Aid	Zooms in to allow easier focusing

Mechanical drawing

[Mechanical drawings here]

DRAFT