FreewayCAM
Digital (IP) LPR Camera

ARH

USER'S MANUAL

FreewayCAM User's Manual

For versions from 3.1.2

Document version: 2015.11.24

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About this Manual

The aim of this guide is to help users to operate the camera and to make the most of it.
With the provided information below, users can easily manage the camera through its web interface.

Key Features

- Auto brightness control designed for license plate recognition
- Automatic day-night mode switch, autofocus
- Camera image rotation (180°), horizontal and vertical mirroring
- Illuminant color compensation, automatic white balance
- Frame filtering
- Hardware motion detection
- Low bandwidth usage, built-in adjustable image compression
- Automatic time synchronization (NTP)
- Trigger IN/OUT
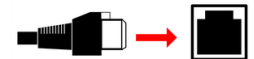- H264 compatibility
- ONVIF compatibility

Accessing the Camera

In order to access the camera, it has to be connected appropriately. For more information, see FreewayCAM Install Guides.
For communication with the camera, camera commands have to be used. The easiest way of handling these commands is through the web interface of the camera. For more information on other communication methods see FreewayCAM Programmer's Manuals.

Access from Browsers

> **Steps of accessing the web interface of the camera from a browser:**
>
> 1. **Connect the camera to a computer or network switch then power it on**. After it is powered on, both status LEDs (red and green on the camera front) are turned on while the camera is booting. After finished, the green status LED flashes two times while the red one turns off signaling that the camera is ready for operation.
>
> 2. Enter an alternate IP address (or set your computer's IP) in the 192.0.2.x subnet – where x is an integer number between 1 and 254 **except 3** – with the subnet mask of 255.255.255.0.
>
>   User configured
>   IP address: 192 . 0 . 2 . 54
>   Subnet mask: 255 . 255 . 255 . 0
>
> 3. **Use the ping command** to test the communication with the camera
>
>   **Windows:**   **Linux:**
>   **C:\>ping -t 192.0.2.3**   **username@mylinux:~$ ping 192.0.2.3**
>
> 4. Soon, the ping package returns: **Reply from 192.0.2.3.** If not:
>   - first check the Ethernet LEDs at the PC or the switch side
>   - check whether the IP address is set correctly; the own IP address of the PC can be pinged.
>   - proxy is set in the browser or the browser is not set to offline.
>
>   If these obstacles are checked and there is still no reply, power off then on and enter the previous ping command again.
>
> 5. **Start a browser** then enter the default IP address of the camera into the address bar (**http://192.0.2.3**). After this, the camera starts with administrator privileges, ready to be set up and configured.
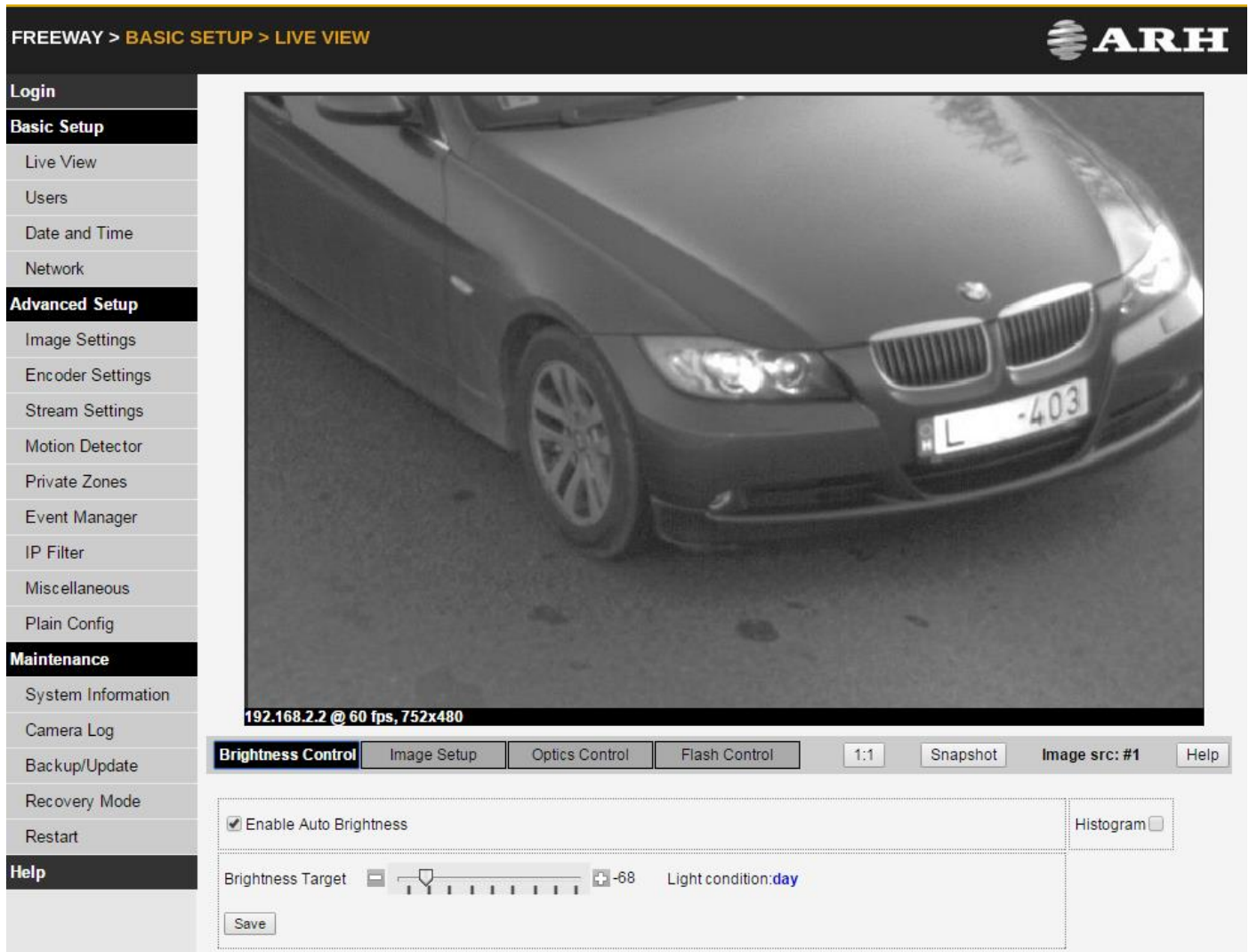>
>   For more information on accessing the camera, see FreewayCAM Install Guide.

Login

Basic Setup

Live View

The live image of the camera can be viewed on this page.

Under the camera image, a status bar is located providing the following information:
- IP address of the camera,
- The currently used FPS of the camera,
- The current resolution of the camera.

Saving still images and video streams

With the help of the *http://IP address/scapture* command, it is possible to get a camera image (in JPEG format) in order to examine the size of it or to check the height of the characters on the license plate in pixels, etc.
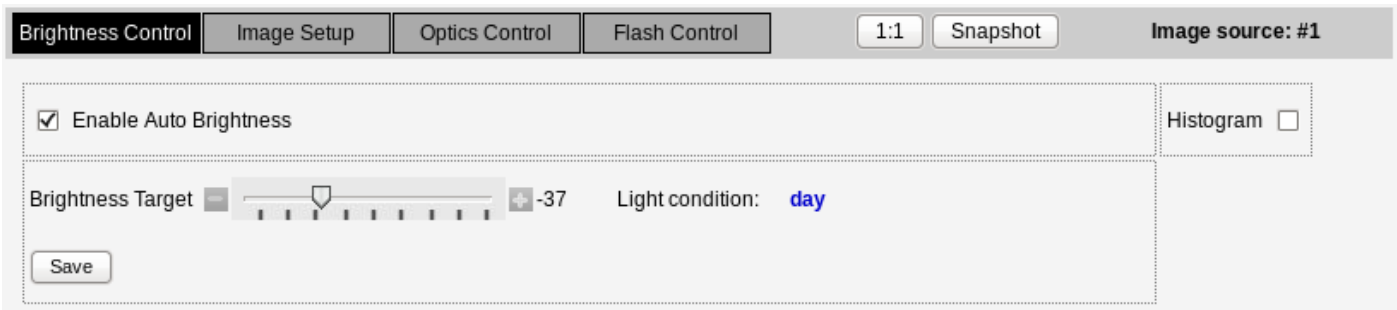
The camera displays the MJPEG stream on port 9901. Entering the command *http://IP:9901* will provide the live video stream.

Brightness Control

1:1: serves for the enlargement of the image. By clicking this button, the live image will be opened in a new window.

Snapshot: it is possible to save a camera image (in JPEG format) in order to examine the size of it or to check the height of the characters on the license plate in pixels, etc.
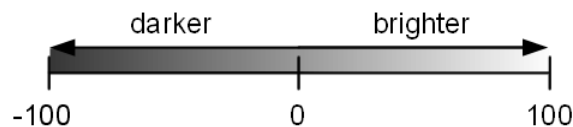
Enable Auto Brightness: if auto brightness is enabled, an automatic strategy is used to adjust the brightness of the camera image.

Histogram - Enable it to draw image histogram on the camera view.
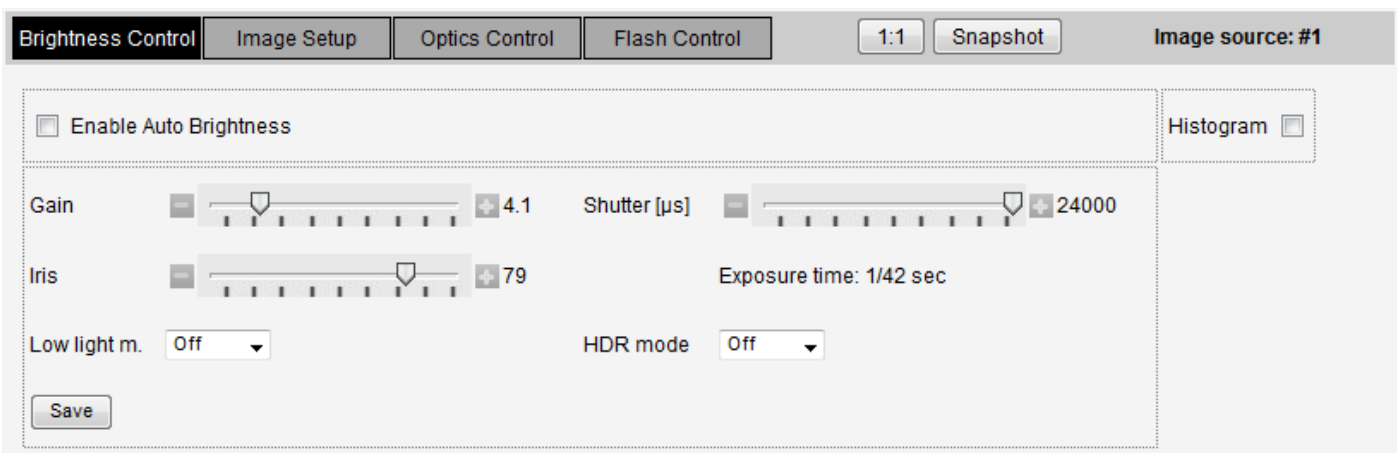
Brightness Target

Light condition: brightness settings can be set for day and night light conditions respectively. The light condition returns the value **day** or **night** based on the camera light sensor.

On the bottom of the appropriate pages a [**Save**] button can be found to save the modified parameters.

The following control panel can be seen if the Auto Brightness mode is disabled:

Gain: gain is the extent to which the strength of a video signal is boosted. Note that high gain values result in noisy images.

Iris: iris is a mechanical device that controls the amount of light reaching the sensor. If 0 then no light can pass through to the camera sensor.

Shutter: controls the length of exposure time. Too high shutter values may result in blurred images.

Exposure time: displays the current shutter speed (fraction of seconds – in 1/sec).

Low light mode: provides not only digital gain, but smoothen the over-burnt parts of the images. This enhancement can be used in case of low light conditions, where the sensor will be set according to these conditions and a digital gain will be applied for burnout reduction.

HDR mode: also known as High Dynamic Range. All areas of an image – from the lightest to darkest parts – are properly exposed. Cameras with HDR mode have the ability to accurately expose bright backgrounds and dim foregrounds (and vice versa). This mode slightly changes the colors of the image as well. This mode increases the consumption of the camera.

NOTE: Flash Intensity cannot be adjusted in case of 1.3MP camera models.

Image Setup

Selected source: two different sources can be assigned to the camera.

Gamma: gamma correction used on the camera image.

Brightness: brightness of the camera image can be adjusted manually.

Contrast: adjust this control to change the contrast of the camera image.
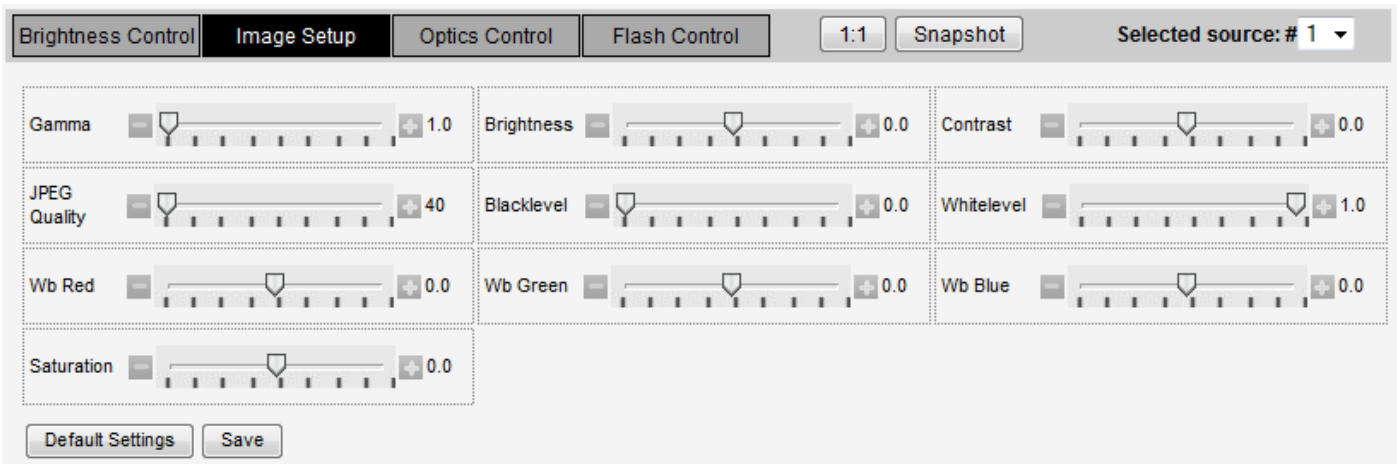
JPEG Quality: the quality of the captured images can be set. The higher this value is, the better the quality and the size of the images will be. Note, that images of better quality are greater in size therefore, they increase network load. For that reason, it is not recommended to set this value above 80. The network transmission must not go over 40 MBit (~4MByte/sec), so the image quality should be chosen according to this.
E.g. if the size of an image is 35 kBytes and the images are transmitted with 30 FPS, it means 35*30 kBytes/s = 1050 kBytes/s ~ 1 MByte/s.

Blacklevel: defines the lowest pixel value that will be mapped to black. This will be the starting point of the gamma curve. Values between 0 and 1.0 are valid.

Whitelevel: defines the highest pixel value that will be mapped to white. This will be the ending point of the gamma curve. Values between 0 and 1.0 are valid.

NOTE: Incorrect whitelevel and blacklevel values may cause entirely black or entirely white camera image. In such cases, reset the whitelevel and blacklevel values to default (whitelevel=1 and blacklevel=0) to restore the camera's live view. See Appendices to inspect the effect of adjusting the main image properties.

Parameters for Color Cameras Only

Wb. Red, Wb. Green, Wb. Blue: with the help of the whitebalance parameters, the gain of the individual color channels can be adjusted: the red, green and blue components can be enhanced (moved to positive direction) and reduced (moved to negative direction). Because of such adjustments, shade of the image color can be altered.

Saturation: the intensity of colors can be adjusted by saturation. See appendices to inspect the changes of saturation value.

Click the [**Default Settings**] button to reset the settings to the defaults.

On the bottom of the appropriate pages a [**Save**] button can be found to save the modified parameters.

Optics Control

Focus: manual focus adjustment. Set focus to make the camera image sharp. Follow the below instructions to calibrate the focus properly:

- point the camera to a static background (preferably a license plate) at the desired target distance,
- turn off the automatic brightness control,
- open the iris fully,
- the image should be a bit overburnt,
- set focus, than close the iris until getting a properly lit and sharp image or use the autofocus feature,
- click save to store the position of the optic.

Autofocus: by autofocus, the camera adjusts focus automatically until it detects that the camera image is sharp enough. Auto-focusing may also include automatic brightness adjustment if the brightness of the camera image is not satisfactory for the auto-focusing process.
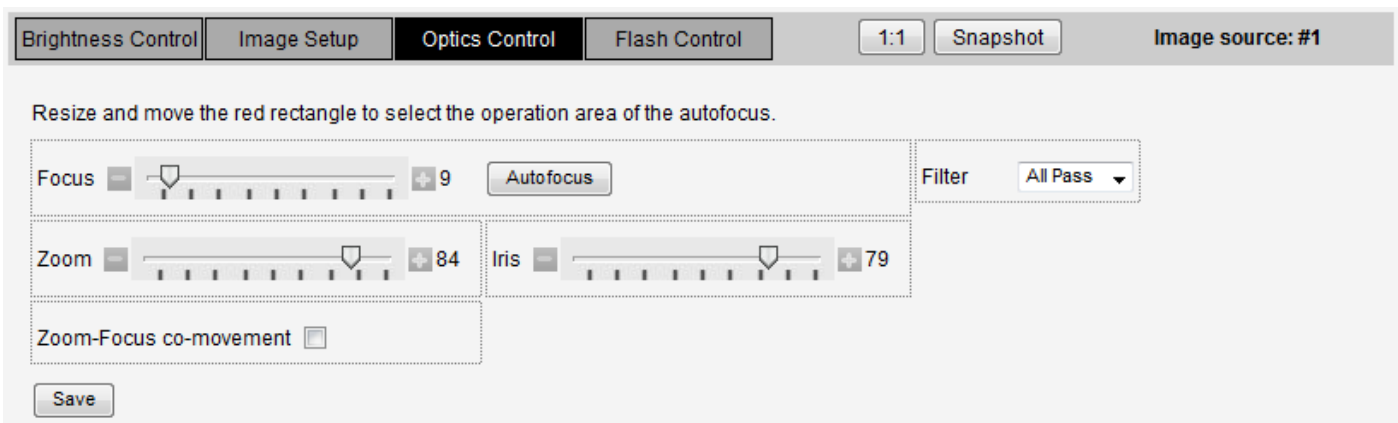
NOTE: The camera is capable of focusing to a specified area within its view (e.g. on a license plate). Move and resize the red rectangle on the camera image to set this area for the autofocus.

Filter: this parameter is available only for cameras equipped with filter switchers. The state of a filter switcher can be of two types:

- **All pass** - The filter passes both visible and infrared light, use this setting when infrared illumination is present and necessary (typically at nighttime capturing).
- **IR cut** - The filter cuts out infrared light to maintain color fidelity on color images.

Zoom: manual zoom adjustment. Set zoom to reach the intended camera view.

Iris: iris is a mechanical device that controls the amount of light reaching the sensor. If 0 then no light can pass through to the camera sensor.

Zoom-Focus co-movement: it can be set by the scroll-down menu.

- Off
- Auto
- Manual

Automatically:
When zooming manually, the camera calibrates the focus automatically to provide sharp image.
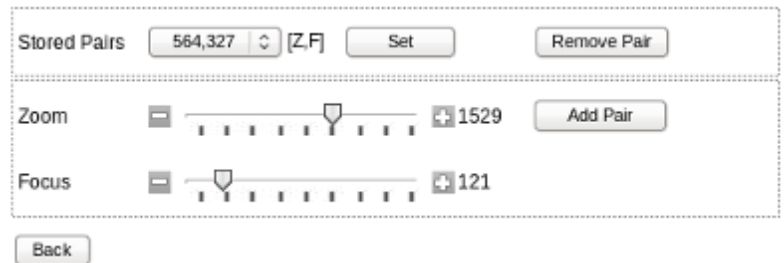
Process of enabling the Zoom-focus co-movement:

1. turn off the auto brightness controller,
2. open the iris fully (adjust iris to 100),
3. adjust zoom to 98,
4. the image has to be sharp (usage of the autofocus button, then correction if necessary by the +/- buttons near the focus slider,
5. turn on the zoom-focus co-movement.

Manually:
Selection can be made among preset zoom-focus pairs. These pairs are defined by the user and their number can be optional. During the operation, the camera sets automatically the corresponding focus (which may be selected only from the previously defined ones) to the zoom.

Defining new pairs and deleting old pairs can be managed anytime in the **Setup** menu.
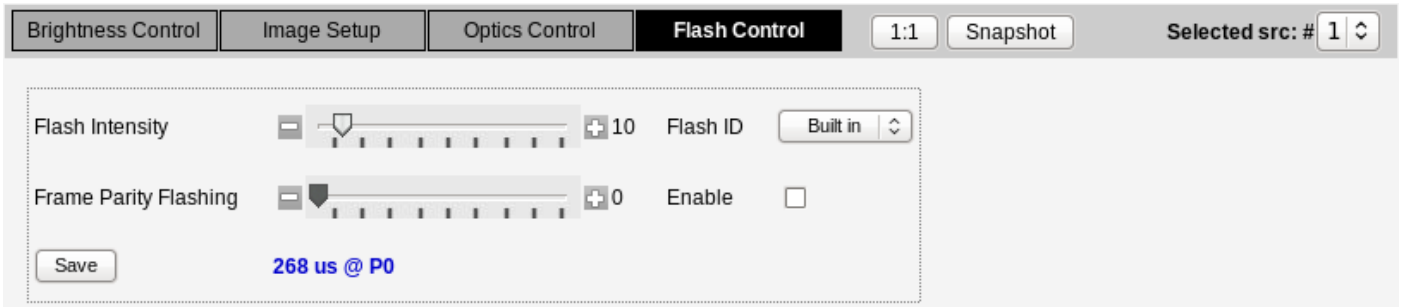

NOTE:

- the slider of the focus is disabled
- selecting the manual mode, the zoom will be set to the lowest among the previously stored values, if the current zoom value is not between the pairs

Flash Control

In the Flash Control section, the following parameters of the camera illumination can be set.

The flashing time and the flash power are indicated at the bottom of the setting panel near the [**Save**] button.

Flash Intensity: By this parameter, the light output of the camera illuminator can be adjusted in percent (the flashlight and the flash power is adjusted).

Frame Parity Flashing: This option can be used to setup the camera for reading both reflective and non-reflective license plates. It is realized by switching to lower and higher light output between odd and even frames. With this illuminating technique, the camera captures images with more and less intensive illumination. The former images will be suitable for the recognition of non-reflective license plates, while the latter ones are for reflective plates. If 'Enable/Disable' is selected, this value stands for the illuminating light output for odd frames and is represented as a percentage of the Flash Intensity value.

E.g. if Flash Intensity is set to 50 and Frame Parity Flashing is set to 20 then the camera will flash with 50% power on even frames and 10% (20% of the 50%) on odd frames.

If the **multi mode** is enabled, the Flash intensity is valid on the source #1 and the Frame Parity Flashing is valid on the source #2. Streams with different flash intensity can be viewed and saved by this. Additional settings may be different as well on the two streams (see: Image Settings).

NOTE: To assign Flash Intensity and Frame Parity Flashing values for brightness modes/light conditions, check 'Enable Auto Brightness' on the Brightness Control Tab and click the [**Save**] button on the Flash Control Tab.

In this case the following screen will appear where the set flash parameters can be saved separately for `day` and `night` light conditions for the built-in illuminators of the camera:

In case of cameras equipped with CMOS sensor the camera illumination can be only enabled or disabled.

| Brightness Control | Image Setup | Optics Control | Flash Control | 1:1 | Snapshot | Selected src: # 1 ↕ |

Enable Flash ☐

Save

Users

Settings related to users can be managed on this page. The camera handles users on five different access levels (detailed below). Users can be deleted and edited with the corresponding buttons.

NOTE:
- Edited user settings will be applied only after restarting the camera.
- The camera automatically starts with administrator rights. In order to create new users, a user with 'admin' privileges must be created first.

Adding new users: New user profiles can be created after clicking on **Add new user** button. In the appearing form, data and the access level of the new user must be provided into the corresponding fields.

Edit/Delete: It is possible to edit or delete all existing users from the system.

Access level of unauthorized users: The camera can be enabled to be accessed by users who are unauthorized. The access level of such users can be set up by this option.

NOTE: Users with 'Guest' access level cannot be created; this access level can be set up as 'Access level of unauthorized users'.

Access levels of the camera

Access level	Privileges	
Guest	No privileges, only login page	
Viewer	Login Live View Help	
Normal user	Login	
	Basic Setup	> Live View
	Advanced Setup	> Motion Detector Private Zones Event Manager
	Maintenance	> System Information Camera Log
	Help	
Power user	Basic Setup	> Live View
	Advanced Setup	> All menu items
	Maintenance	> System Information > Camera Log > Restart
	Help	
Administrator	Access to every camera feature	

Date and Time

Manage date and time settings of the camera easily on this page according to the followings:

Setting camera time

I.   Manually

Type the **Date** and **Time** values into the corresponding fields, select the Time zone then click **Set these values** button. This button appears after adjusting the data.

II. Automatically

a) Adopt the time of the PC

Click **Get the time of the PC** to adopt time and date settings of the PC connected to the camera then click **Set these values**.

b) NTP synchronization

- **Off:** no NTP synchronization,
- **Regular NTP client:** Regular NTP synchronization,
- **Local network NTP client:** query and synchronization in every minute on the local network.

The **Regular NTP client** implements everything according to the NTP standard. It has to be used when the NTP server is not on the local network or in case maximum 1-second accuracy is sufficient.

The **Local network NTP client** solution can only be used if the camera and the NTP server are located on the same local network. The NTP client of the camera sends requests to the NTP server in every minute (or more often if necessary) and synchronizes the clock of the camera with high accuracy. Thus, it causes higher load for the NTP server more than the other solution.

Parameters

- **NTP server hostname/IP**: The address of the NTP server can be set here. The port number can be (but not necessary) specified separated by semicolon. It is 123 by default.
- **Max. I/O time [ms]**: The time of the communication between the camera and the NTP server. The maximum query time can be specified. Usually it is 1ms on a local network. Values between 1 and 10ms can be entered here.

- **Accuracy**: The accuracy of the camera synchronization with the NTP server can be specified here. This is the expected value and the camera can achieve less accuracy (according to the average I/O time) under appropriate conditions. Values between 10 and 1000ms can be entered here.
- **Log**: If it is enabled, messages are sent continuous about the synchronization that can be seen at the Maintenance/Camera log of the web interface.

Use **Time Zone** option to set the time zone according to your region. Click Set these values to apply new time zone.

NOTE: The camera has an internal battery feeding its Real Time Clock (RTC) while the camera is powered off. If this battery is low or down then the camera clock is reseted every time it is disconnected from power. In case of such a problem, contact ARH Support Team.

Network Setup

Hostname: the host name of the camera has to be entered into this field.

The camera can operate in **DHCP** mode in which the camera queries the IP address, Netmask, Gateway, Primary DNS IP and Secondary DNS IP from the server. Otherwise, these values have to be set by the user.

IP version 4 and 6: the camera supports IPv4 and IPv6. Both versions can be enabled simultaneously, but at least one version must be set. When using IPv4, the IP address for the camera can be set automatically via DHCP, or a static IP address can be set manually. Note that only IPv6 fixed IPv6 addresses are supported.

Settings are applied after clicking on **Save**.

NOTE:
- In case of IPv6 addresses /16 stands for the length of the subnet mask (16 refers to an 8 character long mask).
- Two IP addresses can be assigned.

Network setup	
Hostname:	ARHDEV
DHCP:	☐

IPv4 settings

IP address:	192.168.2.3
Netmask:	255.255.255.0
IP address 2:	
Netmask 2:	
Gateway:	192.168.2.254
Primary DNS IP:	
Secondary DNS IP:	

IPv6 settings

IP address:	/
Primary DNS IP:	
Secondary DNS IP:	

Advanced Setup

Image Settings

Image source settings

The camera is capable of the so-called **Multi Mode Imaging**, which means capturing images by one sensor alternately with different settings and collecting them into multiple streams. This feature may be useful in case if the user wants to have a good quality image sequence for ANPR purposes and an image sequence with lower quality for displaying purposes.

If any changes are done here, a warning message will appear. In this case, click **Validate these settings** button to validate the modifications.

If the multi mode is enabled:

- Name of the streams: source #1, source #2
  For example: in case of a WideVGA sensor, operating at 60 FPS,
  two streams will be created, both at 30 FPS
- Even with different resolution
- Even with color / black and white mode
  (WEB INTERFACE > ADVANCED SETUP > PLAIN CONFIG > capture > scapture, scolor parameter)
  (WEB INTERFACE > ADVANCED SETUP > PLAIN CONFIG > control > brightnesscontrol, scolor_day, scolor_night parameters)
- Can be used in case of reflective/non-reflective license plates (Flash Control)
- Can be used in case of Overview/ANPR (no need for two sensors)
- Since the camera is equipped with one sensor, the shutter and gain settings are common
- Since the camera is equipped with one optic, the Iris, Focus and Zoom are common as well

Enable multi mode: It can be enabled or disabled by ticking the checkbox.

Frame limiter settings

The Input box shows the number of frames the sensor captures in one second. The actual number of frames processed by the camera can be further reduced with the help of the frame limiters.
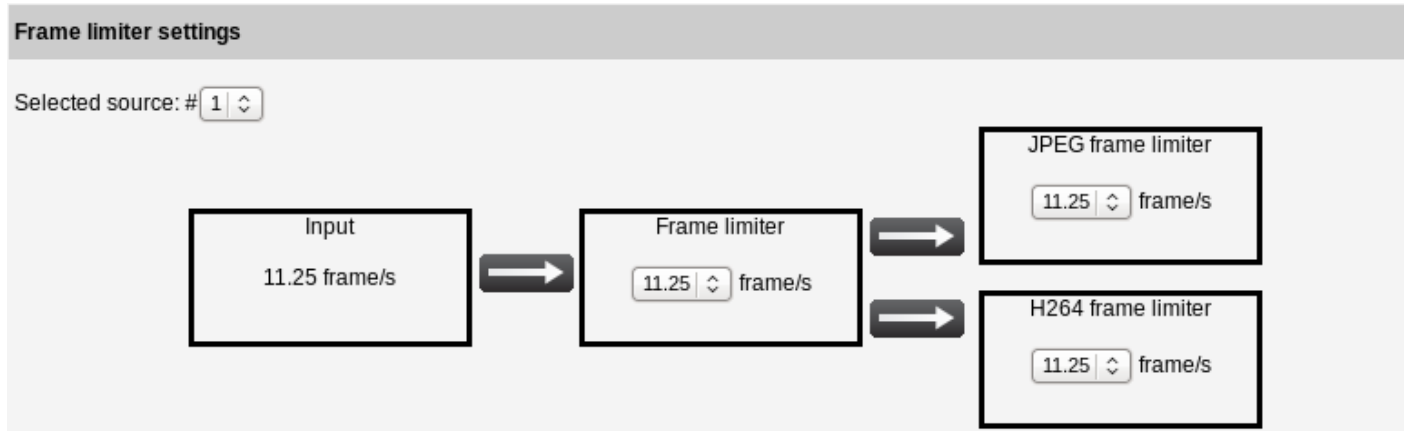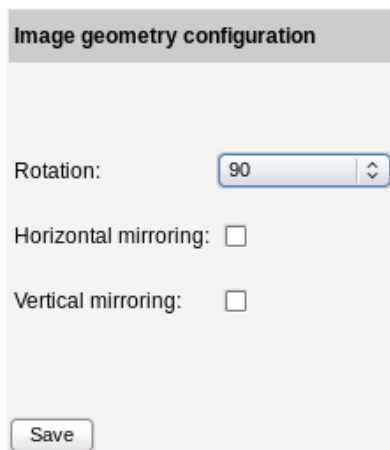If **dual stream** is enabled (enable H264 encoder):

Image geometry configuration

The system is capable of rotating and mirroring images.

- **Rotate in degrees** (0 or 180). Camera image rotation in degrees.
- **Horizontal mirroring**: If ticked then horizontal mirroring is enabled.
- **Vertical mirroring**: If ticked then vertical mirroring is enabled.

Moreover, the system can change the direction of the distortion in case of cameras with rolling-shutter to achieve more ideal image quality for ANPR processes.

Encoder Settings

JPEG encoder settings

NOTE: Contrary to the H264 stream, it can be disabled.

EXIF description of JPEG file: any string can be entered here, which will be written into each JPEG image. It can be retrieved later by an image viewer program.

JPEG quality: quality setting of the image according to the JPEG standards. Values: 40 – 90, where 40 is the worst image quality. This low value is recommended for overview purposes.
Default value: 80 for ANPR purposes.

Ignore JPEG skip frames if event occurred: if it is checked, images are captured continuously even when the frame limiter is set to a lower frame transmission.

Using the event quality: higher image quality can be set, if an event or a motion or both occurred in the image.
The quality of the image can be determined be the **Quality if event occurred** scroll thumb.

On the right upper side of this section, the source can be selected on which these settings have to be applied.

H264 encoder settings

In case of enabling the multi mode the H264 stream can be activated for both the Source #1 and Source #2 as well, so in this way two MJPEG and two H264 streams can be used simultaneously as well.

The H264 encoder can be enabled or disabled by the **Enable H264 encoder** checkbox.

Size of the group contains I and P frames: I-frame (intra coded image) – reference image, which represents a fixed image and which is independent of other image types. Each group of images begins with this type if image. P-frame (predictive coded image) – contains motion-compensated difference information from the preceding and following I- or P-frame within the group if images.
If this field is set to 50, a key frame (I-frame) has to be made after 50 frames by all means.
Default value: 16.

Average bitrate: in this field the desired bandwidth can be defined for the camera in kbit/s.

H264 quality: in case of the H264 encoder if this value is set to 12 that means that only a slight image compression is applied (the best image quality).
If it is set to 51 compression is applied (the worst image quality).
Default value: 26.

H264 quality delta: the amount of deviation of the actual quality value from the set value (H264 quality) in order to keep the Average bitrate constant.

Ignore H264 skip frames if event occurred: if it is checked, images are captured continuously even when the frame limiter is set to a lower frame transmission.

Setup the I-frame handler if event occurred, select from the followings**:**
- Use the size of the group contains I and P frames
- If new events occurred it starts with the I frame (next maybe P)
- All frames will be I frames as long as events last

Using the event quality: if it is set to **Never**, everything happens according to the above settings. If anything else is set, different settings can be applied.

For example: a higher image quality (**H264 quality**) and deviation from this quality (**H264 quality delta**) can be set, if an event or a motion or both occurred in the image.
So the above quality settings can be overridden here.

Window quality if event occurred: the area, where the movement occurred can be improved here.

Stream Settings

It is possible to connect to the MJPEG and H264 streams via eight stream servers. Each server can be configured individually (port, FPS, etc.).

A green rectangle below shows that the current server is turned on. If this rectangle is red, the server is turned off.

Enable: turns on/off the current server.

Image source: if the multimode is turned on, the desired source can be defined here (if the multi mode is turned on, the image source can be 2).

Image channel: the desired channel can be selected here (Motion Detection, JPEG, H.264).

Streaming type: different streaming types can be defined at each channel.

Image channel	Streaming type
Motion detection	H264 Elementary Stream
	MKV (Matroska) container
JPEG	Multipart JPEG
	RAW JPEG
	MKV (Matroska) container
H264	H264 Elementary Stream
	MKV (Matroska) container
	MP4 container

Streaming port: the user can define the port on which the stream can be reached.

RTP link: the stream can be reached by this link as well by using RTP.

Number of skipped frames: if the image channel is set to JPEG, the number of frames reduced at Image Settings menu item of the Advanced Setup can be further divided here by omitting frames from the image stream. The frame rate of the current stream is displayed near the Number of sipped frames.

Maximum number of simultaneous connections: Default: 2.

Idle connection limit (in seconds): Default: 10.

Frame limit: connection is closed as the number of frames the camera has sent reaches this value. Default: 0 (0 = no limit).

Connection time limit: connection is closed after this time is up. It represents the maximal length of connection time in seconds. Default: 0 (0 = no limit).

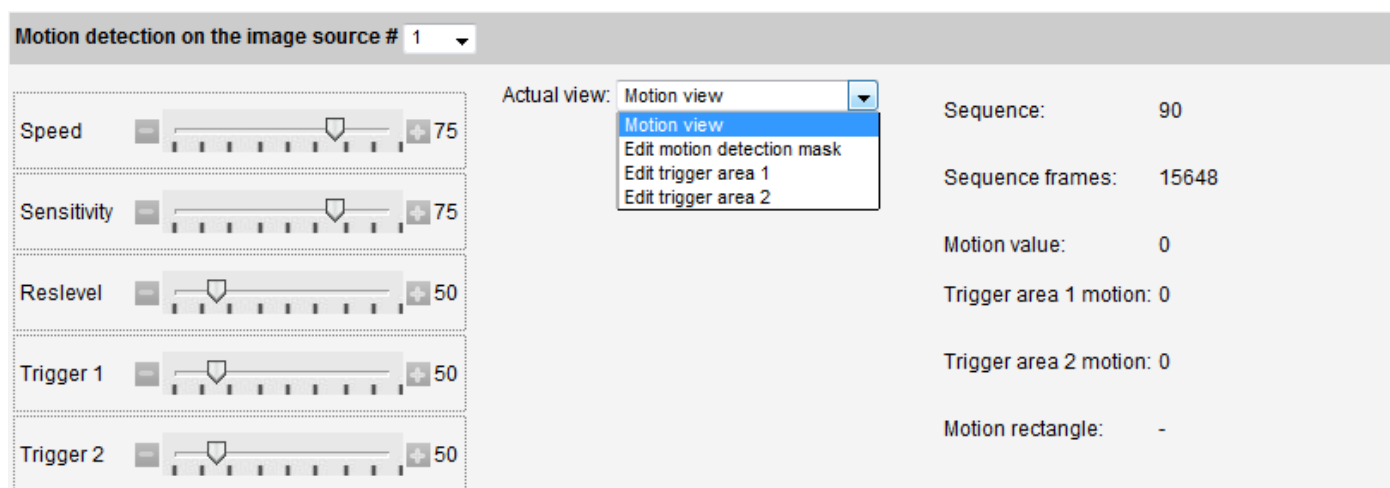**Handling motion detection frames**, select from the followings:
- Store frames if motion detected
- Store frames if motion detected in trigger zone #1
- Store frames if motion detected in trigger zone #2

Values are applied for the current server by clicking the **Save for the server #** button that will appear after modifications.

By the **Start recording** button the stream can be saved continuously with the above set parameters until it is stopped by the **Stop recording** button.

Motion Detector

The motion detection can be assigned to one of the sources. It is turned off by default.

Speed: by setting the speed of the motion detector, it can be specified that how fast pixel changes should be considered as motions. If this value is set too low then slow ambient brightness changes (e.g. cloudy/sunny weather) may be considered as motion. If set too high, even a lightning can trigger signaling motion.

Sensitivity: by sensitivity, it can be set that what extent of pixel changes of the camera image should be considered as motion. If low, then minimal pixel changes are sufficient to cause motion, if high, only great pixel changes initiate motion.

Reslevel: motion limit. The extent of pixel changes below which the detected motion is ignored (the **Motion** text does not appear). The system examines the motion on a reduced image (64x64).

Trigger1 / Trigger2: two different trigger areas can be set. By these scroll thumbs the sensitivity level of these areas can be defined.

NOTE
- Each trigger areas can be registered separately on the Event Manager page (output 1: trigger area 1, output 2: trigger area 2, output 0: if motion occurred
- Even streams that contain frames with motion can be saved.

Sequence: images containing motion are arranged into sequences. These sequences have unique IDs.
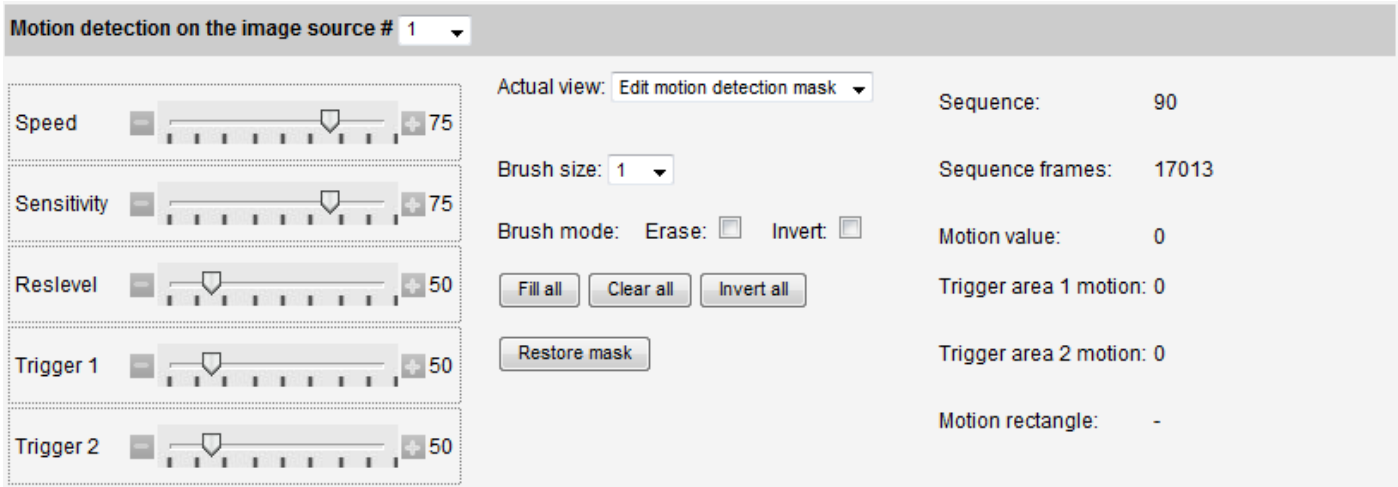
Sequence frames: the index of frames within the sequences.

Motion value: this value shows the extent of motion on the current image. This value is based on the sensitivity, speed and difference from background.

Motion rectangle: the area in which motion has occurred is framed by a motion rectangle defining the place of motion in the image. This option returns the coordinates of the motion rectangle.

Actual view:

If the **Edit motion detection mask** is selected, the following additional settings will appear:

With the help of image masking, certain parts of the camera view can be ignored by the motion detector. This feature is designed for situations when not the entire camera image is interesting for triggering (e.g. if the camera covers two lanes but only one of them is observed by the user).

Modifying the mask:

A. **Erase**
Click **Clear All** to delete the entire mask.
Check **Erase** and click on the masked area(s) to be deleted.

B. **Fill**
Mask the entire camera image by clicking on **Fill All**.

C. **Invert**
When selecting invert, masked areas can be erased and unmasked areas can be masked by simple mouse clicks. The size of the brush can be adjusted in case of inverting as well.

D. **Restore**
Return to the previously saved mask by clicking on **Restore Mask**.

To trigger areas can be created on the image. After setting these areas, if motion occurs on them, the **Trig 1** or **Trig 2** or both texts will appear on the screen.

For example:
If there is an emergency lane on the highway and the user sets it as a Trigger area, the system will alert if someone passes through this lane. The masking has the main priority. If the trigger area is set on the masked area, the system will not detect the motion there.

Private Zone

If there are zones in the monitored area, which are prohibited to see, they can be set to be deleted in the images.
Three different private zones can be set here.

Event Manager

The camera can be set up to execute tasks on various occasions (e.g. to upload images when it detects motion). These occasions are called **triggers** (in the above example: the detection of motion) while executed tasks are called **trigger tasks** (in the example: uploading images). Currently, one trigger task (uploading images) is provided with the camera, but adding further tasks is possible.

Trigger sources

To monitor the relevant trigger source by the Event Manager, a registration must be done by the **Register** button. A trigger source may have **multiple outputs**: this is like having multiple instances of the same trigger source, each may be configured differently (by clicking the **Configure** button).

NOTE: the registered trigger sources in the upper example (see above): Software Trigger, Motion Detection Trigger (with output 0 and output 1, that is multiple outputs).
- Software Trigger: 0
- Hardware Motion Detection: 0
- Hardware Motion Detection: 1

General syntax: trigger source: output

Basically, trigger sources can be of two types:

- external trigger: signals arriving from the trigger input or the user UART of the camera, triggers sent from the client software programmatically or manually (by clicking on the button on *Software Trigger* page),
- internal trigger: the motion detector of the camera, or scheduled (see **Configure Scheduler**) by the user.
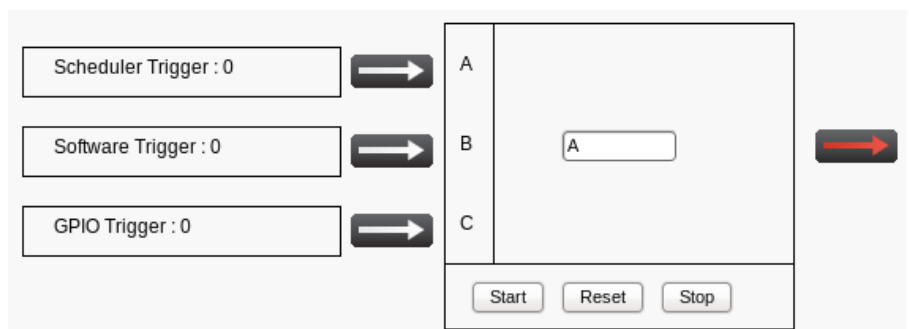
By default, there are five trigger sources:

- Motion Detection Trigger (by default with 3 outputs)
- Software Trigger (by default with 1 output)
- UART Trigger (by default with 1 output)
- GPIO Trigger (by default with 1 output)
- Scheduler Trigger (by default with 2 outputs)

Every trigger source can be assigned with a letter (capital letters of the English alphabet from A to V, see figure below). When configuring through the web interface, it is done automatically. The Event Manager will identify the trigger source using this letter.

Simple events

In the simplest case, the execution of the trigger task depends only on one trigger source. In this case, by simply writing the letter of a trigger source into the formula box, trigger event (upload set on the upload page) occurs when trigger signal arrives on the source associated with letter. E.g. if the UART trigger is assigned with the letter C and C is written to the formula box (see figure) upload will occur on trigger signals arriving through UART. It is not even necessary to register any other trigger source in this case.

The formula is applied (marked with green arrow after the formula box) right after clicking **Start** and can be invalidated (marked with red arrow after the formula box) by the **Stop** button. When clicking **Reset**, all the registered sources are deleted.

NOTE: the formula is applied (marked with green arrow after the formula box), in this case the image upload is activated (trigger task is executed).

Complex events

In case of complex events, upload depends on more than one trigger sources. To express relationships between the sources, logical operators can be used. Available logical operators: AND(&), OR(|), NOT(!).
You can use two shorthands 'any' and 'each', which mean 'launch trigger task if *any* of the registered sources is asserted' and 'launch trigger task if *each* of the registered sources is asserted' respectively.

Example A:

Let **A&B** be set where:
    A is the Hardware Motion Detector,
    B is the Scheduler.
This setup may correspond to a situation where traffic monitoring is only necessary at some times of the day: e.g. we want to upload images containing motion e.g. from 6 to 11. With this setup, the trigger task (uploading of images) will be executed only when both the Scheduler and the Hardware Motion Detector are asserted, so, **both** trigger signals at the same time are necessary to start uploading.

<u>Example B:</u>

Let **A|B** be set where:

    A is the Hardware Motion Detector,

    B is the GPIO trigger.

This setup may correspond to a scenario where an inductive loop is used to send triggers (through GPIO) when it detects motion and the camera Hardware Motion Detector is also used to support the loop (in case of pedestrians or vehicles that can be barely detected by the loop (e.g. bicycles). If **A|B** is set then upload occurs when a trigger signal arrives on the GPIO or from the Hardware Motion Detector or both, so, **either** trigger signal is sufficient to start uploading.

Brackets can also be used in the formulas to express complex relationships:

Let **(A|B)&!C** be set where:

    A is the Hardware Motion Detector,

    B is the Scheduler,

    C is the UART trigger.

In this case, trigger event occurs only if

1. motion is detected,
2. the Scheduler trigger is asserted,   } at the same time.
3. trigger signal does not arrive on the UART.

NOTE: Spaces are not allowed in formulas.

Software Trigger

By using the software trigger source, triggers can be sent to the camera either from user applications or using the **Send Trigger** button on the web interface. The time of trigger start and trigger end can be brought forward or delayed by **Start offset [ms]** and **End offset [ms]**. Settings are applied after clicking **Submit**.

NOTE: number of the uploaded images: depends on the start offset, end offset and FPS.

UART Trigger

The camera can be triggered through its UART. Besides the common UART properties (baudrate, byte size, parity, number of stop bits) the communication protocol can also be specified here.

An UART trigger event starts with a **Trigger Start Token** (TST) byte, then max. 254 bytes of trigger data may follow, and then it ends with a **Trigger End Token** (TET) byte. The trigger start timestamp will be the system time at the instant the TST arrives, plus the **Start Offset**, while the trigger end timestamp will be the system time at the instant the TET arrives, plus the **End Offset**. Trigger data (including the TST and TET) will be forwarded to the Event Manager along with the image.

It is possible to specify the byte value of the TST (e.g. entering 0x0A means the trigger will begin with a '\n' byte) or check 'Start on first byte', which means, whatever byte comes first or follows the last end token will be the trigger start token.

Trigger task (upload) can be set to be launched at various stages of a trigger signal (see GPIO Trigger / Trigger mode).

GPIO Trigger

On this page, the general purpose input and output (GPIO) ports can be set.

GP input can be used for triggering. To do this, the sample rate with which the port is sampled must be specified. Note that if a high sample rate is set then erratic behavior may occur due to bouncing. Always use the lowest possible sample rate. The voltage level can also be set that corresponds to the logic '1' level. A constant offset can be added to the assertion (making active) and the de-assertion (making inactive) of the GP input with start and end offset.

GP input: this is e.g. for detecting the arrival of a car. If the trigger input of the camera is active, the bulb is green. It is red when the input is in an invalid state (debouncing failed).

GP output: if ticked, the trigger output of the camera is active. If empty, it is inactive. This is e.g. for opening the barrier.

Sample rate: this is for debouncing. The General Purpose Input is sampled with this frequency (e.g. 100 Hz means the voltage on the input pin is measured 100 times in a second.)

Required samples: minimal number of equal valued samples to accept the input as active. E.g. we measure the voltage on the GP input pin a 100 times a second (Sample Rate=100). A 'required samples' value of 10 means that we must measure 'high' voltage consecutively 10 times in order to accept the pin as active, without measuring any 'low' values in between. This parameter is for debouncing as well.
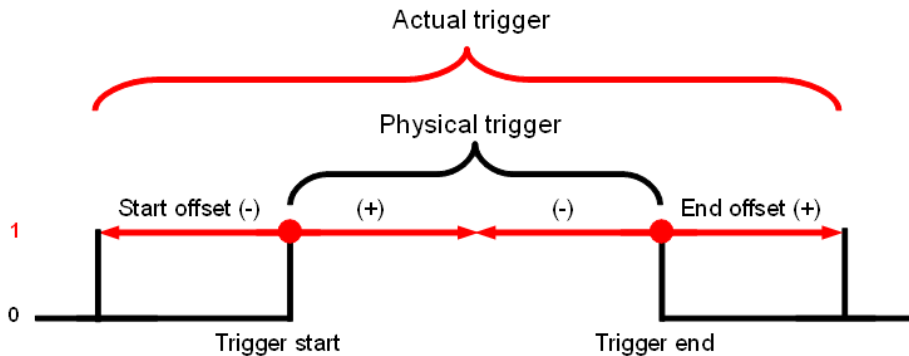
Logic active level: Defines which voltage value (low or high) represents the logic value of '1', that is when is the trigger input considered to be 'Active' by the camera. E.g. if it is set to 'low', then the input is in a 'high' state by default, and if voltage drops to 'low', a trigger event is generated.

Start offset [ms]
This amount of delay will be added to the start timestamp of the trigger event.
Possible values in milliseconds: -10000 <-> +10000

End offset [ms]
This amount of delay will be added to the end timestamp of the trigger event.
Possible values in milliseconds: -10000 <-> +10000

With the help of two outputs, trigger task cannot be launched only on the preconfigured modes (level, rising edge, falling edge -see UART description above) but on 'custom' modes combined from the mentioned ones. E.g. Setting **Output 0** to **Rising edge** and **Output 1** to **Falling edge**, upload can be set to occur on trigger start and trigger end:

Trigger mode

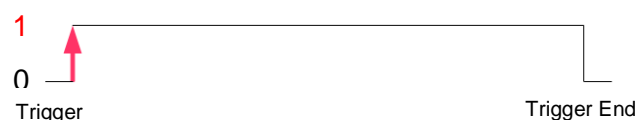Trigger task (upload) can be set to be launched at various stages of a trigger signal:

1. Level Mode
In case of Level Mode, trigger task is executed continuously until the end of the trigger signal:

2. Rising Edge Mode
In case of Rising Edge Mode, trigger task is executed once, at the moment when the trigger signal arrives:

3. Falling Edge Mode

In case of Falling Edge Mode, trigger task is executed once, at the moment when the trigger signal ceases:

4. Rising / Falling Edge Mode

In case of Rising / Falling Edge Mode, trigger task is executed twice, at the moment when the trigger signal arrives and then when it ceases:

Scheduler

With the help of the scheduler, timed trigger events can be launched by users (events must be set on the '*Event Manager*' page). For timing these events, as many outputs (timers) are available as set in the **Output** field (maximum 2).

NOTE: each trigger outputs can be registered separately on the Event Manager page.

In the fields of the outputs, the following expressions can be used:

- numerals separated by semicolons (e.g. 6;9)
- the word 'every'
- hyphens to express intervals (e.g. 7-9)
- + combinations e.g. 6;7;9-11;15

NOTE: Use semicolons at the end of the lines the mark end of data.

Trigger mode: two kinds of triggering can be specified: level and edge.

- when selecting **edge**, trigger signals are emitted according to the set frequency. This frequency can be set from once a month to every second.
- when selecting **level**, a trigger signal is emitted until the specified second/minute/hour has elapsed.

For example:
Day(s) of the month: 12;15 – *on the 12th and 15th of the every month*
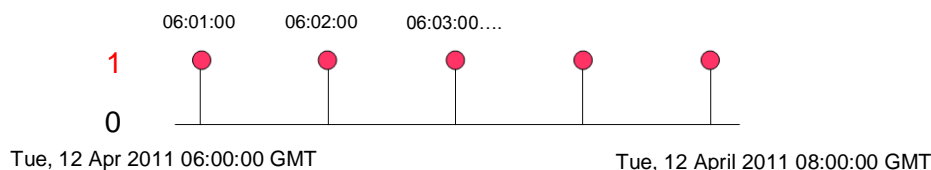Days of the week: ☑ Mon ☑ Tue ☑ Wed ☑ Thu ☑ Fri ☑ Sat ☑ Sun – *on every weekday*
Hour(s) of the day: 6-8; – *from 6am until 8am*
Minute(s): every – *in every minute of the selected hour(s)*
Second(s): 0

Edge:
Trigger signals are emitted on the 12th and 15th in every month, independently from weekdays (since all weekdays are ticked it does not matter that on which weekday 12th and 15th will be), from 6am until 8am once in every minute at 0 seconds.
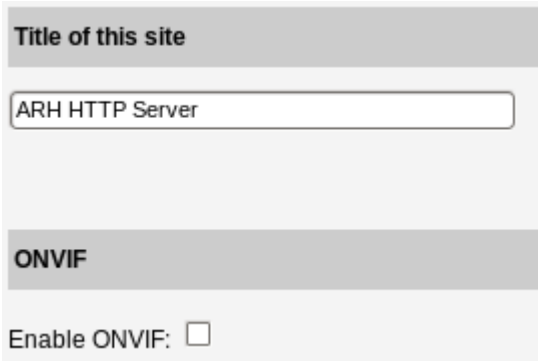

Level:
Trigger signals are emitted on the 12th and 15th of the every month, independently from weekdays (since all weekdays are ticked it does not matter that on which weekday 12th and 15th will be) and asserted from 6am until 8:59:59.99 am.

Settings are saved after clicking **Submit.**

Miscellaneous

Title of this site
ARH HTTP Server

Title of this site: any title can be given to the site.

ONVIF
Enable ONVIF: ☐

ONVIF: if it is enabled, the camera will be ONVIF-compliant. In this case, smaller area is available for image buffering.

Plain Config

Loaded Modules

The loaded modules can be seen on this page grouped and accompanied with version number and a short description. When the mouse pointer is navigated to the name of the module and the text turns to bold, the plain config page of the selected module is accessible. In the plain config page all parameters of the selected module can be set or queried.

NOTE
- Only the important parameters can be adjusted via the web interface.

plain config of module:
If the module has not only default section, then the desired section can be selected by the drop-down menu. After it is selected the parameters of the corresponding section can be adjusted or queried.

By clicking the **Set** button all parameters will be applied and saved.

By clicking the **Help** button and navigating the cursor of the mouse on the desired parameter, the corresponding information will be displayed.

By clicking the **Refresh** button, the parameters will be refreshed.

NOTE
- The camera has to be restarted to apply certain parameters. It is warned by a pop-up window.
- Parameters can be read only (r), write only (w) or readable and writable (rw) parameters.
- Parameter attributes can be seen as well (min, max, default value etc.).

Maintenance

System Information

It provides important data about the camera:

- Temperature: inside temperature of the camera [°C],
- Memory usage,
- Hardware version,
- Camera serial number,
- Camera MAC address,
- Panel type,
- Sensor type.

Camera Log

Camera events are logged into the central log file for administrative and error management purposes. The lines (records) of the log can be filtered for specific events according to the typed in characters. Filtered events are listed after clicking **Save**.

If filtering is not needed, the **Filter** input field has to be left empty (click the **Save** button).

NOTE: the log file content is erased after restarting the camera.

Backup/Update

Current settings backup
The current settings of the current camera can be saved in a tar.gz file so thus all the settings can be uploaded to other cameras. This backup does not save the users, the corresponding passwords, the network settings and the time.

Backup all configurations and settings
This feature can save all configurations of the camera (users, passwords, network settings and all settings, which were saved at startup).

Full system backup
Everything can be saved here, including all modules, programs and data.

Restore settings or update firmware
All backups saved by the above procedures can be uploaded or the firmware version can be updated here.

Settings backup files
In case of each boot, the camera saves the config files. In this part, the last 10 saves can be restored, exported or deleted. The format of the last backup file in the list: year month day – hour minute second.cfz. The format of the above files differs from the last one. The first digit of the year is zero in all cases to keep the order.

NOTE:
- The saved settings and the backup can be uploaded only to the identical cameras.
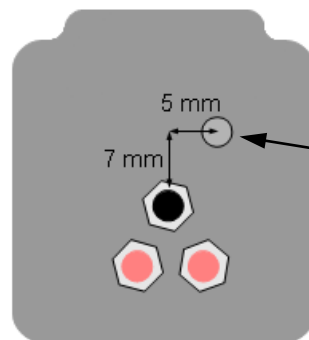- During the update process, do not power off the camera!

Recovery Mode

The camera has a Recovery Mode primarily designed to maintain the communication with the camera when it is unreachable for various reasons e.g. due to misconfiguration. The following section is intended to provide you a complete understanding on the *Recovery mode v3.x*. The *3.x* version can be used in case of cameras with previous firmware versions as well (from 1.12.0.26 firmware version)! In case of previous versions, please update the camera at least to version 1.12.0.26.

Entering Recovery mode

Starting of the Recovery mode can be implemented in the following way:

By magnetization:

1. Power off the camera.
2. Touch a magnet (not included) to the back of the camera and hold it in position. See figures below.
3. Power on the camera and wait 5 seconds.
4. Remove the magnet.
5. Reach the camera via its default (192.0.2.3) IP address.

Magnet
The recommended strength of the magnet is 1210 mT (millitesla).

Camera back

Update, Factory and other compressed files

Difference between the files:

- **Factory-xxx.bin**
  These files are prepared by the manufacturer and they mean a complete system backup. In case of normally functioning cameras these should not be used in the cameras firmware update, because it may damage the well-functioning system (it writes files, which may be currently used by the system). These files can be uploaded by the *Recovery mode*.

- **Update-xxx.bin**
  These are the so-called firmware update files. They serve for the update of a functioning system. It could be for example in case of update from the version 16 to 17. However, these cannot be used in the recovery mode only in normal mode of the camera.

- **Xxx.cfz**
  These files contain only configuration settings. For example, if the 'user' or 'image' settings will be saved and then reloaded later. Such files should be uploaded to or created on the normal mode of the camera (although it can be done in the recovery mode as well).

In some cases, the extension is not .bin or .cfz, but .tar.gz. In these cases, the beginning of the file has to be *Factory* or *Update*.

Web interface of the recovery mode

Information screen

The MAC and the IP address is the same for all cameras at the *Recovery mode*. However, the IP address of the camera can be altered at the *Normal mode* part by clicking the [**Change**] button or at the *Network settings* part of the Settings menu item.

Settings screen

Setting-related backups and restoring can be performed on this screen. Only certain parts of the system can be managed here, operations concerning the whole system can be performed at the **Firmware** menu item of the *Recovery mode*.

Network settings

At the '*Network settings*' part the network settings can be altered by clicking the [Modify] button. In this case, not the recovery mode that is modified, but the network settings of the camera operating in normal mode.

User/Password reset

The '*User/Password reset*' restores the default, factory User and Password.

Restore factory settings

The '*Restore factory settings*' restores all the default factory settings.

Import settings / Export settings

The *'Export settings'* creates a .cfz file and saves the settings of the camera into a directory on the PC. The '*Import settings*' is able to restore these settings by uploading these .cfz files.

Firmware screen

Full system backup-related processes can be implemented on this screen. While at the settings menu only certain parts of the system can be managed, here operations concerning the whole system (settings, programs, complete operating system etc.) can be performed.

Firmware update

At the '*Firmware update'* part, a complete (factory) system can be uploaded to the camera. All settings will be deleted, except the hardware related environment set by the manufacture (MAC address, panel type, sensor type, serial number, license file).

Full factory restore

The '*Full factory restore'* basically behaves as the *Firmware update* with the difference that this feature uploads a default factory package. By contrast, *Firmware update* is waiting for such file from the PC. Restores the factory state.

Full system backup

The '*Full system backup'* saves the entire camera settings (the file system operating in normal mode). It can be used later at the *Firmware update* part. It cannot be used at the firmware update of an active system in a normal mode of the camera!

Updates between versions

Minor changes between versions (e.g. from v1.12.0.10 to v1.12.0.26)
Minor changes means, that the first number of the version is the same (v1.x, v2.x or v3.x). In this case, only the file with higher version starting with *Update-* has to be uploaded at the '*Update'* part of the Setup menu item of the camera web interface (in normal mode). The update packages are prepared to handle the smaller updates (e.g. from v1.1 to v1.2) of the higher versions (v1, v2, v3).

Upgrade of the Recovery mode
Like in case of normal update, a file starting with *Update-Recovery-* has to be uploaded during the normal operation of the camera. It can be done at the '*Update'* part of the Setup menu item of the camera web interface. After the upgrade of the recovery mode the firmware version of the camera is not altered, only the firmware version of the recovery mode!

Restart

Under certain circumstances, the camera must be restarted. The restart takes several seconds after which the camera is ready for operation with saved or default settings.

Help

Opens the camera manual for more information on camera setups and management.

Recovering a Lost IP Address

If the IP address of a camera is unknown (forgotten) it can be reached through the camera MAC address located on the back of the device. Note that this method can be used for only temporary camera access.

Windows

1. Click **Start** and select **Run.**

2. Enter the cmd command.

3. In the appeared window add the MAC address of the camera to the ARP cache table:
   arp -s {desired IPv4 address} {camera MAC address separated by hyphens e.g. 00-1d-4d-00-09-B7}

4. Ping the camera with the IP address set above within 1 minute from camera startup.
   - e.g.: ping –t 192.0.2.6.
   - turn off then on the camera power supply,
   - wait until the ping package returns (about 1 minute).

After the ping package has arrived, the camera picks up the IP address and becomes ready to be set up.

IMPORTANT: In case of using the above process, the camera gets a temporary IP address. After entering the camera web interface, please set the Network accordingly.

Linux

1. Open a console.
2. Add the MAC address of the camera to the ARP cache table:
   arp -s {desired IPv4 address} { camera MAC address separated by colons e.g. 00:1d:4d:00:09:B7}
3. Ping the camera with the IP address set above within 1 minute from camera startup.
   - e.g.: ping -s 777 192.0.2.6.
   - turn off then on the camera power supply
   - wait until the ping package returns (about 1 minute)

After the ping package has arrived, the camera picks up the IP address and becomes ready to be set up.

Windows&Linux

NOTE:
- In order to access the camera successfully, the desired IP address must be in the same subnet with your computer. See the MAC address on the sticker located on the back of the camera.
- The first characters of a MAC address are always 00-1d-4d while the last three hexadecimal numbers are correspond to the last three characters of the camera serial number (also located on the back of the device).
- This IP address can be used for only temporary camera access. It must be changed right after accessing the camera.

Appendices

	Low	Normal	High
Contrast			

	Low	Normal	High
Brightness			

Saturation

Gamma

White balance

	Low	Normal	High
Red			

Green

Blue

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ARH Technical Support System (ATSS) is designed to provide you the fastest and most proficient assistance, so you can quickly get back to business.

Information regarding hardware, software, manuals and FAQ are easily accessible for customers who previously registered to enter the dedicated ATSS site. Besides offering assistance, the site is also designed to provide maximum protection while managing your business information and technical solutions utilized.

New User

If this is your first online support request, please create an account by clicking on this link.

Returning User

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If you need assistance with login or registration, please contact atsshelp@arh.hu for help.