



VaxALPR

***With Make, Model & Color Recognition
and Instantaneous Speed***

On-Camera Software

Software Setup and Axis Camera Configuration

Main Manual

Version 3.0

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1. Introduction

This guide has been designed for those responsible for setting up and configuring the Axis camera and the VaxALPR On Camera software.

The VaxALPR On Camera software is a real-time solution for Automatic License Plate Recognition (ALPR) that runs entirely within the Axis camera.

2. Requirements for License Plate Images

LPR (License Plate Recognition) is an image processing technology used to identify vehicles by their license plates. It is also known as ALPR (Automatic License Plate Recognition) and ANPR (Automatic Number Plate Recognition) among other names.

The following examples show two images of how license plates should be seen in both daytime and night-time conditions:



Ideal daytime license plate image



Ideal night-time license plate image

However, recognizing the license plate is more challenging if the images have any of the following characteristics or artifacts:

- Overexposed
- Blurred
- Distorted
- Unevenly lit
- Low contrast
- Bad weather conditions



Undesirable license plate images

The less clear that the plate images are, then the more likely it is that ALPR software will report then incorrectly. Garbage In → Garbage Out.

As a general guide, if a human has difficulty reading a plate, then so will an intelligent ALPR camera!

It is recommended that the images captured by the ALPR cameras be more like the first two examples shown above.

3. Camera Requirements

An intelligent ALPR camera is a specialized CCTV camera that has in-built software to identify license plates on still or moving vehicles. It is recommended that you use an **Axis Camera** with an **ARTPEC-6** processor or later.

*(Axis cameras with the slower **ARTPEC-5** processors should only be used on start-stop traffic such as at barriers or site entrances where recognition can take over 1 second.)*

3.1 Frame Rate – does not need to be set for VaxALPR On-Camera

The frame rate, also known as frames per second (FPS), is the number of frames or images that the camera can capture per second. For example, 30 fps means the camera captured 30 frames in a single second of video.

When using the Axis camera to send a video stream to a PC running Vaxtor ALPR or if using the camera to send video to a VMS such as Axis ACS, Milestone or Genetec – then the frame rate should be specified as shown below.

However – if you are running the Axis On-Camera VaxALPR App then there is no need to set the frame rate. The App will set this internally.

If you need to set the frame rate for your own use see below:

- ❖ *Lower frame rates:*
 - *Can result in choppy or broken movement*
 - *Are ideal for locations with no fast-moving objects*
 - *Are less intense for the camera and network (bandwidth)*
 - *Result in less frames and smaller video files*

- ❖ *Higher frame rates*
 - *Produce smoother movement*
 - *Are ideal for locations with faster traffic*
 - *Are more intense for the camera and network (bandwidth)*
 - *Result in more frames and larger video files, which may result in the need for more storage capacity.*

For ALPR cameras, the following frame rates are recommended:

- **Barrier or Gate** → **Frame rate > 5 fps**

- **Road or Street** → **Frame rate ≥ 15 fps**

- **Fast Urban** → **Frame rate ≥ 20 fps**

- **Motorways** → **Frame rate ≥ 25 fps**

3.2 Shutter Speed

Shutter speed, also known as the “exposure time”, is the length of time a camera shutter is open for in order to expose light onto the camera sensor. The shutter speed is measured in seconds, or fractions of a second. The bigger the denominator, the faster the speed. For example, 1/250th means one two-hundred-and-fiftieth of a second or four milliseconds. (1 second = 1000 milliseconds)

The following shutter speeds are recommended:

- **Barrier or Gate** → Minimum exposure time **1/250th sec** (4 milliseconds)
- **Road or Street** → Minimum exposure time **1/500th sec** (2 milliseconds)
- **Fast Urban** → Minimum exposure time **1/1000th sec** (1 millisecond)
- **Motorways** → Minimum exposure time **1/1000th sec** (1 millisecond)

3.3 Resolution and Lens Focal Length

3.3.1 Resolution - does not need to be set here for VaxALPR On-Camera

The resolution of the camera determines the amount of detail that can be captured. The smaller the object detail, the higher the resolution that is required.

When using the Axis camera to send a video stream to a PC running Vaxtor ALPR or if using the camera to send video to a VMS such as Axis ACS, Milestone or Genetec – then the resolution should be set as shown below.

However – if you are running the Axis On-Camera VaxALPR App then there is no need to set the resolution in the main camera settings – you can specify this later with the App Settings.

If you need to set the resolution for your own streaming use then there are several factors that determine the detail captured:

1. *The resolution (pixel size) of the camera sensor. This sensor (normally CMOS) where the light eventually falls and a typical IP camera has a sensor resolution of 2 or 4 Megapixels.*
2. *The resolution of the camera’s electronics. An Axis P-1445 can output video at a resolution of 1920 x 1080 – but may be set to a lower resolution if not needed.*

3. The quality and focal length of the lens. The quality of the optics can play a part in challenging circumstances. The focal length (zoom factor) determines the field of view that can be seen.

4. The quality of the images can be influenced by factors such as the type of lighting used.

Depending on where the ALPR camera will be deployed, the following resolutions are recommended for a single lane:

- **Barrier or Gate** → Resolution **800 x 600 pixels** or higher
- **Roadside Deployment** → Resolution **1280 x 720 pixels** or higher

3.3.2 Focal length

The focal length of the lens determines how “zoomed in” the image is. It is usually expressed in millimeters (e.g., 6 mm, 25 mm, or 50 mm). The focal length tells us the angle of view (how much of the scene will be captured) and the magnification (how large individual elements will be). The longer the focal length, the narrower the angle of view and the higher the magnification. The shorter the focal length, the wider the angle of view and the lower the magnification.

In the case of zoom lenses, both the minimum and maximum focal lengths are stated, for example 10–40 mm. Most Axis cameras come with motorized zoom or varifocal lenses and you can see their capabilities on the Axis lens calculator website:

<https://www.axis.com/en-gb/tools/lens-calculator>

As a rough guide, the following cameras will operate at the specified ranges:

Single lane (3m wide):

Q1700-LE - FOV 3m - then 10-40m Range

Q1785-LE - FOV 3m - then 4-40m Range Daytime – Night time 4-20m due to less powerful LEDs

P1445-LE - FOV 3m - then 3-10m Range

P1455-LE (3-9mm lens) - FOV 3m - then 3-10m Range

Dual / Wide lane (6m wide):

Q1700-LE - FOV 6m - then 21-40m Range

Q1785-LE - FOV 6m - then 6-40m Range Daytime – Night time 4-20m due to less powerful LEDs

P1445-LE - FOV 6m - then 3-10m Range

P1455-LE (3-9mm lens) - FOV 6m - then 3-10m Range

Domes:

Q3515-LVE 9mm lens FOV 3m then 2–4m Range

Q3515-LVE 9mm lens FOV 6m then 5–9m Range

Q3515-LVE 22mm lens FOV 3m then 5–23m Range

Q3515-LVE 22mm lens FOV 6m then 18–23m Range

IMPORTANT: The lens should be **IR corrected** to avoid out of focus images.

3.3.3 Infrared illumination

Infrared (or IR) illuminators are designed to provide additional illumination that the camera can see but humans normally cannot. In low light conditions, an IR illuminator is used as a spotlight to facilitate 24-hour recognition. It can penetrate darkness and to a lesser extent fog, rain and snow and it eliminates the inconsistency of ambient light.

Infrared illuminators add light across the camera’s field of view to produce the desired image quality, lighting up the area and reflecting the plate.

For ALPR, it is recommended that the camera **always** has an **infrared illuminator**. This can be built into the camera or added as an external unit providing that it is placed very close to the camera lens. *(The angle made between the light leaving the IR light source and that of the reflected light returning to the camera lens should be 5° or less.)*

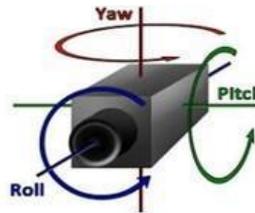
4. Other requirements

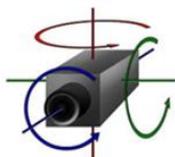
The positioning of the camera is key to achieving maximum OCR accuracy.

4.1 Camera Orientation

The image orientation is a key factor in achieving the maximum OCR efficiency. It is recommended that you stay within the following thresholds:

- Pitch (Vertical) should be:** < 30°
- Roll (Slope) should be:** < 25°
- Yaw (Horizontal) should be:** < 25°



	Slope Below 25 degrees	Horizontal Below 25 degrees	Vertical Below 30 degrees
 <div style="border: 1px solid green; padding: 2px; display: inline-block;">CORRECT</div>			
<div style="border: 1px solid red; padding: 2px; display: inline-block;">INCORRECT</div>			

Examples of different camera orientations

Accuracy will decrease significantly if these guidelines are not adhered to.

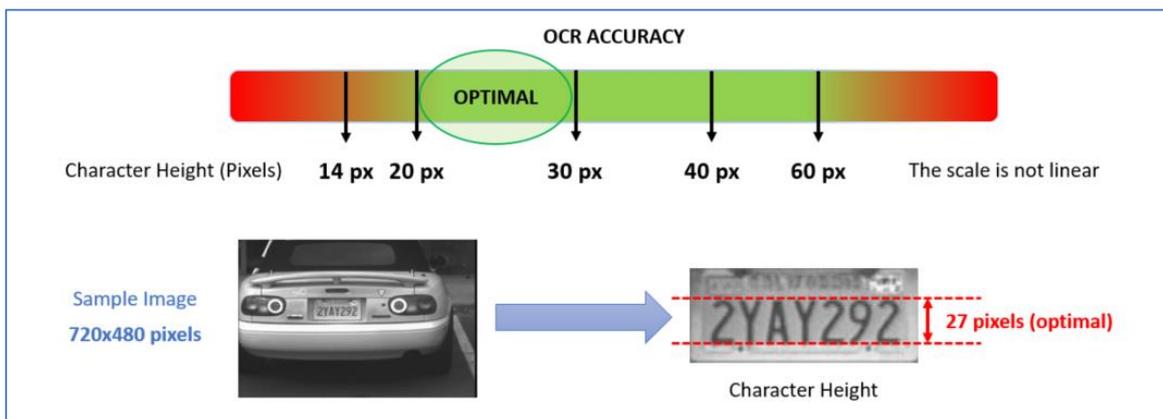
4.2 Distance

The objective of an ALPR system is to capture an image with a good readable plate. In order to achieve this the characters on the plate should have a height between 20 and 30 pixels for larger plate formats (e.g. EU 50cm plates) and about 25-35 pixels for USA-style plates which are physically smaller and have a narrow character stroke width in many states.

Certain Middle East and Arabic plates are smaller still and will need an even greater character pixel height of say 30-40 pixels. For example, in Abu Dhabi the small characters next to or above the main characters are only 3cm high and may require a much higher camera resolution.

The camera should be setup so that the combination of the **distance**, the **lens's focal length** and the **camera's resolution** provide an image that can be accurately analyzed by the OCR.

More details on combining these settings are provided later in this guide.



Optimal character height in pixels

Note that for small plates such as most Arabic plates - or plates with additional small characters such as Costa Rica, – then a minimum character pixel height of 30 pixels is recommended.

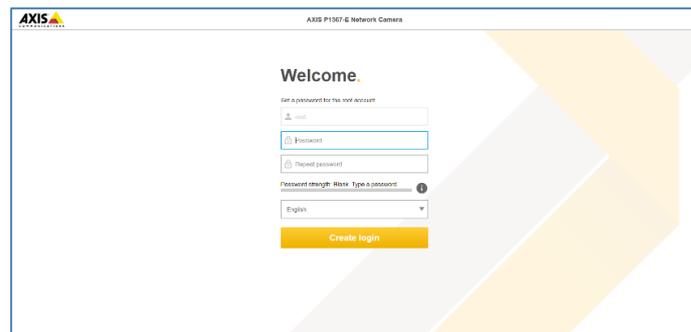
5. Camera Setup and configuration for License Plate Recognition

In this section, we describe how to:

- Set up the Axis Camera for optimum image quality
- Configure the VaxALPR On-Camera software

5.1 Setting up the Axis Camera

Once the Axis camera has been installed it must be set up and configured. Use a web browser to logon to the camera using its IP address. (refer to the Axis documentation for the default IP address. The default username and password are normally: root / root.)



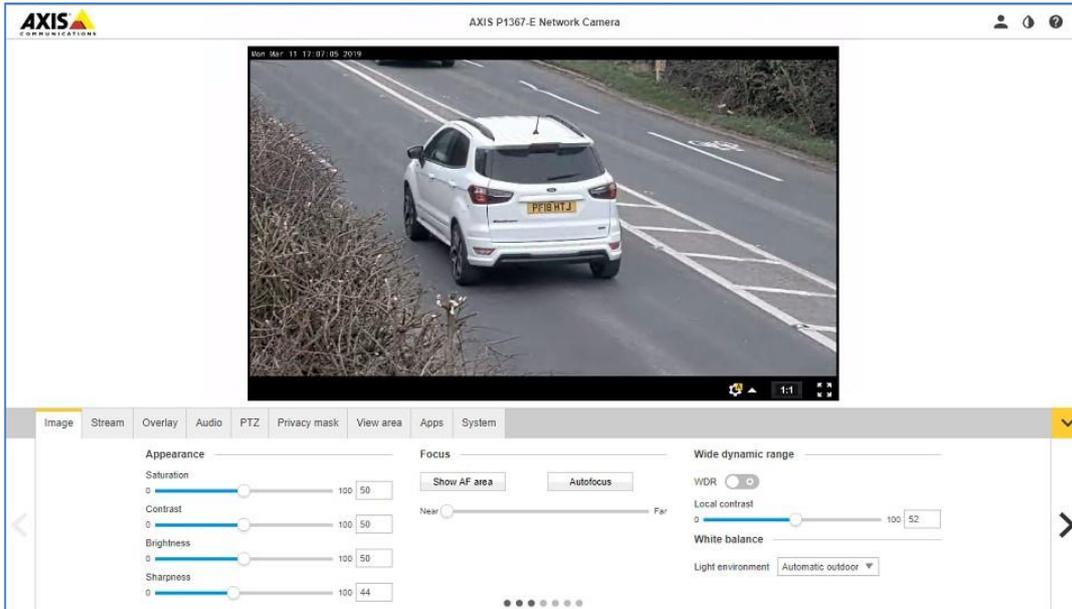
Once logged on, check for the latest firmware update from Axis.

5.1.1 Check for the latest firmware

Select the System tab and the Maintenance. On the left you will see the link to download the latest firmware and then upgrade your camera.

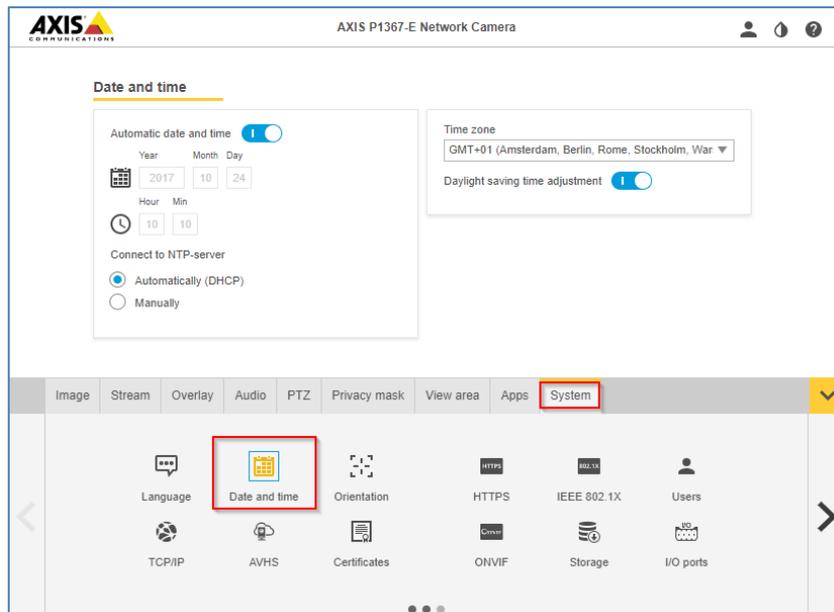
Once installed select “Settings” from the bottom right of the window:





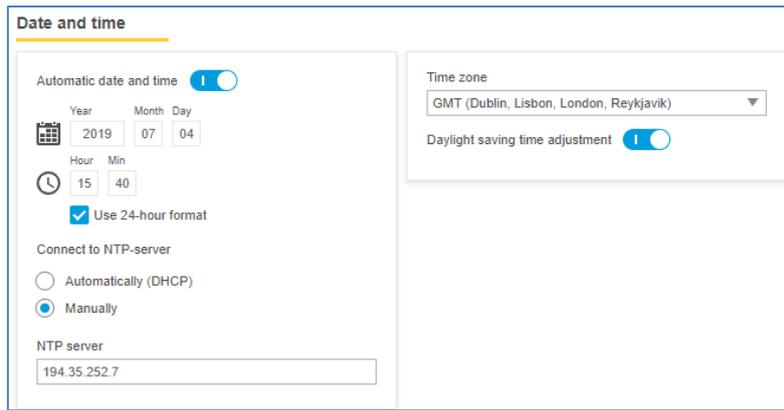
5.1.2 Set the date and time of the camera

To set the **date and time** within the Axis camera, select the “System” Tab and choose the Date & Time option.



Axis camera setup: System > Date & Time

In this example we are using one of the UK Stratum 1 NTP Server:



Date and time

Automatic date and time

Year: 2019, Month: 07, Day: 04

Hour: 15, Min: 40

Use 24-hour format

Connect to NTP-server

Automatically (DHCP)

Manually

NTP server: 194.35.252.7

Time zone: GMT (Dublin, Lisbon, London, Reykjavik)

Daylight saving time adjustment

5.1.3 Setting a DNS Server

When the software is first run it will attempt to connect to the internet to check for the latest version of the software. To allow this to happen you should configure a DNS server (Domain Name Server). (Note this is also often needed for BOF connections to map your domain names).

To do this go to the main Axis setting menu and select System and then TCP/IP.

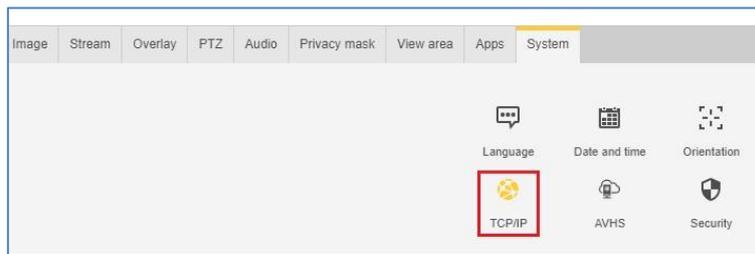
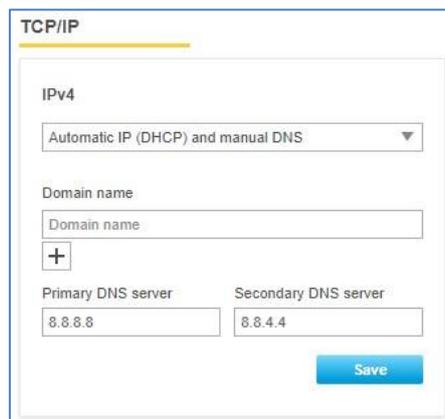


Image Stream Overlay PTZ Audio Privacy mask View area Apps System

Language Date and time Orientation

TCP/IP AVHS Security

Select a DNS server such as Google's as follows:



TCP/IP

IPv4

Automatic IP (DHCP) and manual DNS

Domain name

Domain name

+

Primary DNS server: 8.8.8.8

Secondary DNS server: 8.8.4.4

Save

In this case Google's is 8.8.8.8 with a secondary server of 8.8.4.4. These are free Google DNS servers which will map any domain names needed to the correct IP address.

5.1.4 Recommended frame rates, shutter speeds and resolution

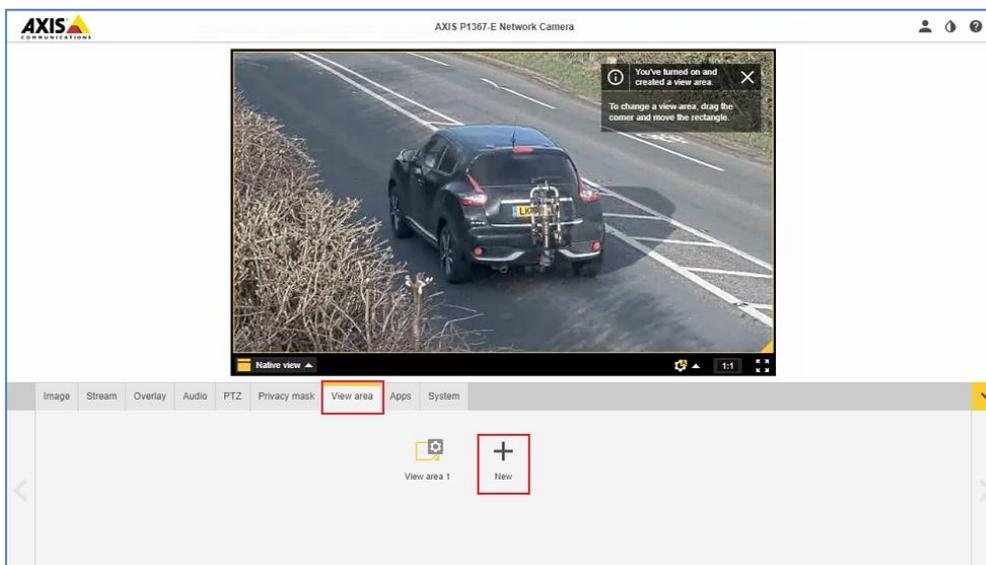
Note that the resolution will be set later on in the App settings and the frame rate need not be set – the App will set this itself.

Set the shutter speed as needed noting that different shutter speeds should be setup depending on where the camera is to be placed:

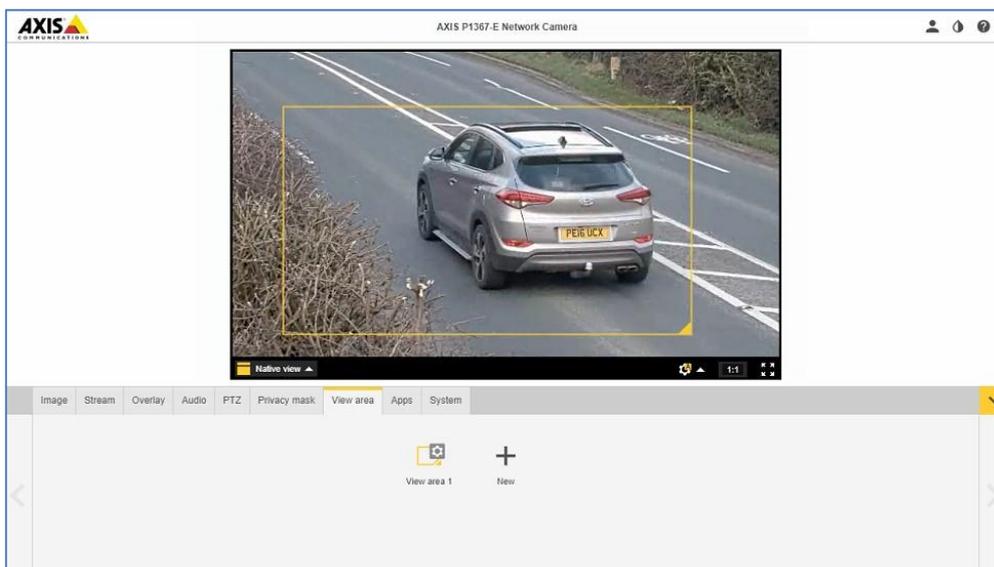
- **Barrier or Gate** → Minimum exposure time **1/250th sec** (4 milliseconds)
- **Road or Street** → Minimum exposure time **1/500th sec** (2 milliseconds)
- **Fast Urban** → Minimum exposure time **1/1000th sec** (1 millisecond)
- **Motorways** → Minimum exposure time **1/1000th sec** (1 millisecond)

5.1.5 Set the View Areas

In some Axis cameras, you can define one or more View Areas. These can be used with higher definition cameras to define one area to be streamed to a VMS and one area to perform ALPR on.



These rectangular areas can be named and are essentially areas of interest which reduces the bandwidth of the data transmitted to a remote recording device and equally saves storage space when video is saved remotely or on the camera's internal SD card if fitted.



In this example only the area bounded in yellow will be sent to any recording equipment – and only this part of the video image will be passed onto the ANPR engine for OCR processing.

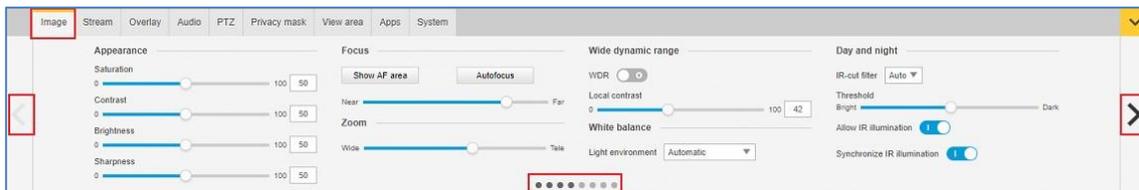
Note that you can also set a Region of Interest (ROI) within the ALPR App - see later.

5.1.6 Set the View Area frame rate and resolution

For each rectangular View Area, the **frame rate (maximum frame rate)** and **resolution** can be set. This has no effect on the On-board ALPR.

5.1.7 Setting the shutter speed and other important image settings

To set the **shutter speed (minimum exposure time)** and other important settings in the Axis camera, we need to click on the Image Tab. The following window is displayed:



Note that these menus have side-scrolling arrows to the left and right to scroll through all the Image setting options.

It is recommended that you park a vehicle or place a license plate in the region of interest.

Important camera settings

- Set the **autofocus** area on the license plate and click Autofocus. If the license plate is still not in focus, fine-tune using the manual focus.
- Set **Sharpness** to 0 or a low value, you do not want the camera enhancing character edges.
- Do **not** enable **Wide Dynamic Range**. *Note that on some models this will reduce the number of resolution options presented for selection and so a compromise will have to be made.*
- Set **Local contrast** to 20. This reduces noise during nighttime but still lights up the license plates enough to make them visible. A higher local contrast value makes the license plates more visible during nighttime, but increases noise.
- Set the **IR-cut filter** to Auto in the **Day and Night** section. This causes the filter to be present on color images (to remove IR light interference / color distortion) and be Off when it gets dark and the IR illumination switches on (if present).
If IR is used then changing between modes should preserve focus as the lenses are IR corrected. (If not using IR then an advanced setting is required)
- **Day / Night Threshold** – Drag the bar towards **Dark** to increase the threshold for the IR-cut filter. The camera changes to night mode later in the day.
Drag the bar towards **Bright** to lower the threshold for the IR-cut filter. The camera changes to night mode earlier in the day.
- Select the **Allow IR Illumination** checkbox in the IR Illumination section.
- Select the **Synchronize IR illumination with day/night** checkbox in the IR Illumination section. This causes the IR to be switched on when the camera changes to monochrome (night mode) and vice versa.
 - Monochrome – IR on
 - Color – IR off

- Set the **Maximum Shutter** speed (maximum exposure time) to **1/1000th sec.** *See Section 3.1 for when this can be decreased.*
- Set the **Max gain** to 24dB to or below to reduce noise on the images. If the plates are overexposed – reduce this value.
- **Blur-noise trade-off** – Low noise means shutter priority, Low motion blur means gain priority. Set this to about 1/3rd of the way along the slider as your maximum shutter speed will determine when the aperture will start to change.
- Turn off **Lock aperture**. This sets the iris to automatic mode, which we recommend especially if the vehicle faces direct sunlight.
- **Target aperture** – this controls the iris and should normally be midway. A smaller iris (towards closed) will increase the depth of field but cut down the light received.
- **Exposure level** – this setting will attempt to lighten or darken the resulting image – subject to the gain, iris and shutter settings. Normally leave midway.

In addition to these guidelines Axis has a few tips:

<https://www.axis.com/en-gb/products/online-manual/50100#t10107225>

Test the above settings by running through the scenario with a vehicle. For best results, test the settings in the darkest lighting conditions. This way, you get a good result both during nighttime and daytime.

Note that a P1445 has a motorized varifocal lens and will therefore need re-focusing after a zoom change. A Q1700 has a true motorized zoom lens that will maintain its focus.

5.1.8 Getting it wrong

In the following image taken at dusk, the shutter speed is too low, WDR has been left ON and there is no IR illumination:



5.2 Configuring the VaxALPR On Camera software

Once the Axis camera is installed and setup, we need to install and configure the VaxALPR On-Camera software. The following steps are recommended:

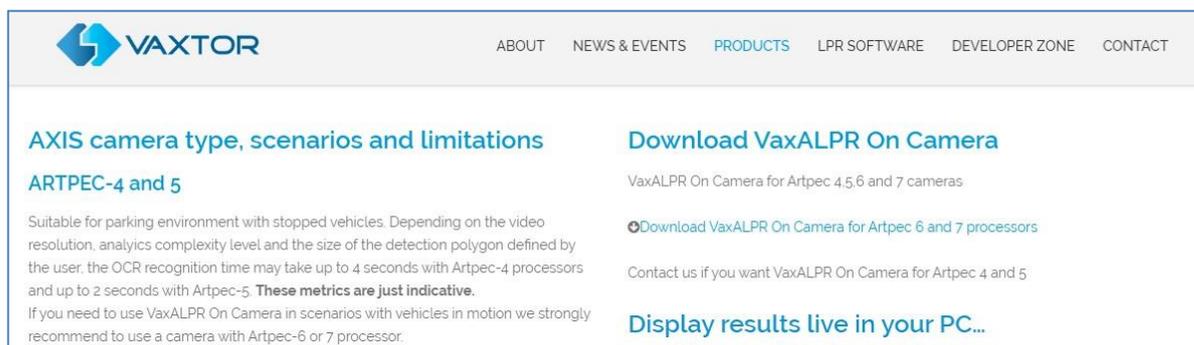
1. Install the ALPR software
2. Upload the license key
3. Restart the Axis Camera
4. Start the software
5. Configure the software
6. See how it works: VaxALPR On Camera Viewer

5.2.1 Installing the software

To install the VaxALPR On Camera software, do the following:

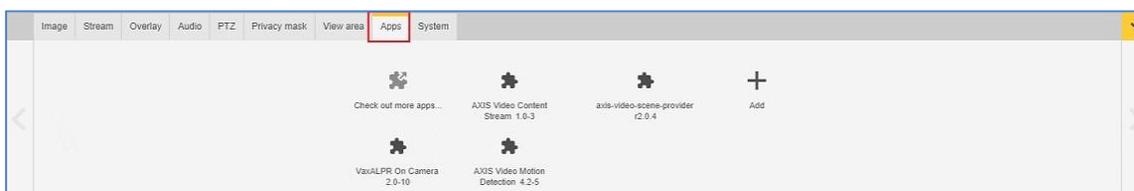
1. Download and save the VaxALPR On Camera software for Axis cameras available on the Vaxtor website: <https://www.vaxtor.com/technology-partners/axis-communications/>

The more recent Axis cameras such as the P1455-LE, the P1375-E & the Q1700-LE & Q1785-LE all have ARTPEC 6 or 7 processors.



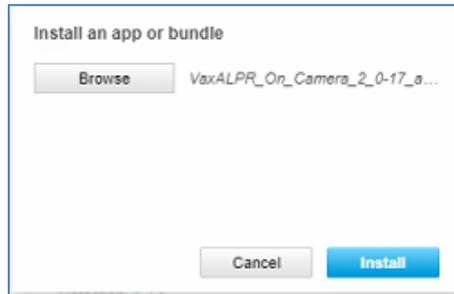
Vaxtor website: Download and Install the On-Camera Software

2. In the Axis camera's settings click on the Applications (Apps) tab.



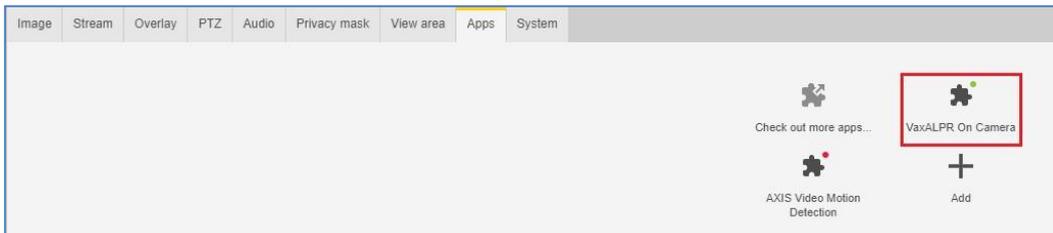
Axis camera setup: Apps > Add

- Click the + (Add button) and browse for the file:
VaxALPR_On_Camera_2_2_15_armv7hf.eap (in this case for release 2.2.15)



Axis camera setup: Apps > Add > Browse

- Click the **Install** button to install the software.
- After installation the App will appear on screen.



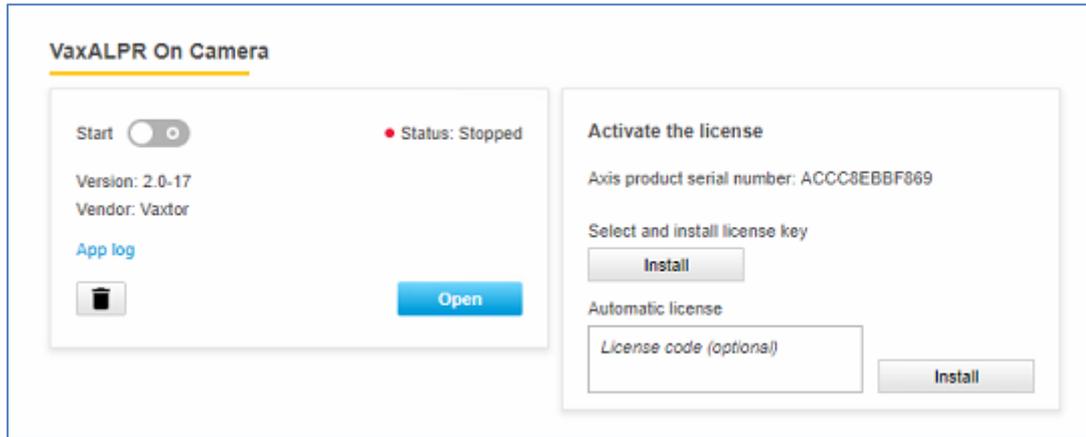
Axis camera setup: Applications > Overview

NOTE: If you encounter any issue while installing the software, upgrade the Axis camera firmware to the latest version available for your specific product model (the minimum version required 5.70).

5.2.2 Upload the license key

The VaxALPR On Camera software requires a license key. Whether you need a trial license (30 days) or already have a paid-for permanent license code, do the following steps and select the appropriate option.

- From the Axis camera's setup screen, and click on the Apps menu. Then click on the VaxALPR On Camera. **Take note of the Axis product serial number that appears in the License Activation section.**

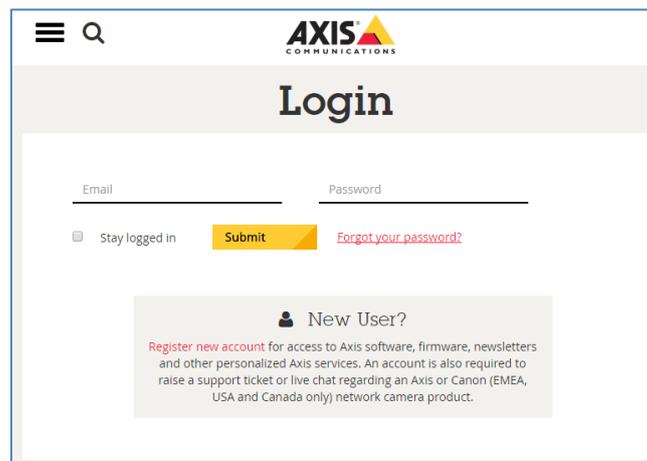


Axis camera setup: Apps > VaxALPR On Camera > License

2. Using your browser, go to the Axis website:

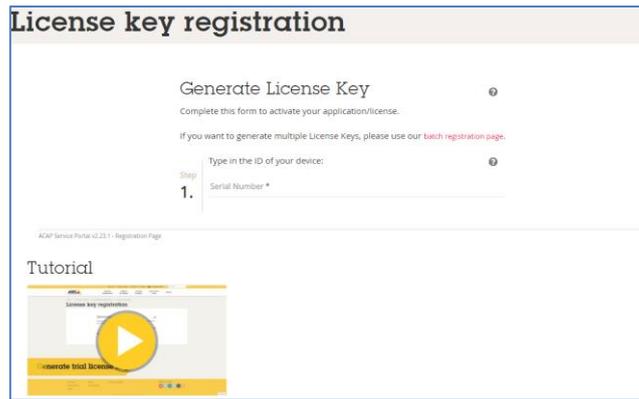
<https://www.axis.com/global/en/products/camera-applications/license-key-registration#/registration>

If you already are an Axis user, just log in. Otherwise register a new account.



Axis website: Log in to download a trial license

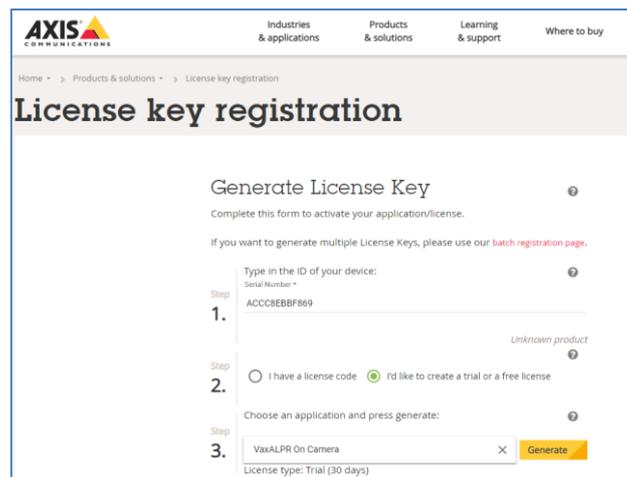
3. In the License key registration web page, do the following:
 - Type in the ID (Axis product serial number) of your camera.



Axis website: Enter the camera serial number

To generate a trial license

- Select the corresponding radio button. Select VaxALPR On Camera as the application name and press the Generate button.



Axis website: Generate a trial license key

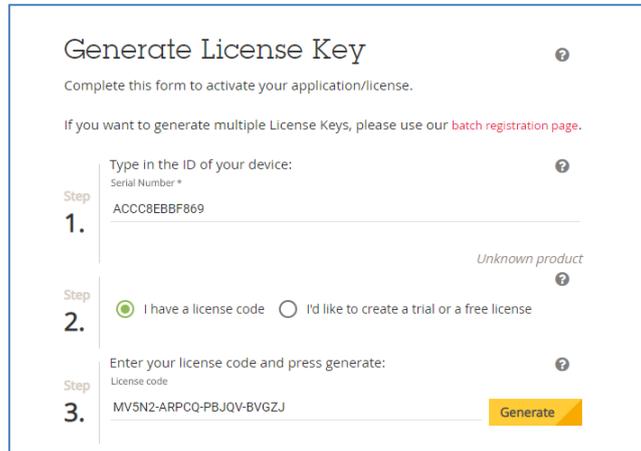
- Download the trial license key to your PC.

Step 4. You can download your license key through the following link:
Expiration date: Nov 24, 2018 ●
[Download license key \(Show the content of the license key \)](#)

Axis website: Download trial license key

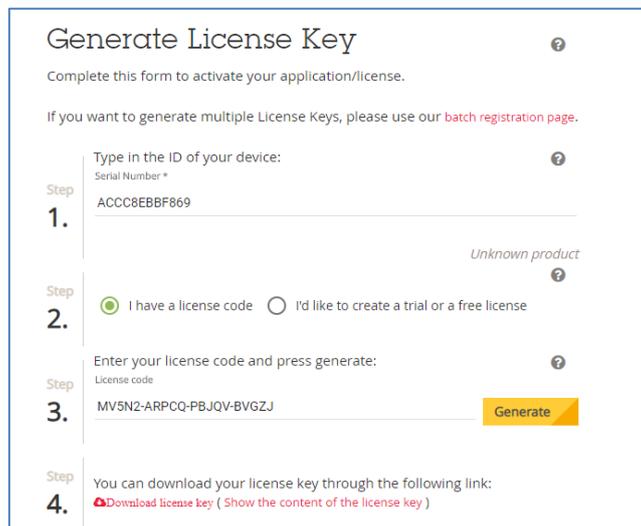
To generate a permanent license

- To purchase your permanent license, contact Vaxtor and send us your Product Serial number along with your order. When this process is completed you will be sent a License code.
- Select the corresponding radio button ('I have a license code') and enter your code and press the **Generate** button.



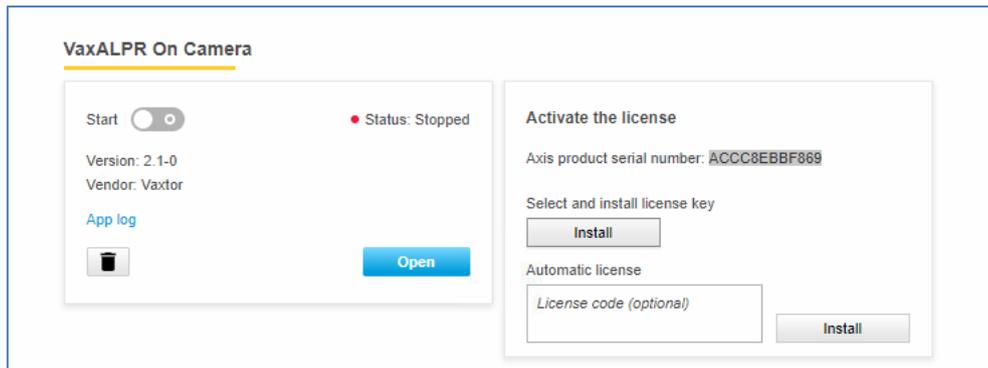
Axis website: Generate a permanent license key

- Download the permanent license key using the link shown in red.

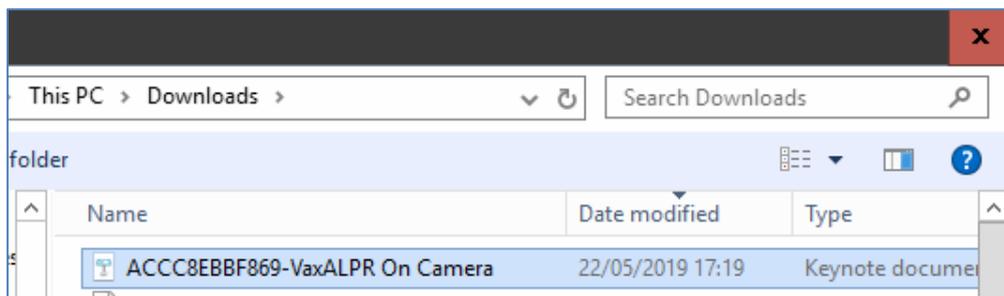


Axis website: Download license key

4. Now that you have the license key, go back to the Axis camera's setup and click on the Apps menu. Click on the VaxALPR On Camera > and in the 'Activate the license' section click 'Install':

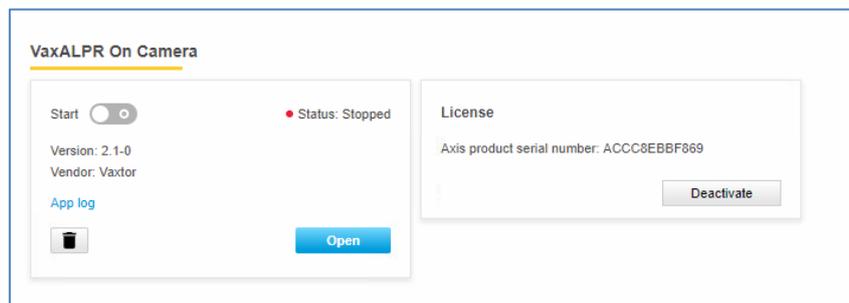


5. A file menu will open appear select 'License option. Click on the Select file button and select the license key file you have just downloaded. Click 'Open'.



Axis camera setup: Applications > VaxALPR On Camera > License

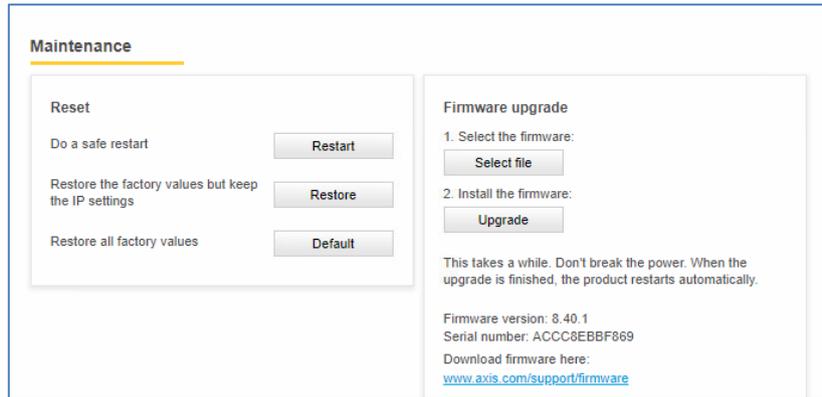
6. Next click on the Install button.
7. The permanent license should now be installed correctly.



Axis camera setup: Apps > VaxALPR On Camera > License

5.2.3 Restart the Axis Camera

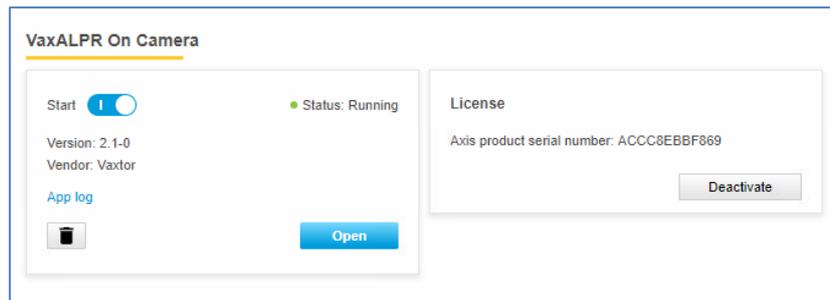
Once the VaxALPR On Camera software is installed and the license key is uploaded, you should restart the Axis Camera. Do this by selecting the 'System' tab and click on the 'Maintenance' on. Select the **'Restart'** button.



Axis camera setup: System Tab > Maintenance > Restart

5.2.4 Starting the ALPR software

To start the VaxALPR On Camera software, select the Axis camera's Settings, click on the Apps Tab and select the VaxALPR On Camera App. Use the Start Slider to start the ALPR App. The Status should change to 'Running'.



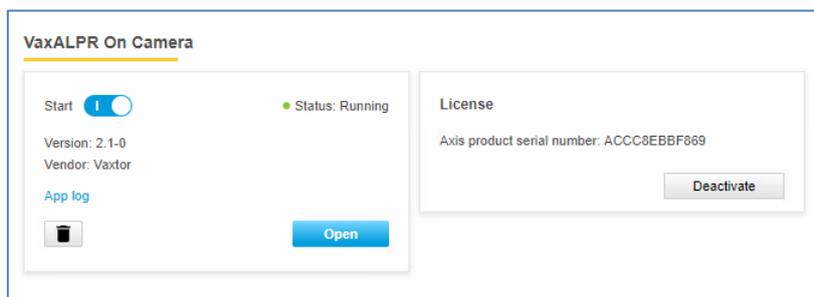
Axis camera setup: Apps > VaxALPR On Camera

Note that you can set up a schedule within the Axis camera to turn the ALPR application on or off at predetermined times. This can be useful in certain situations where it a requirement to only monitor a location between certain times for say privacy reasons.

See Section 8 at the back of this manual for detailed instructions on how to do this.

5.2.5 Configuring VaxALPR On Camera

Once the software is running you can configure the VaxALPR On Camera software by clicking on the blue Open button.

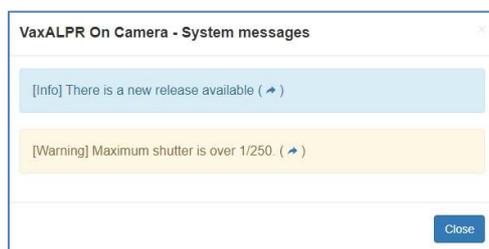


Axis camera setup: Apps > VaxALPR On Camera

5.2.6 System Messages

At this point the software will check that some basic camera settings are correct and display any warnings. Note that in order for the software to check for the latest version of the application an internet connection should be available and the DNS settings configured. See Section 5.1.2 to see how to do this.

If there are any messages a warning symbol  will appear at the bottom right of the screen. This may be clicked at any time to show the current messages.

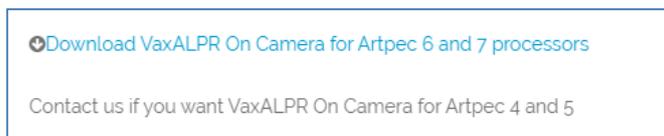


If the warnings are more serious a red symbol will appear: 

Warnings include:

- Checking for the latest version of software on the Vaxtor website. *(This assumes that the camera is connected to the internet)*
- Shutter speed that is too low (slower than 1/250th sec)
- WDR (Wide Dynamic Range) is switched on
- Auto Rotation is enabled
- Gain is over 12db
- Database has been enabled but the SD Card is full or write protected
- Etc.

If there is newer release available and you wish to install it, follow the link in the message to the Vaxtor website and download the latest version:



Return to the Axis Apps page and stop the App running. **DO NOT DELETE THE APP!**

If you do you will have to re-license it.

Click the Add + icon, browse for your new download and click install. This will upgrade to the latest version without having to re-license. Start the App and when running click on Open. You will see the version number displayed at the top the screen.

VaxALPR On Camera user interface

This will open a new window with the VaxALPR On Camera main interface.



VaxALPR On Camera interface

The icon in the top right corner reveals the options menu including:

- **Plates:** To display a live feed of all the most recent plates read (if configured)
- **Settings:** To configure VaxALPR On Camera software
- **Reporting:** To configure reporting options for VaxALPR On Camera.
Check the VaxALPR On Camera Integration Guide for further details.
- **Database:** To review and search the list of recorded plates (If configured)
- **Blacklist:** To manage a Blacklist (to sound alarms)
- **Whitelist:** To manage a Whitelist (to activate a relay)
- **Grammar exception:** To specify a list of plates to be corrected that have been damaged
- **Region of Interest (ROI):** To add/edit ROIs to include or exclude in the OCR analysis.
- **Show logfile:** To display the latest System Log for debugging purposes
- **Upload XML Config:** To import the VaxALPR On Camera settings from an XML file
- **Download XML Config:** To export the VaxALPR On Camera settings to an XML file. The export will not include the blacklist, whitelist or the log file of license plates.

VaxALPR On Camera not running

If VaxALPR On Camera application is not running correctly, any of the options will show the message:

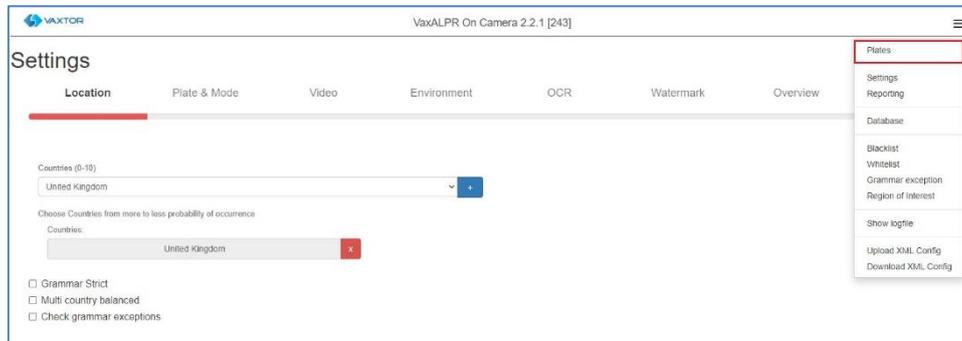


If the software is not able to run correctly, please ensure that:

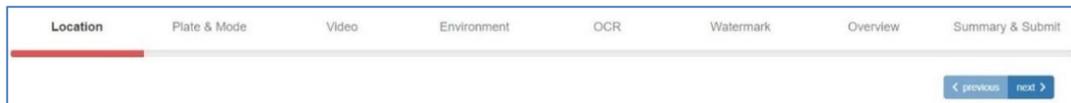
- The date and time of the camera are correctly set.
- A valid license is uploaded.
- The previous version was uninstalled before installing a new one. If this was not performed the System Log file in the camera may contain an error message requiring the software to be reinstalled. In this case
 - Uninstall the current version.
 - Shutdown and restart the camera.
 - Reinstall the latest version.

5.3 VaxALPR Settings

In the **VaxALPR Setting page** it is possible to configure all of the LPR parameters. The settings are divided in 7 different sections and a Summary section. Note that the software version number is displayed in the header bar.



To move between the steps, use the blue previous/next buttons or click on the headers over the red progress bar.

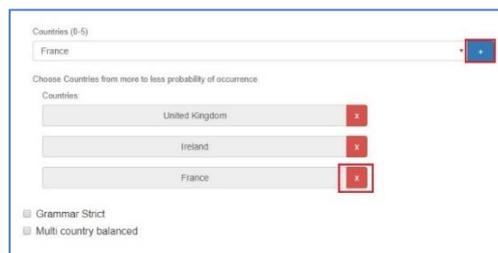


The last step, *Summary & Submit*, will show a resume of all configured options and a Submit button to save all of the settings.

(see **VaxALPR Settings: Summary and Submit changes** the end of the Settings section)

5.3.1 VaxALPR Settings: Location options

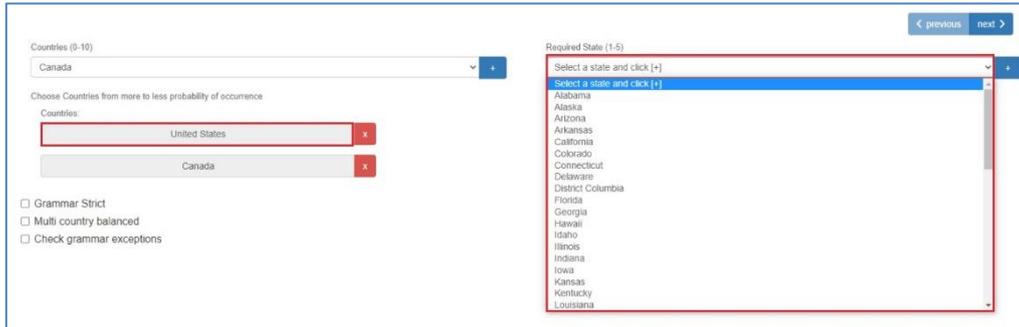
Countries (1-10)



At least one country must be selected and up to ten countries may be included.

- Select a country from the drop-down list and click the  button. The country will be added to the list.
- To remove a country from the list, click the  button.
- Additional countries will be added to the bottom of the list. Make sure that the list is ordered so that those countries with the higher probability of occurrence appear first. *(Tip: Think about this first and then add the countries one-by-one. If you make a mistake you will have to delete one or more entries and add them again.)*

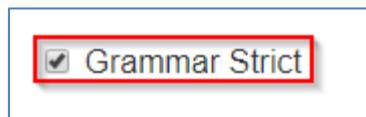
Required State (1-5)



If one of selected countries is *United States*, a main state must be selected from the drop-down menu. A total of five states can be added – again in likely order of occurrence.

Note that the same neural engine (used for matching character shapes) is used for all of the Americas, selecting the state simple loads the possible syntax (grammar) for those states to help with the letter O and zero for example. Other states not in the list will still be recognized.

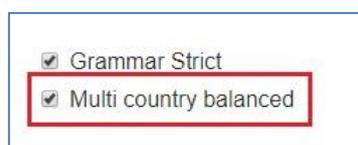
Grammar Strict



- Select this checkbox to force the Engine to only use the syntax from countries or states that you have selected. Plates that do not match these rules will **not** be reported. This is the recommended option for using ALPR for access control where exact matches are required.
- Do not select this checkbox when you want to report ALL valid license plates. This is the recommended option for ALPR in triggered mode. (see Working Mode later)
- In the USA, plates are often seen from multiple States – and so the recommended setting is **OFF**.

NOTE: False triggering may occur when this checkbox is not selected.

Multi country balanced



Default OFF. This option only applies when more than one country is defined in the selected countries list. If the flag is OFF the OCR will select the first country matching the plate grammar, otherwise it will compare candidates with all the countries in the list selecting the best option according to its internal algorithms.

Keep this set to OFF unless there is a high probability of having plates from different countries in equal numbers. e.g. on the border between two countries.

Check Grammar exceptions

Grammar Strict
 Multi country balanced
 Check grammar exceptions

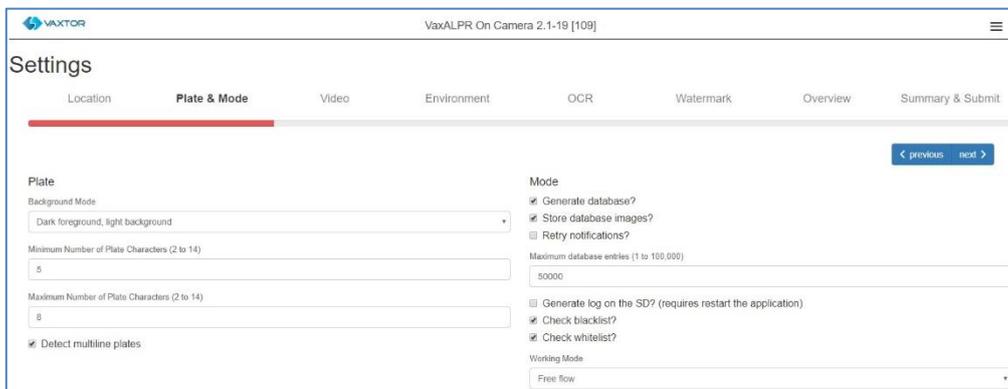
Default OFF. This feature is used to correct plates that have been damaged or tampered with. For example a regular visitor to a site has the plate MM11KLM but it is damaged and is always reported as MM1KLM. An exception can be set up to always report this plate correctly.

A second example would be a tampered plate where a plate has been altered to spell a name. e.g. B16MAN is altered to be read as B1GMAN. A mapping can be set up to always report this correctly.

The third option is where a camera is mis-reading an object as a plate. Sometimes fences, floor tiles or objects can resemble a plate. In this case the system can be programmed to ignore say: "11111".

See section [VaxALPR Grammar Exceptions](#) to set up plates to be replaced/corrected.

5.3.2 VaxALPR Settings: Plate & Mode options



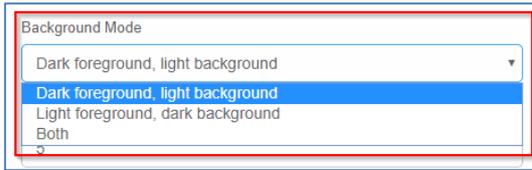
The screenshot shows the 'Settings' page for 'VaxALPR On Camera 2.1-19 [109]'. The 'Plate & Mode' tab is selected. The 'Plate' section includes:

- Background Mode: Dark foreground, light background
- Minimum Number of Plate Characters (2 to 14): 5
- Maximum Number of Plate Characters (2 to 14): 8
- Detect multiline plates

 The 'Mode' section includes:

- Generate database?
- Store database images?
- Retry notifications?
- Maximum database entries (1 to 100,000): 50000
- Generate log on the SD? (requires restart the application)
- Check blacklists?
- Check whitelist?
- Working Mode: Free flow

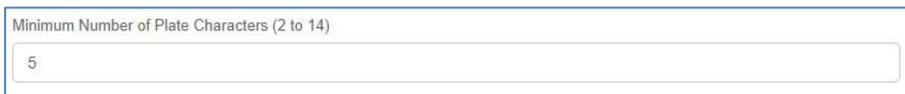
Background Mode



- Select the option from the drop-down list that best defines the color of the target license plate. There are three possibilities:
 - *Dark foreground, light background*: The plate background color is lighter than the characters (e.g. black fonts on white background).
 - *Light foreground, dark background*: The plate background color is darker than the characters (e.g. white fonts on black background)
 - *Both*: Plates are expected in both forms.

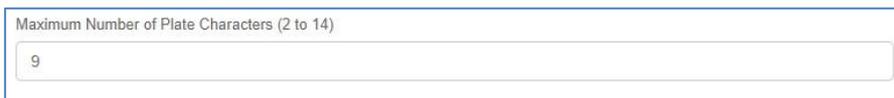
NOTE: Do not select Both unless it you need to recognize both types as this can affect OCR performance.

Minimum Number of Plate Characters



- Set the minimum number of characters that you expect to see in your region.

Maximum Number of Plate Characters



- Set the maximum number of plate characters that expect to see in your region.

Detect multiline plates



- Some countries or regions do not have two or three-line plates. If this is the case then unticking this option will allow the engine to run faster.

Mode

IMPORTANT: In order to save recorded plates in the camera's storage for later retrieval or viewing, you must install and configure an appropriate SD card in the camera.

The application only checks for available space on the SD card when launched and if it becomes full then no new plate reads will be added to the database.



The screenshot shows a configuration window titled 'Mode'. It contains the following options:

- Generate database?
- Store database images?
- Retry notifications?
Retry period (1 - 60 seconds):
- Use low coverage mode
- Maximum database entries (1 to 100,000):

Generate database

- To generate an on-board database (log file) of detected plates, select the 'Generate Database' checkbox. A maximum of 100,000 records may be stored in the database.

Store database images

- To also store images of each plate, select the 'Store database images?' checkbox. These images are automatically deleted when the matching plate is deleted.

Retry notifications

- Select this checkbox to retry the sending of any notifications if any fail, for example due to a comms problem.
- You may then specify a retry period in seconds.
See VaxALPR Reporting later in this manual.

Use low coverage mode

- Select this checkbox if your camera is remote and the communication links (WiFi or 3g for example) are constantly dropping out. When selected, events are not sent in real time to any configured Back Office or recipient (See Reporting options later in this manual). In very bad conditions this would cause a backlog of events being constantly tried. Instead they are retransmitted after a longer interval reducing the chance of an ever-increasing backlog.

Note this should NOT be used when using UTMC protocol or when using the system for access control where real time events are essential.

How retries work

Normally the transfer process takes approximately 100ms without image, and 300ms with image. Even with the low coverage mode active, if the response from the server takes more than 5 seconds, you will get a timeout error on the camera, BUT this does not mean the data hasn't arrived at the endpoint.

Usually this is caused by the server receiving the request and processing the data **before** sending the data received acknowledgement to the client (the camera). The data is already on the server, but the camera only waits 5 seconds for the response. This can cause the same data to be re-sent as the camera does not receive the OK response and the entry in the camera database is still marked as unsent. (or not received)

Check your endpoint software (back office) and ensure that responses are sent to the camera **immediately** after receiving the data before processing the data. Contact Vaxtor for further information.

Maximum database entries (1 to 100,000)

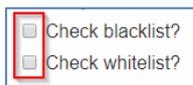
- Next set the maximum database size to the desired level. When this limit is reached the oldest records will be overwritten. Records can be written to the camera's internal SD card (if present) or a network share location if configured. (See Reporting section – Write Result).

*Note that if you are using a small SD card then the card may become full before this circular buffer limit is reached and so **no** new reads will be written to the card and so you should reduce this buffer size accordingly. There is no definite standard record size as this depends on video resolution, the complexity of the image, the jpeg compression factor used etc.*

Generate log on the SD

- Select this option to write log files to the Axis camera's internal SD card (if fitted).
Note that the Application should be restarted after this has been enabled.

Black / White list activation



Check blacklist

- Select this checkbox to enable plate checking against a predefined Blacklist. (see: VaxALPR Blacklist/Whitelist) later in this manual.)

Check whitelist

- Select this checkbox to enable plate checking against a predefined Whitelist.

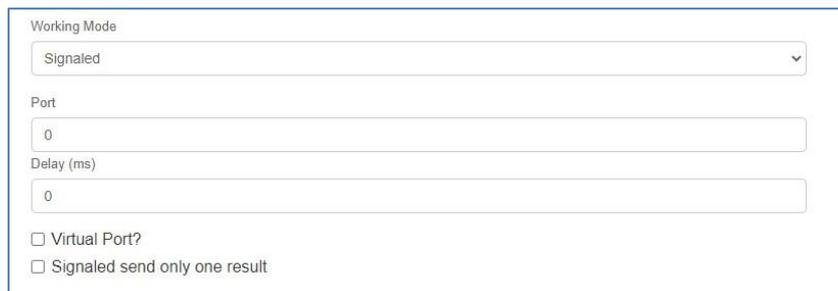
Note that Black and White lists can be stored centrally on Vaxtor's Back Office "Helix" and automatically synchronized with all connected cameras.

Working mode selection

Working mode



- Select the appropriate option from the drop-down list. There are three options:
 - *Free flow*: The system continuously analyzes the video and reports plates when detected. This is the normal mode of operation.
 - *Signaled*: The system only analyzes the video when a trigger is received. See below for the three types of triggers that can be used.
 - *Both*
- If **Working Mode** selected is set to '*Signaled*', a **port** may be specified (physical or virtual) and a **delay** can be set. This causes the App to wait after receiving the trigger before analyzing the frame. See below.



- Specify whether the selected **Port** is virtual or physical.
- Specify if only one plate result is to be sent.
This applies to images that contain multiple plates, - in this case the App will return the most confident plate read.

Signaled Mode

You might use signaled mode in high security scenarios when you are able to detect a vehicle (by a loop or beam for example) and you want to capture an image even if there is no plate or a damaged or disguised plate; in this case you could use a physical port.

In parking scenarios a PTZ camera (e.g. the Axis 6135-LE) could be moved to each parking bay and the ALPR triggered from the camera. The App would then attempt to read a plate and save/send the result to a parking back office. A virtual port would be used in this case.

In signaled mode, if the software cannot find a plate in the image it will return the plate as "NONE" along with all the normal metadata including the id of the signalling source.

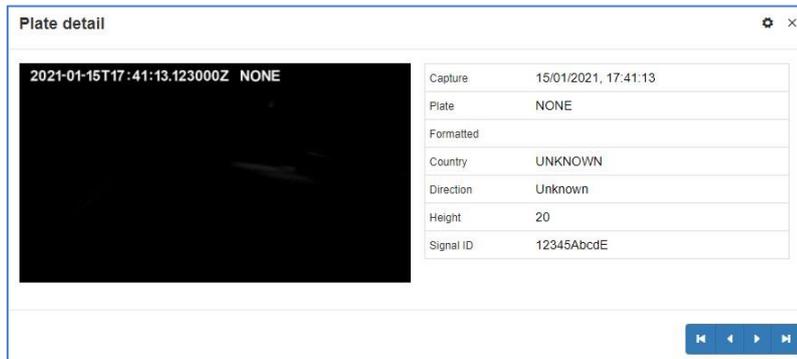
There are three ways of triggering the software:

1. An HTTP request to the App.

Write to the address of the camera as follows:

`http://CAMERA_IP/local/Vaxreader/trigger.cgi?id=12345AbcdE`

..where `id` is optional and can be any string. This will trigger the LPR and links the image with the id. This id will be stored in the plates table in the database and it is included in the Vaxtor protocol TCP/IP message as **\$signalid\$**



2. A electrical signal received via one of the camera's I/O ports

A physical port can be configured to detect an electrical pulse. See Port below.

3. A virtual port trigger received from the Axis camera.

A remote program – or an internal event can call, for example:

`http://camera_ip/axis-cgi/io/virtualinput.cgi?action=6:/500\`

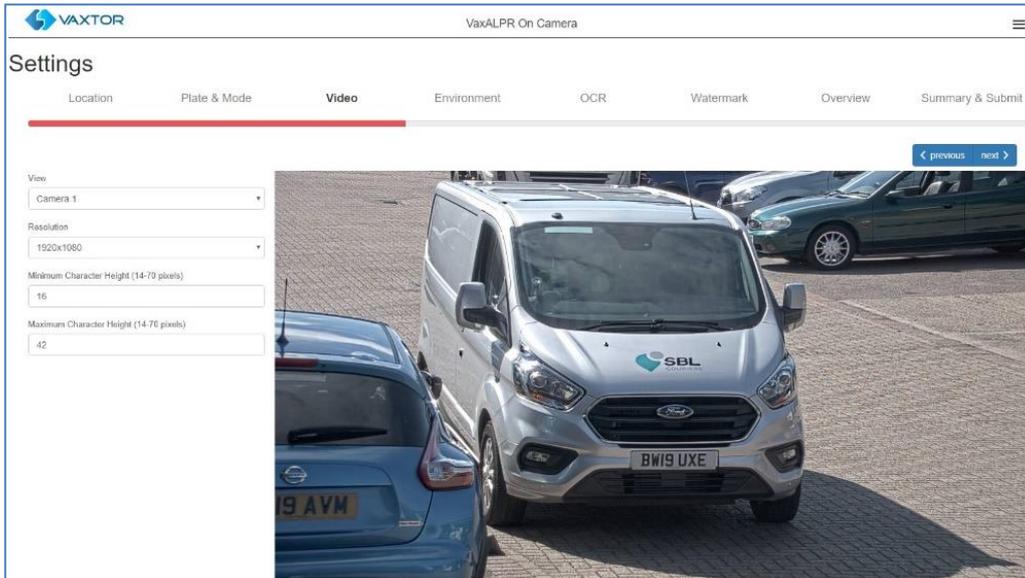
This will trigger virtual port 1 for 500ms.

(6 is virtual port 1, 7 is virtual port 2)

Port

The port is the camera port which can be a physical input port (usually 1 or 2 depending on the camera model and the number of ports available), or it could be a virtual port – which could be 6 or 7. *(6 is virtual port 1, 7 is virtual port 2).*

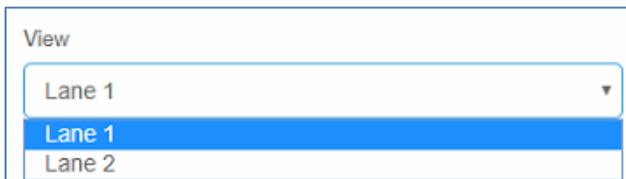
5.3.3 VaxALPR Settings: Video Options



This section displays real-time video based on the current settings. When some parameters are edited such as resolution, the changes are immediately reflected in the video stream.

View

- Select a View area from any available in the drop-down list. *(These are previously set up in the main Axis camera settings. You may setup several View areas from the same camera. Not all models support View Areas)*



Resolution

- Select the desired *Resolution* from the drop-down list. Any changes will immediately be shown on the live display.



NOTE: when the camera is setup to read plates in a single lane then a resolution of 1024x768 or 1280x800 is recommended. When the camera is setup to read plates in wide or multiple lanes, a resolution of 1600x1080 (if available) or 1920x1080 is recommended.

Minimum Character Height (14-70 pixels)

This is the minimum height that a license plate's characters should be before being read. If the camera's lens (zoom) is setup correctly then the plate characters should be about 20-30 pixels high in the area of the field of view where they should be read. Set this too small and the tiny plates will cause misreads.

Note that for small plates such as most Arabic plates - or plates with additional small characters such as Costa Rica, – then a minimum character pixel height of 30 pixels is recommended.

- Set the minimum height of the plate's characters in pixels.

NOTE: The recommended difference between the min and max heights is about 10 pixels.

Maximum Character Height (14-70 pixels)

- Set the maximum height of the plate's characters in pixels.

Verifying the Character Height configuration

To verify that the height settings are correct, click over the live video to show two rectangles which represent the minimum and maximum thresholds. The height of characters on the plate should fall within these two rectangles. You can drag these rectangles around the screen to where your target plates are.



5.3.4 VaxALPR Settings: Environment options

Same Plate Delay (seconds) 30	Multiplate recognition timeout (0-10000 milliseconds) 800
Same Plate Max Chars Distance 2	Multiplate minimum number of occurrences 1
Maximum Slope Angle (0-40 degrees) 20	Multiplate maximum number of occurrences 5
Minimum contrast (0-100) 0	Plate reported Middle capture
<input checked="" type="checkbox"/> Report vehicles moving away <input checked="" type="checkbox"/> Report vehicles approaching <input checked="" type="checkbox"/> Report vehicles with unknown direction	

Same Plate Delay (Max 65535 seconds)

Same Plate Delay (seconds)

- Set the number of seconds that should elapse before reading the same plate twice. This is to prevent multiple reporting of the same plate in situations when the traffic is slow or stationary. For example, if a vehicle stops at a barrier and the plate is reported but the car doesn't move for 30 seconds, then this delay should be set to say 60 seconds or more to prevent a duplicate read.

NOTE: When using signaled (triggered) mode, it is recommended that you set this delay to 0 seconds.

Same Plate Max Chars Distance

Same Plate Max Chars Distance

- Set the number of characters that two plates must differ by to be considered different. The Axis camera is capable of reading a plate several times as it passes through the field of view. If one character is misread on one of the reads then by setting this value to 2 then both reads will contribute towards the reported plate text.

Maximum Slope Angle (0-40 degrees) (Advanced option – Default 20)

Maximum Slope Angle (0-40 degrees)

- Set the angle of slope of a plate that the engine should attempt to read up to.



NOTE: If you know that the plates will be skewed then by setting this parameter higher you can force the engine to look for plate shapes that are more skewed. However, you should setup your ALPR camera to keep plates as close to the horizontal as possible.

Minimum contrast (Advanced option – Default 0 (off))

Minimum contrast (0-100)

This is an advanced feature which should be used with caution.

Sometimes in very low light conditions at night the camera image can become grainy and of very low contrast. This can sometimes cause the plate finder to generate a lot of plate candidates from the image which the engine then takes time to analyze and remove.

If the plates are retro reflective and therefore of a reasonable contrast at night, then by setting this value to say 10, the number of false positive plate candidates generated is dramatically reduced and the OCR time improves resulting in a higher multiplate value and better recognition.

- For most low light situations set to 10 or max 20.

Directional Filtering

The software can output the direction of travel when it reads a plate – but here the user can filter by direction and only reads plates travelling in a certain direction. This is useful at say a narrow access point which is used for both entry and exit. You could for example choose to only read and report plates entering – and not those leaving.

Report vehicles moving away

Report vehicles approaching

Report vehicles with unknown direction

- Select all three options for normal usage

Note that more than one read must be performed in order for the software to be able to determine the direction of travel. (the multiplate rate – see later in this manual)

Multiplate Recognition Timeout

Multiplate recognition timeout (0-10000 milliseconds)

- Set the number of milliseconds that the engine should spend analyzing a plate.
(1000 milliseconds = 1 second)

In free-flow mode the engine continuously analyses video frames and reads and reports plates. It makes a final decision on the plate read after an interval of time - the maximum recognition timeout period. There is a dedicated time counter for every plate which starts counting after the first read. When it reaches the preset timeout it stops, checks the number of samples read of the same plate and returns the “best” result.

If an instantaneous plate read is not needed then set this timer to say 2000ms (2 seconds) so that the engine continues to look for the same plate to read again for as long as possible. Note that if a new plate is spotted, the old one will be reported and a new plate-trace started.

We call the number of times the same license plate has been read within the maximum recognition period the **multiplate rate**. Several reads of each plate are good and produce better results.

Multiplate minimum number of occurrences

Multiplate minimum number of occurrences

- Set the minimum number of times that a plate should be read within the Timeout period to be considered a valid plate.

Multiplate maximum number of occurrences

Multiplate maximum number of occurrences

- Set the maximum number of times that a plate should be read before being reported (this may happen before the timeout).

Plate reported

Multiplate maximum number of occurrences

Plate reported

Last capture ▾

First capture

Middle capture

Last capture

- Select which plate image should be saved from the drop-down list:
 - *First capture.*
 - *Middle capture.*
 - *Last capture*

A plate is normally read several times as it passes through the camera's field of view. You may want to use the largest (Last) image for oncoming traffic & the First image for vehicles moving away from the camera.

5.3.5 VaxALPR Settings: OCR options

Minimum Global Confidence (0-100) 70	LPR complexity Medium
Minimum Character Confidence (0-100) 50	Plate depth Low

Minimum Global Confidence (0-100)

Minimum Global Confidence (0-100) 70
Minimum Character Confidence (0-100) 50

- Set the minimum confidence level that the whole plate read must meet in order to be accepted. The global confidence is the average of all individual characters' confidences. The recommended value is 70. Set lower if you see some plates in very bad condition but want to read them. (Setting this too low will cause the engine attempt to read other items such as vehicle signage etc.)

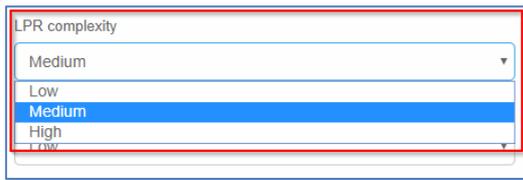
Minimum Character Confidence (0-100)

Minimum Global Confidence (0-100) 70
Minimum Character Confidence (0-100) 50

- Set the minimum confidence level that a single character must meet in order to be accepted. The recommended value is 50.

TIP: In regions with open grammars such as the USA keep these two values high, e.g. 90-80 respectively. Higher values mean a lower probability of false positives but a lower probability of missing plates.

LPR Complexity



- This is the complexity of the analytics to be applied during the ALPR Engine's stage of plate reading. Set this according to the OCR mode and type of traffic expected. There are three possibilities:
 - *Low*: Recommended for very high-speed traffic where the OCR needs to work faster and your preference is for plate detection over perfect recognition.
 - *Medium* (Default): Recommended when the OCR mode is set to free-flow.
 - *High*: Recommended when the OCR mode is set to signaled (triggered.)

NOTE: Higher complexities give more accurate reading but make the ALPR engine run slower.

Plate depth



- This is the complexity of the analytics to be applied during the ALPR Engine's stage of plate finding. Set this to one of the following three values:
 - *Low* – apply up to 3 levels
 - *Medium* – apply up to 8 levels
 - *High* – apply up to 12 levels

NOTE: Always use Medium unless you are losing plates because of processing power.

5.3.6 VaxALPR Settings: Watermark

The Axis camera has a built in Overlay option to overlay text onto the video stream including the last read plate details and other dynamic text.

See the VaxALPR On Camera Axis Software Developer's Guide for more details and see the Reporting section later in this manual.

Inserting a watermark using Reporting is useful when video is being sent to a VMS such as Milestone or Axis's own and the overlay text is written onto the video stream. However, when still images are transmitted to Helix or some other device using one of the other reporting options then the software has no knowledge of the video stream and so this Watermark

option should be used which will write for example the plate text and date onto the still image being sent.

Insert watermark
Watermark template

Watermark position

Watermark font size

The watermark template field allows you to insert dynamic text that will be overlaid onto the still image of the captured plate. Choose from the following variables:

- **\$date\$**: Timestamp in ISO8601 format
- **\$plate\$**: Plate number
- **\$tag\$**: Unique hash for this plate number. Same plate number will always give the same \$tag\$. Format based on UTMC algorithm.
- **\$plateutf8\$**: Plate number in utf8 format.
- **\$country\$**: Full country of origin name.
- **\$countrycode\$**: 3 letter country code.
- **\$state\$**: Plate State for USA.
- **\$category\$**: Plate category for countries that support it.
- **\$blacklist\$**: Description on the blacklist linked to the plate number.
- **\$whitelist\$**: Description on the whitelist linked to the plate number.
- **\$ifblacklist\$ \$ifblacklist\$**: If the plate is on the blacklist, the text in the 'if clause' will be displayed.
- **\$ifwhitelist\$ \$ifwhitelist\$**: If the plate is on the whitelist, the text in the 'if clause' will be displayed.
- **\$ifnolist\$...\$ifnolist\$**: If the plate is not on a list, the test in the 'if clause' will be displayed.
- **\$confidence\$**: Global confidence (0-100).
- **\$charheight\$**: Average charheight (pixels).
- **\$processingtime\$**: Processing time in milliseconds.
- **\$left\$**: Left coordinate for the plate on the image (pixels).
- **\$top\$**: Top coordinate for the plate on the image (pixels).
- **\$right\$**: Right coordinate for the plate on the image (pixels).
- **\$bottom\$**: Bottom coordinate for the plate on the image (pixels).
- **\$absoluteleft\$**: Plate left position based on the total image width (0-1).
- **\$absolutetop\$**: Plate top position based on the total image height (0-1).
- **\$absoluteright\$**: Plate right position based on the total image width (0-1).
- **\$absolutebottom\$**: Plate bottom position based on the total image height (0-1).
- **\$width\$**: OCR image width.
- **\$height\$**: OCR image height.
- **\$ip\$**: Camera IP address.
- **\$roid\$**: Roi ID where the plate number is found.
- **\$speed\$**: Vehicle speed (Km/h).
- **\$multiplate\$**: Amount of times that the plate has been read before reporting.
- **\$signaled\$**: True if the read was caused by a trigger.
- **\$id\$**: Database ID for this read.

- **\$direction\$**: Enumerate with the vehicle direction (0: Unknown, 1: Towards, 2: Away, 3: Stopped)
- **\$directionstr\$**: String with the vehicle direction.
- **\$safedate\$**: Date in format %Y%m%d_%H%M%S in the camera time zone (Useful for filenames).
- **\$localdate\$**: Date in format %d/%m/%Y in the camera time zone
- **\$localtime\$**: Date in format %H:%M:%S in the camera time zone.
- **\$imageid\$**: Signal ID in case of a trigger read.
- **\$plateimage\$**: Plate crop JPEG image encoded in base64.
- **\$platejpegsizes\$**: JPEG size in bytes.
- **\$overviewimage\$**: Overview JPEG image encoded in base64.
- **\$overviewjpegsizes\$**: JPEG size in bytes.
- **\$epoch\$**: Unix epoch (seconds).
- **\$utcdate\$**: Will report the date at ISO8601 format but always in UTC. (2020-12-31T16:11:30.000Z)
- **\$etx\$**: End transmission character (03)
- **\$stx\$**: Start transmission character (02)

See note on UTC format: [here](#)

In the example below we are using the \$plate\$ and \$date\$ fields.

Next select the position of the watermark from the four options available and finally select the font size required. All saved images will now have this information burnt into the still images of the plate capture.



5.3.7 VaxALPR Settings: JPEG Compression

Perform report crop to 640x480
 JPEG quality (1 to 100)

 Maximum JPEG size (0 is unlimited)

- Select the required compression ratio for the saved images. The lower the number, the higher the compression ratio (and smaller the image size) but the quality of images will be lower. 80 is a good compromise.

- Set a maximum size (in Bytes) if your Back Office has size limitations. In the UK the Police National Back Office limits images to 25KB – so in this case set to 25000 Bytes.
- In the case of a restricted size you should use the ‘Perform crop to 640x480’ setting. This will crop an area around the license plate to apply the compression to. This is better than compressing the whole image which will result in a very low-quality result!

5.3.8 VaxALPR Settings: Overview Setup

The Axis cameras have one lens and this is used in this case for reading plates. It is common in ALPR systems to have either a dual lens (in a specialized ALPR camera) or a separate camera connected to the first so that for every plate read, a second color overview or color contextual image can be captured and be associated with the plate read. This second camera is usually zoomed out slightly to capture the scene and show the complete car and, if possible, the driver’s face. It could also be set up to show the rear of a vehicle.

Overview Url <input type="text" value="Overview Url"/>	Overview Password <input type="text" value="Overview Password"/>
Overview User <input type="text" value="Overview User"/>	

Here we can specify the URL of an associated Axis camera which must have an ACAP (Axis Camera Application Platform) that will serve images to the ALPR camera. This is in the form of an application, VaxOverview which is available from Vaxtor for a small charge.

*The file for ARTPEC 6/7 based cameras is called: **Overview_1_0_armv7hf.eap**
.. and for ARTPEC 5 is called: **Overview_1_0_mipsisa32r2el.eap***

(As this is not processor intensive and it is okay to use an ARTPEC 5 based camera if available)

Once setup on the second Axis camera then every time a plate read is performed the Axis ALPR camera requests a single frame (image) from the Overview camera with the exact same timestamp as the plate read.

Note: It is very important that both cameras are NTP synchronized.

The LPR camera will then send the overview image with the plate read if requested to Helix or other third party receptors.

There is a new \$overviewimage\$ and \$overviewimagejpegsize\$ to specify this information.

When the Overview App is running you can set the frame rate and resolution of the images to be captured and sent to the main ALPR camera:

	Overview
FPS <input type="text" value="10"/>	
Resolution <input type="text" value="1920 x 1080"/>	
<input type="button" value="Save Overview"/>	

Overview URL

- Setup the URL to access the Axis camera to be used as the overview camera.
- The address should be: <http://<cameraip>/local/Overview>

e.g. <http://192.168.0.99/local/Overview>

Overview User

- Enter the user name with admin rights on the Overview camera. E.g. 'root'

Overview Password

- Enter the password for the Overview user. E.g. 'pass'

Note that if "Generate database" and "Store database images" have been ticked in the Mode section, then both images (The ALPR image and the associated overview image) will be stored in the ALPR camera database.

Application note:

It is possible to run the Overview App on the same camera as the ALPR App. In this case the overview image can be set to a different resolution to that used for the ALPR. One use of this is when using a very high-resolution Axis camera, e.g. a 4k x 3k model. You would normally not want or need to perform the ALPR at the highest resolution as this would cause the software to take longer than necessary to find and process plates; you should always operate at the minimum resolution necessary using the guidelines described at the start of this manual: e.g. 300 pixels per horizontal meter of road. However, once a plate is found you could use the Overview App running on the same camera so also save a very high-resolution image of the scene for later analysis or reference.

Another time this would be useful is when you are short of processing power e.g. 2 x fast lanes of traffic. In this case you might use an ROI to minimize the field of view .. and by selecting "Crop ROI" a rectangle will be formed around your ROI and the image converted to monochrome to speed up the OCR by quite a lot.

In this case you could use the Overview App to save / send the full color image top the server or Back Office.

When using the Overview App on the same camera you could use the IP address:

<http://127.0.0.1/local/Overview>

5.3.9 VaxALPR Settings: Speed

This is a separately licensable product available from Vaxtor and adds an instantaneous speed capability to the ALPR.

The camera needs to be really well set up and the program will then use the precise timing and position of plates approaching to accurately determine the speed of the vehicle to within a couple of percent accuracy. (A typical speed camera is normally only accurate to 10%). The software works best on front plates as these tend to be set at a consistent height from the ground.

It is imperative that the following guidelines be met:

- Use single lane only detection to achieve the highest accuracy. Do this by focusing on one lane – or by using an ROI to capture in one lane only – preferably the one closest to the camera.
(Dual lanes are possible if the camera is positioned between the two lanes)
- Set the maximum side angle from the camera to the capture point to be 15°
This is the horizontal camera angle (the vertical angle is the tilt) so if the camera was positioned exactly at the edge of the road then this would be the angle from along the road to the capture point)
- The working distances should be between 15-20 meters for slow and urban deployments and between 20-30 meters for higher-speed measurements
- Camera mounting height 4-6 meters
- **The Plate Height in Pixels (average plate character height) should be a minimum of 21**
- Use gantry or rigid pole mounting to eliminate camera roll and vibration. This can affect accuracy.
- The road must be level and not undulating
- The camera should **NOT** be placed near to road bends, speed-bumps, road junctions, traffic lights or roundabouts or anywhere where vehicles are likely to be accelerating or decelerating. The detection area must **NOT** be on a curve in the road.

In Settings select Speed:

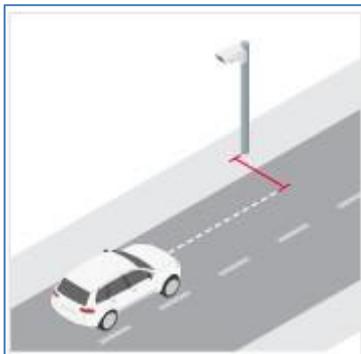
<input checked="" type="checkbox"/> Enable I-Speed		
Sensor Width (mm) 7.93	Camera Tilt Angle (0-45) 20	Speed Factor (m) 1
Sensor Height (mm) 3.182	Minimum Focal Length (mm) 2.8	Minimum Tracking Time (ms) 100
Camera Height (m) 5	Maximum Focal Length (mm) 8.5	Units Km/h
Camera Lane Distance (m) 3	Zoom Level (0-100) 0	

Set the parameters as follows:

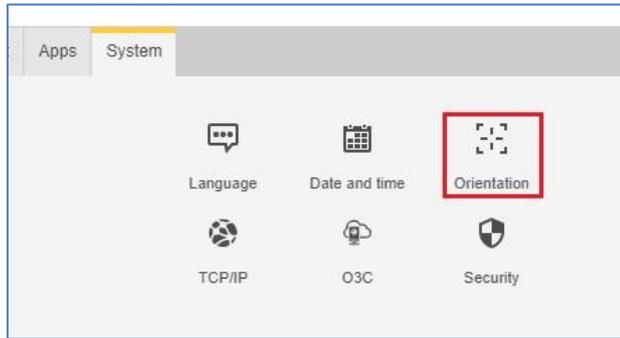
- The Axis Q1700, Q1785 and P1455 all have the same sensor. The sensor is 1/2.8" and size is 7.930 x 3.184mm. *Note that not all 1/2.8" sensors are the same size.*
- Camera resolution (in settings) – use a resolution that matches the sensor aspect ratio – so in this case use 1920x1080 or 1280x720.
- Set the camera height in meters from the ground. A decent height is required to track the plates approaching the camera – 4-6m is good.



- Camera distance - this is the perpendicular distance from the base of the pole to the center of the road in meters.



- Set the camera tilt angle. This is the angle from the horizontal that the camera makes with the vehicle at the typical capture point.
To help calculate this, use the Orientation tool in the Axis System menu.

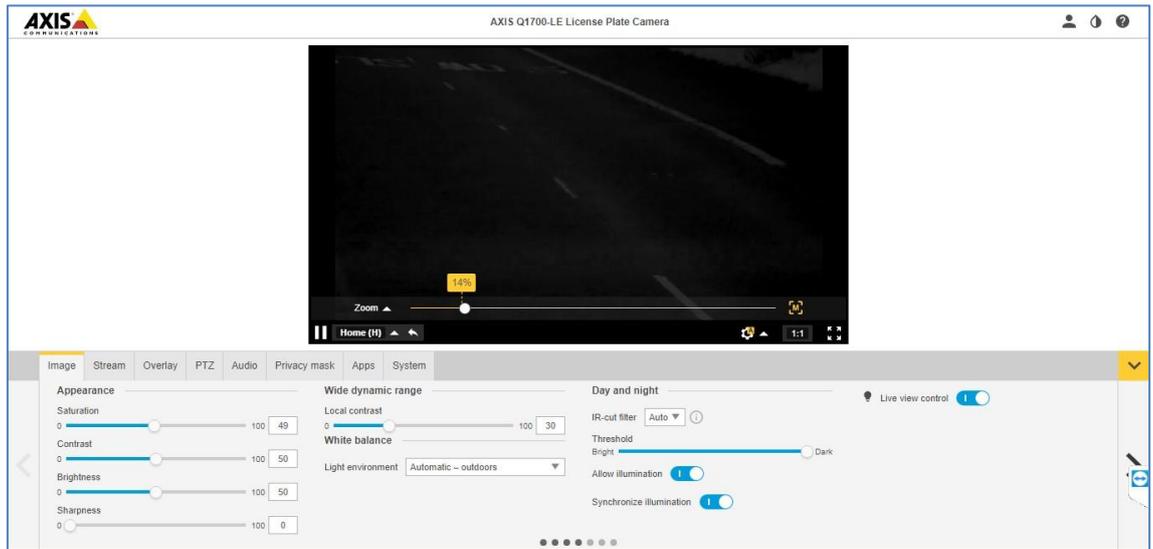


- Select Configure and enter the camera height and road distance (camera distance) as described above (ignore the speed parameter) and press Next.
- The camera will then measure the tilt using its internal sensors and display the tilt angle (Vertical angle) to the vehicle as follows:



- Enter this value as the Camera Tilt Angle.
- Set the minimum and Maximum focal lengths for the camera. In this case the Q1700 has an 18-137mm lens.
- Enter the camera's current zoom value. To find this go to the main camera settings page and gently click the cursor on the zoom slider to reveal the current zoom value.

In this case 14%:



- Leave the zoom factor at 1 until calibrated.
- Set the Minimum Tracking time to 100ms for a single lane.
- Select units of length as Miles or Kilometers per hour.
- Calibrate the Speed Factor.

The Speed factor is the ratio of the App’s estimated speed to the real speed of the test vehicle. We calculate this number by dividing the real speed by the estimated one.

To do this you must drive past the camera at an exact and consistent speed (i.e. no accelerating or decelerating). It is more accurate to use a GPS than the vehicle’s speed display as the accuracy of this can vary with tyre pressure. Alternatively use a speed gun.

- Go to the Plates menu and look at the speed of your test vehicle:

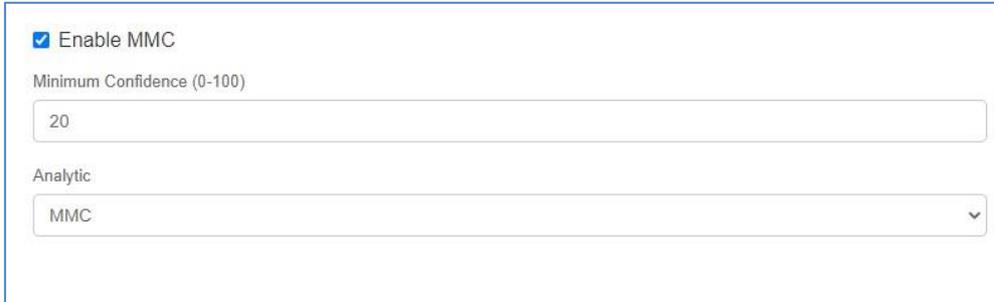
Plates				
Search for plates...				
Capture	Plate	Image	Country	Speed
04/02/2021, 17:22:08	YG65LKA		United Kingdom	15
04/02/2021, 17:21:35	YK67ZHU		United Kingdom	16

- For example, if VaxALPR calculates the speed of the test vehicle to be 55Km/h – but the real speed was measured at 60 Km/h – then the Speed Factor would be set to $60/55 = 1.09091$.

5.3.10 VaxALPR Settings: MMC and Vehicle Classification

This are separately licensable products available from Vaxtor and adds a Make, Model and Color recognition capability to the ALPR along with the Vehicle Class.

They can be used separately or alongside each other.



When MMC is enabled, the engine will find a plate and the MMC analytic will attempt to identify the make model and, if possible, the color of the vehicle using Deep Learning technology.

The software recognized approximately of 680 car manufacturers and 7,250 models and can recognize make, model, color from both front and rear views to a very high accuracy. The engine does not require any calibration and automatically determines the orientation of the vehicle. The software will report up to 11 colors but note that colors are often distorted by lighting and reflection on a vehicle.

Vehicle Classification or VClass should be used cameras that are setup to not only read the plate, but show as much of the front or back of the vehicle as possible at a reasonably shallow angle. The software will report vehicle types including: motorcycle (if it has a plate), car, pickup, van, truck and bus.



- Select MMC / Classification or both analytics.

In the Plates or Database menu you can use the settings icon to display the MMC & V data:

Plates

Capture	Plate	Height	Maker	Model	Color	Class
16/04/2021, 19:15:49	SK61PGV	18	Peugeot	207 CC	Grey	
16/04/2021, 19:15:48	FV56XHZ	25	Toyota	Prius+	Black	
16/04/2021, 19:15:46	YT52DZJ	22	Volkswagen	Passat	Black	
16/04/2021, 19:15:44	SF66YWO	27	Ford	Transit Custom	White	
16/04/2021, 19:15:25	BN11FYL	25	Ford	Focus	Red	

5.3.11 VaxALPR Settings: Summary and Submit changes

IMPORTANT: To avoid unexpected problems, it is recommended that you backup the current configuration to your PC by downloading the configuration XML file (see: [Download XML Config section later in this manual](#)).

Review the settings

Settings

Location
Plate & Mode
Video
Environment
OCR
Overview
Summary & Submit

← previous
Submit

Location

Plate

Background Mode: Dark foreground, light background

Grammar Strict: true

Report Times: false

Minimum Number of Plate Characters: 5

Maximum Number of Plate Characters: 9

Mode

Video

View: Lane 1

Resolution: 1920 x 1080

Minimum Character Height: 21

Maximum Character Height: 51

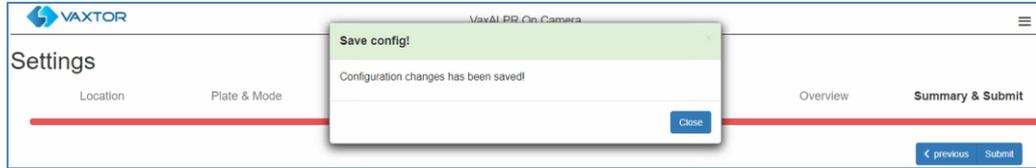
Environment

OCR

To review all the settings, click on each title to open a panel showing each group of settings. E.g. The Plate and Video settings are shown above. If any changes need to be made then use the headings to return to the desired section and edit any settings as necessary.

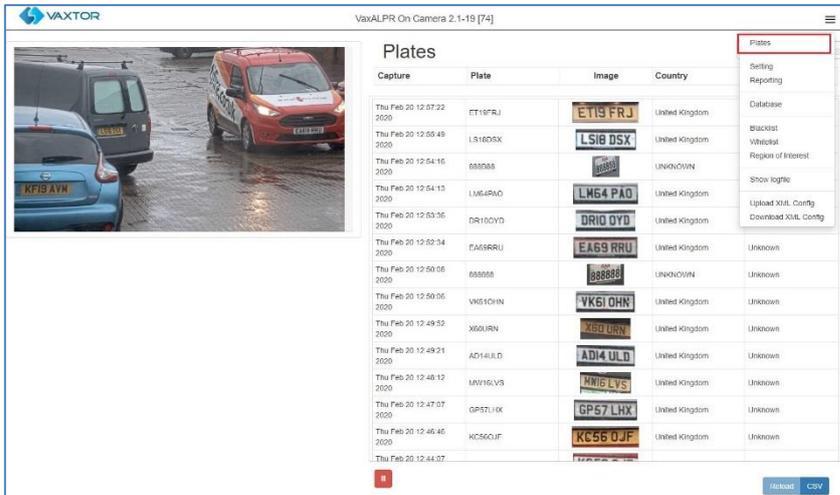
Submit configuration

1. To save all of the ALPR settings, click the **Submit** button.
2. Wait for the confirmation (or error) message.



5.4 VaxALPR Plates

The 10 most recent plate reads are stored in the camera's internal memory and are displayed when the Plates menu is selected:



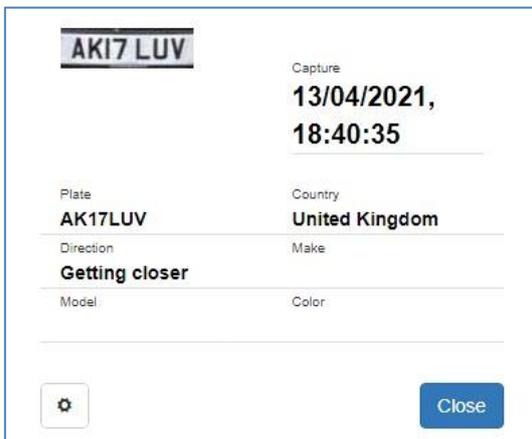
More can be viewed as they will be stored in the browser's cache.

If the camera has a SD card installed, it is possible to store the LPR activity in a local database which can store up to 100,000 records. See the Database section below.

You can perform a simple search on this short list by entering a plate or partial plate in the Search for plates ... box. For example, search for all plates that contain 17:



Click on a plate to display details of the read including the character height, multiplate reads etc. This is useful when checking that you have set the min and max plate heights up correctly as you can see some of the variances in captured plates.



Click the gear icon (bottom left) to reveal a list of fields that can be shown when a plate is selected:

Fields to show ×

<input type="checkbox"/> ID	<input checked="" type="checkbox"/> Plate
<input type="checkbox"/> Formatted	<input checked="" type="checkbox"/> Country
<input type="checkbox"/> Region	<input checked="" type="checkbox"/> Direction
<input type="checkbox"/> Height	<input type="checkbox"/> Confidence
<input type="checkbox"/> In blacklist	<input type="checkbox"/> Blacklist
<input type="checkbox"/> In whitelist	<input type="checkbox"/> Whitelist
<input type="checkbox"/> Multiplate	<input type="checkbox"/> ROI Id
<input type="checkbox"/> OCR Time	<input type="checkbox"/> Category
<input type="checkbox"/> Speed	<input checked="" type="checkbox"/> Make
<input checked="" type="checkbox"/> Model	<input checked="" type="checkbox"/> Color
<input type="checkbox"/> Class	

Default
Save

Make, Model and Color and Vehicle Class are only available if you have bought the MMC or VClass version from Vaxtor. Contact Vaxtor for further details.

Note that you can get a more comprehensive view of the vehicle from the Database option described in the next section. You will need to have an SD card fitted to use this feature.

Download this short search list as a .csv file to your PC by clicking the **CSV** button at the bottom of the screen. The file will be saved in your downloads folder and appears as follows:

```
plate_number;id;country;region;category;confidence;roi_id;process_time;multiplate_rate;vehicle_direction;date;
"MA17JVM";"ca4fc774-8119-4132-b0f5-a98f95357f95";"United Kingdom";"UNKNOWN";"";99.571428571428569;-1,800.8592240028083;1;0;"Thu Jun 6 17:02:18 2019";
"PE62LNT";"5dfb5cc8-ba07-4f94-bcdd-826140bb0b79";"United Kingdom";"UNKNOWN";"";99.857142857142861;-1,735.7950519993901;1;0;"Thu Jun 6 17:02:16 2019";
"YC59SUU";"3cd1ba32-10e5-4eac-81a0-e59268aa2c21";"United Kingdom";"UNKNOWN";"";100;-1;342.7925049997866;1;0;"Thu Jun 6 17:02:07 2019";
"AF65HSE";"864f9a70-68cd-4112-9025-e477684848cd";"United Kingdom";"UNKNOWN";"";100;-1;336.6689030006528;1;0;"Thu Jun 6 17:01:41 2019";
"OE11HHW";"c671abdf-5e79-47b8-915f-26574d410c27";"United Kingdom";"UNKNOWN";"";99;-1;668.0454799979925;1;0;"Thu Jun 6 17:01:31 2019";
```

The first row contains the field headers.

There is a Pause / Play button for preventing any new plates being added to the list for a short period. Pressing Play once more catches up any cached reads.

Longer searches are possible using the Database feature below.

OCR Processing Time

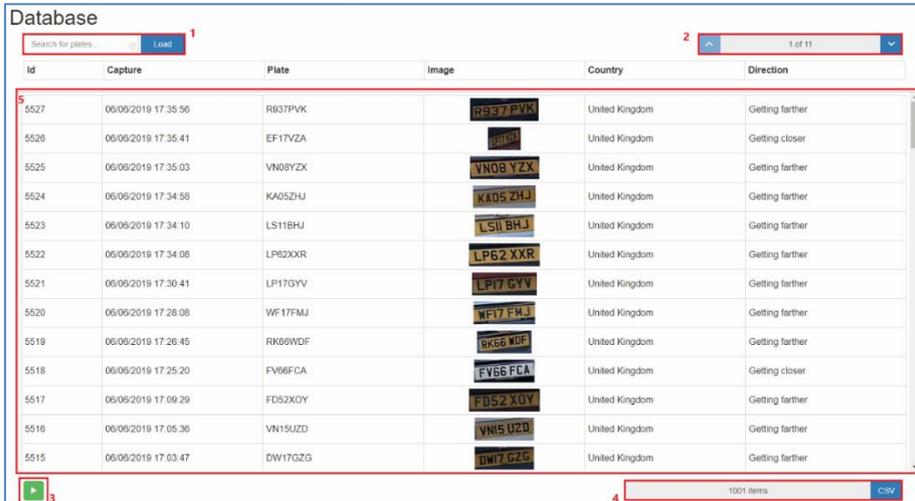
Note that if you do not have an SD card installed, you can look at the logfile to see the ocr processing time. See Show Logfile below.

*When you view the OCR processing time you will see the multiplate rate alongside it. So if the multiplate rate is say 5 and the OCR processing time shows as 150ms, – then that means that **ONE** of the 5 reads (the one used to display the actual read being examined) took 150ms.*

5.5 VaxALPR Database

If the camera has a SD card installed, it is possible to store up to 100,000 plate reads in a local database. Once this limit is reached, new plate reads will replace the oldest ones.

Database



Id	Capture	Plate	Image	Country	Direction
5527	06/06/2019 17:35:56	R837PVK		United Kingdom	Getting farther
5526	06/06/2019 17:35:41	EF17VZA		United Kingdom	Getting closer
5525	06/06/2019 17:35:03	VN08YZX		United Kingdom	Getting farther
5524	06/06/2019 17:34:58	KA05ZHJ		United Kingdom	Getting farther
5523	06/06/2019 17:34:10	LS11BHJ		United Kingdom	Getting farther
5522	06/06/2019 17:34:06	LP62XXR		United Kingdom	Getting farther
5521	06/06/2019 17:30:41	LP17GYV		United Kingdom	Getting farther
5520	06/06/2019 17:26:08	WF17FMJ		United Kingdom	Getting farther
5519	06/06/2019 17:26:45	RK69WDF		United Kingdom	Getting farther
5518	06/06/2019 17:25:20	FV66FCA		United Kingdom	Getting closer
5517	06/06/2019 17:09:29	FD52XOY		United Kingdom	Getting farther
5516	06/06/2019 17:05:36	VN15UZD		United Kingdom	Getting farther
5515	06/06/2019 17:03:47	DW17GZG		United Kingdom	Getting farther

The Database screen comprises:

- (1) Search and Load area
- (2) Page display control
- (3) Play / Pause updating the database with new reads
- (4) Total items stored and CSV download
- (5) Main plate list

Plate details

1. To show item details, click on a plate record.

964	20/02/2020 10:47:54	K14CWA	United Kingdom
963	20/02/2020 10:41:48	L400ELD	United Kingdom
962	20/02/2020 10:40:20	OW69JGY	United Kingdom

2. A new window appears with the vehicle details.

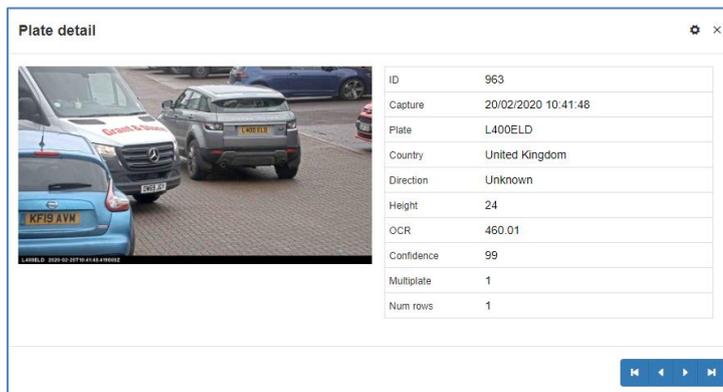


Plate detail	
ID	963
Capture	20/02/2020 10:41:48
Plate	L400ELD
Country	United Kingdom
Direction	Unknown
Height	24
OCR	460.01
Confidence	99
Multiplate	1
Num rows	1

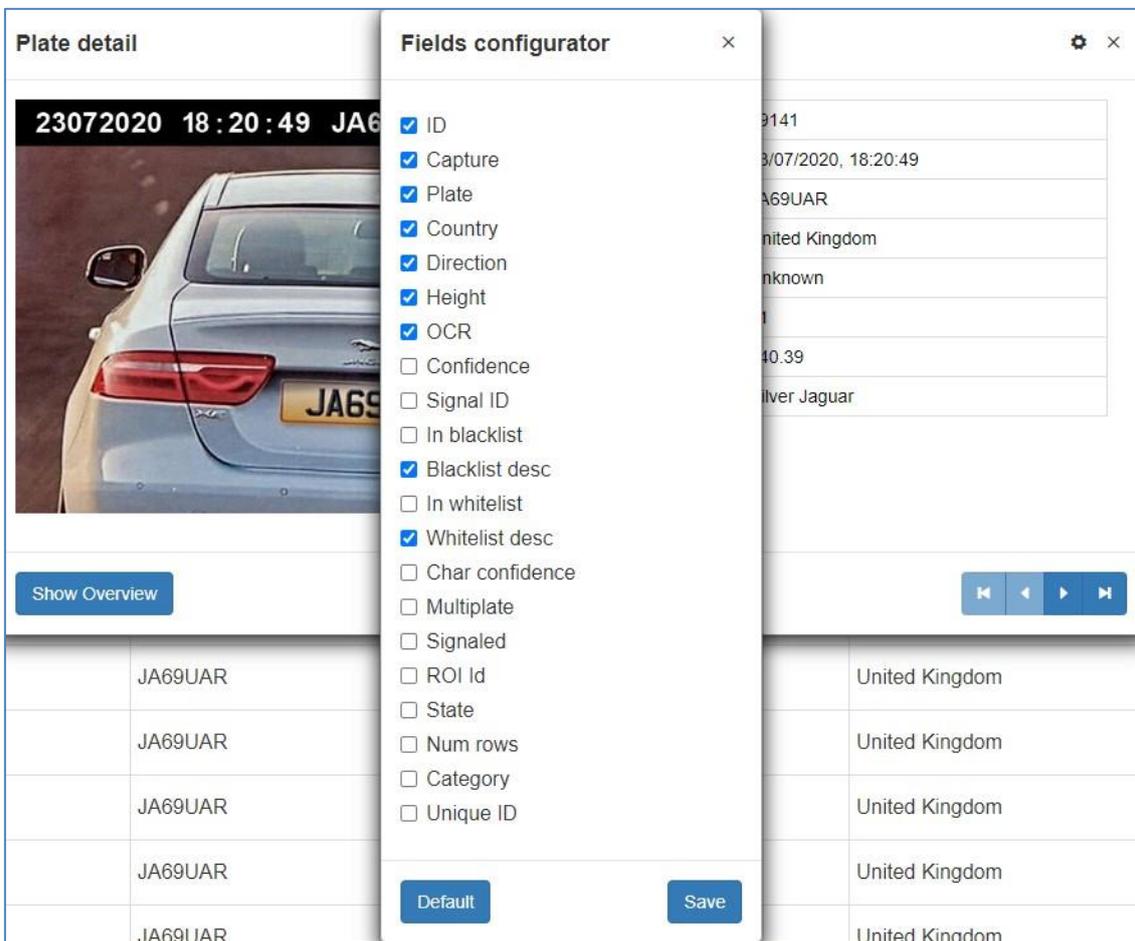
You can move up and down the complete database by using the arrows at the bottom of the plate record.



Use the double arrows to move to the first or last record in the database.

Note that if you have performed a Search (see below), then here you can step through all the plates that satisfy the search. E.g. all plates containing the numbers “123”.

Use the Settings Icon, top right, to control what information is displayed when you select a plate. i.e. a list of the available stored fields:



The screenshot shows the 'Plate detail' view on the left, a 'Fields configurator' dialog in the center, and a list of plate records on the right. The 'Plate detail' view shows a car with license plate 'JA69UAR' and a timestamp '23072020 18:20:49'. The 'Fields configurator' dialog lists various fields with checkboxes: ID, Capture, Plate, Country, Direction, Height, OCR, Confidence, Signal ID, In blacklist, Blacklist desc, In whitelist, Whitelist desc, Char confidence, Multiplate, Signaled, ROI Id, State, Num rows, Category, and Unique ID. The 'Fields configurator' dialog has 'Default' and 'Save' buttons. The list of plate records shows the license plate 'JA69UAR' and the country 'United Kingdom'.

Note that some of these fields may not be available in your version of the software or are used for internal purposes such as communicating with certain third-party applications of Back Offices or VMS systems such as Genetec or Milestone.

When setting up a system the most useful to display include the Height (average character height), OCR (processing time), Confidence, Multiplate (how many reads were processed) etc.

Page Control

If there are more than 100 stored plate reads, the camera will paginate the results.

1. Use the Page Control box to navigate through the pages



Use the UP and DOWN buttons to scroll 100 plates at a time – or click on the central part of the button (in this case on 2/11) and enter the target page directly and click on GoTo:



Search and Load Plates

Load plates

1. To load all the detected plates stored in camera, keep the Search input zone



empty and click the **Load** button

This will refresh the list with the latest captures.

Search for plates

1. To search for a specific plate or partial plate stored in camera, enter the plate in the Search box and click the **Search** button. Use the symbol “%” as a wildcard character.
2. Example of all plates containing the characters: ‘10’

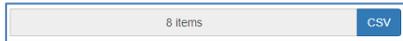
Database						
%10%		Search		1 of 1		
Id	Capture	Plate	Image	Country	Direction	
5539	06/06/2019 18.02.58	P100NEM		United Kingdom	Getting farther	
5422	06/06/2019 14.15.02	X10AJX		United Kingdom	Getting closer	
5401	06/06/2019 13.55.50	DK10WOY		United Kingdom	Unknown	
5398	06/06/2019 13.54.01	DK10WOY		United Kingdom	Getting closer	
5117	06/06/2019 09.16.54	DA10DXS		United Kingdom	Getting closer	
5113	06/06/2019 09.07.43	PL10BMV		United Kingdom	Getting closer	
5089	06/06/2019 08.18.32	P100NEM		United Kingdom	Getting closer	
5067	05/06/2019 18.51.10	DR10OYD		United Kingdom	Getting farther	
5053	05/06/2019 17.39.24	P100NEM		United Kingdom	Getting farther	
5020	05/06/2019 16.25.22	DR10OYD		United Kingdom	Getting closer	
5005	05/06/2019 15.23.43	SP10CXU		United Kingdom	Getting closer	
4856	05/06/2019 09.56.25	DR10OYD		United Kingdom	Getting closer	
4816	05/06/2019 08.26.44	P100NEM		United Kingdom	Getting closer	

3. To clear the search criteria, click  button inside the Search window zone, and click the **Load** button.



Download the Plate list.

You can download the current Plate list by clicking on the CSV button:



button. The resulting .csv file will be saved in your downloads folder.

NOTE: In this example only 8 items were in the search list which were then downloaded successfully. If you need to download the full database, then this must be downloaded page by page, 100 records at a time.

Do this by Pausing the live reads  and then selecting each page in turn and downloading.

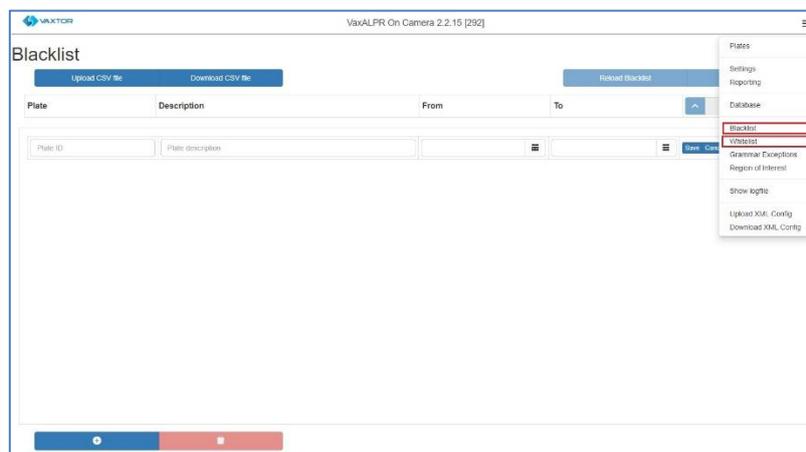
If you need to see all of the camera reads then it is recommended that you send all the plate reads as they happen to a back office such as Helix. The program contains many reporting protocols and methods, - see the Reporting section.

5.6 VaxALPR Blacklists and Whitelists

The software can be configured to match any captured plates against a blacklist or whitelist or determine if a plate is not in a list. This will generate an event that can be captured and processed.

These lists are stored in the camera or on a network shared location:

1. If a camera SD card is installed, the lists will be stored on it.
2. If there is a network share available and there is no SD card, the lists will be stored on the network share.
3. If none of the above are available, the list will be stored in the camera's internal memory. *NOTE: The camera's internal memory is limited and so a maximum of 200 plates can be stored.*



Note that Lists can now be automatically synchronized with a central Helix Server. If you are running the Vaxtor Helix Back Office you can choose to merge and then synchronize all of your blacklists and similarly your whitelists with any number of connected Axis cameras running VaxALPR. This enables you to perform real time checks or access control on the edge in case a network fails. Once reconnected the lists will synchronize once more. This can be setup in the Helix-6 menu in Reporting. See later in this manual: [Helix Reporting](#).

VaxALPR Blacklist / Whitelist Disabled

Remember to enable black and/or whitelist checking in settings (see earlier in this manual):

Check blacklist?
 Check whitelist?

VaxALPR Blacklist: Initial load

- When Blacklist is first selected, then if no plates have been added to the list, a message appears:



But if the Blacklist *does* already contain plates then a message appears confirming how many plates have been loaded into temporary memory.

VaxALPR Blacklist: Reload

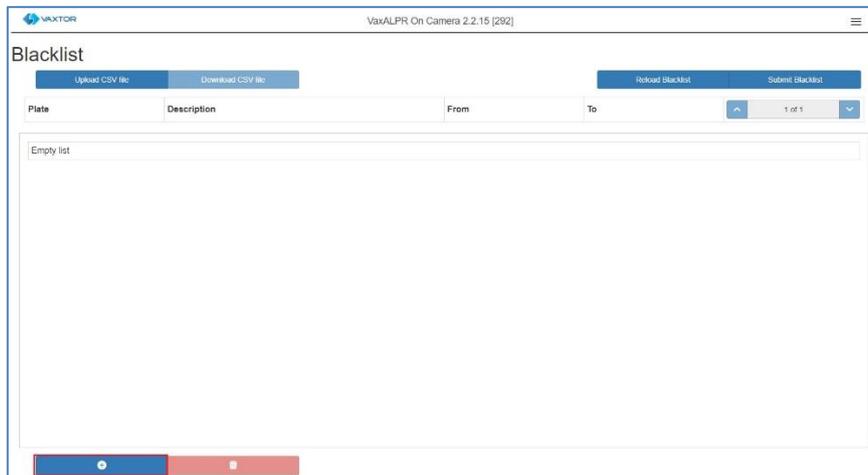


1. To Reload the saved Blacklist from the camera, click the  button and wait for the confirmation (or error) message

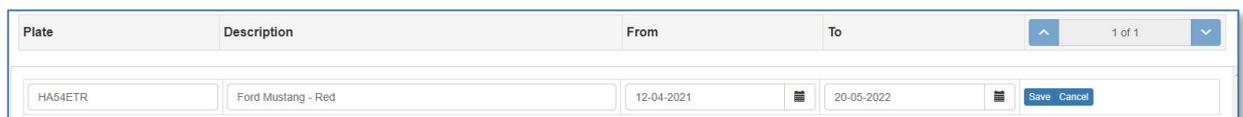
VaxALPR Blacklist: Edit the Blacklist

NOTE: Any edits will not be uploaded to the camera storage until you submit the current Blacklist by selecting: 

Add a Plate



1. To add a Plate to the Blacklist click the  button and enter the plate details:



2. Write a valid Plate (e.g. HA54ETR) and add an optional description. Plate numbers must not contain spaces or special characters such as “-”.
3. Enter the **From** and **To** dates that the vehicle will be checked. In the case of a white list, this would be the dates that the vehicle would be allowed access to a site (so the Axis relay will be triggered only within these two dates).

Note that the maximum To date that can be set at present is 31/12/2030.

(The reason being that in the 2030s, there is a millennium-type event where the number of seconds since Jan 1st 1970 will exceed a 16 bit value! Beware!)

4. Click the **Save** button to save the plate or the **Cancel** button to discard the plate.

Edit a Plate

1. Click on the **Edit** button to re-edit a plate.
2. Edit any fields and click **Save** or **Cancel**.

Clone a Plate

1. To add an identical entry to speed-up editing, click the **Clone** button.
1. Edit as before and save or cancel.

Remove a Plate from the list

1. Click the **Remove** button to remove a plate. *Note: there is no confirmation message!*

VaxALPR Blacklist: Remove all plates

1. Click the  button to remove all plates from the local Blacklist.
Beware that there is no confirmation message!

NOTE: All these actions are not saved to the camera's memory until you click the Submit Blacklist button.

VaxALPR Blacklist: Upload/Download a list from a CSV file

Upload a CSV File

The VaxALPR On Camera software can import a whitelist/blacklist from a .csv file by using the **Upload CSV file** button. Simply select the .csv file on your PC.

IMPORTANT: Only four fields are required: **PLATE, DESCRIPTION, FROM and TO** but others can be present in the file. The first row of the csv file **MUST** contain field names including these four.

For example:

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	FIRST NAME	SURNAME	PLATE	MAKE	MODEL	COLOR	DESCRIPTI	FROM	TO				
2	Kenneth	Williams	KW69KSL	BMW	I3	Silver	Staff	01/01/2021	31/12/2022				
3	Barbara	Windsor	BW65JSW	AUDI	Q3	Black	Staff	01/01/2021	31/12/2022				
4	Kenneth	Connor	KC20LAD	FORD	MUSTANG	Blue	VIP	01/01/2021	31/12/2022				
5	Hattie	Jacques	HJ68ABC	HYUNDAI	IONIQ	White	Staff	01/01/2021	31/12/2022				
6	Sid	James	SJ19MXV	KIA	STINGER	Red	Visitor	01/01/2021	31/12/2022				
7	Charles	Hawtrey	CH66GOK	TESLA	MODEL 3	Red	Visitor	01/01/2021	31/12/2022				
8													
9													

Opening in Notepad:

```
FIRST NAME,SURNAME,PLATE,MAKE,MODEL,COLOR,DESCRIPTION, FROM, TO
Kenneth,Williams,KW69KSL,BMW,I3,Silver,Staff,01/01/2021,31/12/2022
Barbara,Windsor,BW65JSW,AUDI,Q3,Black,Staff,01/01/2021,31/12/2022
Kenneth,Connor,KC20LAD,FORD,MUSTANG,Blue,VIP,01/01/2021,31/12/2022
Hattie,Jacques,HJ68ABC,HYUNDAI,IONIQ,White,Staff,01/01/2021,31/12/2022
Sid,James,SJ19MXV,KIA,STINGER,Red,Visitor,01/01/2021,31/12/2022
Charles,Hawtrey,CH66GOK,TESLA,MODEL 3,Red,Visitor,01/01/2021,31/12/2022
```

Note

Note that the file should contain semi colons as delimiters and not commas and the date delimiter should be a hyphen, US format) – so the file must be edited to become:

```
FIRST NAME;SURNAME;PLATE;MAKE;MODEL;COLOR;DESCRIPTION;FROM;TO
Kenneth;Williams;KW69KSL;BMW;I3;Silver;Staff;01-01-2021;12-31-2022
Barbara;Windsor;BW65JSW;AUDI;Q3;Black;Staff;01-01-2021;12-31-2022
Kenneth;Connor;KC20LAD;FORD;MUSTANG;Blue;VIP;01-01-2021;12-31-2022
Hattie;Jacques;HJ68ABC;HYUNDAI;IONIQ;White;Staff;01-01-2021;12-31-2022
Sid;James;SJ19MXV;KIA;STINGER;Red;Visitor;01-01-2021;12-31-2022
Charles;Hawtrey;CH66GOK;TESLA;MODEL 3;Red;Visitor;01-01-2021;12-31-2022
```

After import the list is displayed thus:

Plate	Description	From	To	
KW69KSL	Staff	01-01-2021	31-12-2022	Edit Remove Clone
BW65JSW	Staff	01-01-2021	31-12-2022	Edit Remove Clone
KC20LAD	VIP	01-01-2021	31-12-2022	Edit Remove Clone
HJ68ABC	Staff	01-01-2021	31-12-2022	Edit Remove Clone
SJ19MXV	Visitor	01-01-2021	31-12-2022	Edit Remove Clone
CH66GOK	Visitor	01-01-2021	31-12-2022	Edit Remove Clone

Note: After uploading – remember to Submit the file by selecting [Submit Blacklist](#)

Download a CSV file.

- To download the Blacklist file from the camera to your PC, click the [Download CSV file](#) button.
- It will be downloaded to your PC’s downloads folder as the file blacklist.csv.
- The file will contain just the four required fields, PLATE and DESCRIPTION:

```
PLATE;DESCRIPTION;FROM;TO
KW69KSL;Staff;2021-01-01T00:00:00.000Z;2022-12-31T00:00:00.000Z
BW65JSW;Staff;2021-01-01T00:00:00.000Z;2022-12-31T00:00:00.000Z
KC20LAD;VIP;2021-01-01T00:00:00.000Z;2022-12-31T00:00:00.000Z
HJ68ABC;Staff;2021-01-01T00:00:00.000Z;2022-12-31T00:00:00.000Z
SJ19MXV;Visitor;2021-01-01T00:00:00.000Z;2022-12-31T00:00:00.000Z
CH66GOK;Visitor;2021-01-01T00:00:00.000Z;2022-12-31T00:00:00.000Z
```

VaxALPR Blacklist: Save changes

IMPORTANT:

- To save any Blacklist changes in camera, current list must be submitted.
- If current list is empty, clicking the submit button will delete the blacklist stored in the camera and once a list is deleted, it cannot be recovered.

VaxALPR: Whitelists

All the operations described above equally apply to whitelists.

5.1 VaxALPR Grammar Exceptions

In this section the user can define a list of plates which can define a plate that should be changed to another character string when read. This could be used if a car had a damaged plate that would read incorrectly – or a plate that had been deliberately tampered with.

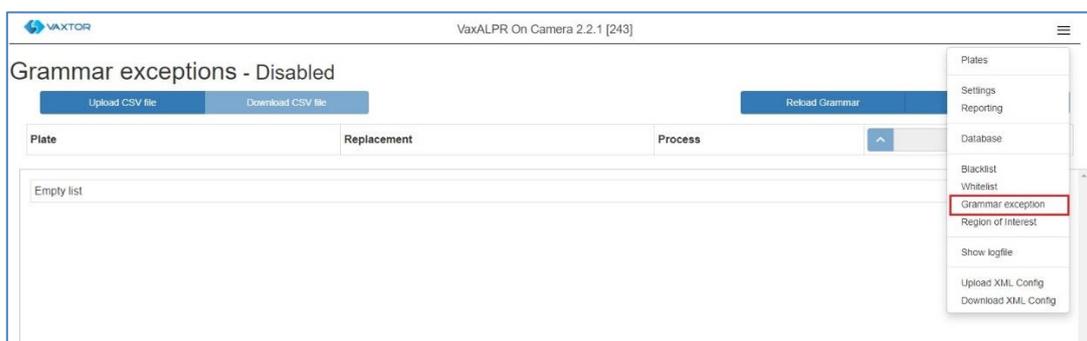
For example a plate is issued as MR11 EAD .. **MR11 EAD** and the owner deliberately inserts two bolts between the two 1s to form: **MRH EAD** .. and the software may read this as the owner intended: MR HEAD !

In this case we can create an entry mapping one text string to another and the plate will then always be reported correctly as MR11EAD.

A plate might also be damaged and characters distorted or missing. Again, a grammar exception can be created to correct this problem.

A third example is an object in the field of view which is being recognized as a plate such as a fence or a floor tile. This can be programmed to be ignored.

Select Grammar Exception from the Main Menu:



VaxALPR Grammar Exceptions: Initial load

- When Grammar Exceptions is first selected, then if plates have been added to the list, a message showing that the plates have been loaded into temporary memory will be shown:



- If the Exceptions list is empty a message will be displayed.

VaxALPR Grammar Exceptions: Reload

- Click Reload Grammar to reload the saved grammar exceptions list from the camera where it can be edited.



VaxALPR Grammar Exceptions: Edit the List

NOTE: Any edits will not be uploaded to the camera storage until you submit the current list by selecting Submit Grammar.

- To add a Plate to the list, click the + button at the bottom of the screen and enter the details:



- Add the plate to be replaced, the replacement text and tick the Process box:

Plate	Plate replacement	<input type="checkbox"/>	Save Cancel
-------	-------------------	--------------------------	-------------

- Click Save and the plate to be replaced will be added to the list:

MRHEAD	MR11EAD	YES	Edit Remove Clone
MRHOPE	MR11OPE	YES	Edit Remove Clone

- To prevent a plate from being reported then leave the Replacement text blank and untick Process. (set to NO). This might be useful if a fence is often in the field of view & generating 1111111 (which might be the same syntax as a legal plate). Using this method stops this from being transmitted.
- Use the Edit button to change the plate or replacement text and select Clone to copy the list item to save time when batch editing.

- Click the **Remove** button to remove a plate from the list. *Note: there is no confirmation message!*
- Use the Red Bin icon to delete all the items in the list:



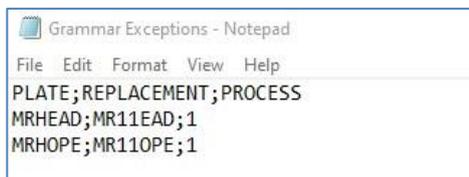
Note: there is no “are you sure” message – all the entries will be deleted!

VaxALPR Grammar Exceptions: Upload/Download a list from/to a .csv file

The VaxALPR On Camera software can import a grammar exceptions list from a .csv file by using the **Upload CSV file** button. Simply select the .csv file on your PC.

IMPORTANT: Only three fields are required: **PLATE, REPLACEMENT and PROCESS**. The first row of the csv file **MUST** contain these field names.

For example:



Note that the file should contain semi colons as delimiters – and not commas.

Tip: If using Excel, in Options, Advanced, untick use system separators & change the decimal separator to a ; (semi-colon).

- After uploading, remember to click the **Submit Grammar** button to save the list to the camera’s internal memory.

VaxALPR Grammar Exceptions: Download a list

- To download the exception list file from the camera to your PC, click the **Download CSV file** button.
- It will be downloaded to your PC’s downloads folder as a file similar to: ‘20201021-grammar’. (based on the date)
- The file will contain just the three required fields, PLATE, REPLACEMENT and PROCESS as shown above.

Once saved then enable grammar exception checking in Settings / Location: [Check grammar exceptions](#)

5.2 VaxALPR Region of Interest

A Region of Interest (ROI), sometimes known as the Crop Zone, is used to define an area within the video frame where the OCR analytics takes place. The user can define a polygon and

choose whether the area to look for plates in Inside or Outside this region. The user can then set multiple regions, i.e. multiple ROIs, in complex situations although this is rare.

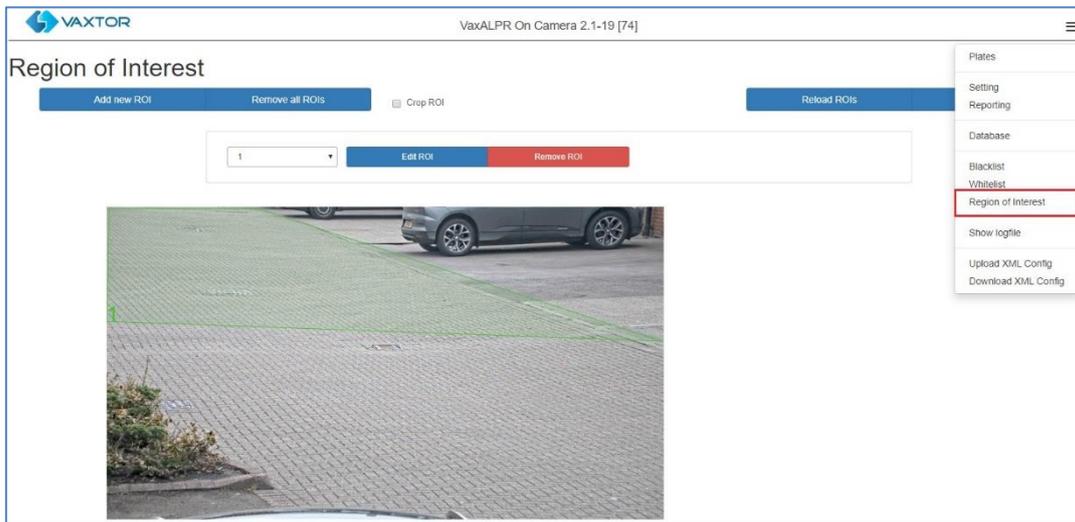
Using an ROI can decrease OCR processing time and also reduce false positives.

So, if the camera is looking across a large stretch of road as in the example below, the ROI can be used to limit the OCR to the area near to the camera thus reducing the processor load.

If a plate-shaped house window or road sign for example is within the camera's field of view and keeps getting mistaken for a license plate, then these false positives can be eliminated by creating a crop zone to exclude this part of the image.

Each ROI must be given a unique numeric Identifier from the dropdown list.

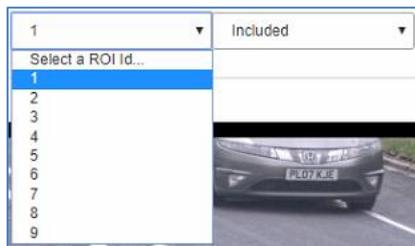
Note that the whole license plate must be in or out the ROI to pass the test.



IMPORTANT: ROIs can be configured to either include the areas defined from the OCR – or exclude them. If multiple ROIs are added they must all be of the same type.

VaxALPR ROI: Add ROIs

1. To add a new ROI, click the main **Add new ROI** button:
2. Then, use the pop-down to allocate an ID number to the ROI that you are adding and if this is the first ROI, then specify the ROI Type between: *Included* or *Excluded*./



3. Draw points:
 - a. Add points: Click on the live image to add new points to define the polygon.



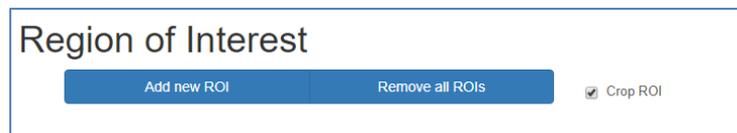
NOTE: Each ROI must have at least 3 points but can also be quite complex

- b. To start again, click on the Clear points button.
 - c. To cancel the new ROI, click Cancel Edit button.
 - d. When you are satisfied with the shape click the Confirm ROI button.
4. Click Add new ROI to add more ROIs as required remembering to select a new ID number.
5. ROIs are not stored on the camera until changes are submitted.

6. Crop ROI

When you define one or more ROIs, the bounding points are passed to the OCR engine so that plates within the ROI(s) will be reported. This is useful if the camera can just see other vehicles in an adjacent lane for example.

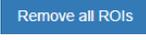
However, if you only define one ROI, then you can select the tick box "Crop ROI". In this case the image is actually cropped and the smaller image is passed to the OCR engine for processing.



This works by cutting out the ROI and extracting just the luminance part of the image for processing. This therefore speeds up the OCR process as it only has to process a smaller area.

However, the side-effect of this is that all saved/transmitted ANPR images will be in monochrome.

VaxALPR ROI: Remove ROIS

1. To remove all of the ROIs click  button.

NOTE: This only deletes them in the local web interface. If they have been saved to the camera then you will need to Submit ROIs once more.

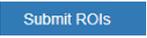
VaxALPR ROI: Edit an ROI

1. To edit an existing ROI, select the *ROI Id* from the list and click  button:
2. Move any points as required:
 - a. Add an extra point to last point added by moving the cursor and mouse click.
 - b. Or, clear all existing points  and start again.
3. To confirm changes by clicking the  button.
4. To reject any changes, click the  button.

VaxALPR ROI: Save changes

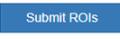
Submit current ROIs

Once the ROIs have been setup, they **must** be saved into memory in the Axis camera.

- To save all ROIs, Click on the  button and wait for the confirmation message.

Note: Once deleted, an ROI cannot be recovered. To avoid unexpected problems, it is recommended that you periodically backup the ROI configuration by downloading the current configuration XML file (see: [Download XML Config section later in this manual](#)).

Delete all the current saved ROIs in the Camera

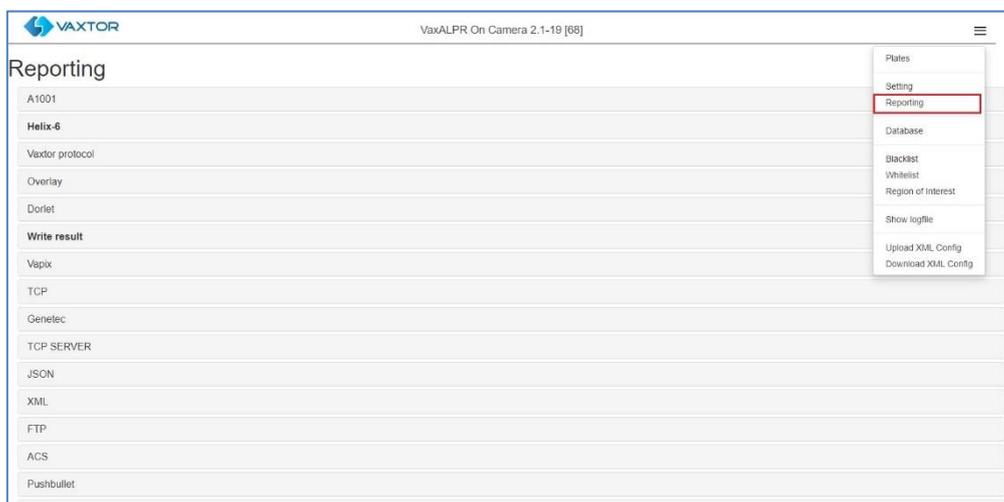
- Delete all of the ROIs individually and then click the  button.
- A confirmation message will appear. Accept to delete all of the stored ROIs and wait for the confirmation message.

VaxALPR ROI: Reload ROIs

1. To reload *ROIs* from the camera into the web interface for editing, click the  button.

5.3 VaxALPR Reporting

VaxALPR is able to output all plate reads in real time using a variety of standard protocols so that the plate reads can be accepted remotely by a variety of programs including Vaxtor's powerful Back Office - Helix, which can accept and store plate reads in real time from hundreds of Axis cameras.

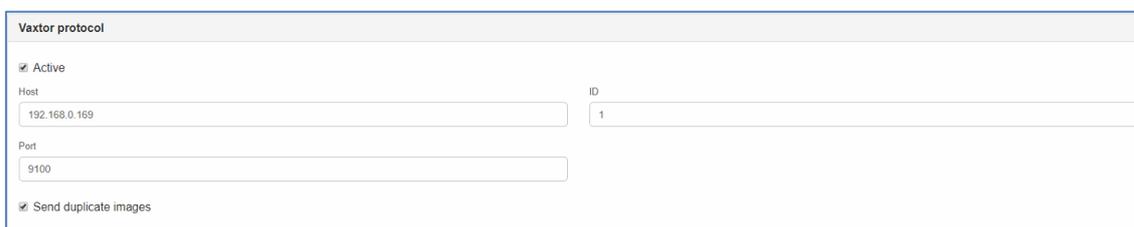


By selecting one of the listed protocols, a sub-menu will appear with fields for setting up parameters such as remote IP addresses etc.

A couple of the main reporting options are included here – but for a full description then see the *'VaxALPR On Camera Software Developer's Guide'* for more detailed information.

5.3.1 Reporting to Helix

In the case of sending reads to Helix, select **Vaxtor protocol** and enter the IP address of the receiving PC, the port number to be used and the Lane ID to be sent:

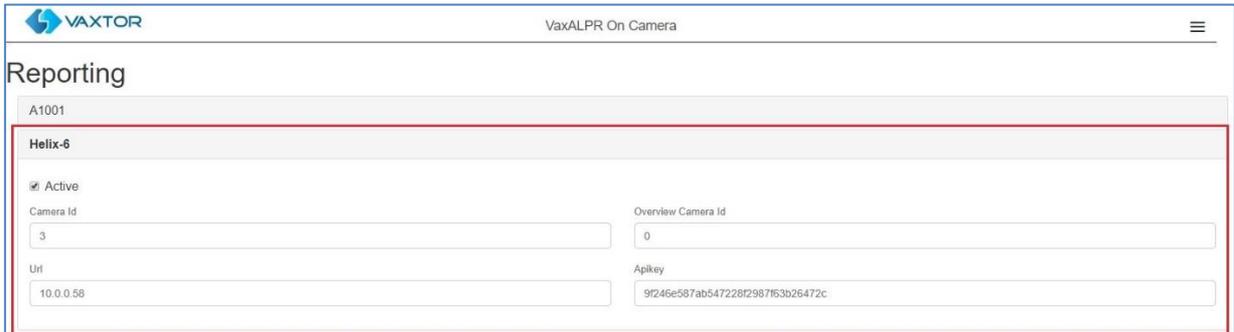


The screenshot shows the 'Vaxtor protocol' configuration form. It includes the following fields and options:

- Active
- Host:
- ID:
- Port:
- Send duplicate images

Send duplicate images is used in cases where a vehicle is stationary for some time in the field of view. Note that the user can set 'Same plate delay' (seconds) to specify a time to wait before attempting to read the same plate again (see earlier in this manual). However, here the user can instruct the reporting software to never send duplicate images of the same plate by unticking the box - or it may be that the user wants to see how long the vehicle is present in the field of view for and so DOES want duplicate images of the vehicle sent every n seconds.

If you need to encrypt the data sent to Helix – or support cameras in different time zones, - then select **Helix-6** Reporting Option.



The screenshot shows the 'Reporting' section of the VaxALPR On Camera interface. Under the 'Helix-6' heading, there is a form with the following fields:

- Active
- Camera Id:
- Overview Camera Id:
- Uri:
- Apikey:

Select Active and enter the IP address (URL) of the receiving PC. E.g. **10.0.0.12:8080/helix6**
Note that this can be an http or an https address supporting data encryption.

Enter the Camera ID to be sent to Helix along with the Camera ID to be used for an associated Color Overview camera. Here you can specify an API key to be used for authentication.

5.3.2 Write result

This is the most basic of outputs and saves all the ALPR reads to the camera’s internal SD card if fitted, or a network share location.

Note that this is different to the Database option in the App’s settings. The database option will write to the SD card obeying the maximum entries limit and will delete the oldest records to make way for the newer ones. It allows searching and export. This feature is in ADDITION to that and simply writes all reads and images in the format specified below to the SD card or network share location. When the SD card becomes full then no more data can be written. This feature is normally used by third parties for testing – or in applications where they transfer this data from the camera via FTP and delete the residual data themselves.

In Reporting select **Write result** and the following window appears:



The 'Write result' window contains the following options and a text field:

- SD
- Network share
- Write images
- Write plate images
- Line template:

Select either the SD card – or a network share location or both options.

In either case you can chose if the plate patch images and/or the full video images are saved along with a text file. You can modify the suggested fields:

\$date\$ \$plate\$ \$country\$ \$confidence\$ \$left\$ \$top\$ \$right\$ \$bottom\$ \$blacklist\$ \$whitelist\$

.. using any if the following reserved words:

- **\$date\$**: Timestamp in ISO8601 format
- **\$plate\$**: Plate number
- **\$tag\$**: Unique hash for this plate number. Same plate number will always give the same \$tag\$. Format based on UTMC algorithm.
- **\$plateutf8\$**: Plate number in utf8 format.
- **\$country\$**: Full country of origin name.
- **\$countrycode\$**: 3 letter country code.
- **\$state\$**: Plate State for USA.
- **\$category\$**: Plate category for countries that support it.
- **\$blacklist\$**: Description on the blacklist linked to the plate number.
- **\$whitelist\$**: Description on the whitelist linked to the plate number.
- **\$ifblacklist\$ \$ifblacklist\$**: If the plate is on the blacklist, the text in the 'if clause' will be displayed.
- **\$ifwhitelist\$ \$ifwhitelist\$**: If the plate is on the whitelist, the text in the 'if clause' will be displayed.
- **\$ifnotin\$...\$ifnotin\$**: If the plate is not on a list, the test in the 'if clause' will be displayed.
- **\$confidence\$**: Global confidence (0-100).
- **\$charheight\$**: Average charheight (pixels).
- **\$processingtime\$**: Processing time in milliseconds.
- **\$left\$**: Left coordinate for the plate on the image (pixels).
- **\$top\$**: Top coordinate for the plate on the image (pixels).
- **\$right\$**: Right coordinate for the plate on the image (pixels).
- **\$bottom\$**: Bottom coordinate for the plate on the image (pixels).
- **\$absoluteleft\$**: Plate left position based on the total image width (0-1).
- **\$absolutetop\$**: Plate top position based on the total image height (0-1).
- **\$absoluteright\$**: Plate right position based on the total image width (0-1).
- **\$absolutebottom\$**: Plate bottom position based on the total image height (0-1).
- **\$width\$**: OCR image width.
- **\$height\$**: OCR image height.
- **\$ip\$**: Camera IP address.
- **\$roid\$**: Roi ID where the plate number is found.
- **\$speed\$**: Vehicle speed (Km/h).
- **\$multiplate\$**: Amount of times that the plate has been read before reporting.
- **\$signaled\$**: True if the read was caused by a trigger.
- **\$id\$**: Database ID for this read.
- **\$direction\$**: Enumerate with the vehicle direction (0: Unknown, 1: Towards, 2: Away, 3: Stopped)
- **\$directionstr\$**: String with the vehicle direction.
- **\$safedate\$**: Date in format %Y%m%d_%H%M%S in the camera time zone (Useful for filenames).
- **\$localdate\$**: Date in format %d/%m/%Y in the camera time zone
- **\$localtime\$**: Date in format %H:%M:%S in the camera time zone.

- **\$imageid\$**: Signal ID in case of a trigger read.
- **\$plateimage\$**: Plate crop JPEG image encoded in base64.
- **\$platejpegsize\$**: JPEG size in bytes.
- **\$overviewimage\$**: Overview JPEG image encoded in base64.
- **\$overviewjpegsize\$**: JPEG size in bytes.
- **\$epoch\$**: Unix epoch (seconds).
- **\$utcdate\$**: Will report the date at ISO8601 format but always in UTC. (2020-12-31T16:11:30.000Z)
- **\$etx\$**: End transmission character (03)
- **\$stx\$**: Start transmission character (02)

The database option needs to be enabled if writing to the SD card

All reads will be stored in the SD Card folder: /areas/Vaxreader/YYYYMM-DD/

If the plate is in a whitelist or blacklist, the images will be stored in:

/areas/Vaxreader/YYYY-MM-DD/WHITELIST/ or
/areas/Vaxreader/YYYY-MM-DD/BLACKLIST/

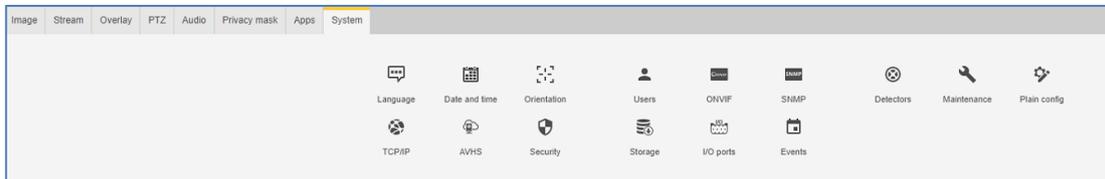
Each image saved will be labelled as **HHMMSS-PLATE.jpg** with the timestamp in UTC/GMT.

Scroll down and save your changes by clicking on the



button to save your changes.

Next, go to the Axis camera's main settings page and select the System Tab and click on Storage:



Format the SD card if necessary and then set any other options as required:

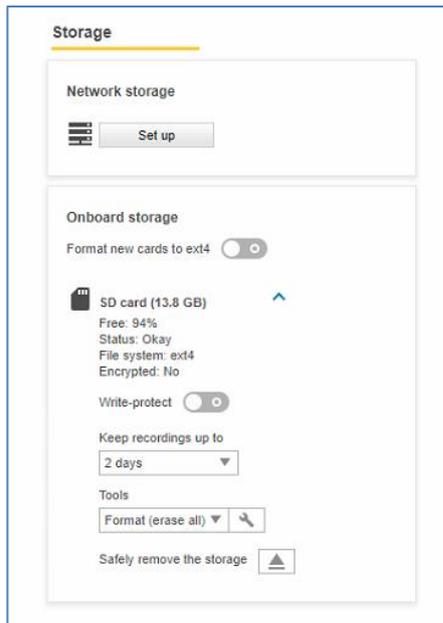


Plate reads will now be written to this location using the format specified.

If writing to the Axis Network Share Storage

All reads will be stored on the network share in the folder:

axis<DeviceSerialNumber>/areas/Vaxreader/YYYYMM-DD/

If the plate is in a whitelist or blacklist, the images will be stored in:

axis<DeviceSerialNumber /areas/Vaxreader/YYYY-MM-DD/WHITELIST/ or
axis<DeviceSerialNumber /areas/Vaxreader/YYYY-MM-DD/BLACKLIST/

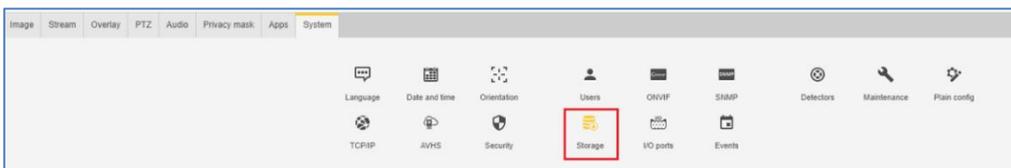
Each image saved will be labelled as **HHMMSS-PLATE.jpg** with the timestamp in UTC/GMT.

Scroll down and save your changes by clicking on the

Submit Reporting

button to save your changes.

Go to the Axis camera's main settings page and select the **System** Tab, click on **Storage**:



1. Ensure that you have already setup a public shared folder!
2. Click on Network storage Set up and enter the address of the shared folder:

Storage

Network storage

Host

Share

Security ^

The share requires login

Username

Password

SMB version Auto

Plate reads will now be written to this location using the format specified.

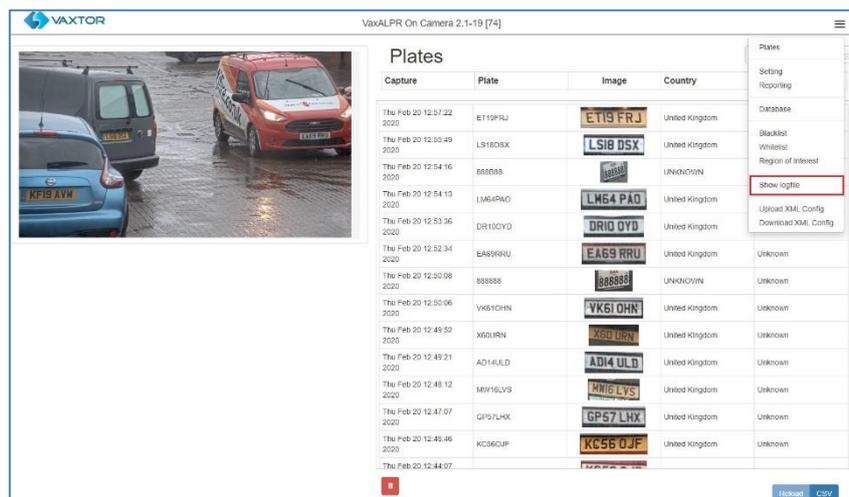
Note that this list of protocols is always being updated, contact Vaxtor for details.

See the separate manual: “VaxALPR On Camera Integration Guide” for more details of Vapix and how to communicate with Axis’s own software.

Also see the separate VaxALPR On Camera Software Developer’s Guide for more detailed information on the reporting options.

5.4 VaxALPR Show Logfile

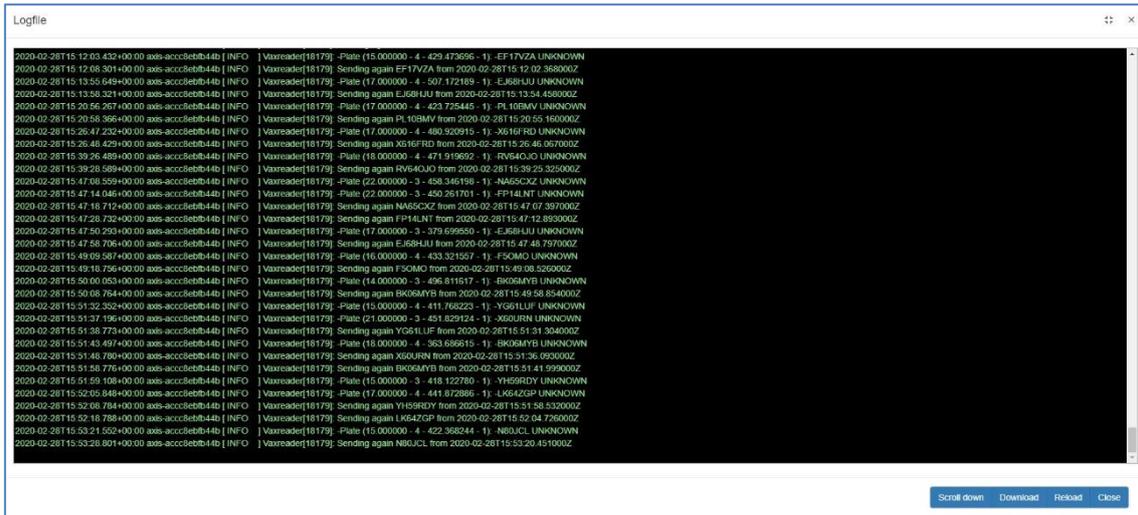
This function displays the current System Log for debugging and testing purposes.



Capture	Plate	Image	Country
Thu Feb 20 12:57:22 2020	E119PRU		United Kingdom
Thu Feb 20 12:50:49 2020	LS18DSX		United Kingdom
Thu Feb 20 12:54:16 2020	668R83		UNKNOWN
Thu Feb 20 12:54:13 2020	LM64PAO		United Kingdom
Thu Feb 20 12:53:36 2020	DR10OYD		United Kingdom
Thu Feb 20 12:52:34 2020	EA864RU		United Kingdom
Thu Feb 20 12:50:08 2020	888888		UNKNOWN
Thu Feb 20 12:50:06 2020	VK61OHN		United Kingdom
Thu Feb 20 12:48:50 2020	X80URN		United Kingdom
Thu Feb 20 12:49:21 2020	AD14ULD		United Kingdom
Thu Feb 20 12:48:12 2020	MN16LYS		United Kingdom
Thu Feb 20 12:47:57 2020	GP57LHX		United Kingdom
Thu Feb 20 12:45:46 2020	KC56OJF		United Kingdom
Thu Feb 20 12:44:57			

(Note that you can also access the log file from the main menu using the App Log button. See section 6.4)

The application log is displayed thus:



```

2020-02-28T15:12:03.432+00:00 axis-accf8bb44b [ INFO ] Vaxreader[18179] -Plate (15 000000 - 4 - 429 473696 - 1) -EF17VZA UNKNOWN
2020-02-28T15:12:08.301+00:00 axis-accf8bb44b [ INFO ] Vaxreader[18179] Sending again EF17VZA from 2020-02-28T15:12:02.368000Z
2020-02-28T15:13:55.649+00:00 axis-accf8bb44b [ INFO ] Vaxreader[18179] -Plate (17 000000 - 4 - 507 172189 - 1) -EJ68HJU UNKNOWN
2020-02-28T15:13:56.321+00:00 axis-accf8bb44b [ INFO ] Vaxreader[18179] Sending again EJ68HJU from 2020-02-28T15:13:54.486000Z
2020-02-28T15:20:56.267+00:00 axis-accf8bb44b [ INFO ] Vaxreader[18179] -Plate (17 000000 - 4 - 423 725445 - 1) -PL 109MV UNKNOWN
2020-02-28T15:20:58.386+00:00 axis-accf8bb44b [ INFO ] Vaxreader[18179] Sending again PL 109MV from 2020-02-28T15:20:55.160000Z
2020-02-28T15:26:47.232+00:00 axis-accf8bb44b [ INFO ] Vaxreader[18179] -Plate (17 000000 - 4 - 480 520915 - 1) -X616FRD UNKNOWN
2020-02-28T15:26:48.429+00:00 axis-accf8bb44b [ INFO ] Vaxreader[18179] Sending again X616FRD from 2020-02-28T15:26:46.057000Z
2020-02-28T15:39:26.489+00:00 axis-accf8bb44b [ INFO ] Vaxreader[18179] -Plate (18 000000 - 4 - 471 191892 - 1) -RV54OJO UNKNOWN
2020-02-28T15:39:28.589+00:00 axis-accf8bb44b [ INFO ] Vaxreader[18179] Sending again RV54OJO from 2020-02-28T15:39:26.320000Z
2020-02-28T15:47:08.559+00:00 axis-accf8bb44b [ INFO ] Vaxreader[18179] -Plate (22 000000 - 3 - 458 346198 - 1) -NA65CZK UNKNOWN
2020-02-28T15:47:14.046+00:00 axis-accf8bb44b [ INFO ] Vaxreader[18179] -Plate (22 000000 - 3 - 450 261701 - 1) -FP14LNT UNKNOWN
2020-02-28T15:47:18.712+00:00 axis-accf8bb44b [ INFO ] Vaxreader[18179] Sending again NA65CZK from 2020-02-28T15:47:07.397000Z
2020-02-28T15:47:28.702+00:00 axis-accf8bb44b [ INFO ] Vaxreader[18179] Sending again FP14LNT from 2020-02-28T15:47:12.859000Z
2020-02-28T15:47:50.293+00:00 axis-accf8bb44b [ INFO ] Vaxreader[18179] -Plate (17 000000 - 3 - 379 699550 - 1) -EJ68HJU UNKNOWN
2020-02-28T15:47:58.706+00:00 axis-accf8bb44b [ INFO ] Vaxreader[18179] Sending again EJ68HJU from 2020-02-28T15:47:48.797000Z
2020-02-28T15:49:09.581+00:00 axis-accf8bb44b [ INFO ] Vaxreader[18179] -Plate (16 000000 - 4 - 433 321567 - 1) -FS0MO UNKNOWN
2020-02-28T15:49:18.750+00:00 axis-accf8bb44b [ INFO ] Vaxreader[18179] Sending again FS0MO from 2020-02-28T15:49:08.850000Z
2020-02-28T15:50:00.063+00:00 axis-accf8bb44b [ INFO ] Vaxreader[18179] -Plate (14 000000 - 3 - 496 811617 - 1) -BK09MYB UNKNOWN
2020-02-28T15:50:08.784+00:00 axis-accf8bb44b [ INFO ] Vaxreader[18179] Sending again BK09MYB from 2020-02-28T15:49:58.854000Z
2020-02-28T15:51:32.352+00:00 axis-accf8bb44b [ INFO ] Vaxreader[18179] -Plate (15 000000 - 4 - 411 766223 - 1) -YG61LUF UNKNOWN
2020-02-28T15:51:37.156+00:00 axis-accf8bb44b [ INFO ] Vaxreader[18179] -Plate (21 000000 - 3 - 451 029124 - 1) -XG0URN UNKNOWN
2020-02-28T15:51:38.773+00:00 axis-accf8bb44b [ INFO ] Vaxreader[18179] Sending again YG61LUF from 2020-02-28T15:51:31.304000Z
2020-02-28T15:51:49.497+00:00 axis-accf8bb44b [ INFO ] Vaxreader[18179] -Plate (18 000000 - 4 - 363 886615 - 1) -BK09MYB UNKNOWN
2020-02-28T15:51:48.780+00:00 axis-accf8bb44b [ INFO ] Vaxreader[18179] Sending again XG0URN from 2020-02-28T15:51:36.090000Z
2020-02-28T15:51:58.776+00:00 axis-accf8bb44b [ INFO ] Vaxreader[18179] Sending again BK09MYB from 2020-02-28T15:51:41.999000Z
2020-02-28T15:51:59.108+00:00 axis-accf8bb44b [ INFO ] Vaxreader[18179] -Plate (15 000000 - 3 - 418 122780 - 1) -YH59RDY UNKNOWN
2020-02-28T15:52:05.848+00:00 axis-accf8bb44b [ INFO ] Vaxreader[18179] -Plate (17 000000 - 4 - 441 872886 - 1) -LK64ZGP UNKNOWN
2020-02-28T15:52:08.784+00:00 axis-accf8bb44b [ INFO ] Vaxreader[18179] Sending again YH59RDY from 2020-02-28T15:51:58.532000Z
2020-02-28T15:52:18.788+00:00 axis-accf8bb44b [ INFO ] Vaxreader[18179] Sending again LK64ZGP from 2020-02-28T15:52:04.726000Z
2020-02-28T15:53:21.502+00:00 axis-accf8bb44b [ INFO ] Vaxreader[18179] -Plate (15 000000 - 4 - 422 368244 - 1) -NB0UCJ UNKNOWN
2020-02-28T15:53:28.801+00:00 axis-accf8bb44b [ INFO ] Vaxreader[18179] Sending again NB0UCJ from 2020-02-28T15:53:20.451000Z
    
```

Note that the latest information is added to the bottom of the file so use the slider bar on the right to navigate up and down. Use the **'Scroll down'** button to move to the end of the file.

If new data is being recorded whilst you are browsing, then use the **'Reload'** button to re-open the latest version of the file.

Error messages will appear here including if the program has failed to send data to a third-party application for some reason – or it has been rejected by a server.

Basic plate data includes the plate height, number of reads, time to process etc.

5.5 ADR Plates

There is an optional analytic which can be purchased from Vaxtor which give the Application the ability to read ADR plates.



ADR is an acronym for “Accord européen relatif au transport international des marchandises Dangereuses par Route” and orange ADR plates must be displayed on both the front and rear of vehicles travelling in Europe which are transporting any such dangerous goods.

The ADR plate is made up of two parts: the 2-3 digit Hazard Identification Number (HIN) and the four-digit UN number (**Kemler Code**). The HIN number indicates the hazard such as Radioactivity, Corrosivity, Flammability etc. whilst the lower UN number identifies the actual substance being transported.

If the ADR version of the App is being used then both the license plate and the ADR plates will be read and consecutively reported. Note that the ADR plate will be reported as Country = ADR and so ADR must be added to the list of countries to be recognised.

Tips

ADR plate characters are large so make sure that you set the minimum and maximum character heights accordingly.

Remember that vehicles following each other will have difference license plates but may carry the same ADR plates. You should therefore set the Same Plate Delay to say 1 second.

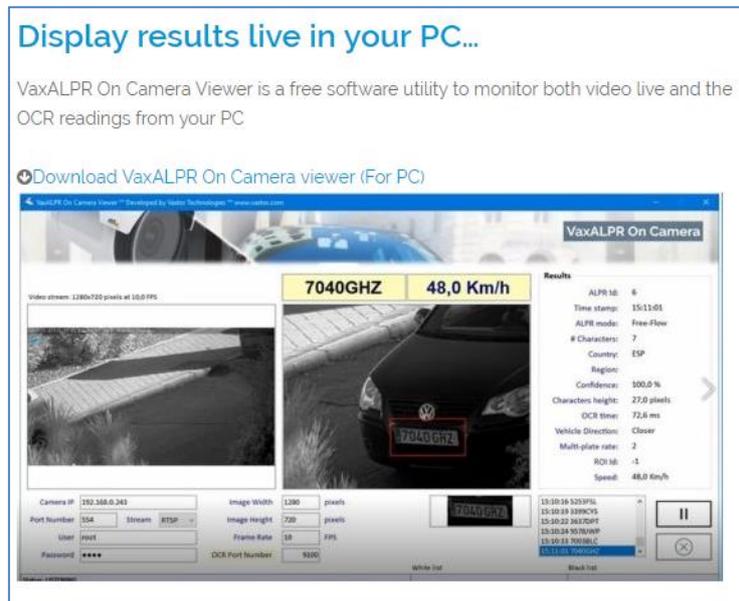
Being recognised a country takes advantage of our powerful integration and reporting capabilities offered by all VaxALPR series products including Milestone & Genetec VMS and many more.

Contact Vaxtor for more information.

5.6 See how it works: The VaxALPR On Camera Viewer

Once the camera and App have been setup, you can see if it is working by using the Plates function. In order to do a more detailed examination, then you should setup the camera to send the plate reads to the VaxALPR On Camera Viewer which can display the results in real time as they are received from the Axis camera.

1. Download the Viewer from the Vaxtor website and install on your PC:
<https://www.vaxtor.com/vaxalpr-on-camera/>



Vaxtor website: Download and install the Viewer

2. Setup transmission to the Viewer from the App by using the Reporting Menu (see previous section in this manual).
3. Select the Vaxtor protocol and setup the IP address of your PC where you have installed the Viewer:

Vaxtor protocol

Active

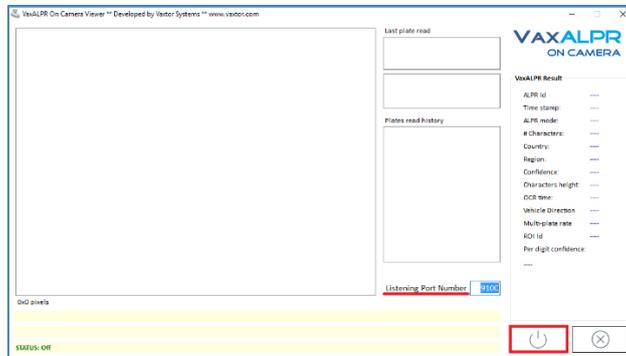
Host: ID:

Port:

Send duplicate images

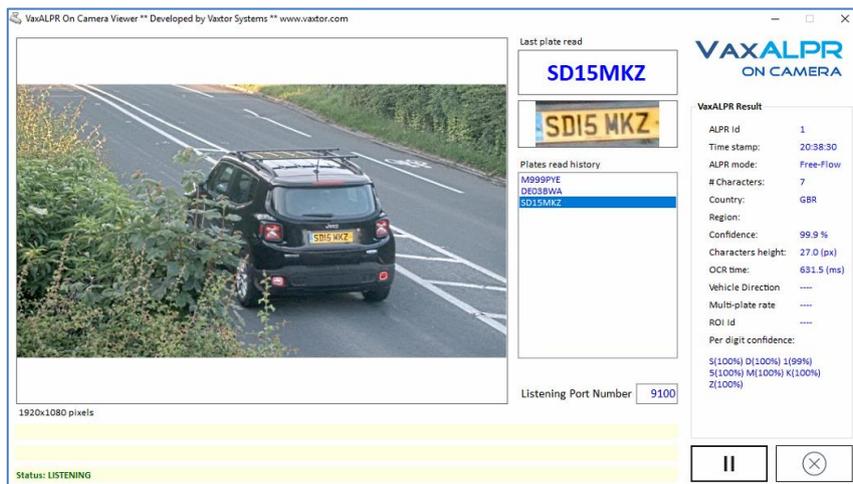
4. Set the Port to any free port on the pc, for example 9100.
5. Set the Camera ID to a number of your choice, for example 1.
6. Scroll down to the bottom of the page and click on Submit Reporting.

- On your PC, launch the Viewer and set the Listening Port Number of the VaxALPR On Camera viewer to the same port number as set in the VaxALPR On Camera above. Start the viewer using the button shown below.



VaxALPR On Camera Viewer

- The status of the VaxALPR On Camera viewer should now change to LISTENING and any plates captured should appear:



VaxALPR On Camera Viewer Listening

IMPORTANT: If no license plate numbers displayed, check that any firewalls are not blocking the connection.

The Viewer can be paused to study the last received plate and the various plate read information can be studied. The most important one is probably the Characters height, in this case 27, which is perfect for an accurate read. (20-30)

6. Troubleshooting

Many license plate reading issues are caused due to:

- Incorrect positioning of the camera
- Incorrect camera lens (or zoom setting)
- Insufficient illumination
- Incorrect camera settings - e.g. shutter speed
- Incorrect settings of the ALPR App.

In this section, we will study the most common of these issues and how to fix them.

6.1 The VaxALPR On Camera software starts and then stops suddenly.

Solution:

Check that you have uploaded the license key and check that the date and time of the Axis camera is set correctly.

6.2 The VaxALPR On Camera license is valid but a 'Check license' message appears.

Solution:

Check that the date and time of the Axis camera is set correctly.

6.3 The VaxALPR On Camera software is running but not reading plates.

Solution:

Check if you can see the license plate in the image and that the image is of good quality, not under or over exposed. As a general rule, if you can't easily read the plates then the software won't be able to read them either!

Image is everything so first try to adjust the camera lens to zoom in or out. Failing that, check if the camera itself can be repositioned closer or further from the reading point. The captured image should show the complete vehicle. This however depends on the resolution that the camera has been set to.

If the video quality looks good then go to the camera's settings and ensure that the shutter speed is set high enough. (See earlier in this manual for a guide to shutter speeds)

If you CAN see the license plate clearly in the image and the software is not reading anything, try changing following parameters in the settings section of the App to be more tolerant:

1. In the Country options, do not select the **Grammar Strict** checkbox.
2. In the Video options, change the **Minimum Character Height** to 14 pixels.
3. In the Video options, change the **Maximum Character Height** to 60 pixels.

4. In the OCR options, change the **Minimum Global Confidence** to 50.
5. In the OCR options, change the **Minimum Character Confidence** to 25.
6. In the Region of Interest section, delete any existing **Region of Interests (ROIs)**.

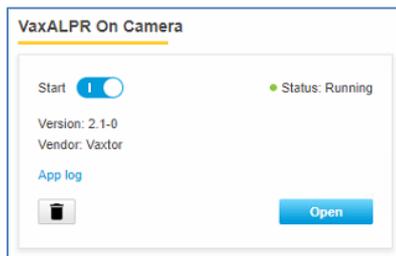
Once you can see the license plate image and the software is now reading, change these settings back one by one.

6.4 The VaxALPR On Camera software is running but it does not read all of the plates.

Solution:

In the VaxALPR configuration, in the Video options, check the that value of the resolution in the drop-down list is adequate.

1. Return to the Axis camera's main setup and select the VaxALPR On Camera App. Next click carefully on the blue words App Log:

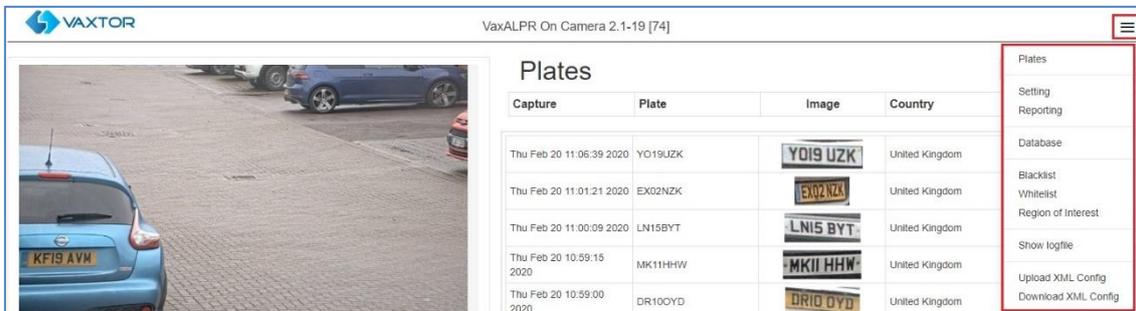


Do NOT click on the Bin Icon – this will give you the option of deleting the App!

2. Scroll to the end of the log file and look for the message:
`[INFO] Vaxreader[xxxx]: -Plate 0 (<pixel height> - <milliseconds>): <plate>`
 and check the value of the plate's character pixel height registered in the log.

If the resolution is 1280 x 960 and the pixel height of the plate is 40, it is recommended you set the resolution to a lower value.

Alternatively – use the “Show logfile” option in the main menu.



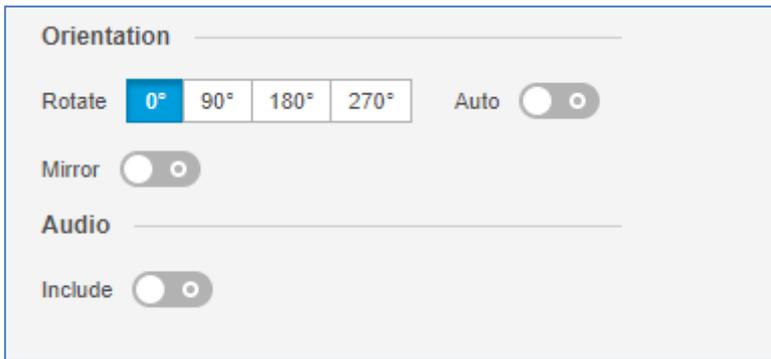
Capture	Plate	Image	Country
Thu Feb 20 11:06:39 2020	YO19UJK		United Kingdom
Thu Feb 20 11:01:21 2020	EX02NZK		United Kingdom
Thu Feb 20 11:00:09 2020	LN15BYT		United Kingdom
Thu Feb 20 10:59:15 2020	MK11HHW		United Kingdom
Thu Feb 20 10:59:00 2020	DR10OYD		United Kingdom

6.5 Plate patches are inverted on the plates list.

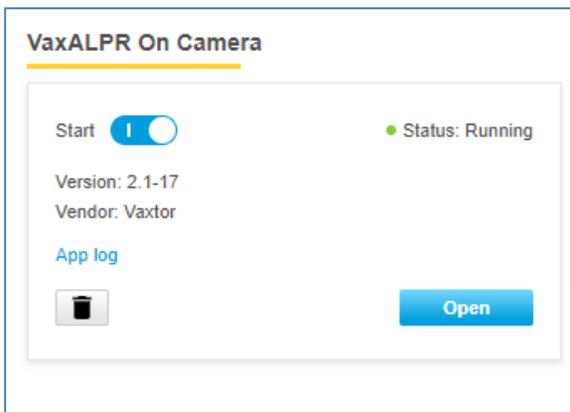
After installing a new Axis camera, sometimes the plate patches appear upside down after being read. Note that the camera has an auto-sensor to determine the orientation.

Solution:

Set the correct orientation required in the Axis Camera Settings/ Stream section:



After changing this (or any other settings in the camera) you should stop start and restart In the VaxALPR Application – and all should be well.



6.6 Examples of incorrect camera setup

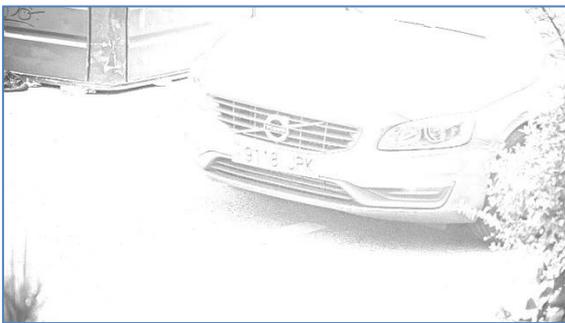
The camera is zoomed out too much and the plates are too small to be read properly:



The camera is zoomed in too much and the plates are too big to be read:



The license plates appear over exposed:



Solution:

Adjust the exposure in the camera, possibly by decreasing the shutter speed (e.g. to 1/2000th sec). If this is a night-time shot, try reducing the IR illumination

The license plates appear blurred:

**Solution:**

Try adjusting the focus or shutter speed of the camera. If this only happens at night, check that the Temperature correction is set to none. To set the Temperature correction, access the Axis camera's setup and click on the System Options menu and select the Plain Config option.

Select Image Source from the drop-down list and set the Temperature correction to none.

The license plate image appears distorted or at an acute angle:**Solution:**

Try adjusting the position of the camera to make the plates more level and all angles less severe.

The plate image appears unequally lit or contains shadows:**Solution:**

Avoid placing the camera where it can encounter direct sunlight or reflections. Shadows in the image can decrease the recognition accuracy.

The plate images are of low contrast at night:

**Solution:**

Try improving low lighting conditions and always use a good IR illuminator.

6.7 JSON or TCP setup but no plates being received

Solution

If you are using a remote URL to receive the data, check that a DNS server has been selected in the main Axis setup.

Go to the main Axis setting menu and select System and TCP/IP. Select a DNS server such as:

8.8.8.8 with a secondary server of say 8.8.4.4.

These are free Google DNS servers which will map your URL names.

Domain name	
<input type="text" value="Domain name"/>	
<input data-bbox="252 1305 292 1350" type="button" value="+"/>	
Primary DNS server	Secondary DNS server
<input type="text" value="8.8.8.8"/>	<input type="text" value="8.8.4.4"/>
<input type="button" value="Save"/>	

7. Dynamic Text Replacement Reserved Words

- **\$image\$**: Full JPEG image encoded in base64.
- **\$jpegsize\$**: JPEG size in bytes.
- **\$date\$**: Timestamp in ISO8601 format
- **\$plate\$**: Plate number
- **\$tag\$**: Unique hash for this plate number. Same plate number will always give the same \$tag\$.
Format based on UTMC algorithm.
- **\$plateutf8\$**: Plate number in utf8 format.
- **\$country\$**: Full country of origin name.
- **\$countrycode\$**: 3 letter country code.
- **\$state\$**: Plate State for USA.
- **\$category\$**: Plate category for countries that support it. E.g. the small prefix on some UAE plates.
- **\$blacklist\$**: Description on the blacklist linked to the plate number.
- **\$whitelist\$**: Description on the whitelist linked to the plate number.
- **\$ifblacklist\$ \$ifblacklist\$**: If the plate is on the blacklist, the text in the 'if clause' will be displayed.
- **\$ifwhitelist\$ \$ifwhitelist\$**: If the plate is on the whitelist, the text in the 'if clause' will be displayed.
- **\$ifnotin\$...\$ifnotin\$**: If the plate is not on a list, the text in the 'if clause' will be displayed.
- **\$confidence\$**: Global confidence (0-100).
- **\$charheight\$**: Average charheight (pixels).
- **\$processingtime\$**: Processing time in milliseconds.
- **\$left\$**: Left coordinate for the plate on the image (pixels).
- **\$top\$**: Top coordinate for the plate on the image (pixels).
- **\$right\$**: Right coordinate for the plate on the image (pixels).
- **\$bottom\$**: Bottom coordinate for the plate on the image (pixels).
- **\$absoluteleft\$**: Plate left position based on the total image width (0-1).
- **\$absolutetop\$**: Plate top position based on the total image height (0-1).
- **\$absoluteright\$**: Plate right position based on the total image width (0-1).
- **\$absolutebottom\$**: Plate bottom position based on the total image height (0-1).
- **\$width\$**: OCR image width.
- **\$height\$**: OCR image height.
- **\$ip\$**: Camera IP address.
- **\$roid\$**: Roi ID where the plate number is found.
- **\$make\$**: The vehicle make
- **\$model\$**: The vehicle model
- **\$color\$**: The vehicle color
- **\$class\$**: The vehicle classification (type – e.g. car, van etc)
- **\$speed\$**: Vehicle speed (Km/h).
- **\$multiplate\$**: Amount of times that the plate has been read before reporting.
- **\$signaled\$**: True if the read was caused by a trigger.
- **\$id\$**: Database ID for this read.
- **\$direction\$**: Enumerate with the vehicle direction (0: Unknown, 1: Towards, 2: Away, 3: Stopped)
- **\$directionstr\$**: String with the vehicle direction.
- **\$safedate\$**: Date in format %Y%m%d_%H%M%S in the camera time zone (Useful for filenames).
- **\$localdate\$**: Date in format %d/%m/%Y in the camera time zone
- **\$localtime\$**: Date in format %H:%M:%S in the camera time zone.
- **\$imageid\$**: Signal ID in case of a trigger read.

- **\$plateimage\$**: Plate crop JPEG image encoded in base64.
- **\$platejpegsizes\$**: JPEG size in bytes.
- **\$overviewimage\$**: Overview JPEG image encoded in base64.
- **\$overviewjpegsizes\$**: JPEG size in bytes.
- **\$epoch\$**: Unix epoch (seconds).
- **\$utcdate\$**: Will report the date at ISO8601 format but always in UTC. (2020-12-31T16:11:30.000Z)
- **\$etx\$**: End transmission character (03)
- **\$stx\$**: Start transmission character (02)

7.1 Note on UTC time format:

Time UTC: 2021-04-13T00:50:15.000Z

(YYYY-MM-DDTHH:MM:SS.mmmZ - The last Z indicates the time is UTC)

Local Time: 2021-04-13T00:50:15.000-03:00

(YYYY-MM-DDTHH:MM:SS.mmm±hh:mm - Where the last ±hhmm is the difference from UTC time)

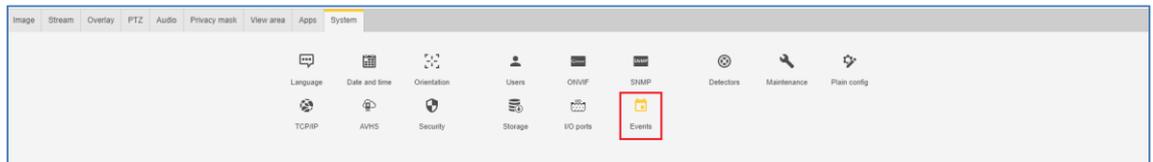
8. Scheduling VaxALPR to automatically start or stop processing

There are situations where you do not always want the ALPR application to monitor a road or entrance and report plates. This could be a privacy requirement for example where it is only permitted to monitor a secure area at night.

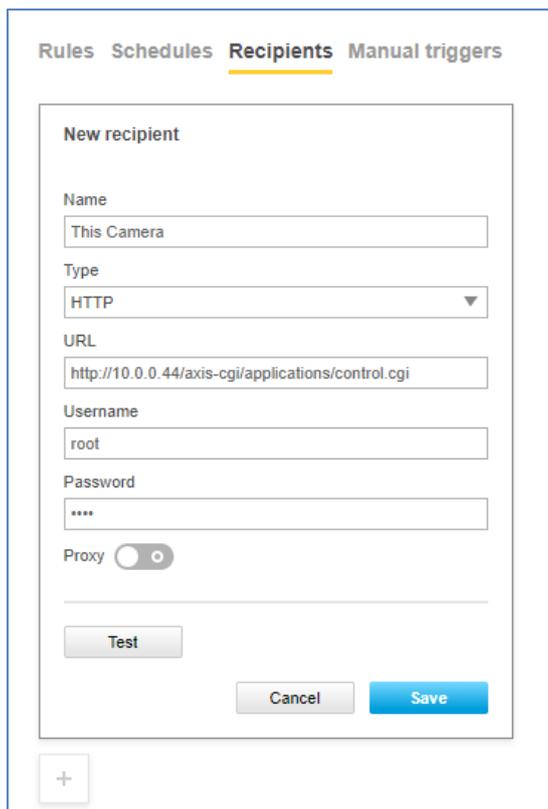
This can be done by setting up a schedule to trigger an event withing the Axis camera.

Do this as follows:

1. In the Axis camera main menu – select System & Events.



2. Select the **Recipients** Tab and use the + icon to add a recipient as follows:
(The recipient of the event is going to be this camera – i.e. itself!)



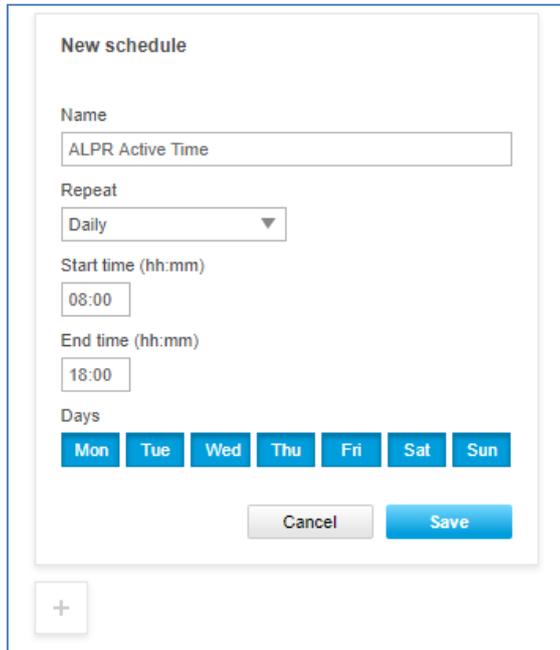
Name the recipient, set type of recipient to HTTP and enter the URL as follows:

<http://10.0.0.44/axis-cgi/applications/control.cgi>

(in this example the camera's IP address was 192.168.0.89)

Enter the username & password for the camera (usually root/pass) and press Test to verify everything is correct. Press Save.

- Next select the **Schedule** Tab and create a new schedule by clicking the + icon.
Select Schedule (not pulse) and create it, name it e.g. 'ALPR Active Time' and set the schedule as required:



Click Save.

- Next, setup a new Rule to start the App by clicking the Rules Tab followed by the + icon.

Name it – e.g. 'Start ALPR'.

Set the condition = Scheduled event

Select your schedule e.g. ALPR Active Time

Set the Action to be: 'Send notification through HTTP'

Set the Recipient e.g. 'This Camera'

Set the Query string suffix to: `action=start&package=Vaxreader`

.. and click Save:

New rule

Use this rule

Name

Wait between actions (max 23:59:59)

Condition ^

Invert this condition

Use this condition as a trigger

Schedule

+

Action ^

Recipient
This Camera

Query string suffix

Message (will be encoded)

Full recipient URL:
<http://10.0.0.44/axis-cgi/applications/control.cgi?action=sta>

- Next, setup a new Rule to stop the ALPR App by clicking the Rules Tab followed by the + icon.

Name it – e.g. ‘Stop ALPR’.

Set the condition = Scheduled event

Select ‘Invert this condition’

Select your schedule

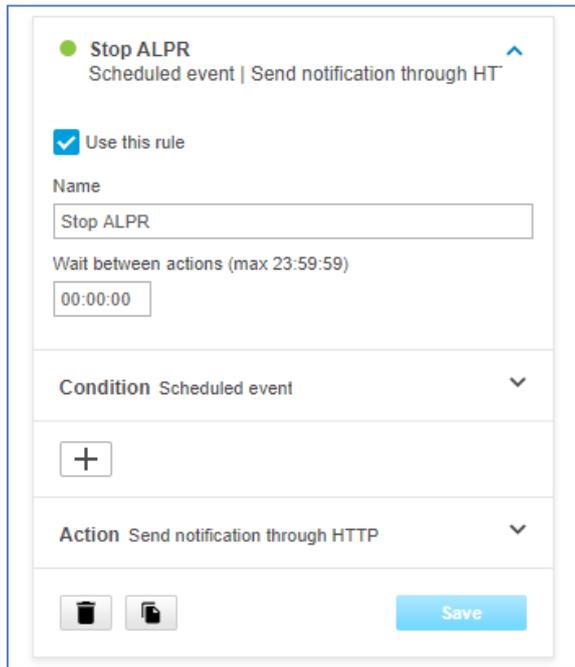
Set the Action to be: ‘Send notification through HTTP’

Set the Recipient e.g. ‘This Camera’

Set the Query string suffix to: `action=stop&package=Vaxreader`

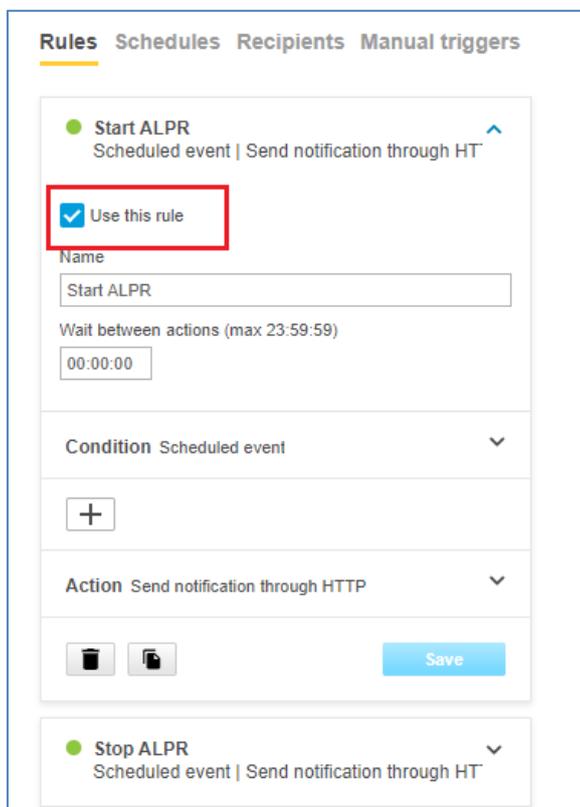
.. and click Save.

The rule then looks like this in our example:



The screenshot shows the configuration for a rule named "Stop ALPR". At the top, it is identified as a "Scheduled event | Send notification through HT". A checkbox labeled "Use this rule" is checked. Below this, the "Name" field contains "Stop ALPR" and the "Wait between actions (max 23:59:59)" field is set to "00:00:00". The "Condition" is set to "Scheduled event" and the "Action" is "Send notification through HTTP". At the bottom, there are icons for deleting and duplicating the rule, and a blue "Save" button.

6. You can turn the scheduling on & off by going to each of the rules using the tick box:



The screenshot shows the "Rules" management interface with tabs for "Rules", "Schedules", "Recipients", and "Manual triggers". The "Rules" tab is active. The first rule, "Start ALPR", is shown with its "Use this rule" checkbox checked and highlighted by a red rectangle. Below it, the "Stop ALPR" rule is partially visible. The interface includes fields for name, wait time, condition, and action, along with delete and duplicate icons and a "Save" button.

8.1 Advanced API Calls to various ALPR related functions & settings

View the ALPR Logfile:

http://camera_ip/axis-cgi/admin/systemlog.cgi?appname=Vaxreader

Logfiles Storage:

/var/spool/storage/SD_DISK/

(5 archives (log.txt, log.txt.1 ... log.txt.4) of 10 MB each)

View the ALPR Configuration file:

http://camera_ip/local/Vaxreader/alpr.cgi

Reset the ALPR Configuration file to factory default

<http://192.168.0.89/local/Vaxreader/alpr.cgi?reset=true>

Trigger the ALPR Engine:

http://camera_ip/local/Vaxreader/trigger.cgi

http://camera_ip/local/Vaxreader/trigger.cgi?id=12345

http://camera_ip/axis-cgi/io/virtualinput.cgi?action=6:/500

This will trigger the virtual port 1 for 500 ms

- 6 = virtual 1

- 7 = virtual 2

URL of any associated overview camera

http://camera_ip/local/Overview

Start or Stop the Application remotely

<http://192.168.0.89/axis-cgi/applications/control.cgi?action=start&package=Vaxreader>

<http://192.168.0.89/axis-cgi/applications/control.cgi?action=stop&package=Vaxreader>

For other API calls see the separate On-Camera Axis Software Developer's guide.

9. Changelog

9.1 Version 1.9.11

- ✓ New reporting option: JSON output. The camera will send the defined JSON object in an HTTP POST message to the server configured.
- ✓ Integration with Axis A1001 controller
- ✓ Oman is now supported.
- ✓ Improvements in Australian plate recognitions
- ✓ First part of the improvements for Italy plates recognitions. We will be making new improvements for Italy in the next week.
- ✓ Improved German plate recognition
- ✓ Minor corrections to European grammars

9.2 Version 1.9.8

- ✓ Corrected a bug when creating items on the whitelist and blacklist under Internet Explorer
- ✓ Rotation of the camera will be automatically detected based on AXIS configuration
- ✓ Blacklist and Whitelist will handle correctly non ASCII characters (Ö, Ü, Ä)
- ✓ Defined grammars for Australia, Taiwan and Jordan
- ✓ Corrected a bug related with German, French and Ireland grammars
- ✓ OCR Improvements for Europe and Taiwan
- ✓ Added an overlay to check how a plate with a character height of 24 pixels looks like while defining the region of interest
- ✓ Suppressed functionality “auto adjust character height”
- ✓ The reserved information in the proprietary protocol has been modified.

9.3 Version 1.9.7

- ✓ Improvements on accuracy and performance
- ✓ Corrected a bug related with Netherlands plates
- ✓ Corrected a bug related with black foreground plates
- ✓ A warning message has been added if ROI definition is made with different resolutions.
- ✓ Configurable Overlay port
- ✓ Added new TCP connector
- ✓ Corrected a bug related with ROI definition in Internet Explorer
- ✓ HTTP POST Camera IP can be any string
- ✓ Added import XML option

9.4 Version 1.9.5

- ✓ Improvements on accuracy and performance
- ✓ New: Whitelist management
- ✓ New: Blacklist management
- ✓ New: CameraApplicationPlatform/Analysis/Whitelist and Blacklist Axis events.

- ✓ New: Dynamic Overlay management
- ✓ New: Write ALPR results to network share
- ✓ New: AS/3 TCP controller integration (Dorlet)
- ✓ UI improvements
- ✓ Minor bug fixes

9.5 Version 2.1.0

- ✓ New VaxALPR Config interface.
- ✓ Fix: NEDAP and Overview default values when loading previous XML files.

9.6 Version 2.1.5

- ✓ Added: Watermark interface.
- ✓ Updated: Update internal libcurl and libssl versions.
- ✓ Changed: HTTP timeouts reduced from 30 to 5 seconds.
- ✓ Updated OCR to latest version.

9.7 Version 2.1.6

- ✓ Minor bugfixing.

9.8 Version 2.1.7

- ✓ Fix: UTMC confidence is now an integer.
- ✓ Changed: Retry notification period is now 3 seconds.

9.9 Version 2.1.8

- ✓ Updated OCR to the latest version.
- ✓ Fix: Error storing crop option.

9.10 Version 2.1.9

- ✓ Added: HTTPS output for integration with Helix-6.
- ✓ Fix: ACS bookmark description was incorrectly sent.

9.11 Version 2.1.12

- ✓ Update OCR to the latest version.

9.12 Version 2.1.14

- ✓ Added: UTMC versions 1 and 2.
- ✓ Added: Genetec reporting.
- ✓ Updated OCR to the latest version.

9.13 Version 2.1.15

- ✓ Update OCR to the latest version.

9.14 Version 2.1.19

- ✓ Updated OCR – speed improvements.

- ✓ Added new messages for WDR, Shutter speed, SD, Network Share and new versions.
- ✓ Added RSP (Italian integrator)
- ✓ Added Low Coverage Mode
- ✓ Added Log to SD card
- ✓ Improved transmission retry algorithm
- ✓ Improved frame acquisition
- ✓ Improved database access
- ✓ Added overview image storing
- ✓ Improved UI (Database records)
- ✓ Added ability to disable multi-line plates

9.15 Version 2.1.21

- ✓ Added multiline option. Enable this option if you want to read plates with multiple lines.
- ✓ Added ADR as selectable country. User must add ADR as a country to enable ADR detection. (The ADR license is still needed to detect ADR plates correctly).
- ✓ Date format displayed on the web page use machine locale (USA format).
- ✓ Added integration with Network Optix.
- ✓ Fix: Error on TCP server reporting with messages bigger than 300k.
- ✓ Added: \$utcdatex\$ as a valid template word. It will write the read date in UTC and in ISO8601 format.
- ✓ Added: Signaled - will return only one plate as an option.
- ✓ Update OCR engine and minor bug fixing.
- ✓ Significant OCR speed improvements. In some scenarios you will see read times 40-50% faster.
- ✓ Added ability to disable multi-line plates

9.16 Version 2.1.23

- ✓ Fix: Issue exporting data to CVS
- ✓ Fix: TCP Server disconnections
- ✓ Added no report flag on manual triggers (To allow testing communication with the software without sending a result to third parties)
- ✓ Save overview images on Record to SD and Network share option
- ✓ Added \$ip\$ to OcrContainers templates
- ✓ Add /delplate.cgi endpoint to delete plates from the camera DB
- ✓ Split \$confidence\$ on \$confidencecode\$ and \$readconfidence\$ for OcrContainers. \$confidencecode\$ is the validation digit \$readconfidence\$ is the global confidence value
- ✓ Add filter by direction
- ✓ Added SHA1 for Wiegand26 transmission over TCP

Ocr update.

9.17 Version 2.2.9

- ✓ Updated ACAP SDK to latest version.
- ✓ Remove same length constraint on the grammar exception plates that are replaced.
- ✓ Fix: Crash using proprietary protocol with environment images.
- ✓ Fix: Solved an issue exporting plates with Arabic characters to CSV.

- ✓ Autorotation now is detected correctly.
- ✓ Added: Automatic list synchronization with Helix.
- ✓ Added: Configurable page size using the database API.
- ✓ Fix: UI search accepts non-ASCII characters.
- ✓ Added: Generic country.
- ✓ Fix: Corrected Genetec UID.
- ✓ Added: From and to fields to the whitelist/blacklist.
- ✓ Added product UIC.
- ✓ Added Mopped product.
- ✓ Fix: CSV export from database.
- ✓ Fix: Log export.
- ✓ Fix: Crash if plate doesn't fit on the cropping area.
- ✓ Remove: Crop ROI option.
- ✓ Added a configurable timeout to UTMC operations.
- ✓ Added a secondary UTMC export.
- ✓ Added a daily report generation.
- ✓ Added GUID as optional ID for UTMC plates.
- ✓ Added iSpeed.
- ✓

9.18 Version 2.2.13

- ✓ Removed maximum resolution. It is possible to select resolution over 1920x1080.
- ✓ Added char bounding as a possible output.
- ✓ Update OCR engine (less memory usage).

9.19 Version 2.2.14

- ✓ UI revamp. All tables are configurable.
- ✓ Genetec: Added test flag to switch between demo and production releases.
- ✓ Fix: Typo reporting Rastatt region
- ✓ Added: Support for electric vehicles plates in Mexico.
- ✓ Added: Support for new Irish plates format.
- ✓ Fix: Ohio grammar.

Ends.