VaxALPR

With ADR, Make, Model & Color Recognition Vehicle Classification and Instantaneous Speed

On-Camera Software

Software Setup and Axis Camera Configuration

Main Manual

Version 2.2.53

January 2023

1. Table of Contents

2. Introduction

This guide has been designed to guide you through the process of 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. There are various options available including MMC (Make, Model & Color Recognition), Vehicle Classification and Instantaneous speed and ADR (Hazard Identification Numbers / Kemmler codes) which are covered in this manual.

Other ALPR manuals are available from Vaxtor including Axis Camera Integration (VAPIX use) and a software developer's guide to help with configuring the many reporting options such as JSON, Milestone, Genetec etc.

Contact Vaxtor for more information or register on the Vaxtor website Partner Zone.
https://www.vaxtor.com/support/partner-downloads/

3. Best Practices in positioning and setting up the Axis camera

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

A good clear image captured at the optimum angle is essential in order to achieve a good license plate recognition rate.

Very Important

Please read the separately available document: "**IP Camera Setup for ALPR"** for a comprehensive guide to the best practices when setting up and positioning your ALPR camera.

This covers camera positioning, shutter speed, frame rate, image quality and infrared illumination.

4. Camera Setup and configuration for License Plate Recognition

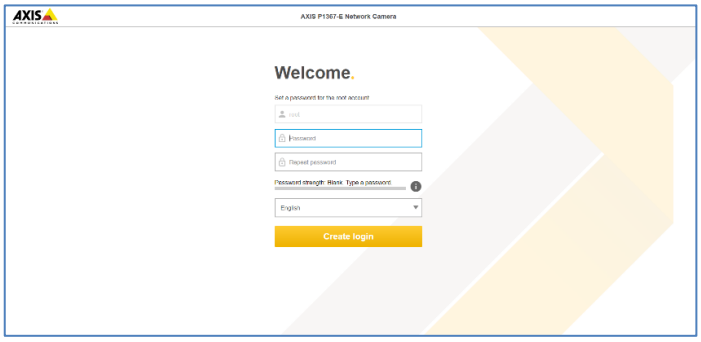
In this section, we describe how to set up the Axis Camera for optimum image quality.

An intelligent ALPR camera is a specialized CCTV camera that has in-built software to identify license plates on still or moving vehicles. You should use an **Axis Camera** with an **ARTPEC-6** or above processor. Note that there are currently two versions on the ALPR software: one for ARTPEC 6 & 7 and another version for ARTPEC 8 processors.

*We no longer support the older / slower **ARTPEC-5** processors.*

4.1 Setting up the Axis Camera

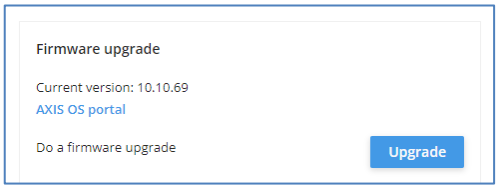
Once the Axis camera has been installed it must be set up and configured. Use a web browser to log on to the camera using its IP address. *(refer to the Axis documentation for the default IP address. The default username and password are normally: root / root.)*



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

4.1.1 Check for the latest firmware

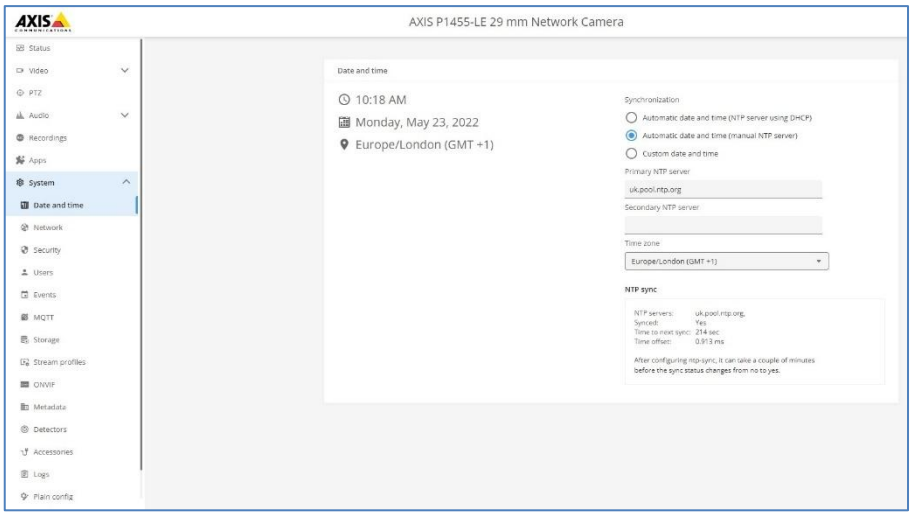
Select the System tab and the Maintenance. In the Firmware Upgrade box you will see the link to download the latest firmware and then upgrade your camera.



Once installed you can configure the rest of the camera's more important settings.
See Axis's product guides for a comprehensive description of all the camera settings.

4.1.2 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.



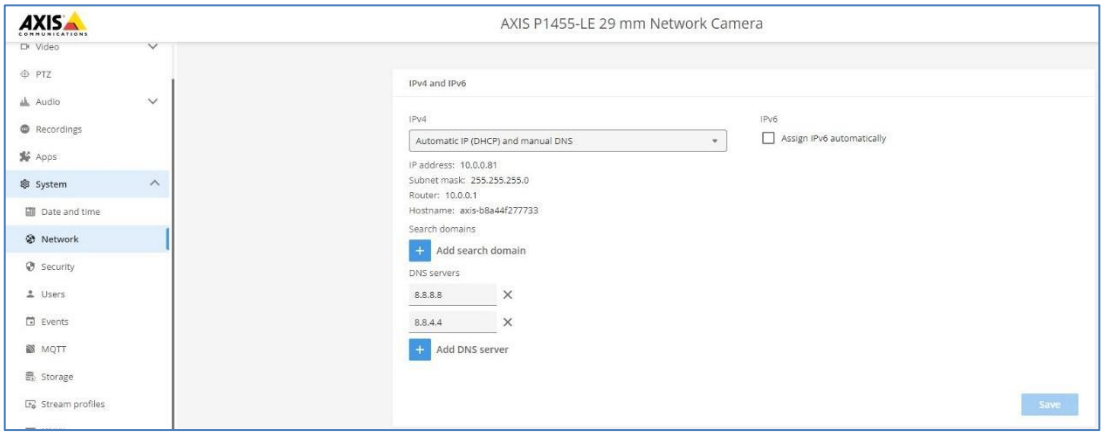
Here we can set the time zone and synchronize the time with a time server and in this example we are using one of the UK Stratum 1 NTP Servers.

4.1.3 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 Network:

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



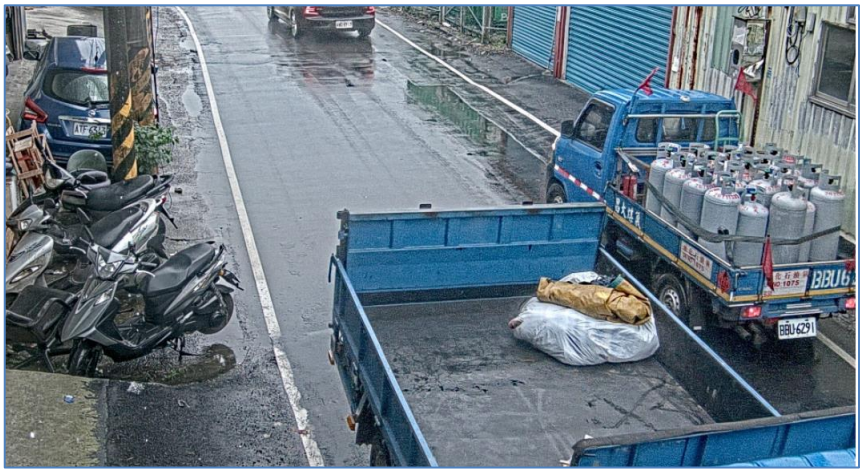
In this case Google's is 8.8.8.8 with a secondary server of 8.8.4.4. These are free Google DNS servers which will map any domain names needed to the correct IP address.

4.1.4 Zoom (Focal Length) and Focus

Under the **Video** and **Installation** tab you can set the camera's field of view (FOV) to the portion of road that you require. Concentrate the FOV on the road only and do not waste resolution on grass verges, pavements etc.

Sometimes this results in not enough resolution being available for accurate results in the main part of the image and it can also slow down recognition times.

In this example about 2m on the left of the image is not being used for recognition:



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
P1455-LE (3-9mm lens) - FOV 3m - then 3-10m Range
P1455-LE (10.9-29mm lens) - FOV 3m – then 6-24m 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
P1455-LE (10.9-29mm lens) - FOV 6m - then 12-24m 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.

4.1.5 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 are to be streamed to a VMS and one are to perform ALPR on. View areas are found under the Video Tab.

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.

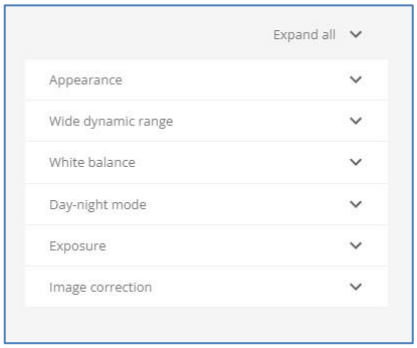
Note that you can also set a Region of Interest (ROI) within the ALPR App - see later.

4.1.6 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.***

4.1.7 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:



Click on "Expand all" to view and edit all the settings.

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

Important camera settings

- 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 50 or below. 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 **Exposure zone** to the area of the FOV where the plates will appear and set the **Maximum Shutter** speed (maximum exposure time) to **1/1000th sec.**
  This can be reduced for slow traffic scenarios. Please read the separately available document: "**IP Camera Setup for ALPR"** for a more detailed explanation.
- Set the **Max gain** to 24dB to or below to reduce noise on the images. If the plates are overexposed – reduce this value.
- **Motion-adaptive exposure** – select to reduce motion blur in low light conditions.
- **Blur-noise trade-off** (if available) – 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.
- **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.
- Turn **EIS (Electronic image stabilization) OFF** to prevent the camera generating in-between frames. A high shutter speed will prevent any motion blurring from vibrating camera mounts or poles.

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 P1455 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.

4.1.8 Stream Settings: Resolution

NOTE: 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. If you are only 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.

4.1.9 Stream Settings: Frame Rate

NOTE: Does not need to be set for VaxALPR On-Camera

The frame rate, is the number of frames or images that the camera can capture per second. For example, 30 fps means the camera captures 30 frames in a single second of video.

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

5. Installing and Licensing the VaxALPR On Camera software

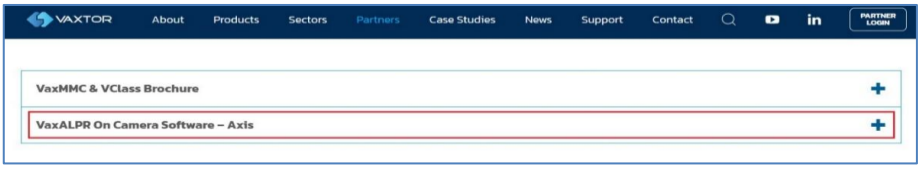
Once the Axis camera is installed and setup, we need to install and configure the VaxALPR On-Camera software. The following steps are recommended:

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

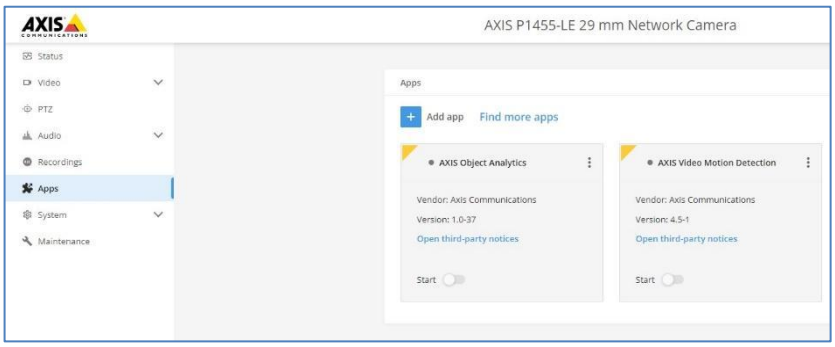
5.1 Installing the software

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

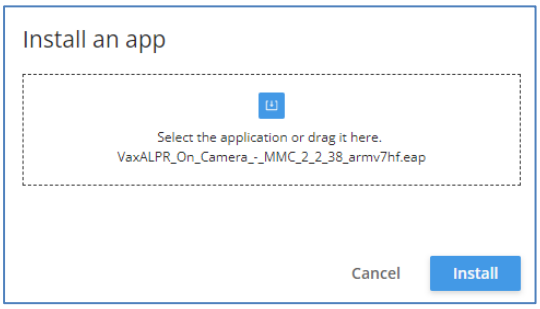


2. In the Axis camera´s settings click on the Applications (Apps) tab.



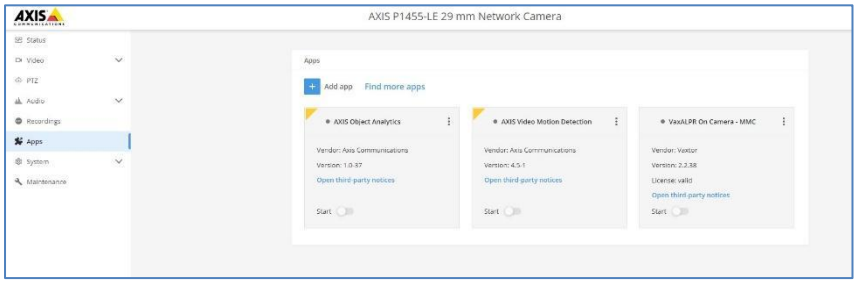
3. Click the + (Add button) 

and browse for the file:
VaxALPR_On_Camera_-_2_2_40_armv7hf.eap (in this case for MMC for an ARTPEC 6,7 processor)



4. Click the **Install** button to install the software.

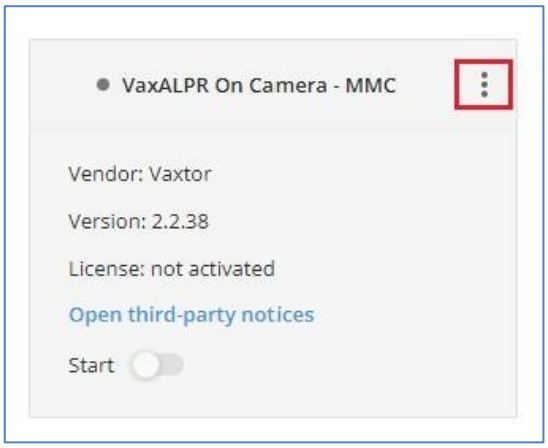
5. After installation the App will appear on screen.

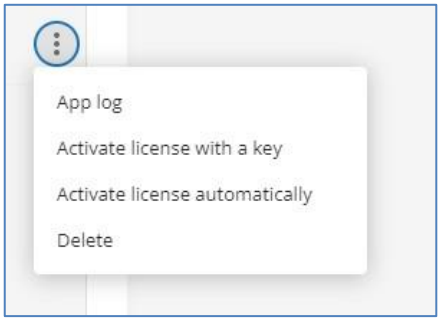


NOTE: If you encounter any issue while installing the software, upgrade the Axis camera firmware to the latest version available for your specific product model. (the minimum version required is 10.4).

5.1.1 Upload the license key

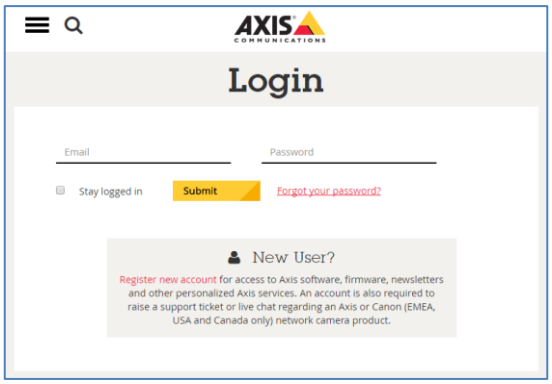
The VaxALPR On Camera software requires a license key. Whether you need a 30 day trial license or already have a paid-for permanent license code, do the following steps and select the appropriate option. Click on the Apps menu and click on the 3 dots in the VaxALPR On Camera icon.



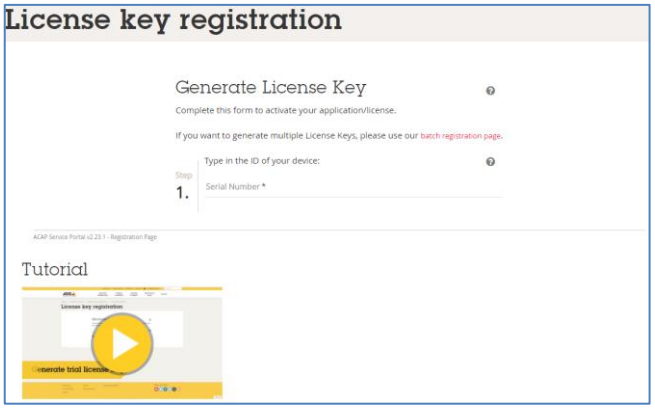


To generate a 30 day demonstration license, then click on Activate license with a key and **take note of the Axis product serial number that appears in the License Activation section.**

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.

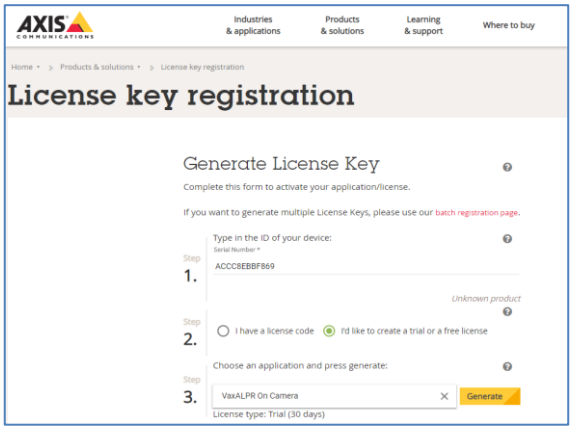


In the License key registration web page, do the following:
Type in the ID (Axis product serial number) of your camera.

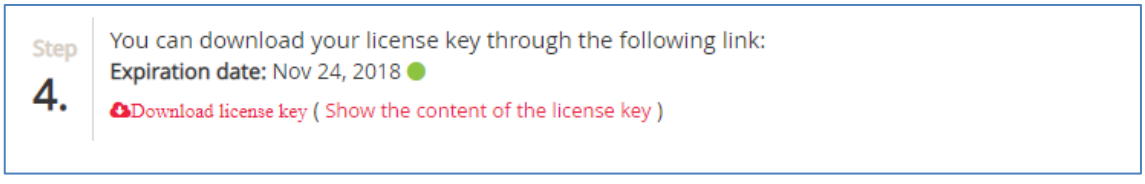


To generate a trial license

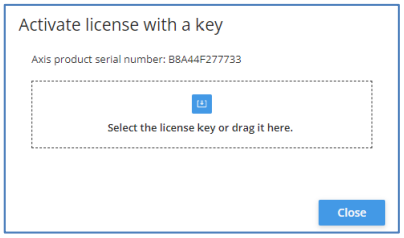
Select the corresponding radio button. Select VaxALPR On Camera as the application name and press the Generate button.



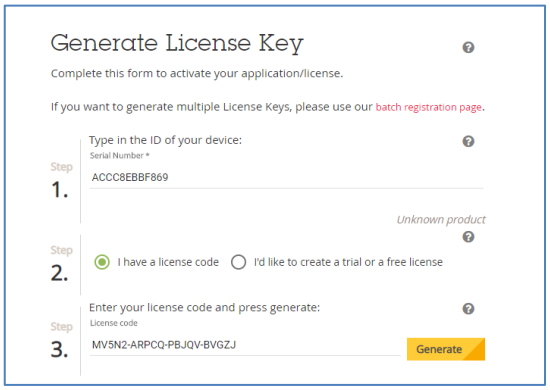
Download the trial license key to your PC.



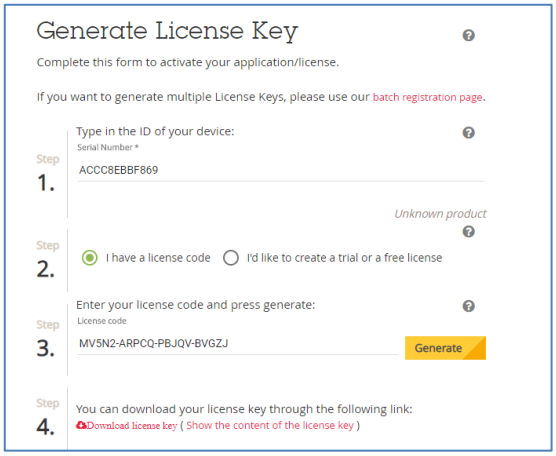
Once downloaded return to your camera menu and select the license as directed:



To generate a 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.



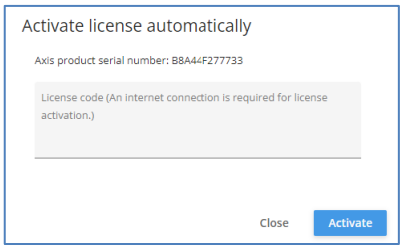
Download the permanent license key using the link shown in red.



Now that you have the license key, go back to the Axis camera's setup and click on the Apps menu, select the VaxALPR On Camera and select **Activate the license with a key** and select the downloaded license.

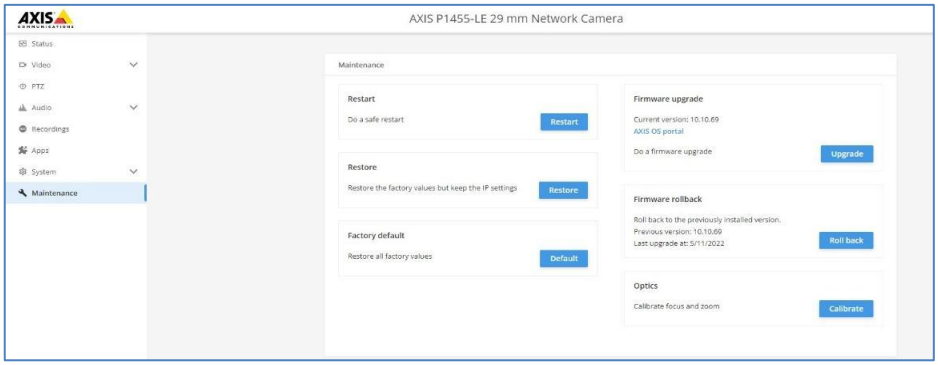
The permanent license should now be installed correctly.

Alternatively you may have been sent a batch of license key codes from Vaxtor (for bulk installations), in this case select simply enter **Activate license automatically** and enter the license code and activate:



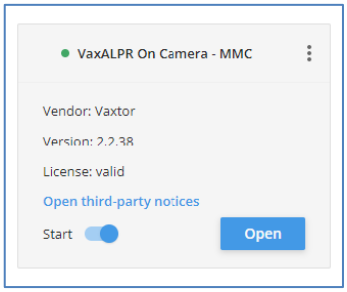
5.1.2 Restart the Axis Camera

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 'Maintenance' and Select the '**Restart'**



5.1.3 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 Open button to start the ALPR App.



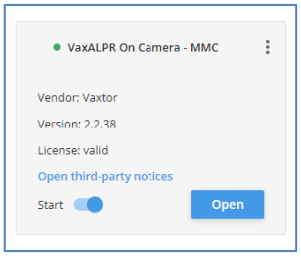
Note that you can set up a schedule within the Axis camera to turn the ALPR application on or off at predetermined times. This can be useful in certain situations where it a requirement to only monitor a location between certain times for say privacy reasons.

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

Scheduling VaxALPR to automatically start or stop processing

6. Configuring VaxALPR On Camera Software

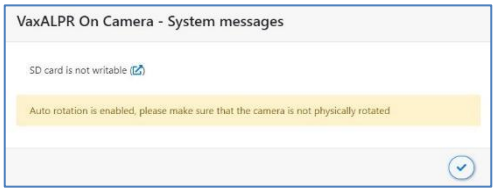
Once the software is running you can configure the VaxALPR On Camera software by clicking on the blue Open button.



6.1 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 Setting a DNS Server 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:

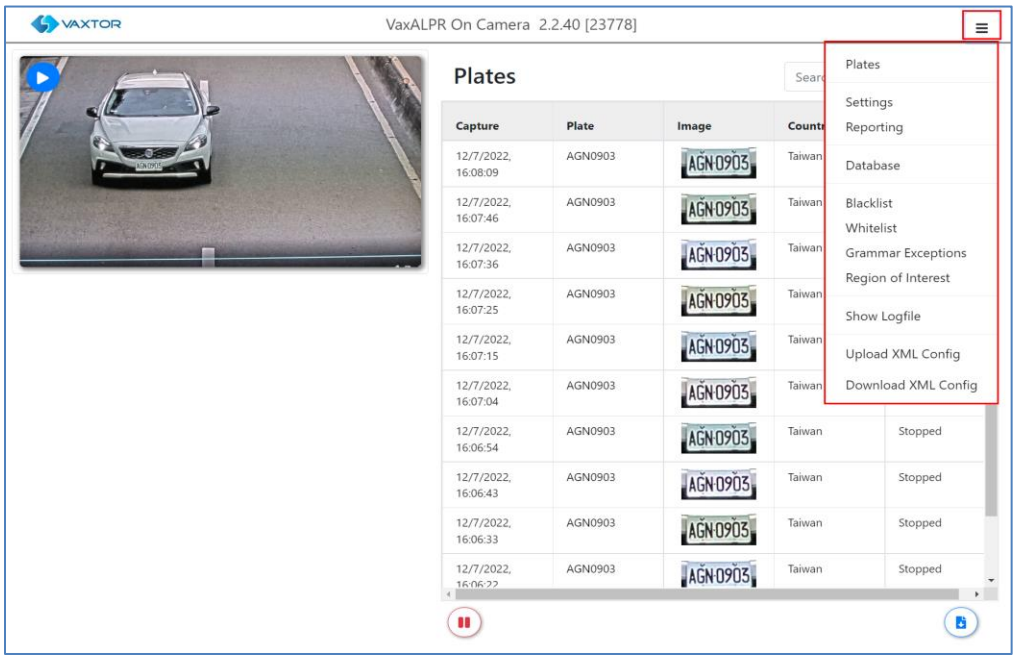
- Checking for the latest version of software on the Vaxtor website. *(This assumes that the camera is connected to the internet)*
- Shutter speed that is too low (slower than 1/250th sec)
- WDR (Wide Dynamic Range) is switched on
- Auto Rotation is enabled
- Gain is over 12db
- Database has been enabled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

6.2 VaxALPR On Camera user interface

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



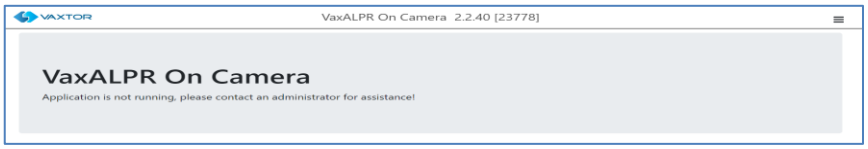
VaxALPR On Camera interface

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 (e.g. to sound alarms).
- Whitelist: To manage a Whitelist (e.g. to activate a relay)
  (These appear if they have been enabled in Settings)
- 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 black or whitelists or the recorded log file of license plates.

VaxALPR On Camera not running

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



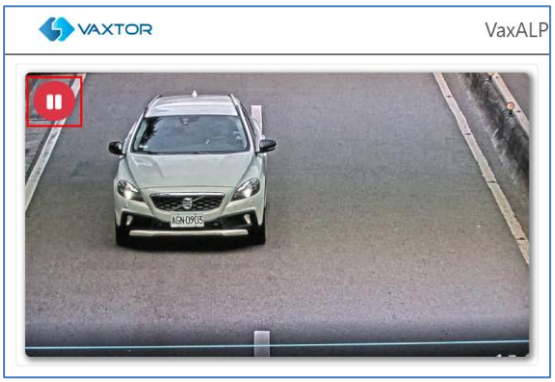
If the software is not able to run correctly, please ensure that:

- 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.

Live Video Button

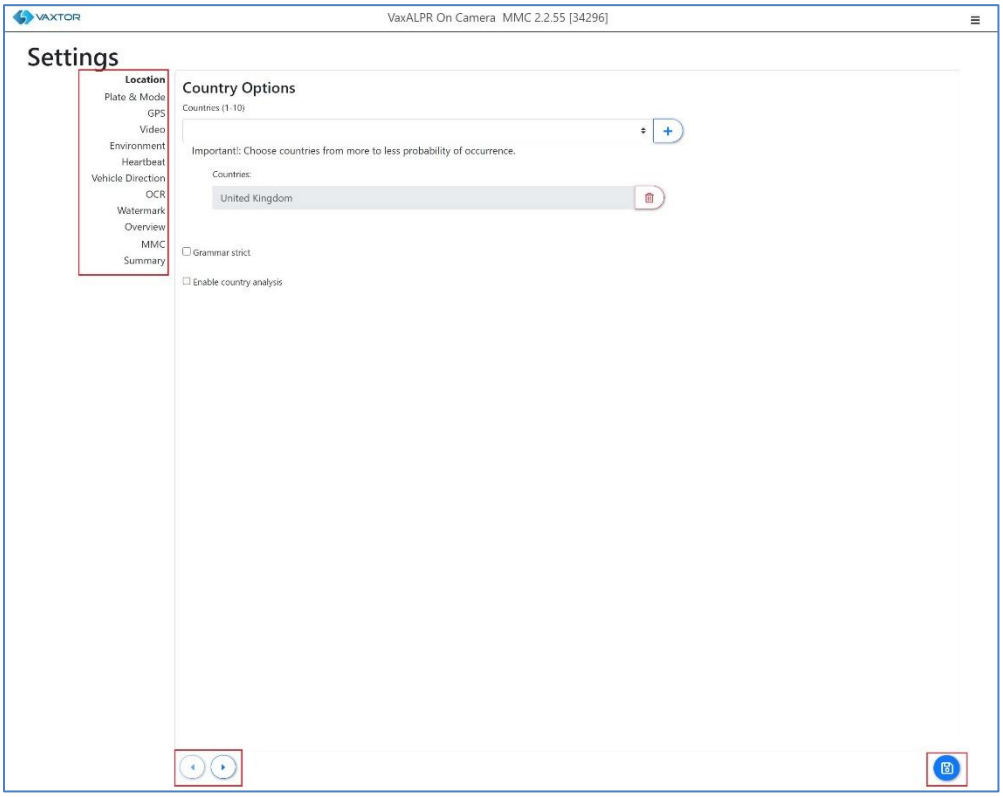
When the GUI starts, a single image is grabbed from the camera and frozen for you to select from the menu or view captured plates. Press the Play icon to start the live video.
If you do not need to see live video then press the Pause icon.



Note that if you are using say a 4g connection to the camera, then by viewing a live image in a browser window you will be streaming data over your connection to your PC which you may be charged for.

7. VaxALPR Settings

In the **VaxALPR Setting page** it is possible to configure all of the LPR parameters. The settings are divided in 8 different sections and a Summary section. Note that the software version and build number is displayed in the header bar.



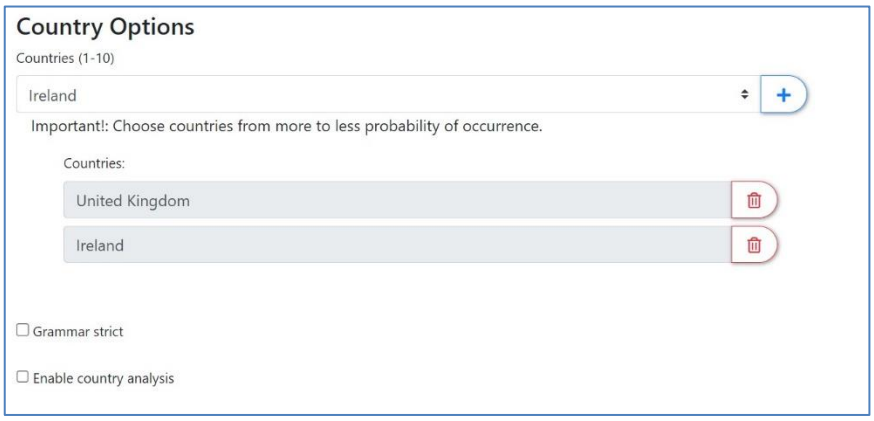
Select each section in turn from the headers on the left or move between them using the left and right arrows at the bottom of the screen: 

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

You can also save the current settings at any time by clicking on the disk symbol, bottom right:

7.1 VaxALPR Settings: Location

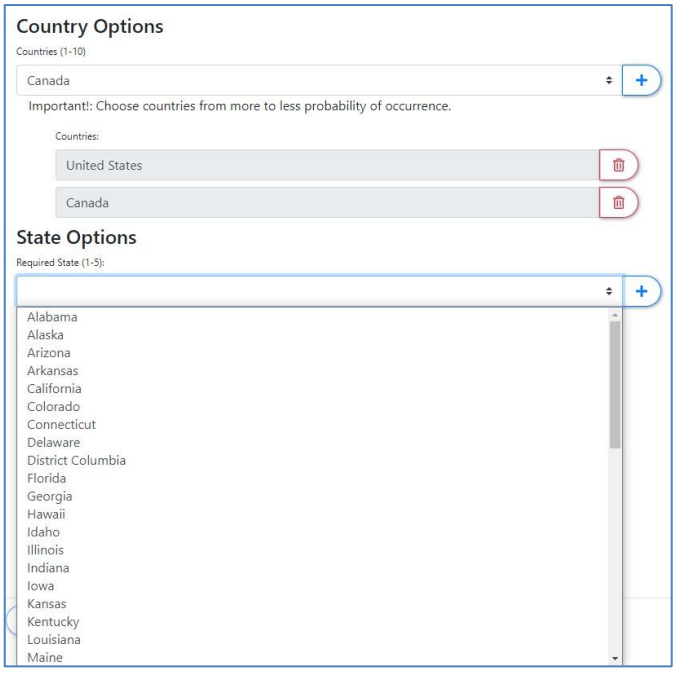
Countries (1-10)



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. E.g. some text seen on the rear of a truck may be read as it doesn't match the selected grammar.

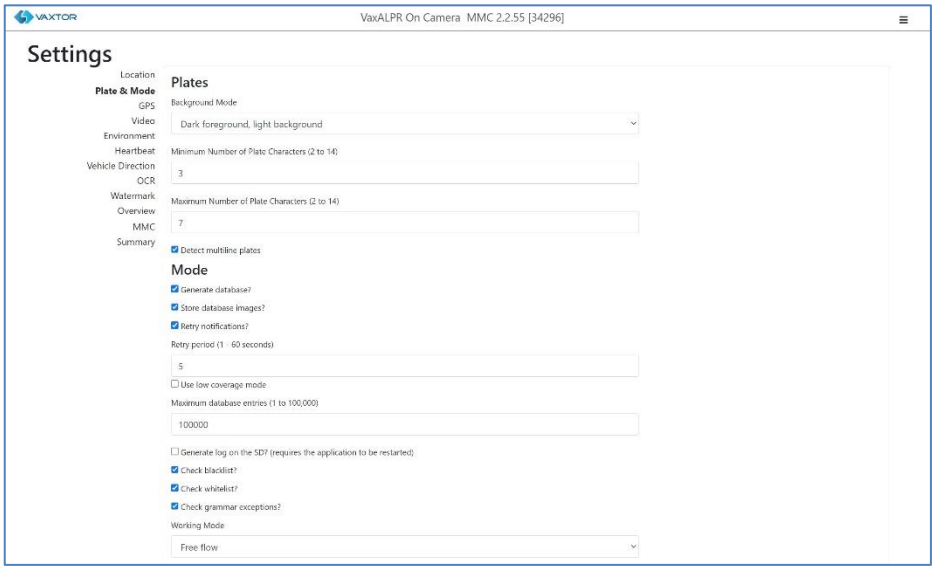
Enable country analysis

Default OFF. This uses deep learning to determine the country of the plate being read.

When enabled the engine will compare the appearance of the plate with a reference set using advanced learning techniques and can then report the country of origin. This is independent of the reading of any characters and removes the need for the user to add for example the closest ten 10 EU countries when reading plates near to a border. Using this feature will increase the processing time so use with caution.

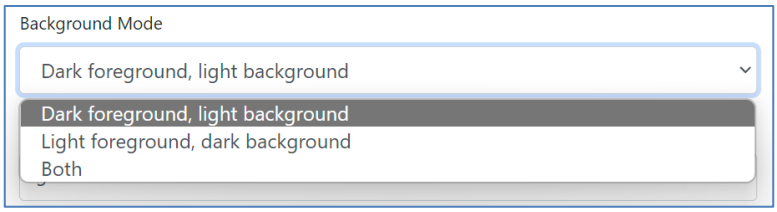
In a forthcoming release users will simply select a geographic region instead of a country list. (This is the new Phobos Engine).

7.2 VaxALPR Settings: Plate & Mode options



7.2.1 Plates

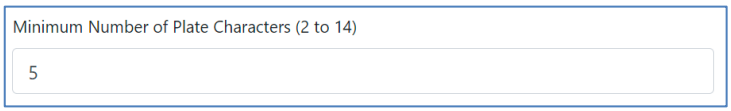
Background Mode



- 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.

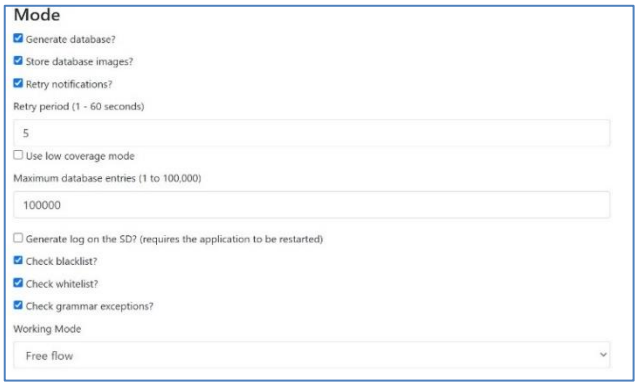
Detect multiline plates

- 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.

7.2.2 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.



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 (FIFO)

- Select this checkbox ☑ if your camera is remote and the communication links (3g for example) are regularly 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. With Low Coverage Mode selected, reads are retransmitted after a longer interval reducing the chance of an ever-increasing backlog.

  So the system will use a FIFO policy for sending reads.

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 case 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) end ensure that responses are sent to the camera **immediately** after receiving the data before processing the data. Contact Vaxtor for further information.

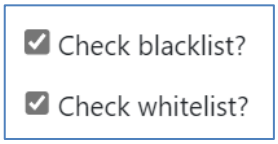
Maximum database entries (1 to 100,000)

- 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 to 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. As a rough guide a 32GB SD card would store approximately 80,000 reads at 1920h.*

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.

7.2.3 Black / White list activation



Check blacklist

- Select this checkbox to enable plate checking against a predefined Blacklist.
  Once selected the blacklist options will appear in the main menu.
  (see: VaxALPR Blacklists and Whitelists later in this manual)

Check whitelist

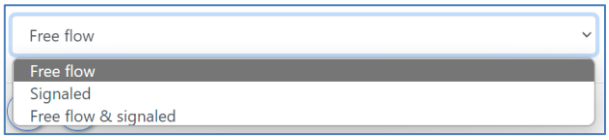
- Select this checkbox to enable plate checking against a predefined Whitelist.
  Once selected the whitelist options will appear in the main menu.
  Note that Black and White lists can be stored centrally on Vaxtor's Back Office "Helix" and automatically synchronized with all connected cameras.

7.2.4 Check grammar exceptions

- Select this checkbox to enable grammar exceptions to be checked.
  Once selected the Grammar exceptions options will appear in the main menu.
  Here 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

7.2.5 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.
  - Both

- ***Free flow*** is the normal mode of operation and the engine will continuously look for plates.
- If ***Signaled*** is selected, 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.
- If when triggered, no plate is found in the field of view, then you can specify if the word 'NONE' should be transmitted at this point.

Signaled Mode

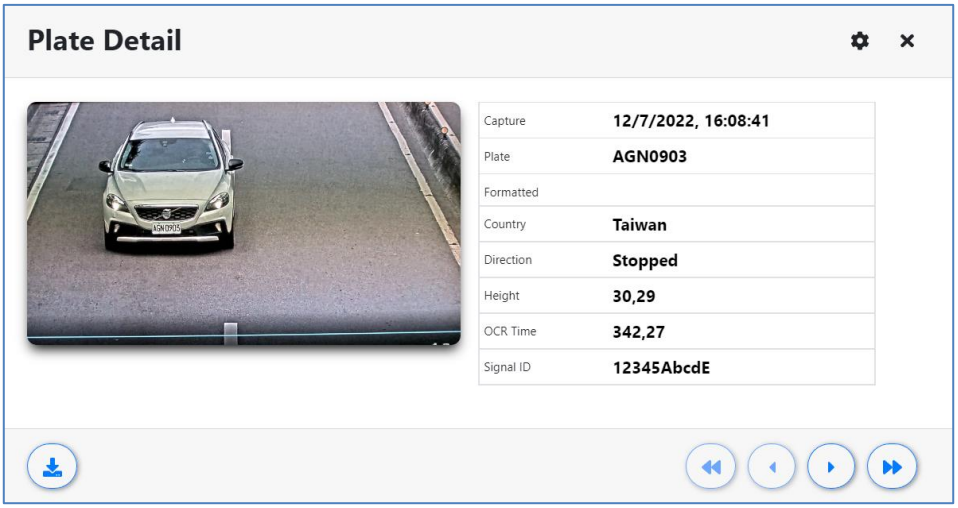
You might use signaled mode in high security scenarios when you are able to detect a vehicle (by a loop or beam for example) and you want to capture an image even if there is no plate or a damaged or disguised plate; in this case you could use a physical port.

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 signaling 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.

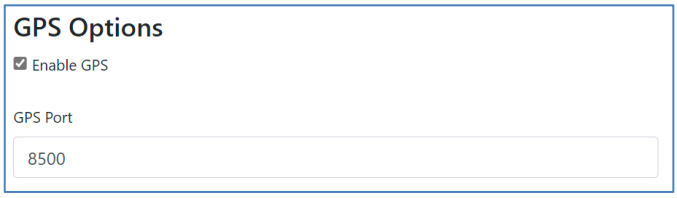
A remote program – or an internal event can call, for example:
http://camera_ip/axis-cgi/io/virtualinput.cgi?action=6:/500

This will trigger virtual port 1 for 500ms.
(6 is virtual port 1, 7 is virtual port 2)

Port

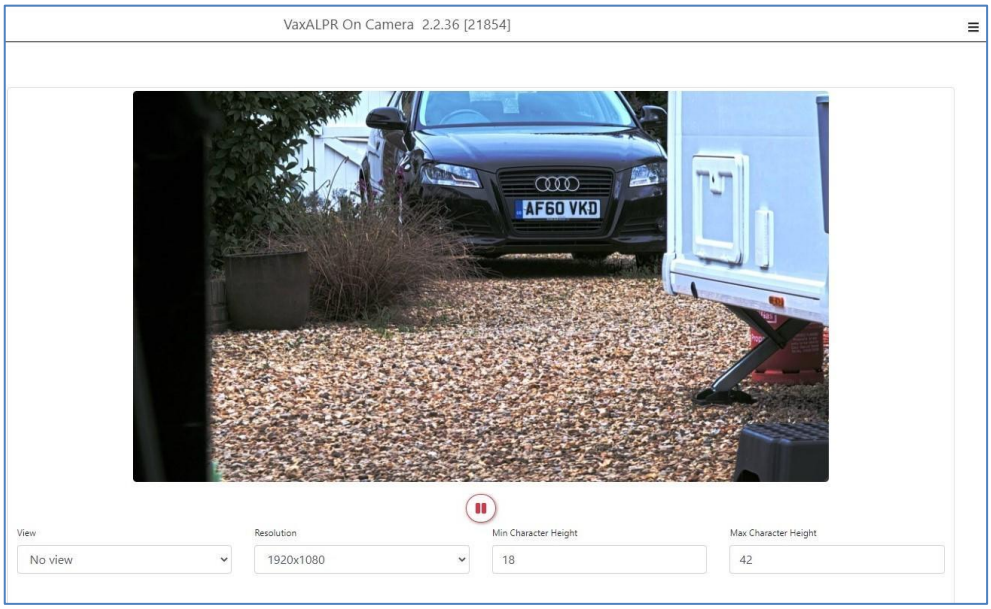
The port is the camera port which can be a physical input port (usually 1 or 2 depending on the camera model and the number of ports available), or it could be a virtual port – which could be 6 or 7. *(6 is virtual port 1, 7 is virtual port 2).*

7.3 VaxALPR Settings: GPS



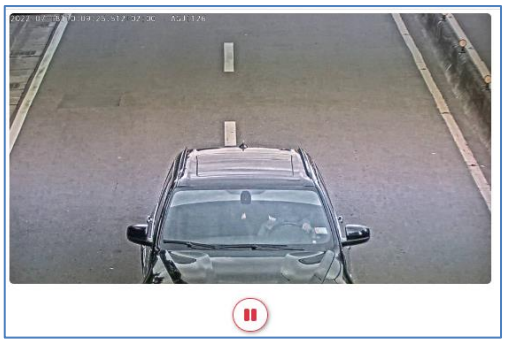
If a supported GPS enabled router / modem is connected to the camera (e.g. the Teltonika RUT955) then the ALPR App will obtain the current GPS coordinates after each plate read and these can be sent as metadata to any configured back office. (see Reporting section).
After enabling, set the correct port for the connected modem.

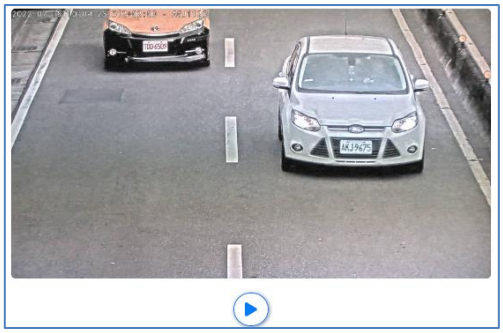
7.4 VaxALPR Settings: Video



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.

Play/pause video

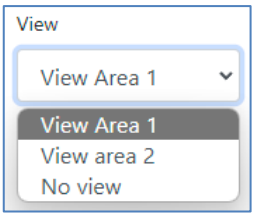




In order to select a suitable image to verify the Character Height configuration, you can pause the video reproduction, using the play/pause button.

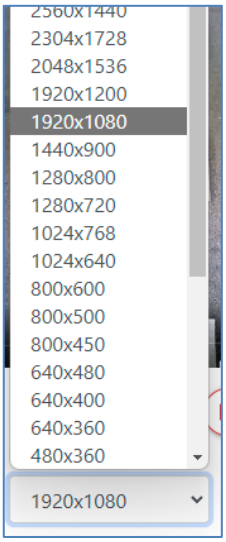
7.4.1 View

- 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)



7.4.2 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 1280x720 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.

7.4.3 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 10-20 pixels.

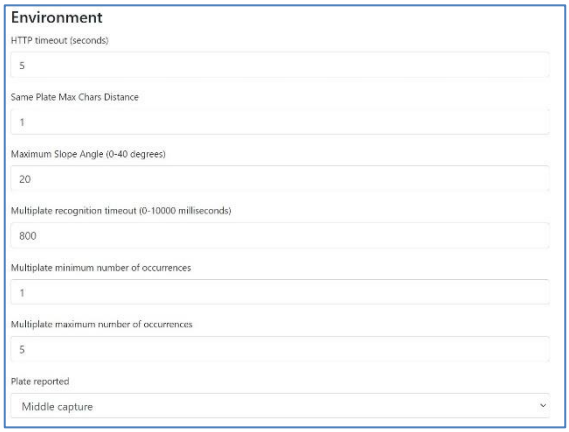
7.4.4 Maximum Character Height (14-70 pixels)

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

7.4.5 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.

7.5 VaxALPR Settings: Environment options



7.5.1 HTTP timeout (seconds)

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 has not arrived at the endpoint.

What is happening here is the server receives the request and processes the data before sending the response "OK I received it" to the client (the camera), or something similar (network issues etc).

The data is already on the server, but the camera only waits 5 seconds for the response. That could cause a BOF to receive the same reads multiple times as the camera did not receive the OK response and the plate on the camera database still marked as unsent. (or not received)

First check the endpoint software to check that it sends the response to the camera immediately after receiving the data, and **then** processes the read.

If this has already been done, and for some other reason the response takes more than 5 seconds to arrive at the camera then a solution could be to increase the HTTP.

In normal scenarios, the transfer process takes approximately 100ms without images, and 300ms with images.

7.5.2 Same Plate Max Chars Distance

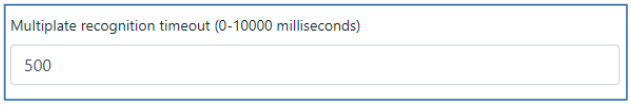
- Set the number of characters that two plates must differ by to be considered different. The Axis camera is capable or reading a plate several times as it passes through the field of view. If one character is misread on one of the reads then by setting this value to 2 then both reads will contribute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

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

- 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.

7.5.4 Multiplate Recognition Timeout

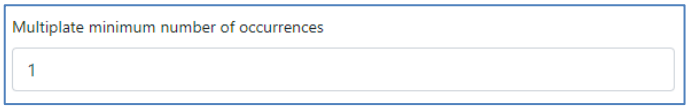


- Set the number of milliseconds that the engine should spend analyzing a plate. *(1000 milliseconds = 1 second)*

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 1000ms (1 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 during this time, the old one will be reported and a new plate-trace started.

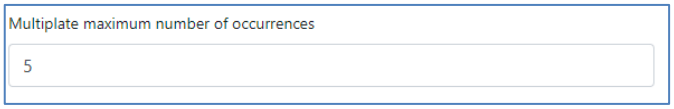
We call the number of times the same license plate has been read within the maximum recognition period the **multiplate rate**. Several reads of each plate are good and produce better results.

7.5.5 Multiplate minimum number of occurrences



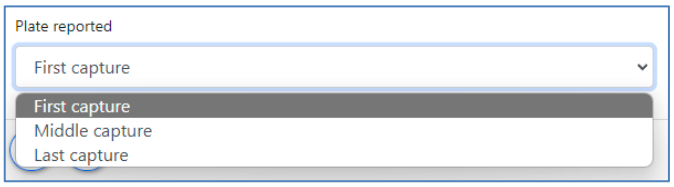
- Set the minimum number of times that a plate should be read within the Timeout period to be considered a valid plate.

7.5.6 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).

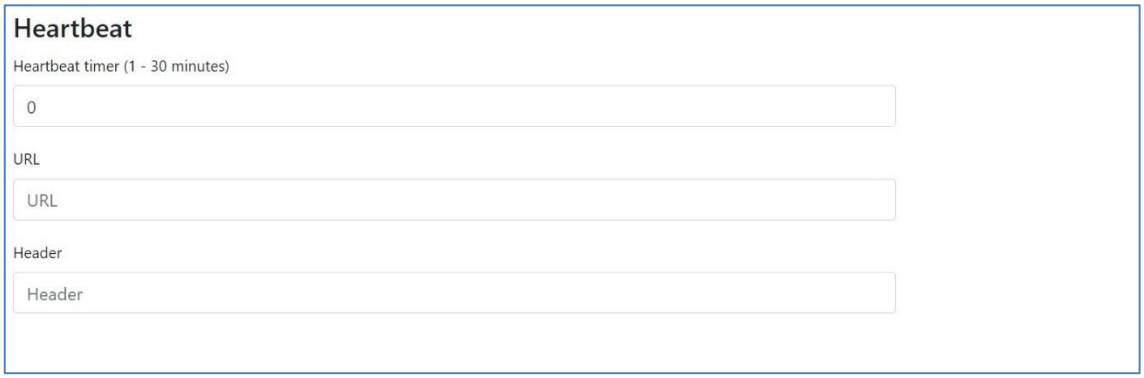
7.5.7 Plate reported



- 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.

7.6 Heartbeat



The Heartbeat function is used when communicating with back offices and other endpoints to monitor and detect any issues with the camera, software or communication devices.

Specify a timer (1-30 minutes) and the Header information and a fixed message will be repeatedly sent to the receiving URL at that interval.

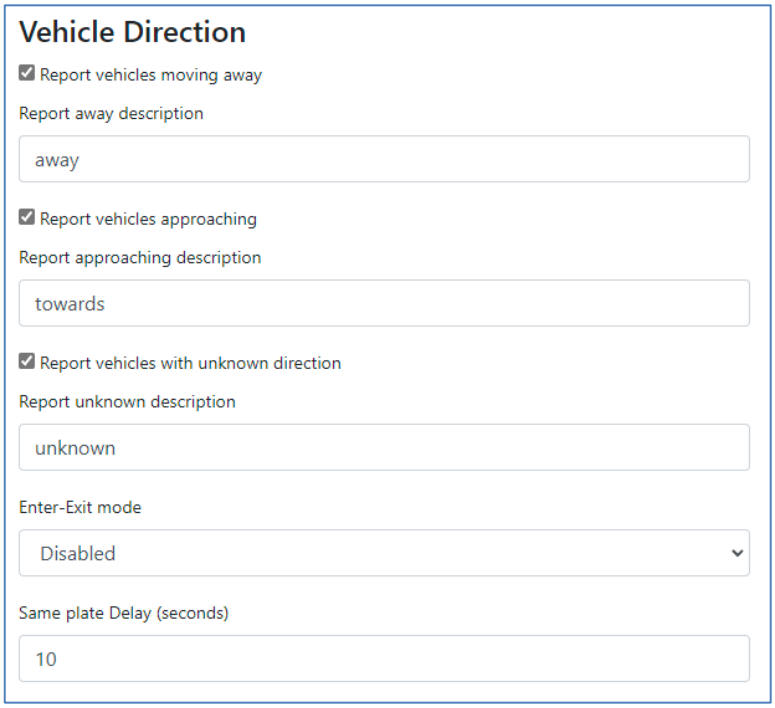
The Header can be used to send a unique identifier, for example:

"api-key:1234abcd"

The fixed message is made up as follows:

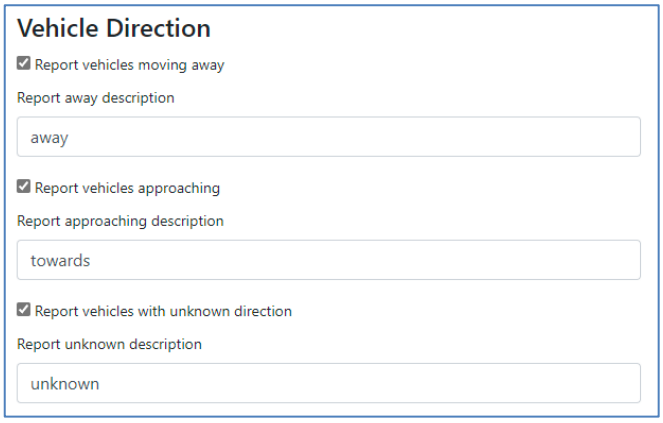
{"Pending":1,
"SoftwareVersion":"2.2.54",
"BuildNumber":"123456",
"Manufacturer":"Axis",
"SerialNumber":"ACCC8Exxxxxx",
"Model":"P1367-E",
"FirmwareVersion":"10.12.104",
"Date":"2023-01-17T11:35:45Z",
"PID":"2f7603df-0abf-4c54-834d-2d2f4e2c9829",
"IP":"192.168.0.49"}

7.7 VaxALPR Settings: Vehicle Direction



This section contains Vehicle Direction filters and the parking bay monitoring features. (Enter – Exit Mode).

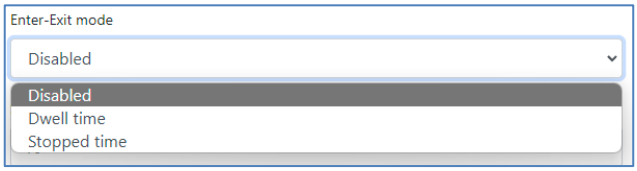
7.7.1 Direction Filters



If the camera is pointing at a road or entrance where traffic is moving in both directions, then by ticking the boxes you can choose to only process/report plates in one direction. Note that at least two reads of a plate must have been obtained in order to determine the direction. If a car is maneuvering or stopped (or moving so fast that you only capture the plate once), then by also selecting 'Report vehicles with unknown direction' you will ensure that all required plates are captured.

Select all three options for normal usage.

7.7.2 Enter – Exit Mode



Enter – Exit Mode: Dwelling Time

The first of these is Dwell time and once setup the software will monitor the region of interest (usually a parking bay), recording/sending plate reads when a vehicle arrives and again when it leaves.

This is useful in parking applications where a parking back office can then calculate a parking fee based on the duration of stay. The feature can also be used to monitor electric vehicle charging bays for genuine or pre-booked customers. This removes the need for an ALPR system to repeatedly send plate reads of a parked car to monitor its stay.

Note that a 1920h resolution camera can often be used to monitor up to 3 bays and a 2400h camera can sometimes monitor 4 bays.

See an example of Bay Monitoring in action running on a PC: https://youtu.be/WALtkEr4UQs

Select the Dwell Time Mode and set the parameters.

Enter Timeout - (Between 3 and 3600 secs)

This is the amount of time the vehicle should be continuously stopped before creating an 'enter' event and is designed to handle exceptions such as vehicles turning round in the parking bay – or just driving through it. It is not a good idea to use an ROI defined exactly around the parking bay as the software needs to monitor a vehicle's plate as it is leaving the bay, it is best to set a bigger area around the bay or bays.

The minimum timeout allowed is 3 seconds, but a longer timeout is recommended in order to filter out more vehicles that are turning or passing through the bay. 20 or 30 seconds would prevent most of these.

After the "enter timeout" seconds have elapsed (after the vehicle has stopped), the software will generate an ENTER event. During this period the plate shall be visible and readable, and any occlusions (obstructions such as a passing car) are not managed (see later) so if something occludes the plate during the "enter timeout" period the counter will restart after the plate becomes visible again.

If the “enter timeout” is set to 20 seconds, the eventual dwell time value after the plate event will be around 20 seconds plus a maximum delta defined by the OCR check frequency influenced by the maximum recognition period. If this period is say 2000 ms the dwell time will be around 30 and 33 seconds approximately at this point.

Occlusion Timeout (Max 86400 secs = 1440 mins = 24 hours)

This feature will monitor the bay in the event of an obstruction such as a passing vehicle or a pedestrian returning to their car with shopping etc. and obstructing the view of the plate being monitored.

When set the ALPR will discard/remove a vehicle (stop monitoring it) after “occlusion timeout” seconds without having read the plate. In this case we will have an ENTER event but we won’t have an EXIT event and we will lose the vehicle.

Having no EXIT event may happen under the following circumstances:

a) The vehicle leaves but we could not achieve a multiplate of 2 (motion) as it exited. (We need at least two reads of the plate in motion to establish that it has departed).
b) The plate is obstructed for more than “occlusion timeout” seconds
c) The vehicle leaves during an obstruction so we can’t read the plate leaving.

Exit Timeout - (Between 3 and 3600 secs)

This is the amount of time the vehicle should be continuously stopped for before creating an ‘exit’ event.

Whilst the enter timeout requires a fully stopped vehicle, the exit timeout only requires the existence of MOTION in the last read. (this is how obstructions are handled).

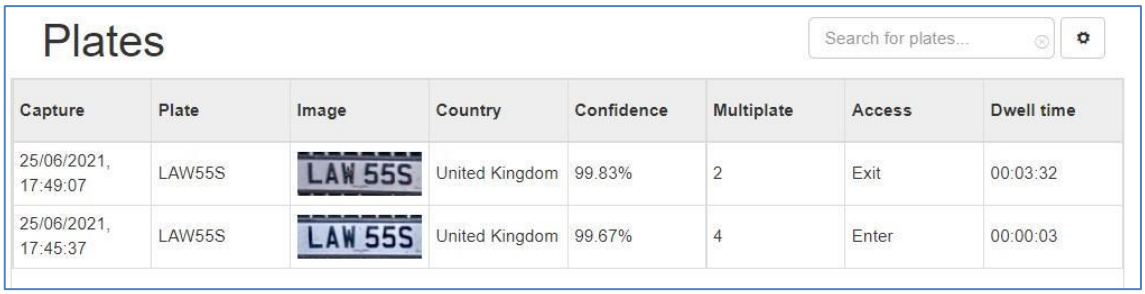
As mentioned previously, motion is detected my reading a minimum of two plate reads as the vehicle leaves the bay and so it is important not to set high maximum recognition periods to guarantee 2 complete reads during the exit.

Entry and Exit Events

Events can be displayed on the Plates screen and on the Database screen.

When a plate arrives:

.. and when it eventually leaves:



These fields can be sent to a receiving PC or back office using any of the reporting options using the following reserved words:

- **$vehicleaccess$:** Entry / Exit events (0: Unknown, 1: enter, 2: exit, 3: overstay)
- **$dwelltime$:** Time spent in monitored area in seconds

Enter – Exit Mode: Stopped Time

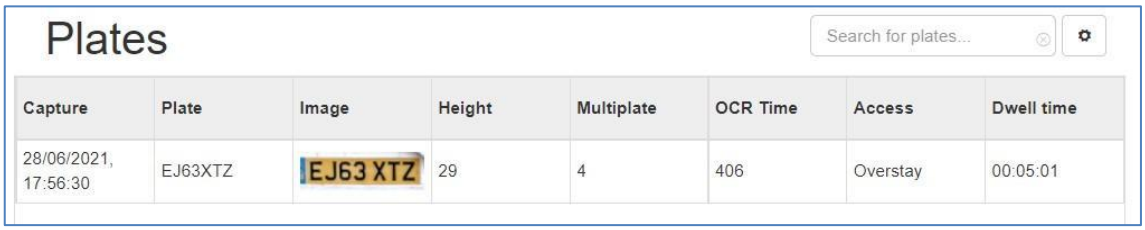
This mode cannot be used whilst monitoring the Dwell Time of a parking bay – but it does require you to set some of the Dwell Time parameters.
When selected there are two fields available:

Minimum detection time (seconds)

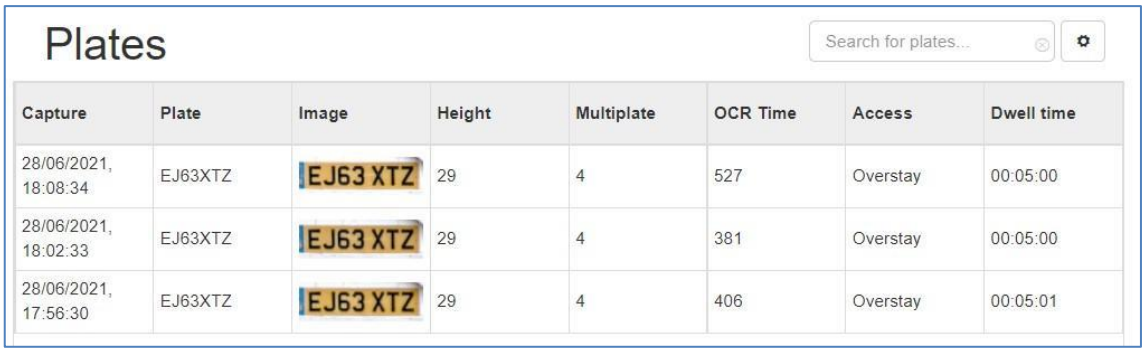
This is used in conjunction with Dwell time and will cause an overstay event to be generated when a vehicle has been in view for this amount of time. If a parking bay gave 5 minutes grace time before charging they you would set the Overstay timeout to 300 secs as shown above.

You will also have to set both the Enter Timeout to 300 seconds and the Occlusion timeout to at least 300 seconds.

After an overstay the event will be generated:



If the overstay continues, then more events will be created at an interval equivalent to the overstay period. In this case every 5 minutes:



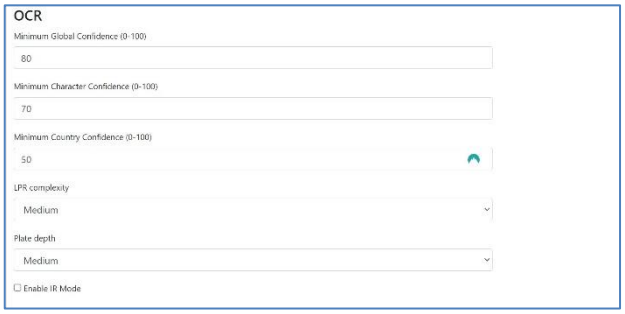
Capture	Plate	Image	Height	Multiplate	OCR Time	Access	Dwell time
28/06/2021, 18:08:34	EJ63XTZ	EJ63 XTZ	29	4	527	Overstay	00:05:00
28/06/2021, 18:02:33	EJ63XTZ	EJ63 XTZ	29	4	381	Overstay	00:05:00
28/06/2021, 17:56:30	EJ63XTZ	EJ63 XTZ	29	4	406	Overstay	00:05:01

Same Plate Delay (Max: 65535 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.

7.8 VaxALPR Settings: OCR options



7.8.1 Minimum Global Confidence (0-100)

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.)

7.8.2 Minimum Character Confidence (0-100)

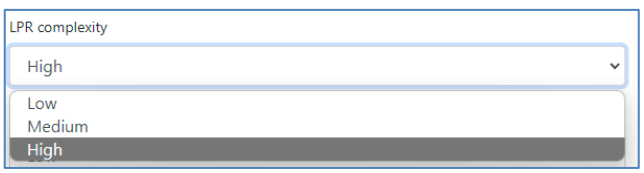
Set the minimum confidence level that a single character must meet in order to be accepted. The recommended value is 50.

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.

7.8.3 Minimum Country Confidence (0-100)

- Set the minimum country confidence level that the automatic "country analysis" must meet in order to be accepted.

7.8.4 LPR Complexity



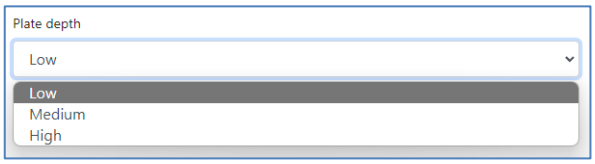
- This is the complexity of the analytics to be applied during the ALPR Engine's stage of plate reading. Set this according to the OCR mode and type of traffic expected.

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.

7.8.5 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.

7.9 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.

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 list in the Annex **7. Dynamic Text Replacement Reserved Words**.

See note on UTC format: here

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

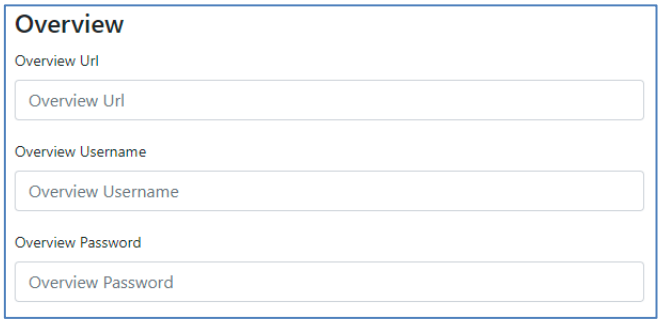
Next select the position of the watermark from the four options available and finally select the font size required. All saved images will now have this information burnt into the still images of the plate capture.

7.9.1 VaxALPR Settings: JPEG Compression

- 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!

7.10 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.



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**

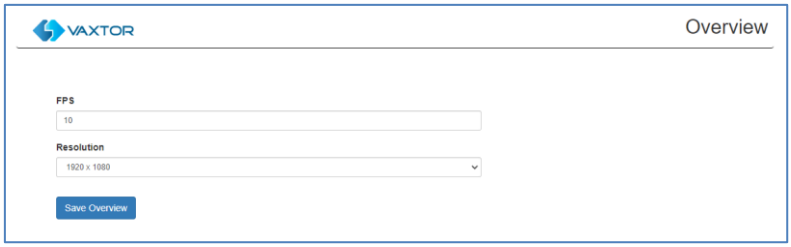
(As this is not processor intensive and it is okay to use an ARTPEC 5 based camera if available)
Once setup on the second Axis camera then every time a plate read is performed the Axis ALPR camera requests a single frame (image) from the Overview camera with the exact same timestamp as the plate read.

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:



7.10.1 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

7.10.2 Overview User

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

7.10.3 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

7.11 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 15º
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

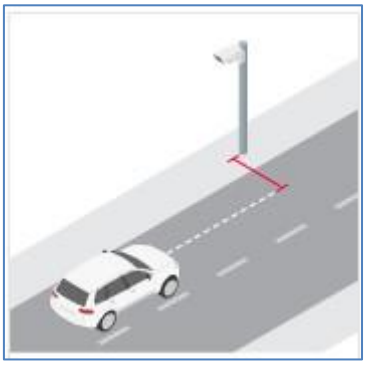
- The camera should **NOT** be placed near to road bends, speed-bumps, road junctions, traffic lights or roundabouts or anywhere where vehicles are likely to be accelerating or decelerating. The detection area must **NOT** be on a curve in the road.

In Settings select Speed:

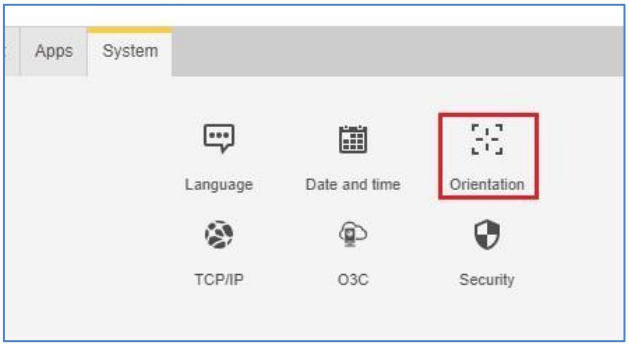
Set the parameters as follows:

- 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.

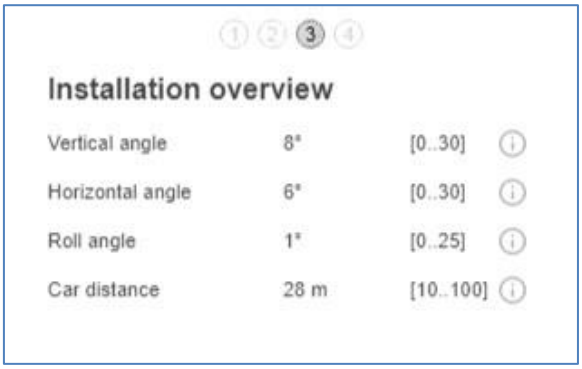
- Camera distance - this is the perpendicular distance from the base of the pole to the center of the road in meters.



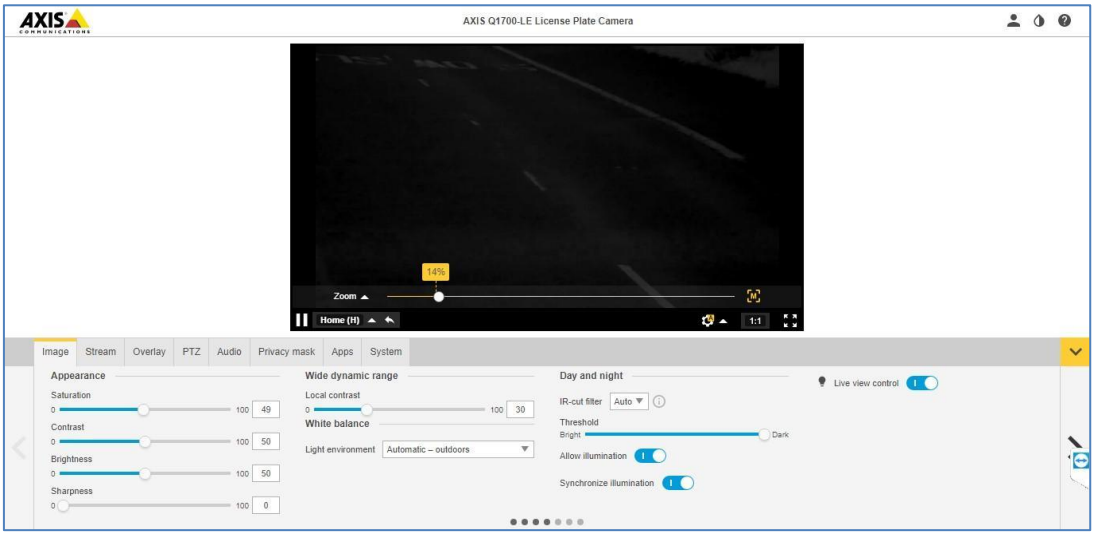
- Set the camera tilt angle. This is the angle from the horizontal that the camera makes with the vehicle at the typical capture point.
  To help calculate this, use the Orientation tool in the Axis System menu.



- 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:



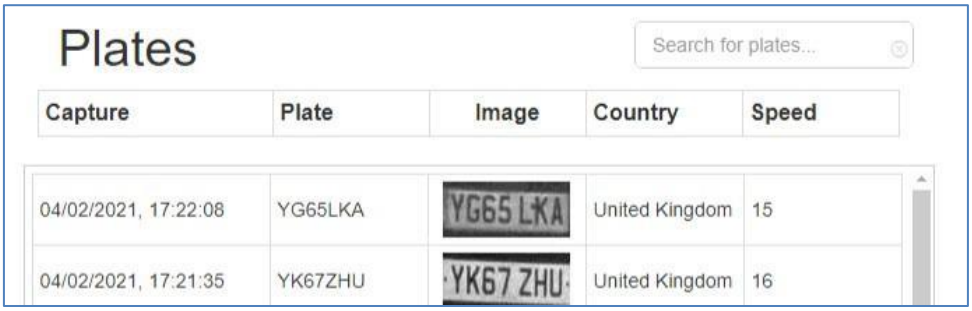
- Enter this value as the Camera Tilt Angle.
- Set the minimum and Maximum focal lengths for the camera.
  In this case the Q1700 has an 18-137mm lens.
- Enter the camera's current zoom value. To find this go to the main camera settings page and gently click the cursor on the zoom slider to reveal the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

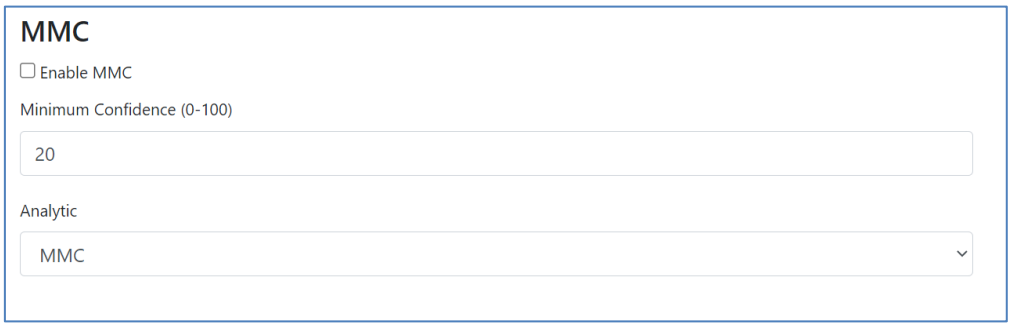
- Go to the Plates menu and look at the speed of your test vehicle:



- 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.

7.12 VaxALPR Settings: MMC and Vehicle Classification

The Axis software includes Make, Model, Color and vehicle Classification as standard. They can be used separately or alongside each other.

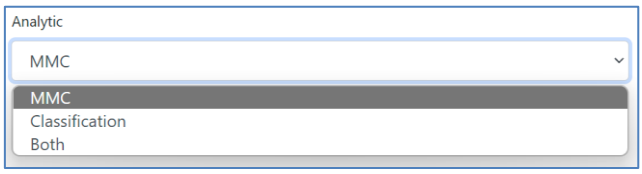


When MMC is enabled, the engine will find a plate and the MMC analytic will attempt to identify the make model and, if possible, the color of the vehicle using Deep Learning technology.

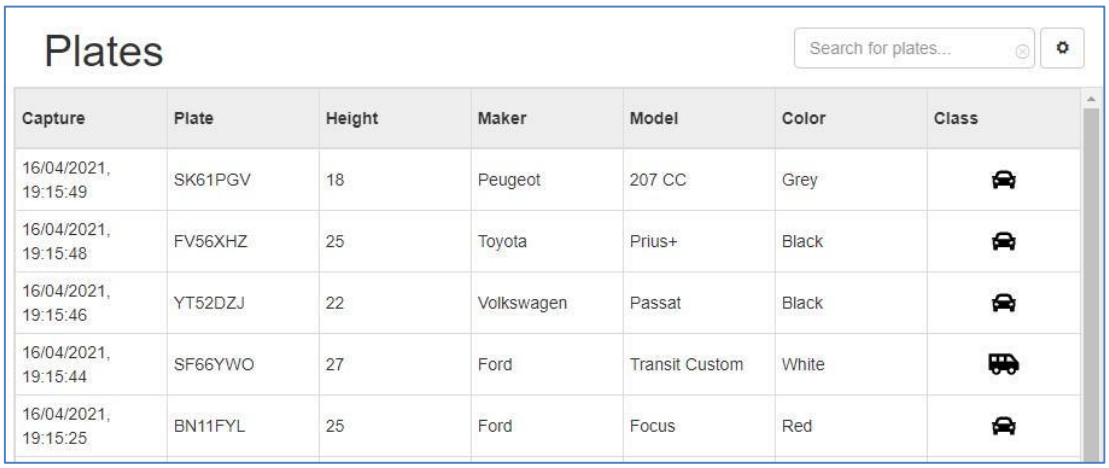
The software recognized approximately of 680 car manufacturers and 7,250 models and can recognize make, model, color from both front and rear views to a very high accuracy. The engine does not require any calibration and automatically determines the orientation of the vehicle. The software will report 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 & Classification data:



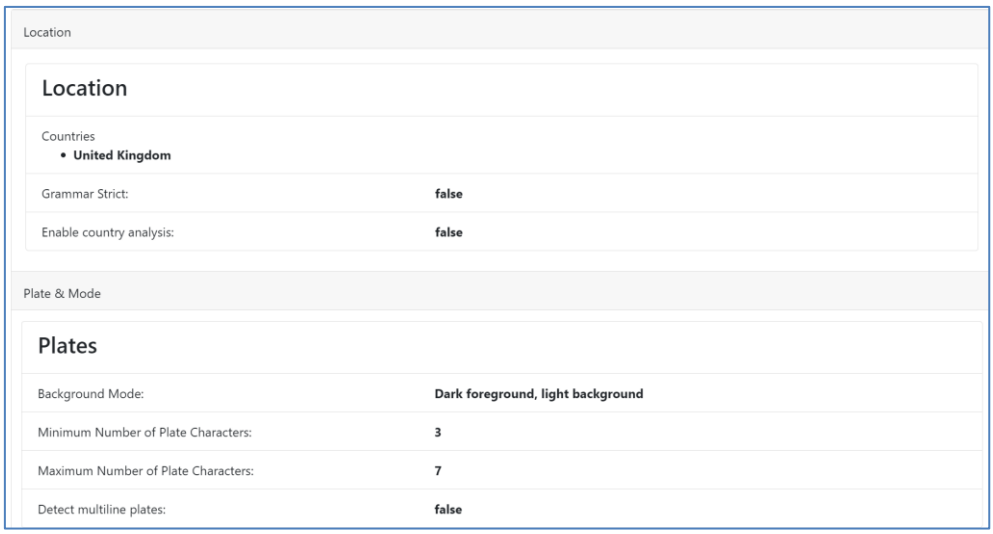
Capture	Plate	Height	Maker	Model	Color	Class
16/04/2021, 19:15:49	SK61PGV	18	Peugeot	207 CC	Grey	
16/04/2021, 19:15:48	FV56XHZ	25	Toyota	Prius+	Black	
16/04/2021, 19:15:46	YT52DZJ	22	Volkswagen	Passat	Black	
16/04/2021, 19:15:44	SF66YWO	27	Ford	Transit Custom	White	
16/04/2021, 19:15:25	BN11FYL	25	Ford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

Note that MMC cannot be used at the same time as the Speed variant due to memory restrictions.

7.13 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*).

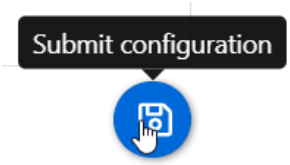
7.13.1 Review the settings



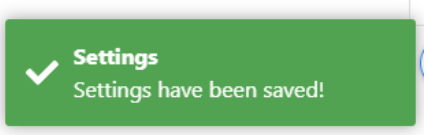
To review all the settings, click on each title to open a panel showing each group of settings.
E.g. The Location and Plates settings are shown above.
If any changes need to be made then use the headings to return to the desired section and edit any settings as necessary.

7.13.2 Submit configuration

1. To save all of the ALPR settings, click the **Submit configuration** button.

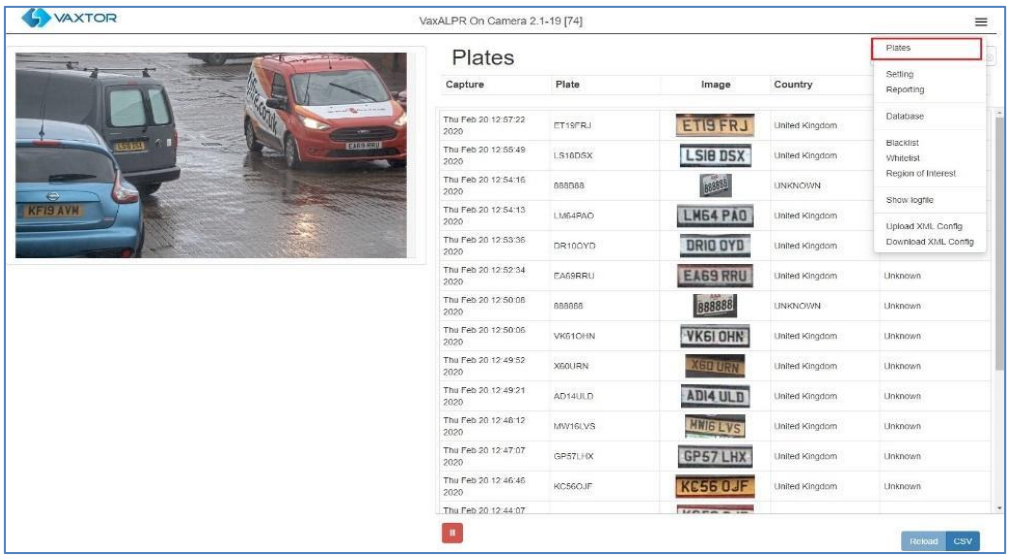


2. Wait for the confirmation (or error) message.



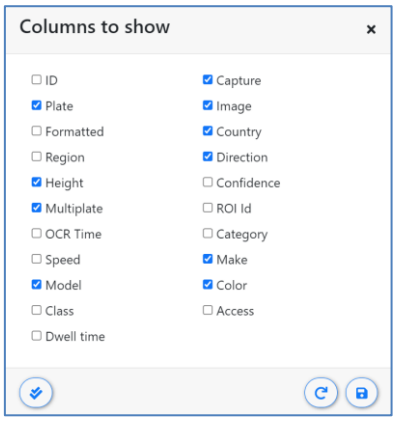
8. VaxALPR Plates

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.

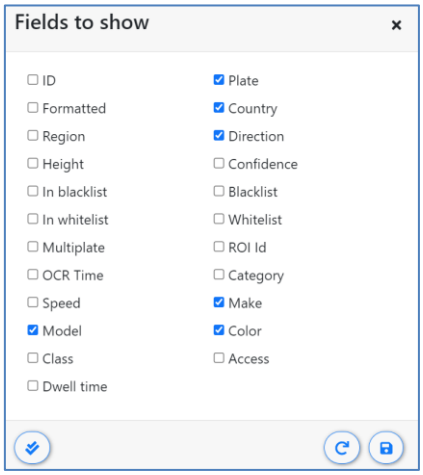
Click on the gear icon (top right) to configure what columns are displayed:



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 (top right) to reveal a list of fields that can be shown when a plate is selected:

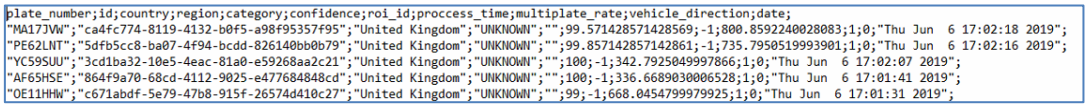


Note that you can get a more comprehensive view of the vehicle from the Database option described in the next section. You will need to have an SD card fitted to use this feature.

8.1 Download CSV

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;proccess_time;multiplate_rate;vehicle_direction;date;
"MA17JVW";"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.

8.2 Play/pause plates refresh

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

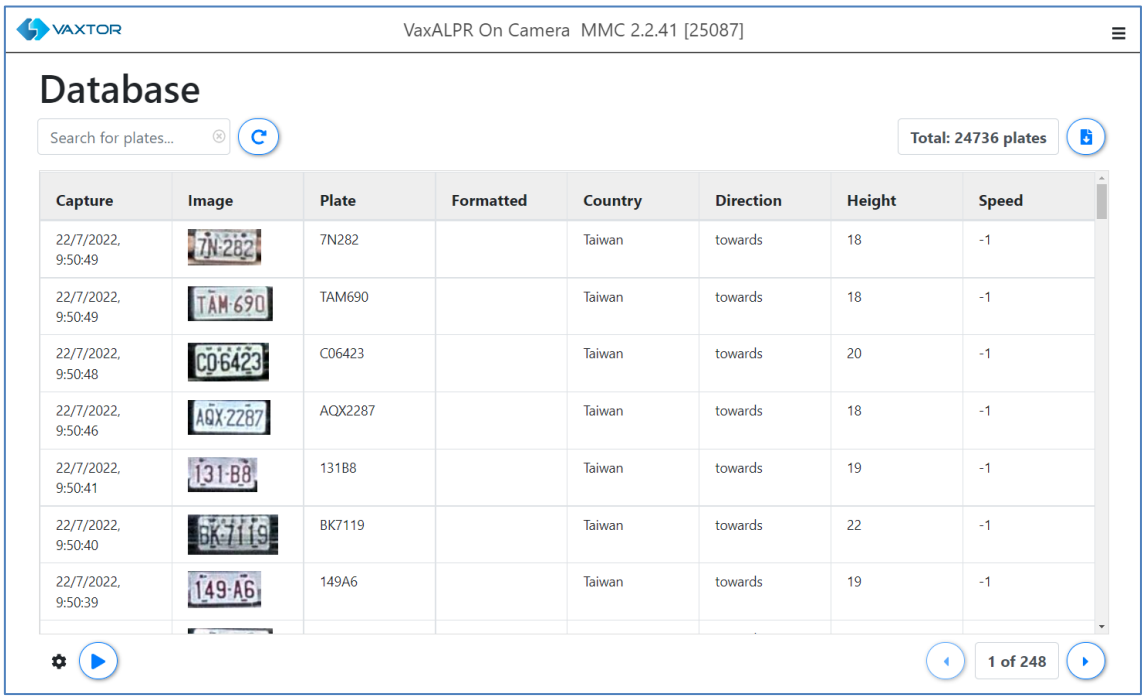
Note that if you do not have an SD card installed, you can look at the logfile to see the OCR processing time. See Show Logfile below.

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.

9. 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. However if the SD card becomes full before you set limit is reached then data will no longer be able to be saved.
- As a rough guide a 32GB SD card would store approximately 80,000 reads.

9.1 Database



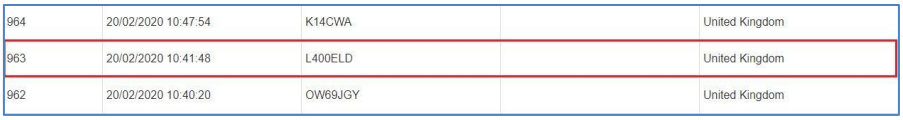
The Database screen comprises:

(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

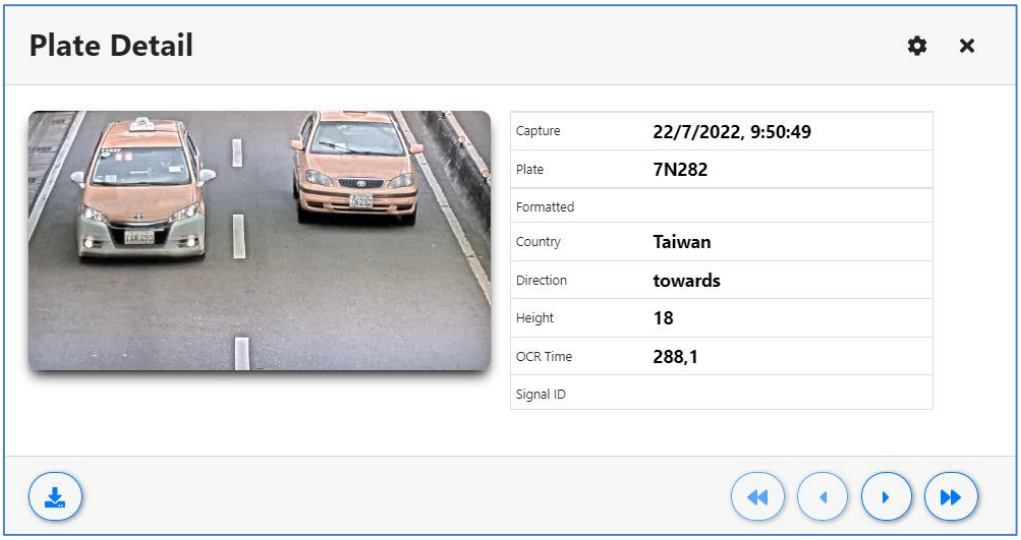
As in Plates, you can control what columns are displayed by using gear icon (bottom left).

9.1.1 Plate details

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

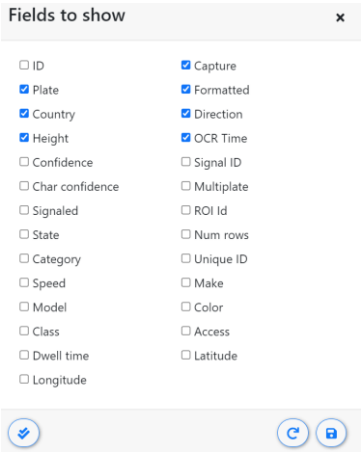


2. A new window appears with the vehicle details.



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 of 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:



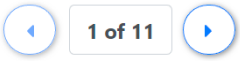
Note that some of these fields may not be available in your version of the software or are used for internal purposes such as communicating with certain third-party applications of Back Offices or VMS systems such as Genetec or Milestone.

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.

9.1.2 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

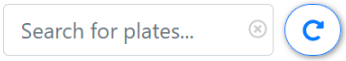


Use the UP and DOWN buttons to scroll 100 plates at a time – or click on the central part of the button (in this case on 2/11) and enter the target page directly and click on GoTo:

9.1.3 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 button

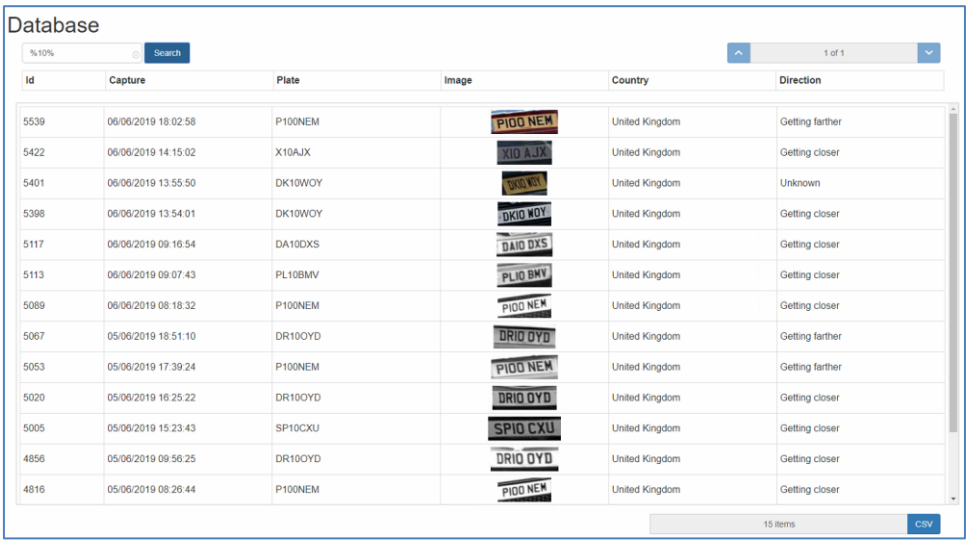


This will refresh the list with the latest captures.

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'



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

9.1.4 Download the Plate list.

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

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

NOTE: In this example only 28 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.

9.1.5 Play/pause

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

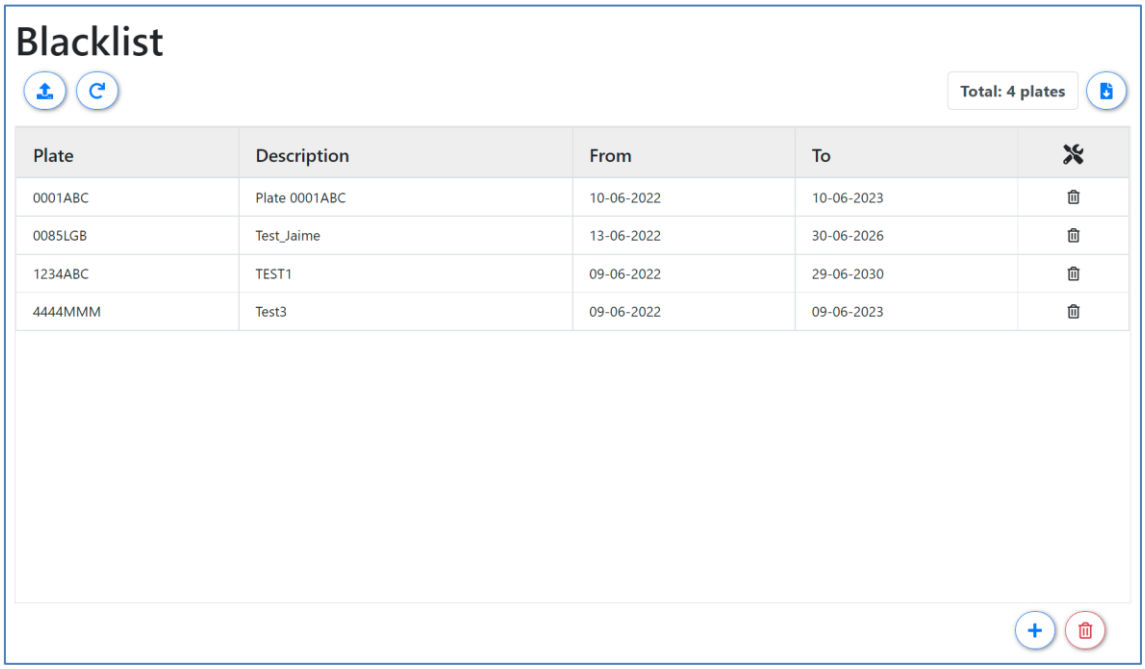
If you need to see all of the camera reads then it is recommended that you send all the plate reads as they happen to a back office such as Helix. The program contains many reporting protocols and methods, - see the Reporting section.

10. 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 depending on available space. Approximately up to 1 million plates can be stored.
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.*



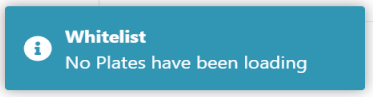
Note that Lists can now be automatically synchronized with a central Helix Server. If you are running the Vaxtor Helix Back Office you can choose to merge and then synchronize all of your blacklists and similarly your whitelists with any number of connected Axis cameras running VaxALPR. This enables 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.***

10.1 VaxALPR Blacklist / Whitelist Disabled

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

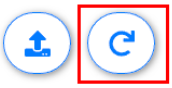
10.2 VaxALPR Blacklist: Initial load

- 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.

10.3 VaxALPR Blacklist: Reload

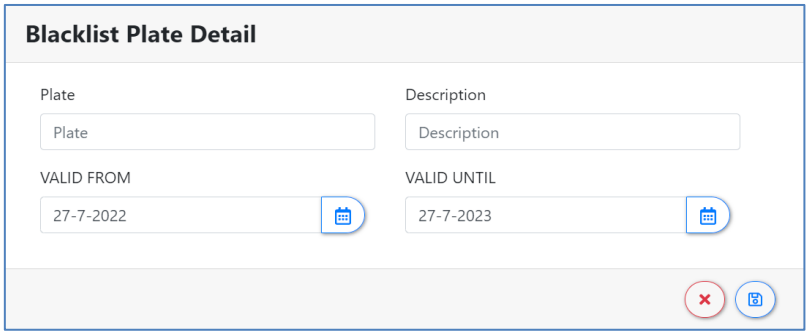


1. To Reload the saved Blacklist from the camera, click the button and wait for the confirmation (or error) message

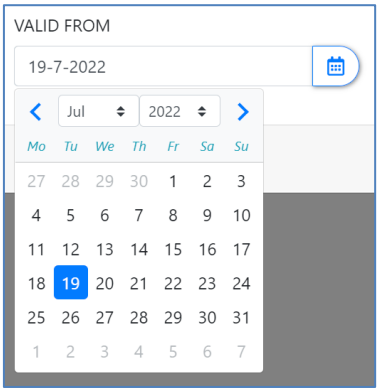
10.4 VaxALPR Blacklist: Edit the Blacklist

10.4.1 Add a Plate

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

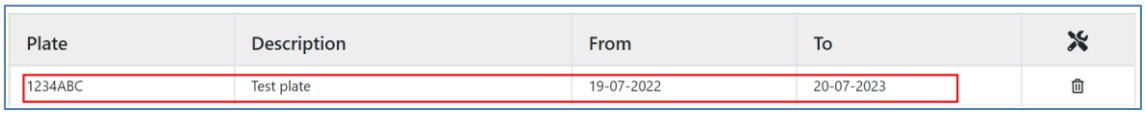


2. Write a valid Plate (e.g. HA54ETR) and add an optional description. Plate numbers must not contain spaces or special characters such as "-".
3. Enter the **From** and **To** dates that the vehicle will be checked. In the case of a white list, this would be the dates that the vehicle would be allowed 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 button to save the plate or the button to discard the plate.

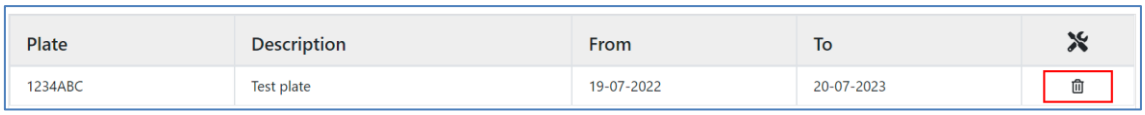
10.4.2 Edit a Plate



1. Click on over the line with the data to update. Then, a popup dialog is opened to re-edit a plate.

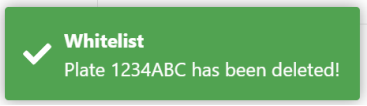
2. Edit any fields and click or

10.4.3 Remove a Plate from the list



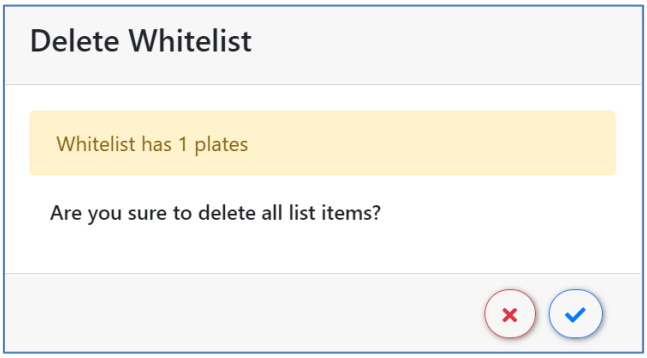
1. Click the button to remove a plate.
2. A confirmation dialog is opened. Click confirm to delete the list item:

3. Then, a confirmation message appears:



10.4.4 VaxALPR Blacklist: Remove all plates

1. Click the button to remove all plates from the local Blacklist.
2. A confirmation dialog is opened. Click confirm to delete the list, or cancel:



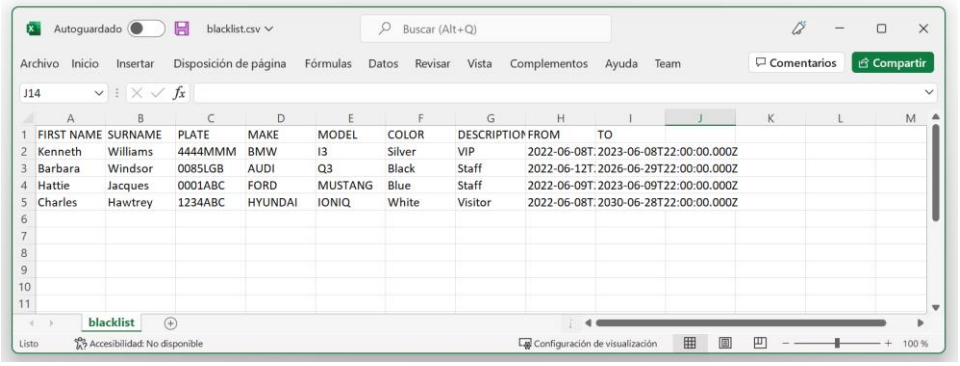
10.5 VaxALPR Blacklist: Upload/Download a list from a CSV file

10.5.1 Upload a CSV File

The VaxALPR On Camera software can import a whitelist/blacklist from a .csv file by using the upload 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:



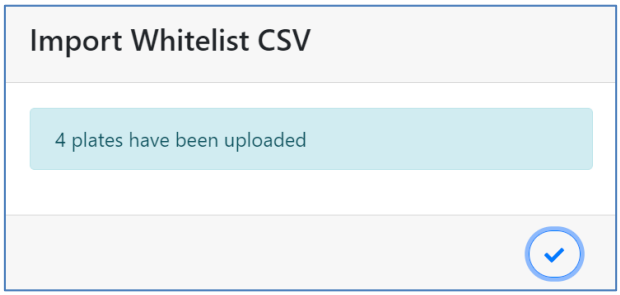
Opening in Notepad:

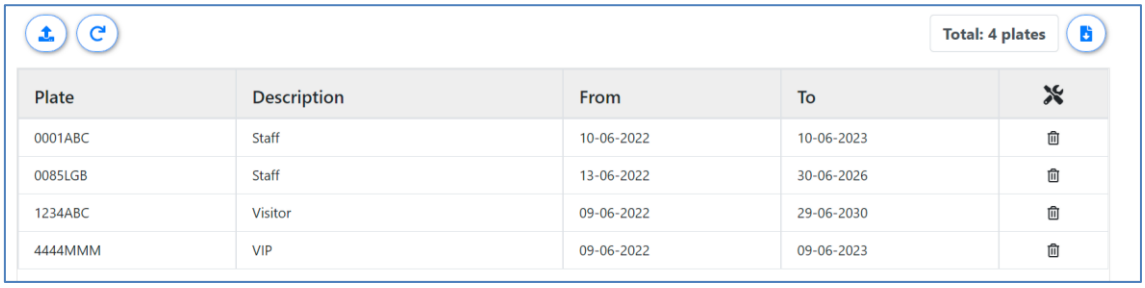
```
FIRST NAME;SURNAME;PLATE;MAKE;MODEL;COLOR;DESCRIPTION;FROM;TO
Kenneth;Williams;4444MMM;BMW;I3;Silver;VIP;2022-06-08T22:00:00.000Z;2023-06-08T22:00:00.000Z
Barbara;Windsor;0085LGB;AUDI;Q3;Black;Staff;2022-06-12T22:00:00.000Z;2026-06-29T22:00:00.000Z
Hattie;Jacques;0001ABC;FORD;MUSTANG;Blue;Staff;2022-06-09T22:00:00.000Z;2023-06-09T22:00:00.000Z
Charles;Hawtrey;1234ABC;HYUNDAI;IONIQ;White;Visitor;2022-06-08T22:00:00.000Z;2030-06-28T22:00:00.000Z
```

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:





10.5.2 Download a CSV file.

1. To download the Blacklist file from the camera to your PC, click the download button.
2. It will be downloaded to your PC's downloads folder as the file blacklist.csv.
3. The file will contain just the four required fields, PLATE and DESCRIPTION:

```
PLATE;DESCRIPTION;FROM;TO
4444MMM;VIP;2022-06-08T22:00:00.000Z;2023-06-08T22:00:00.000Z
0085LGB;Staff;2022-06-12T22:00:00.000Z;2026-06-29T22:00:00.000Z
0001ABC;Staff;2022-06-09T22:00:00.000Z;2023-06-09T22:00:00.000Z
1234ABC;Visitor;2022-06-08T22:00:00.000Z;2030-06-28T22:00:00.000Z
```

10.6 VaxALPR: Whitelists

All the operations described above equally apply to whitelists.

11. 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 .. 

and the owner deliberately inserts two bolts between the two 1s to form: 

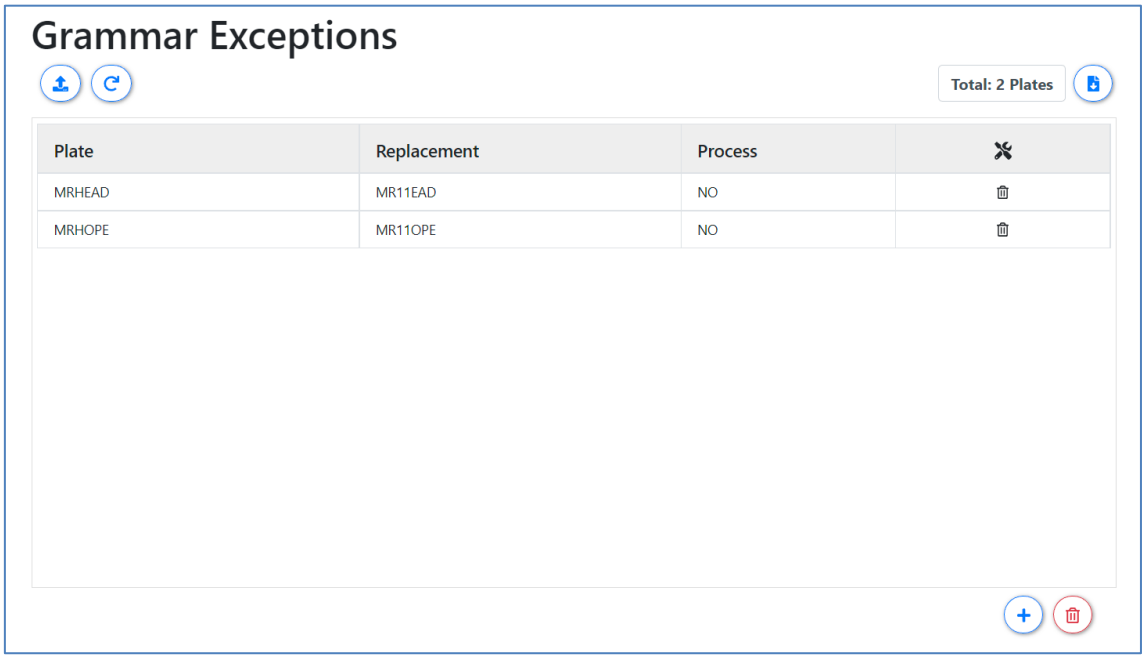
.. and the software may read this as the owner intended: MRHEAD !

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.

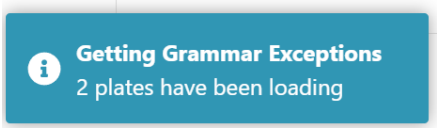
A third example is an object in the field of view which is being recognized as a plate such as a fence or a floor tile. This can be programmed to be ignored.

Select Grammar Exception from the Main Menu:

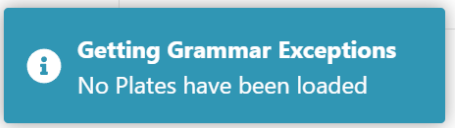


11.1 Initial load

- 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.

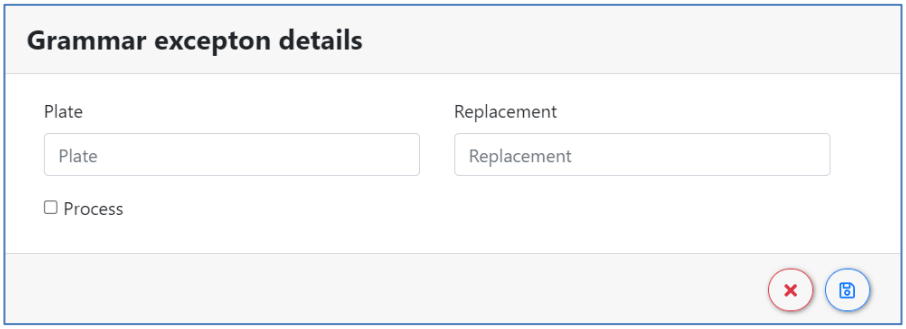


11.2 Reload

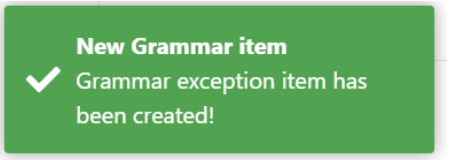
- Click  button to reload the saved grammar exceptions list from the camera where it can be edited.

11.3 Add and Edit the List

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

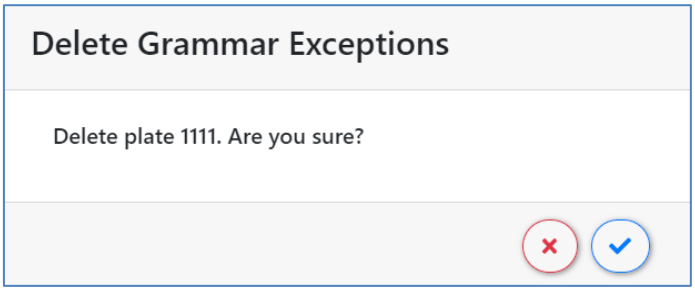


- Add the plate to be replaced, the replacement text and tick the Process box.
- Click Save and the plate, a confirmation message appears:

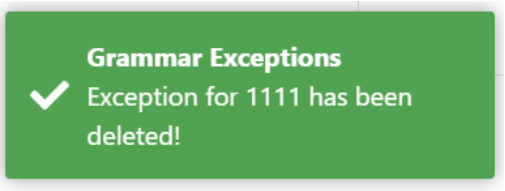


- To prevent a plate from being reported then leave the Replacement text blank and untick Process. (set to NO). This might be useful if a fence is often in the field of view & generating 1111111 (which might be the same syntax as a legal plate). Using this method stops this from being transmitted.
- Click on the plate to be updated, and change the plate or replacement text.
- Click the  button to remove a plate from the list.

- A confirmation dialog opens:



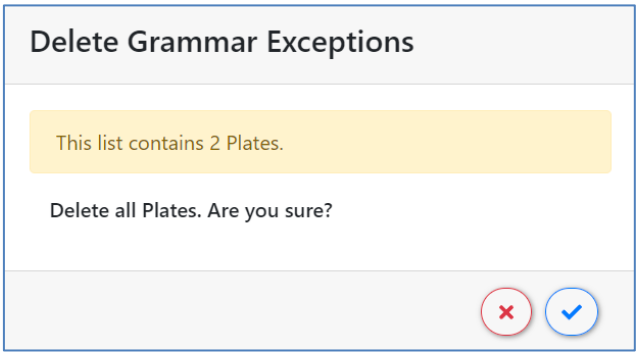
- Click the button to confirm. Then, a confirmation message appears:



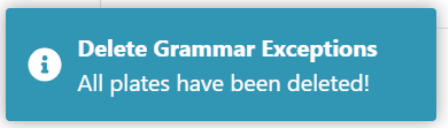
-

11.4 Delete all Grammar Exceptions items

- Use the button to delete all the items in the list.
- A confirmation dialog opens:



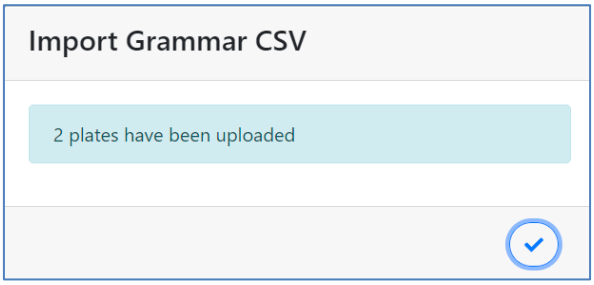
- Click the button to confirm. Then, a confirmation message appears:



11.5 Upload/Download a list from/to a .csv file

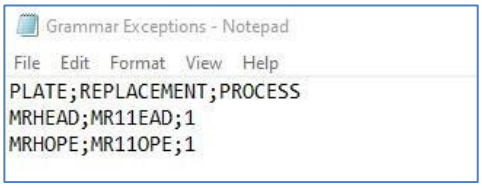
- The VaxALPR On Camera software can import a grammar exceptions list from a .csv file by using the button. Simply select the .csv file on your PC.

- A confirmation message dialog opens:



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 semicolons 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.

11.6 Download a list

- To download the exception list file from the camera to your PC, click the  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.

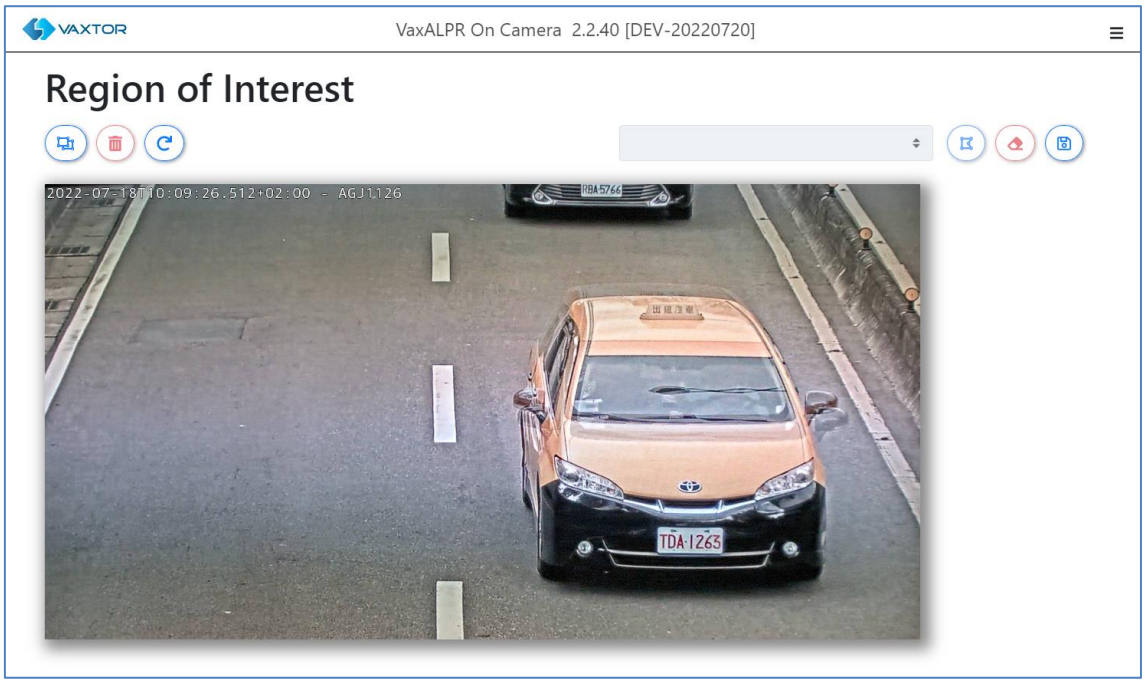
12. VaxALPR Region of Interest

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.

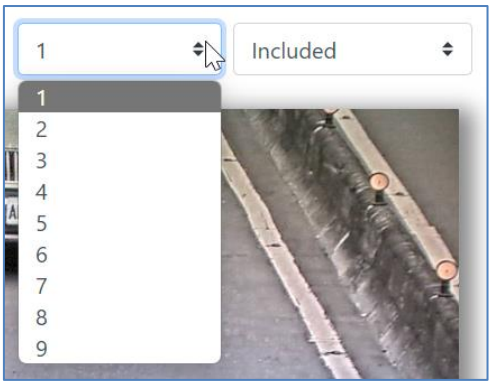
Note that the whole license plate must be in or out the ROI to pass the test.



IMPORTANT: ROIs con 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.

12.1 VaxALPR ROI: Add ROIs

1. To add a new ROI, click the main  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 button.

    c. To cancel the new ROI, click button.

    d. When you are satisfied with the shape click the button.

4. Click 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.

12.2 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.

12.3 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.

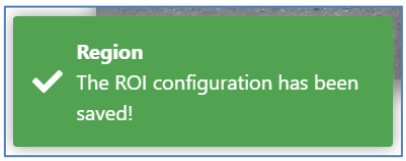
4. To reject any changes, click the  button.

12.4 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.

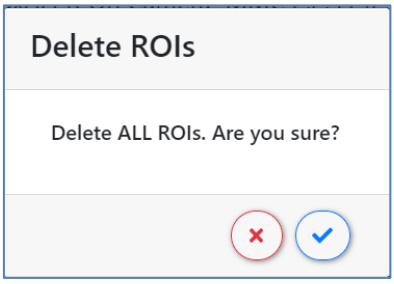


Note: Once deleted, an ROI cannot be recovered. To avoid unexpected problems, it is recommended that you periodically backup the ROI configuration by downloading the current configuration XML file
(see: *Download XML Config section later in this manual*).

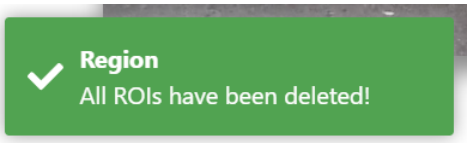
12.5 Delete all the current saved ROIs in the Camera

- 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.



- Accept to delete clicking  all of the stored ROIs and wait for the confirmation message.

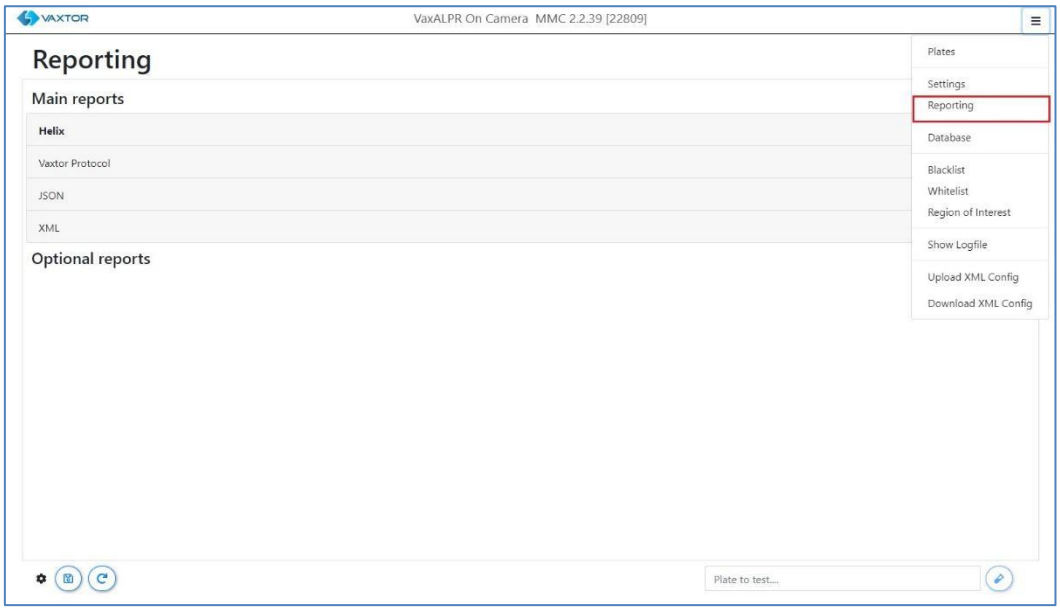


12.6 VaxALPR ROI: Reload ROIs

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

13. VaxALPR Reporting

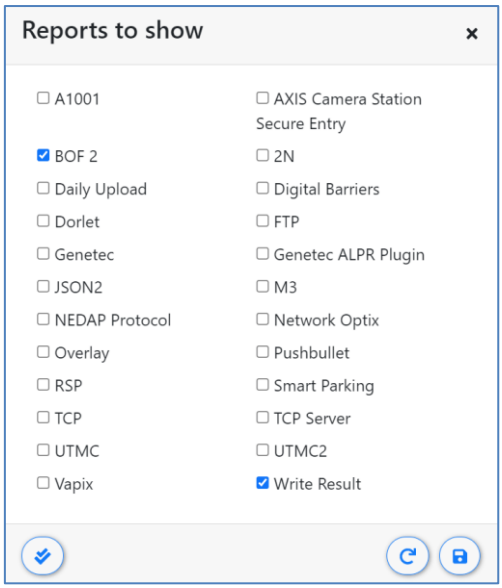
VaxALPR is able to output all plate reads in real time using a variety of standard protocols so that the plate reads can be accepted remotely by a variety of programs including Vaxtor's powerful Back Office - Helix, which can accept and store plate reads in real time from hundreds of Axis cameras.



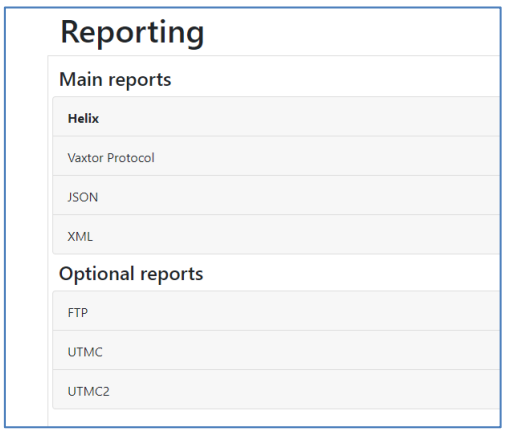
By selecting one of the listed protocols, a sub-menu will appear with fields for setting up parameters such as remote IP addresses etc.

To expand this list, click the gear icon (bottom left) to display a list of optional reports.

Select one or more from the list and the Save using the disk icon.



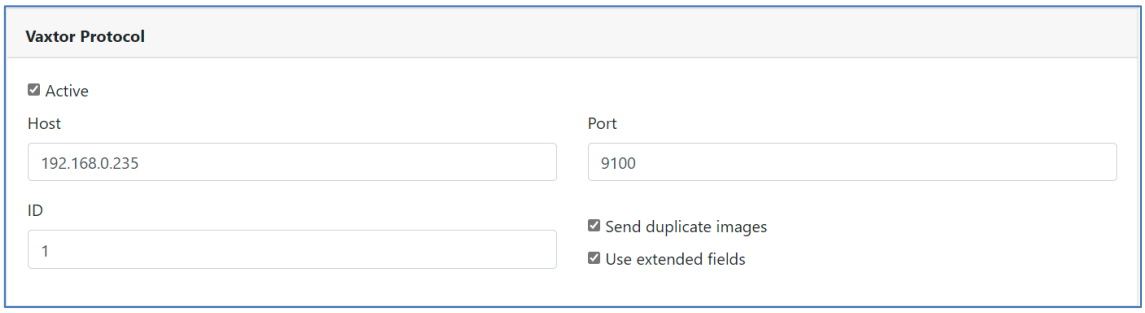
Use the icon to select **All** the options, the icon to reset all the options and to save the options. The additional reporting options will then appear on the main display.



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.

13.1 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:



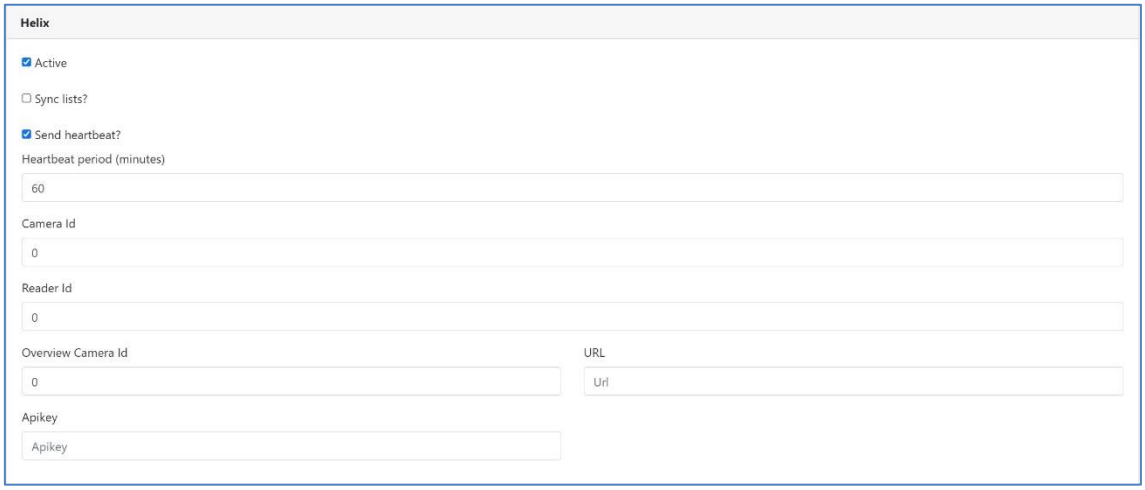
Send duplicate images is used in cases where a vehicle is stationary for some time in the field of view. Note that the user can set 'Same plate delay' (seconds) to specify a time to wait before attempting to read the same plate again (see earlier in this manual). However, here the user can instruct the 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.

Use extended fields will send the data in UTF-8 format. (Unicode Transformation Format - 8 bits):
PlateUTF8
StateUTF8
CategoryUTF8
FormattedUTF8

ExtendedUTF8

Color
Make
Model
Class

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



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.

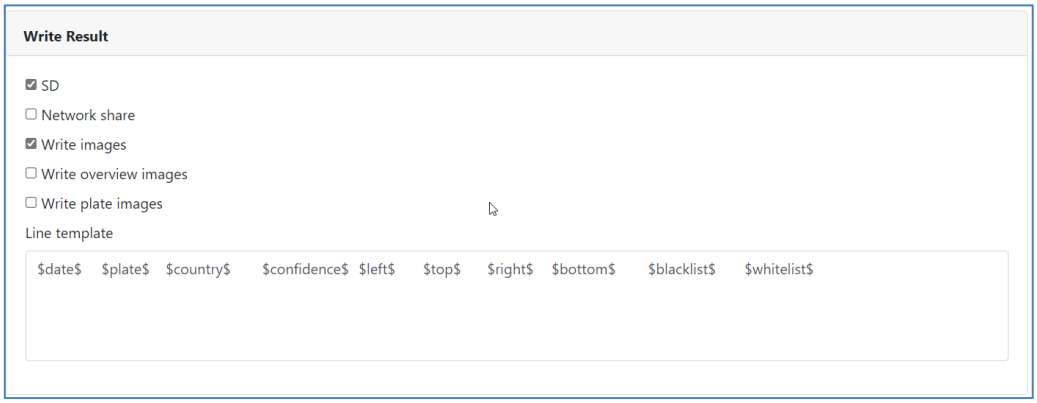
Enter the Camera ID to be sent to Helix along with the Camera ID to be used for an associated Color Overview camera. Here you can specify an API key to be used for authentication.

13.2 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:



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 of the reserved words in the annex **7. Dynamic Text Replacement Reserved Words**.

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

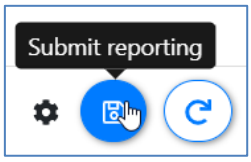
All reads will be stored in the SD Card folder: /areas/Vaxreader/YYYYMM-DD/

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

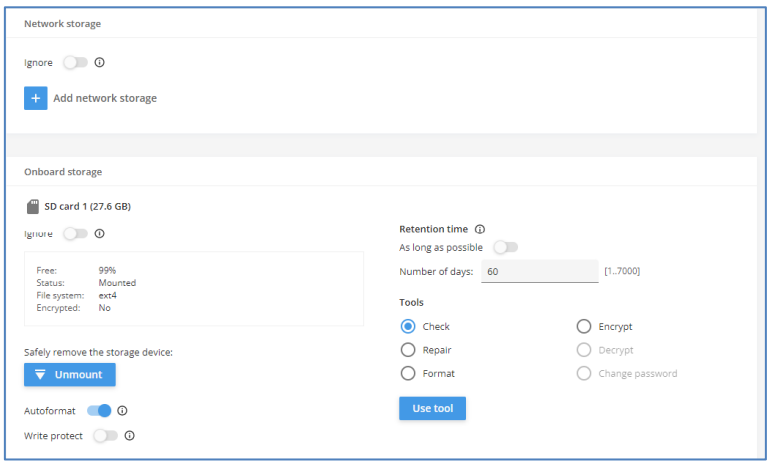
/areas/Vaxreader/YYYY-MM-DD/WHITELIST/ or
/areas/Vaxreader/YYYY-MM-DD/BLACKLIST/

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 Submit 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 button to save your changes.

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

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

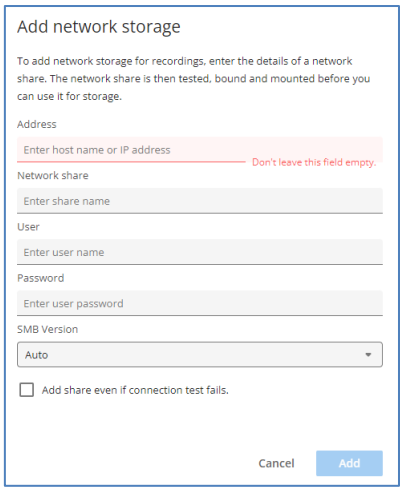


Plate reads will now be written to this location using the format specified.
Note that this list of protocols is always being updated, contact Vaxtor for details.

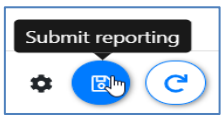
See the separate manual: "VaxALPR On Camera Integration Guide" for more details of VAPIX and how to communicate with Axis's own software.
Also see the separate VaxALPR On Camera Software Developer's Guide for more detailed information on the reporting options.

13.3 Other Reporting Options

For a full list and explanation of all the other Axis on-camera Reporting options then see the separate Vaxtor "On-Camera Axis Software Developer's guide".

13.4 Submit Reporting Settings

Once you have configured your reporting options then remember to save them by pressing the Submit button at the bottom of the menu.



13.5 Testing Reporting

After configuring a notification, it is possible to simulate a read transmission. This feature can be used to confirm that the notification has been set up and is operating correctly.

To simulate a plate read notification:

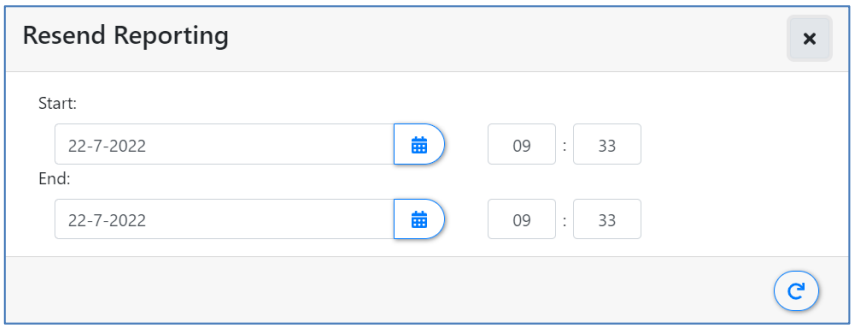
1. Open the reporting option menu.
2. At the bottom of the page, insert a plate number on the "Plate to test" textbox.
3. Click on the Test reporting icon:

13.6 Resend Plate Reads

If an end point (a receiving server for your reporting) loses any plate reads for any reason, then it is possible to re-send ALL plate reads between a start and end timestamp.

At the bottom of the reporting options select the Resend icon:

A dialogue box appears where to can specify the start and end dates / times for the data to be retransmitted:

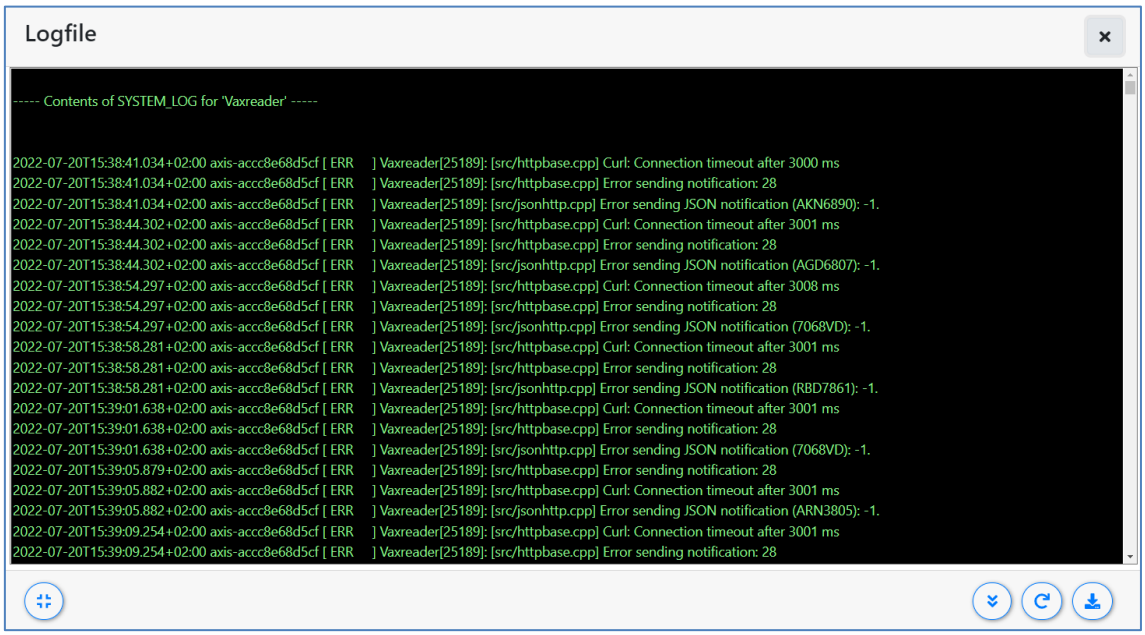


Note that data will be resent to **ALL** selected reporting end points!

14. VaxALPR Show Logfile

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

(Note that you can also access the log file from Axis's App menu using the 'App Log' button. The application log is displayed thus:



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.

15. 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 recognized 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.

16. 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.

16.1 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.

16.2 The VaxALPR license is valid but a 'Check license' message appears.

Solution:

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

16.3 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).

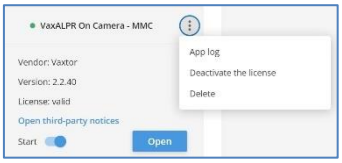
Once you can see the license plate image and the software is now reading, change these settings back one by one.

16.4 VaxALPR 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 App Log:



Do NOT delete the App or deactivate the license!

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.

16.5 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.

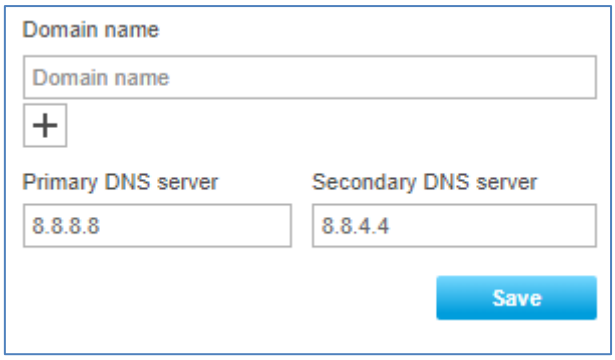
16.6 JSON or TCP setup but no plates being received

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.



17. Dynamic Text Replacement 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.
$ifnolist$...$ifnolist$	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.
$roiid$	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)

17.1 Additional values

$image$	Full JPEG image encoded in base64.
$jpegsize$	JPEG size in bytes.
$make$	The vehicle make
$model$	The vehicle model
$color$	The vehicle color
$class$	The vehicle classification (type â€“ e.g. car, van etc)
$vehicleaccess$	Entry / Exit events (0: Unknown, 1: enter, 2: exit, 3: overstay)
$dwelltime$	Time spent in monitored area in seconds
$year$	Year

$month$	Month number
day	Day number
$hour$	Hour
$minute$	Minute
$second$	Seconds

17.2 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)

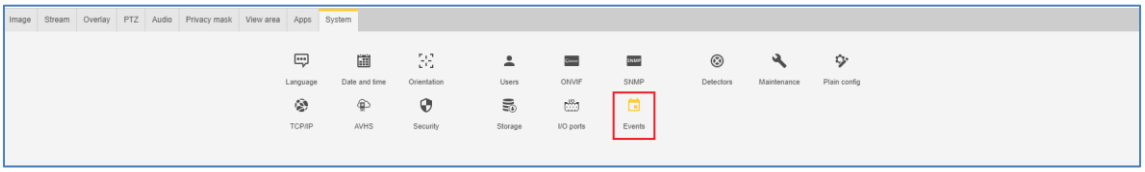
18. Scheduling VaxALPR to automatically start or stop processing

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.

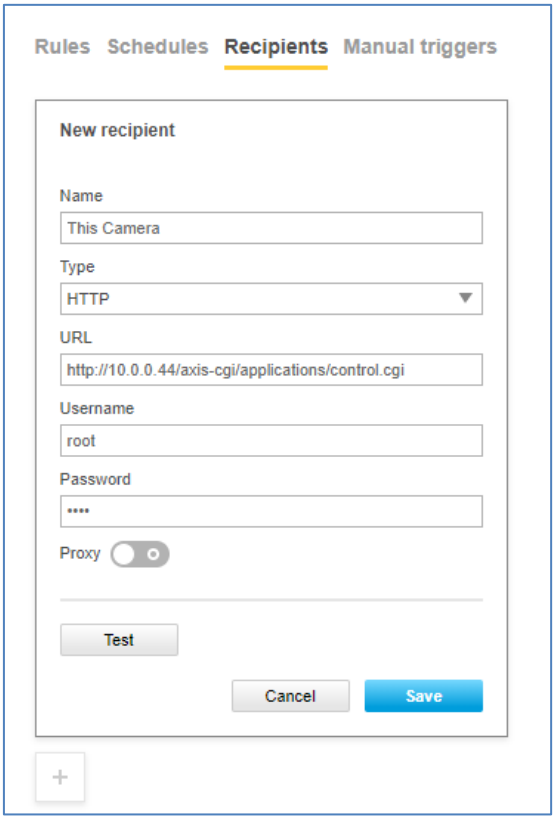
This can be done by setting up a schedule to trigger an event withing the Axis camera.

Do this as follows:

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

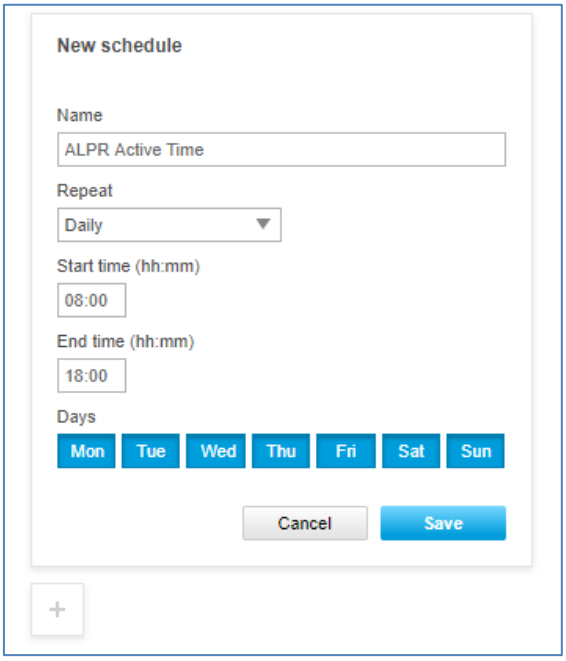


2. Select the **Recipients** Tab and use the + icon to add a recipient as follows:
(The recipient of the event is going to be this camera – i.e. itself!)



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.

3. 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:



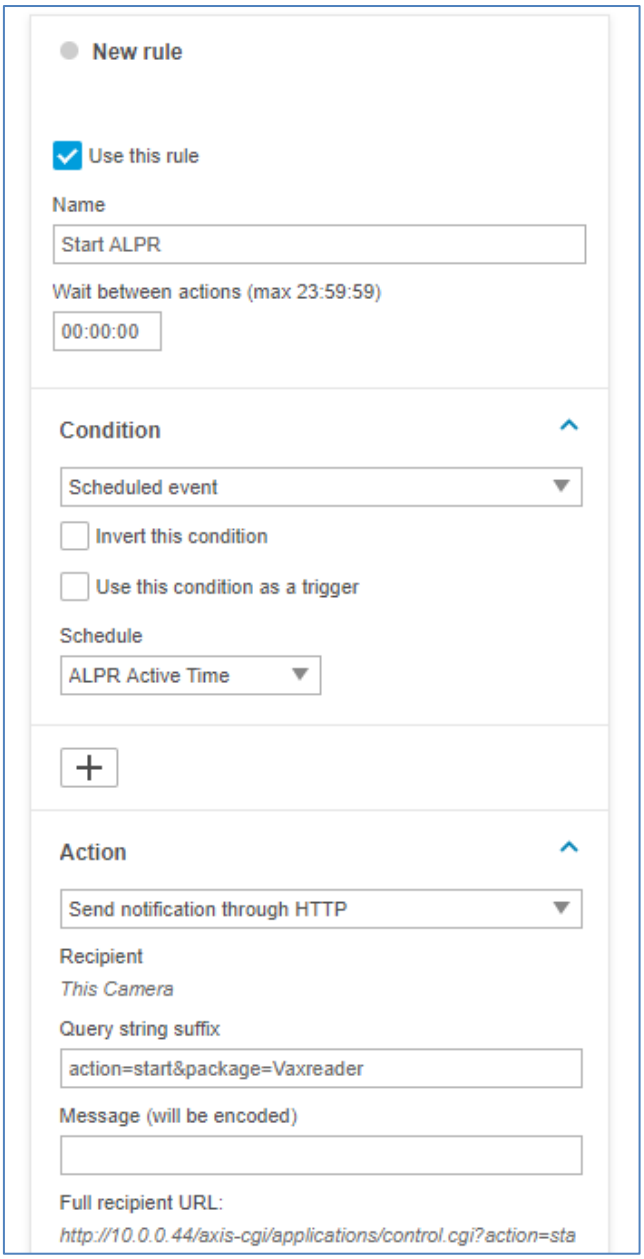
Click Save.

4. 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

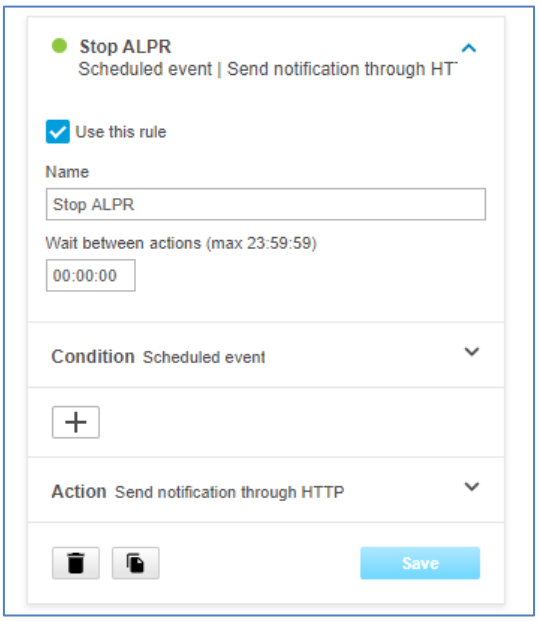
   .. and click Save:



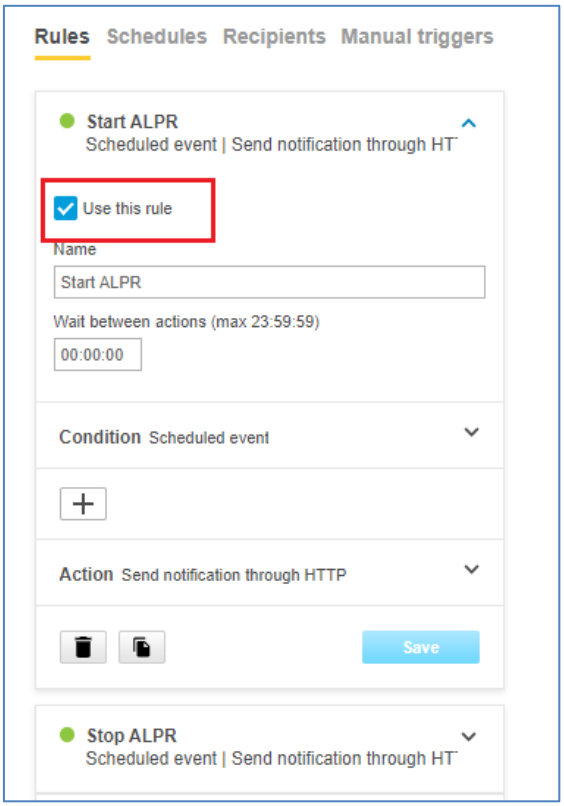
5. Next, setup a new Rule to stop the ALPR App by clicking the Rules Tab followed by the + icon.
   Name it – e.g. 'Stop ALPR'.

   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:



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



18.1 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.

19. Changelog

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

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

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.

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

Version 2.1.0

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

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.

Version 2.1.6

- ✓ Minor bugfixing.

Version 2.1.7

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

Version 2.1.8

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

Version 2.1.9

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

Version 2.1.12

- ✓ Update OCR to the latest version.

Version 2.1.14

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

Version 2.1.15

- ✓ Update OCR to the latest version.

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

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: $utcdate$ 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

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.

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.
- ✓

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).

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.

Version 2.2.16

- ✓ Added integration with 2N.
- ✓ Added integration with Digital Barriers encoders.
- ✓ Added char bounding as a data field.
- ✓ Added Genetec test flag to be used on demo installations.
- ✓ Added minimum contrast option.
- ✓ Added MMC data to the VAPIX events.
- ✓ UI revamp. All fields are now customizable.
- ✓ Removed maximum resolution. It is possible to select resolutions over 1920x1080.
- ✓ Improved whitelist and blacklist import.
- ✓ Multi country balance option may enable multiple neural networks.
- ✓ OCR update. Improved memory usage and analytic times.
- ✓ Fix: Camera ID can be a string now in UTMC.
- ✓ Fix: Daily report filename is PREFIX_YYYYMMDD.csv.
- ✓ Fix: Corrected an issue with Vaxtor Protocol v2.

Version 2.2.17

- ✓ Added Enter - Exit mode. $vehicleaccess$ (0: Unknown, 1: Entry, 3: Exit, 4: Overstay), $dwelltime$
- ✓ Added reserved words: $year$, $month$, day, $hour$, $minute$, $second$.
- ✓ Improved FTP reporting.
- ✓ Improved CURL connection management
- ✓ UI: Made play video off by default on the webpage.

Version 2.2.18

- ✓ Added Lost state to dwelling mode.
- ✓ Added configurable authorization header to JSON reporting.
- ✓ Increase accuracy in Saudi Arabia.
- ✓ Reduced analytic time in mode 1,1 and 2,1.
- ✓ Fix: Overlay on plate patch images for FTP and Smart Parking reporting.
- ✓ Fix: Grammar corrections for Mexico.

Version 2.2.19

- ✓ Added: Read stacked characters USA
- ✓ Added: Integration with M3
- ✓ UTMC protocol allows XML response without SOAP envelope

Version 2.2.20

- ✓ Added: Engine updates for Singapore & USA

Version 2.2.21

- ✓ Update libMNN to latest version
- ✓ New DL color network
- ✓ Enhanced stacked character recognition
- ✓ Grammar modifications for Australia and Singapore

Version 2.2.22

- ✓ Belgium grammar extension
- ✓ Include 'Electric' in the vehicle category for Germany
- ✓ Fix: Germany state exceeding maximum string size

Version 2.2.23

- ✓ Fix: Race condition on UTMC reporting

Version 2.2.24

- ✓ Added BOF2 reporting
- ✓ Updates for Germany, Singapore and UK grammars.

Version 2.2.25

- ✓ Fix stacked characters issue when the US plate state is not identified

Version 2.2.26

- ✓ Add: Option to resend reads that has already been send correctly
- ✓ Add: Heartbeat option to Helix
- ✓ Add: Option to disable send NONE on signaled mode

Version 2.2.27

- ✓ New USA NN
- ✓ Include specific mechanism for very steppy vertical angles
- ✓ Fix: Apply MMC to cars and vans only

Version 2.2.28

- ✓ Illinois grammar improvement
- ✓ Singapore grammar correction

Version 2.2.29

- ✓ Fix: Canadian grammar

Version 2.2.31

- ✓ Added: Genesis
- ✓ Added: configurable http timeout
- ✓ Updated OCR (Aruba, EU Trailers, Spain, USA, Jordan & Hong Kong)

Version 2.2.32

- ✓ Fix: problem with Helix-6 heartbeat
- ✓ Added: Orientation flag to Genesis

Version 2.2.33

- ✓ Update grammar for UK &Turkey

Version 2.2.34

- ✓ Fix: Error message if there are no countries selected
- ✓ Fix CSV exports will export all the available fields
- ✓ Fix Views on multilens cameras
- ✓ Added: Genetec LPR plugin
- ✓ Added: Secondary JSON output
- ✓ OCR: Update Taiwan grammar
- ✓ OCR: Improvements for Egypt, European Trailers
- ✓ OCR: Reduce sample points for iSpeed (50 -> 32)
- ✓ OCR: Singapore checksum is reporter on the region field if it doesn't match

Version 2.2.35

- ✓ Fix bug uploading configuration from the webpage

Version 2.2.36

- ✓ Fix small bug on setting controller when uploading a config file
- ✓ Added ARTPEC 8 support

Version 2.2.37

- ✓ Fix VAPIX and ACS event integration
- ✓ Added: GPS support

Version 2.2.38

- ✓ Support new plate format from Dubai
- ✓ OCR improvements for Taiwan and Spain
- ✓ Grammar fix for Finland, European Trailer and Australia
- ✓ Robustness improvement in corner cases
- ✓ Fix: VAPIX event declaration with fresh installs on latest Axis firmware

Version 2.2.38-1

- ✓ Fix: FTP selection bug on UI

- ✓ Fix: Product kind visualisation on GUI

Version 2.2.39

- ✓ Fix: Genetec bookmarks
- ✓ Fix: Finland initialization error
- ✓ Fix: Features appear multiple times on UI

Version 2.2.40

- ✓ Added: $serial$
- ✓ Added: Store the plates on the DB before discarding due to a high queue usage
- ✓ Fix: $plateimage$ and $overviewimage$ will return and empty string if there are no images.
- ✓ Fix: CSV upload for blacklist and whitelist
- ✓ Fix: Restored grammar exception interface
- ✓ Update Australian and Taiwan NN model
- ✓ Improvements for Hong Kong custom plates
- ✓ Fix: Greek grammar
- ✓ Fix: Germany grammar for electric vehicles
- ✓ Fix: Background mode light on dark

Version 2.2.40-1

- ✓ Add: Grammar exception checkbox
- ✓ Fix: Corrected Digital Barriers name on the reporting
- ✓ Add: Reporting options are alphabetically ordered

Version 2.2.41

- ✓ New MMC network that fix Audi detection problems.
- ✓ More debug lines for SD problems.

Version 2.2.42

- ✓ Improves in the main loop of levels/depth in the plate finder.

Version 2.2.43

- ✓ UI was updated: log download was fixed

Version 2.2.44

- ✓ Error in UTMC reporting (couldn’t open image) fixed

Version 2.2.46

- ✓ Added option to disable country analysis
- ✓ Added IR mode detection to increase OCR performance
- ✓ Added option to enforce IR mode to black & white on the OCR engine

Version 2.2.47

- ✓ Fix: remove size and type from the UI

Version 2.2.48

- ✓ Fix: Import configuration downloaded directly from alpr.cgi

Version 2.2.49

- ✓ Grammar fix: Australia, Austria, Latvia, Spain and Switzerland
- ✓ Use DNN Country Network to discard false positives (if enabled)
- ✓ Remove minimum contrast option

Version 2.2.50

- ✓ Fix: UI bug on cameras without views

Version 2.2.51

- ✓ Fix: bug in Germany region identification
- ✓ Lists CSV files uploaded by 50 items per iteration

Version 2.2.52

- ✓ Improvement discarding false positives
- ✓ Update: Australia and Hungary grammars

Version 2.2.53

- ✓ Fix: Potential crash on country recognition

Ends.