



VaxALPR On-Camera Software

Software Setup and i-PRO Configuration Main Manual

**Version 1.1
June 2023**

Contents

1.	Introduction	4
2.	Requirements for License Plate Images	4
3.	Camera Requirements.....	5
3.1	Frame Rate – does not need to be set for VaxALPR On-Camera	5
3.2	Shutter Speed.....	6
3.3	Resolution and Lens Focal Length	7
3.3.1	Resolution - does not need to be set here for VaxALPR On-Camera	7
3.3.2	Focal length	7
3.3.3	Infrared illumination	7
4.	Other requirements	8
4.1	Camera Orientation.....	8
4.2	Distance.....	9
5.	Camera Setup and configuration for License Plate Recognition.....	10
5.1	Setting up the i-PRO Camera.....	10
5.1.1	Set the date and time of the camera	10
5.1.2	IP Configuration.....	10
5.1.3	Shutter speed and other important image settings.....	10
5.1.4	Important camera settings.....	11
5.1.5	SD Card	11
6.	Installing and licensing VaxALPR On-Camera.....	12
6.1	Installing the software.....	12
6.2	Upload the license key	13
6.3	Reinstalling or upgrading the software.....	16
7.	Main Menu Options	17
7.1	Plates	18
7.2	Settings - Configuring VaxALPR On-Camera.....	21
7.2.1	Country options.....	21
7.2.2	Plate.....	22
7.2.3	Environment.....	24
7.2.4	OCR.....	26
7.2.5	Reporting.....	27
7.2.6	Log Level.....	27

7.3	Region of Interest.....	28
7.4	Reports	30
7.4.1	Helix.....	30
7.4.2	JSON	31
7.4.3	Overlay	31
7.4.4	XML.....	31
7.4.5	ONVIF	32
7.4.6	Test Plate.....	33
7.4.7	Save all Reporting Options	33
7.5	Database.....	33
7.6	Log file	37
7.7	Upload Config.....	37
7.8	Download Config.....	37
8.	Sending data to Milestone	38
9.	Troubleshooting	40
9.1	The VaxALPR On-Camera software starts and then stops suddenly.....	40
9.2	The VaxALPR On-Camera license is valid but a 'Check license' message appears.....	40
9.3	The VaxALPR On-Camera software is running but not reading plates.....	40
9.4	Examples of incorrect camera setup.....	41
9.5	JSON or TCP setup but no plates being received	43
9.6	Licencing Error -78.....	43
9.7	Licensing Error -64.....	43
10.	Dynamic Text Replacement Reserved Words	44
10.1	Note on UTC time format:.....	46

1. Introduction

This guide has been designed for those responsible for setting up and configuring the i-PRO 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 embedded on the i-PRO camera.

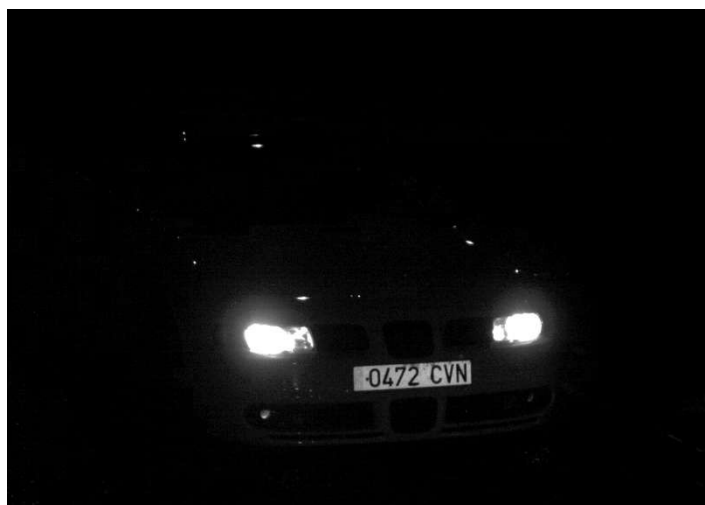
2. Requirements for License Plate Images

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

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



Ideal daytime license plate image



Ideal night-time license plate image

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

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



Undesirable license plate images

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

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

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

3. Camera Requirements

An intelligent ALPR camera is a specialized CCTV camera that has in-built software to identify license plates on still or moving vehicles. It is recommended that you use a i-PRO Camera with the correct processor for the installation and solution requirements. VaxALPR is available for both several WV-S and WV-X models.

The S-Series cameras have less memory and so a maximum resolution of 1280 x 720 is recommended. The X-Series runs well at 1920 x 1080.

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

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

When using the i-PRO camera to send a video stream **to a PC** running Vaxtor ALPR or if using the camera to send video to a VMS such as Video Insight, Milestone or Genetec – then the frame rate should be specified as shown below.

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

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

- ❖ *Lower frame rates:*
 - *Can result in choppy or broken movement*
 - *Are ideal for locations with no fast-moving objects*
 - *Are less intense for the camera and network (bandwidth)*
 - *Result in less frames and smaller video files*
- ❖ *Higher frame rates*
 - *Produce smoother movement*
 - *Are ideal for locations with faster traffic*
 - *Are more intense for the camera and network (bandwidth)*
 - *Result in more frames and larger video files, which may result in the need for more storage capacity.*

For ALPR cameras, the following frame rates are recommended:

- **Barrier or Gate** → *Frame rate > 5 fps*
- **Road or Street** → *Frame rate ≥ 15 fps*
- **Fast Urban** → *Frame rate ≥ 20 fps*
- **Motorways** → *Frame rate ≥ 25 fps*

3.2 Shutter Speed

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

(1 second = 1000 milliseconds)

The following shutter speeds are recommended:

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

3.3 Resolution and Lens Focal Length

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

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

When using the i-PRO camera to send a video stream **to a PC** running Vaxtor ALPR or if using the camera to send video to a VMS such as Video Insight, Milestone or Genetec – then the resolution should be set as shown below.

1. *The resolution (pixel size) of the camera sensor. This sensor (normally CMOS) where the light eventually falls and a typical IP camera has a sensor resolution of 2 or 4 Megapixels.*
2. *The resolution of the camera's electronics. Some cameras are capable of resolutions in excess of 1920 x 1080 – but may be set to a lower resolution if not needed.*
3. *The quality and focal length of the lens. The quality of the optics can play a part in challenging circumstances. The focal length (zoom factor) determines the field of view that can be seen.*
4. *The quality of the images can be influenced by factors such as the type of lighting used.*

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

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

3.3.2 Focal length

The focal length of the lens determines how “zoomed in” the image is. It is usually expressed in millimetres (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.

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

3.3.3 Infrared illumination

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

to a lesser extent fog, rain and snow and it eliminates the inconsistency of ambient light.

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

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

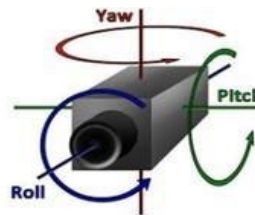
4. Other requirements

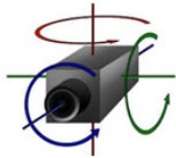






The positioning of the camera is key to achieving maximum OCR accuracy.

4.1 Camera Orientation

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

Pitch (Vertical) should be: $< 30^\circ$
Roll (Slope) should be: $< 25^\circ$
Yaw (Horizontal) should be: $< 25^\circ$



	 <div>CORRECT</div>	Slope Below 25 degrees 	Horizontal Below 25 degrees 	Vertical Below 30 degrees 
	<div>INCORRECT</div>			

Examples of different camera orientations

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

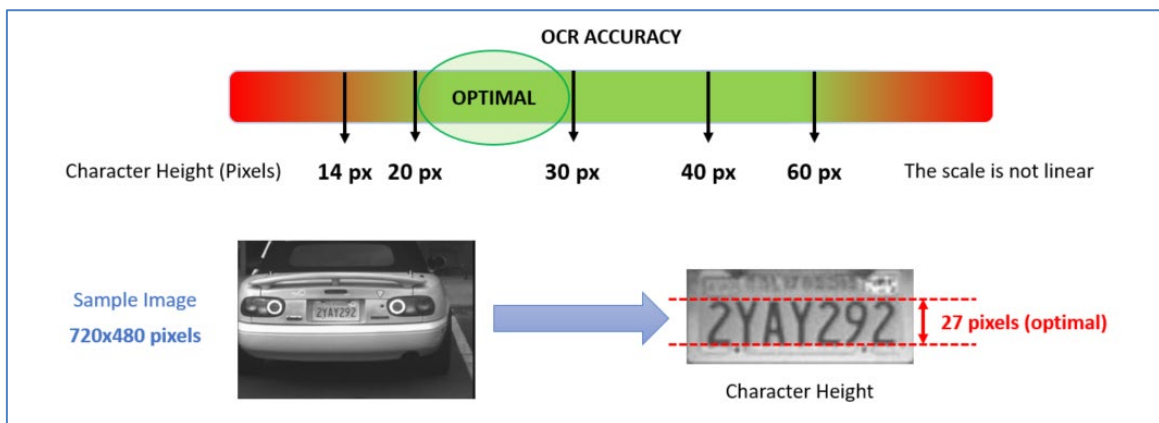
4.2 Distance

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

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

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

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



Optimal character height in pixels

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

5. Camera Setup and configuration for License Plate Recognition

In this section, we describe how to:

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

5.1 Setting up the i-PRO Camera

Once the i-PRO camera has been installed it must be set up and configured. Use a web browser to logon to the camera using its IP address. *(refer to the i-PRO documentation for the default IP address and username/password)*

Once logged on, check for the latest firmware update from i-PRO.

Check for the latest firmware

Select the Maintenance tab / Upgrade. On the right you will see details of the current firmware. To Upgrade select "Choose file".
Contact i-PRO for further details on upgrading

5.1.1 Set the date and time of the camera

To set the date & time select **Basic** setup. It is recommended that you use an NTP Time Server.

5.1.2 IP Configuration

Before installing the software, please configure the IP and DNS settings as required ensuring routes are available for the reporting options. To do this go to the main i-PRO **Network** menu. A recommended option is Google's is 8.8.8.8 with a secondary server of 8.8.4.4.

These are free Google DNS servers which will map any domain names needed to the correct IP address.

5.1.3 Shutter speed and other important image settings

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

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

To set the **shutter speed (minimum exposure time)** and other important settings in the i-PRO camera It is recommended that you park a vehicle or place a license plate in the region of interest.

5.1.4 Important camera settings

Select **Image/Audio** and **Image quality** to adjust the main image settings

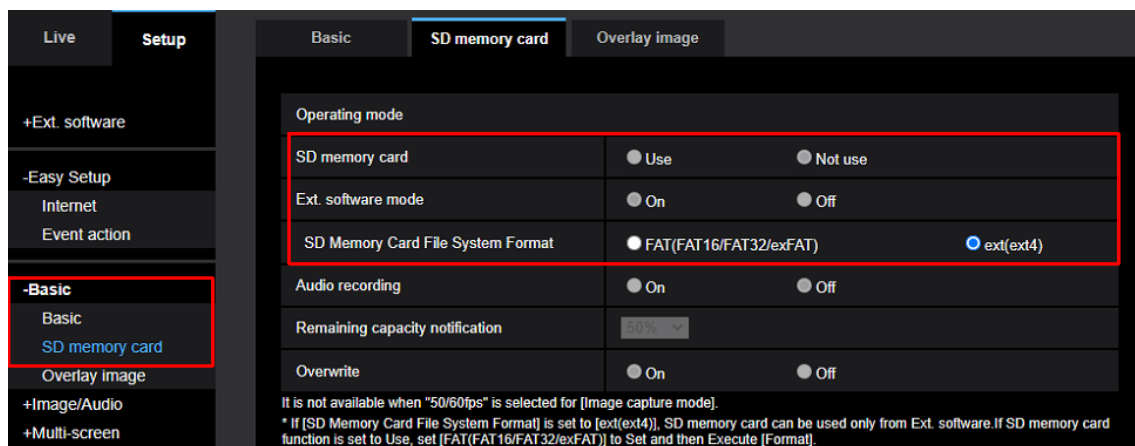
Refer to i-PRO's documentation for further details

5.1.5 SD Card

It is recommended that you install an SD card in your i-PRO camera (see i-PRO's documentation for details of how to do this.)

The card should be a 32GB or 64GB and is used by the ALPR software to store plate patch images and to cache reads prior to transmission. If there is a communication problem then the ALPR software will attempt to retransmit all unsent plate reads.

Once installed, enable the **SD card**, select **Ext software mode** and **ext(ext4)** for SD Memory Card File System Format as follows:

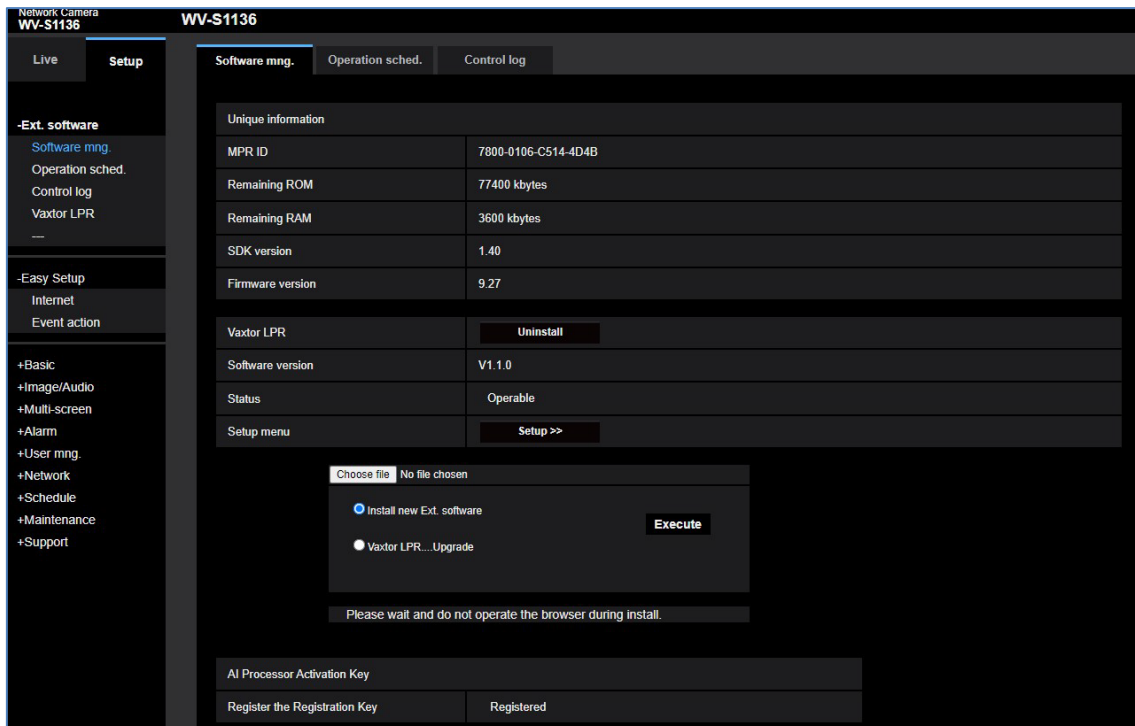


6. Installing and licensing VaxALPR On-Camera

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

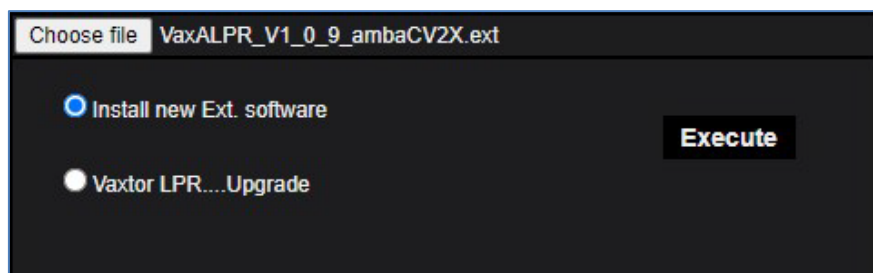
1. Install the ALPR software
2. Upload the license key
3. Start the software
4. Configure the software
5. Confirm the software is working correctly and providing the expected results

6.1 Installing the software

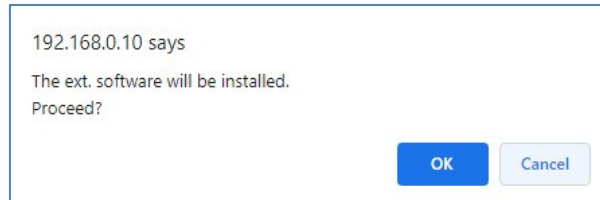


To install the VaxALPR On-Camera software, do the following:

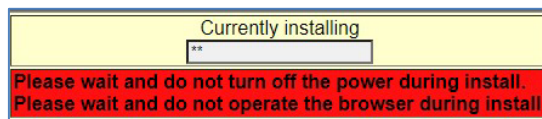
1. Select the **Setup** Tab
2. Select **Software mng.** (Manager)
3. Select '**Install new Ext. software**'
4. Select **Choose file** and browse to the latest software
5. The file will appear on the dialogue box:



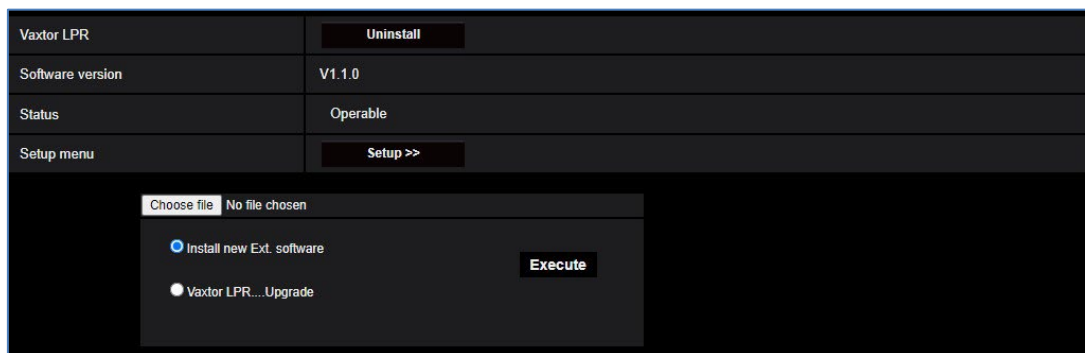
6. Select **Execute** to start the installation.
7. You must **Agree** to the Third-Party Terms and Conditions and then press **OK** to start the installation.



8. Confirm the installation. You must wait until the software has been completely installed:



Once installed the software will appear on the main screen:

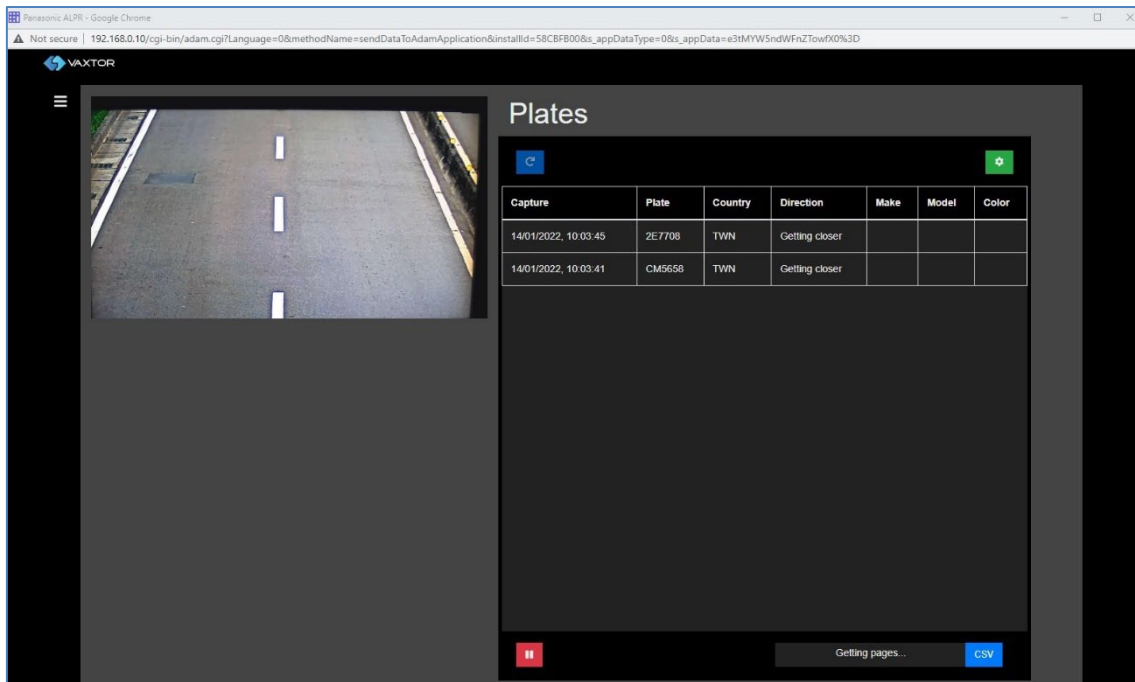


6.2 Upload the license key

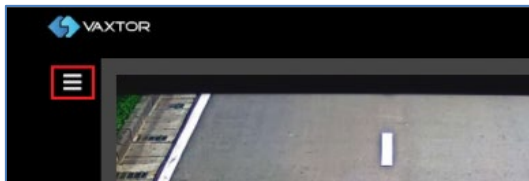
Select **Setup** to open a new browser page to license and then configure the software:



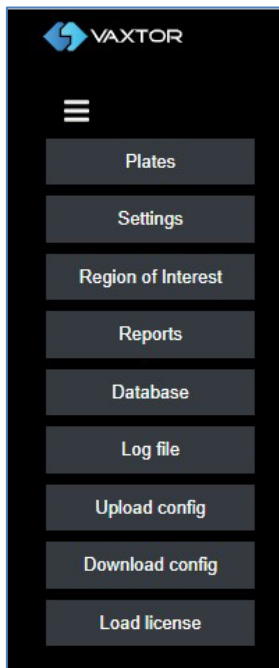
The main Setup screen will appear:



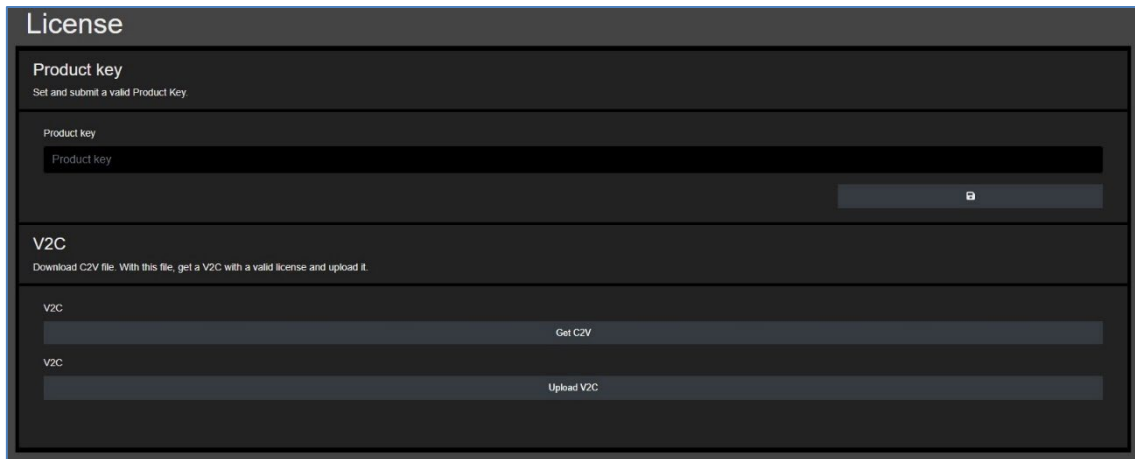
Select the 3 bars (top left) to open the Main Menu.



The Main Menu appears:



Select Load License to open the Licensing Screen:



License

Product key
Set and submit a valid Product Key

Product key

Product key

V2C
Download C2V file. With this file, get a V2C with a valid license and upload it.

V2C

Get C2V

V2C

Upload V2C

The Vaxtor On-Camera software for i-PRO uses the Sentinel software licensing system from Thales. Contact your supplier or Vaxtor in order to purchase a software license. You will be sent a Product Key which looks something like: a13c5eb4-a962-406c-99e0-93f8fd9ae7

Licenses can be redeemed in 2 ways: -

1. **Online** (Camera must have access to <https://licensing.vaxtor.com>)
 - a. Type or copy in the provided **Product Key**
 - b. Select the Disk icon to submit the Product Key

2. **Offline**
 - a. Select **Get C2V**. This saves a c2v file to your computer's Download Directory.
 - b. Upload and generate the V2C at <https://licensing.vaxtor.com> using your product key to login
 - c. Select **Upload V2C** and browse to the V2C file to upload it

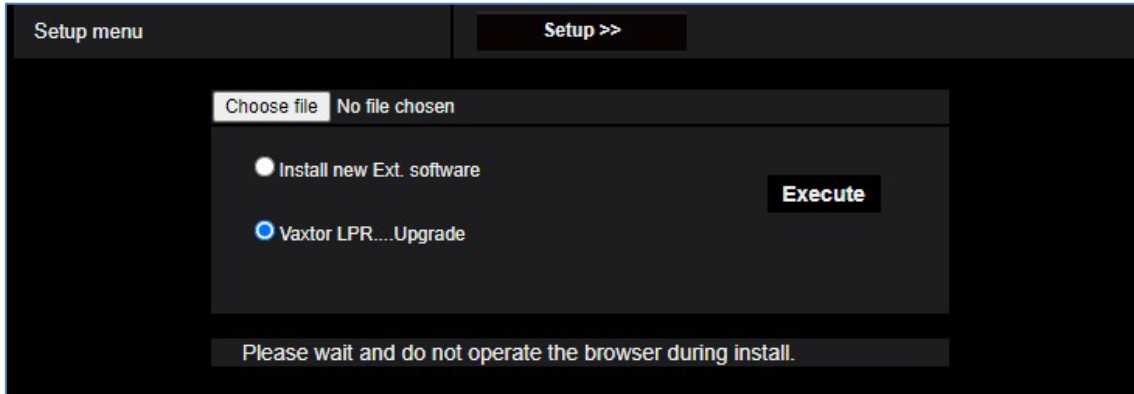
Online licensing is preferable where possible as the license becomes permanent as does not have to be reinstalled following a App software update.

Once licensed, return to the main menu.

6.3 Reinstalling or upgrading the software

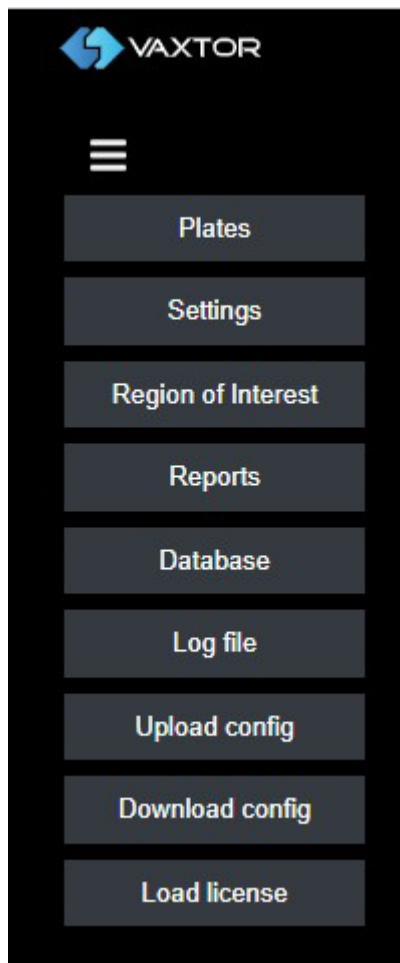
If you need to re-install the APP due to a new release being available then use the **Download config** function (see later) to save your OCR settings.

Next install the new software using the **Upgrade** option in the same menu as you used to install the original App:



The confirmation messages appear as before.

7. Main Menu Options

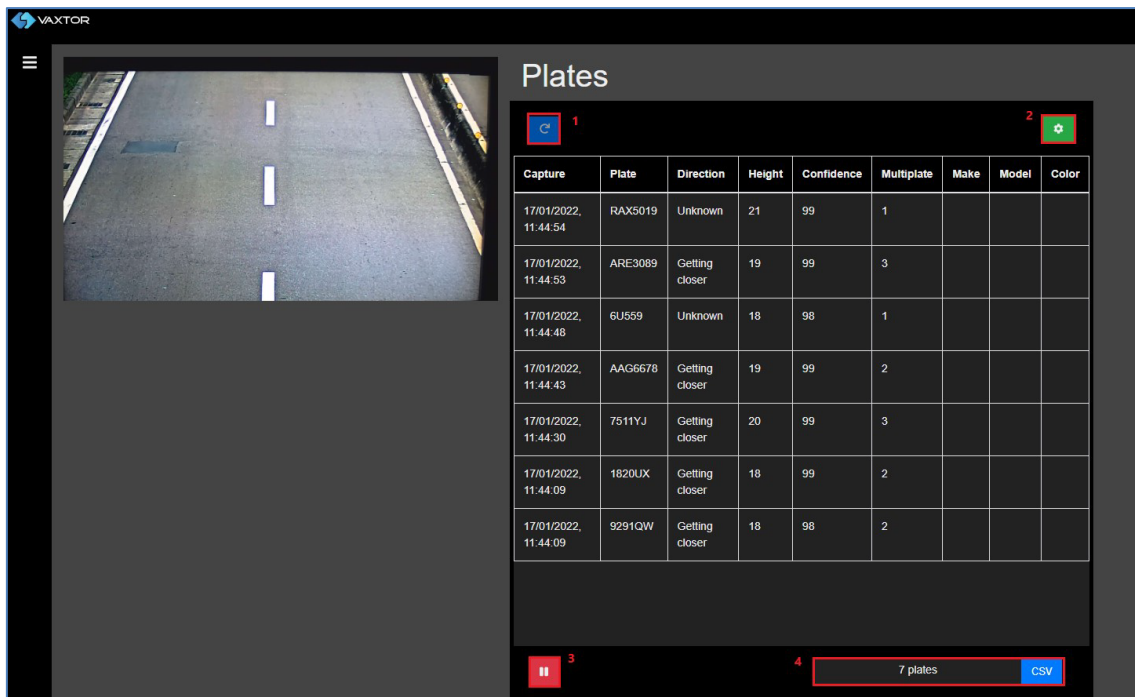


The Main Menu is always accessed by clicking on the three bars at the top of the menu. From here you can configure the application including the OCR settings, regions of interest, reporting options etc.

Plates	Display a short list of plates recently read
Settings	Configure the OCR parameters
Region of Interest	Define one or more regions of interest
Reports	Configure reporting options to send reads to 3 rd party software
Database	Display a more comprehensive list of stored plate reads
Log file	Display a log file of application activity, useful when debugging
Upload config	Load an xml configuration file
Download config	Save the current configuration file in xml format
Load license	Install a software license

7.1 Plates

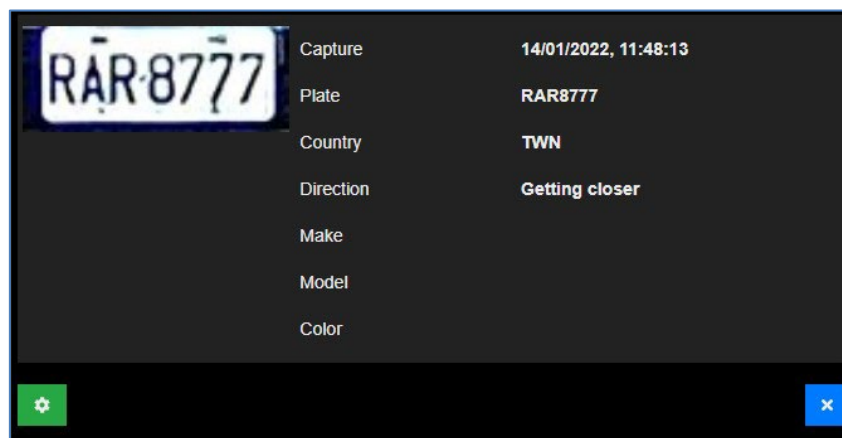
The most recent plate reads are stored in the camera's internal memory and are displayed when the Plates menu is selected. The number of plates stored



Capture	Plate	Direction	Height	Confidence	Multiplate	Make	Model	Color
17/01/2022, 11:44:54	RAX5019	Unknown	21	99	1			
17/01/2022, 11:44:53	ARE3089	Getting closer	19	99	3			
17/01/2022, 11:44:48	6U559	Unknown	18	98	1			
17/01/2022, 11:44:43	AAG6678	Getting closer	19	99	2			
17/01/2022, 11:44:30	7511YJ	Getting closer	20	99	3			
17/01/2022, 11:44:09	1820UX	Getting closer	18	99	2			
17/01/2022, 11:44:09	9291QW	Getting closer	18	98	2			

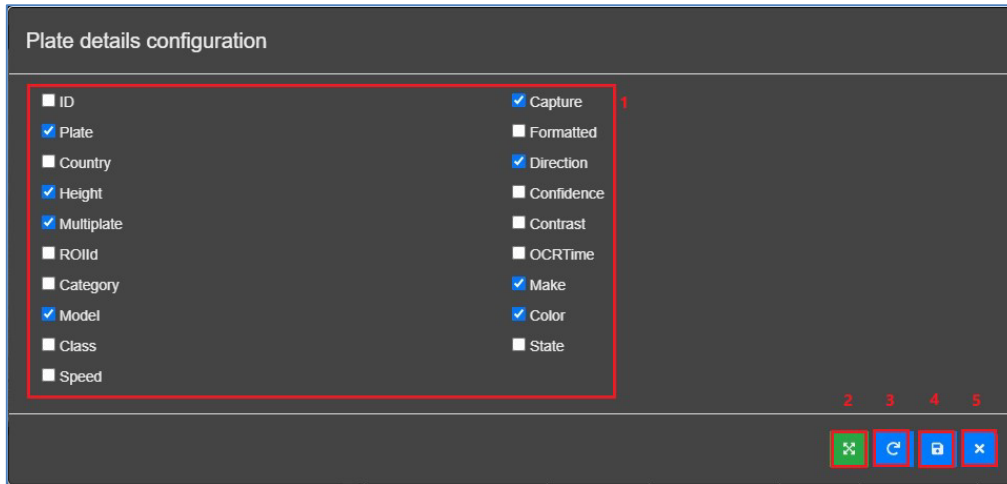
1. Refresh: Select to refresh the current view
2. Config Columns: Select to define the displayed columns
3. Play / Pause: Select Play to continuously refresh the current view
4. Export: Select to export the list of detected plates in a csv format

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.



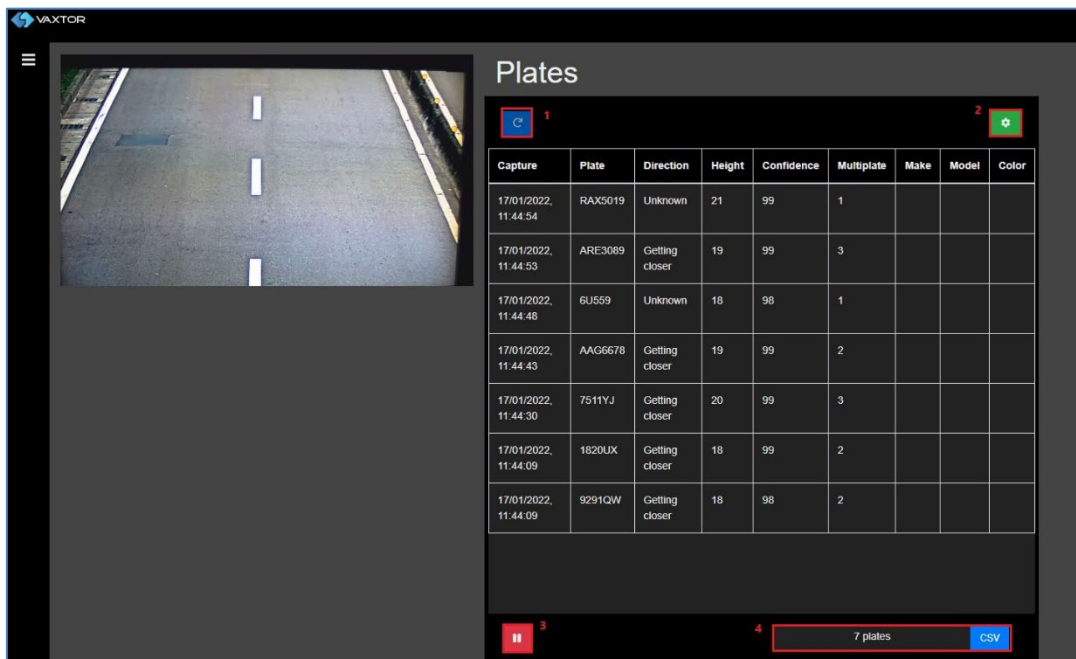
Capture	14/01/2022, 11:48:13
Plate	RAR8777
Country	TWN
Direction	Getting closer
Make	
Model	
Color	

Click on the green cog (bottom left)  to configure what information to show here:

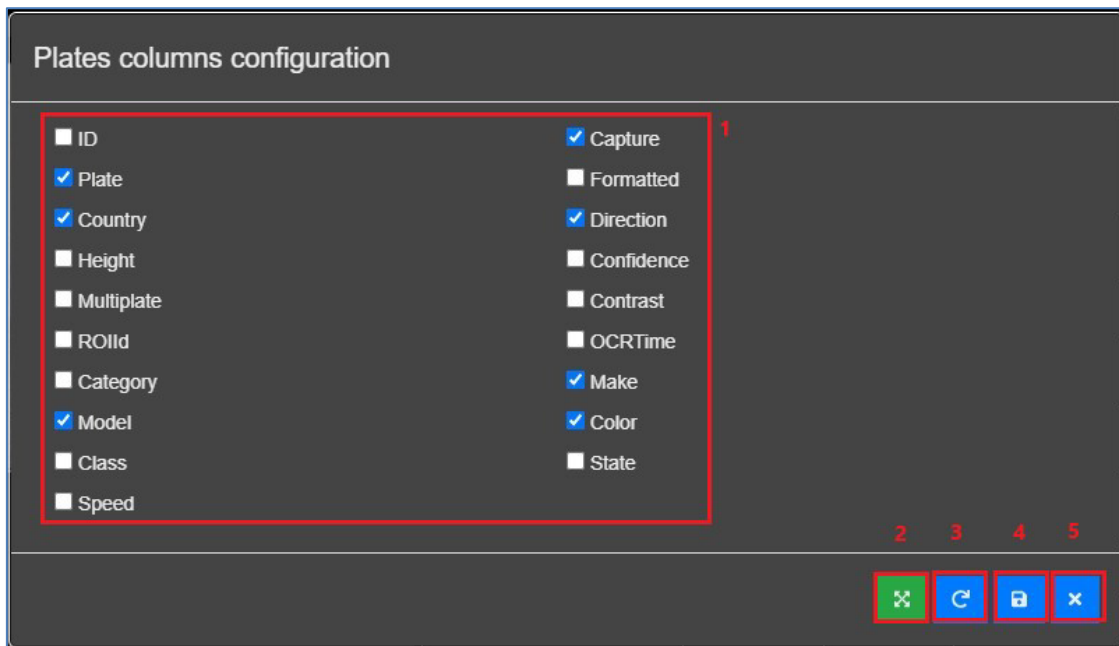


Note that Make, Model and Color and Vehicle Class are only available if you have bought the MMC or VClass version from Vaxtor. Contact Vaxtor for further details.

1. This area is where you can control which fields are displayed when you click on a plate
2. Selecting this icon enables ALL the fields
3. This resets the fields displayed to their default settings
4. Select the disk icon to save your current display settings
5. Select the X icon to close the menu and return to the main plates screen:



Select the green cog top right to control what columns are displayed on the Plates screen:



1. This area is where you can control which fields are displayed when you click on a plate
2. Selecting this icon enables ALL the fields
3. This resets the fields displayed to their default settings
4. Select the disk icon to save your current display settings
5. Select the X icon to close the menu and return to the main plates screen

Select the CSV icon on the main plates screen to save a .csv file to your PC.



The file will be saved in your downloads folder and appears as follows:

category;char_height;class;color;confidence;contrast;country;date;direction;formatted;id;make;model;multiplate;plate_number;processing_time;roi_id;speed;state																									
1	category;char_height;class;color;confidence;contrast;country;date;direction;formatted;id;make;model;multiplate;plate_number;processing_time;roi_id;speed;state																								
2	;19;;99;-1;TWN;2022-01-14T1247116510100;1;8281PW;bb5973be-33f4-4a43-aba8-4dc48cbe2919;;3;8281PW;151;-1;-1;																								
3	;19;;99;-1;TWN;2022-01-14T124720510100;1;AUG0126;5e231e05-291d-4f5d-b51b-e4ef7ef285c9;;2;AUG0126;178;-1;-1;																								
4	;17;;99;-1;TWN;2022-01-14T1247259520100;1;0232J8;52b8d55d-5438-4515-8683-ea17a01e05b7;;2;0232J8;123;-1;-1;																								
5	;18;;99;-1;TWN;2022-01-14T1247339190100;1;AAE0695;0cf072fc-d36e-4945-b994-b0ad9bbe18ea;;2;AAE0695;159;-1;-1;																								
6																									

The first row contains the field headers.

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

Note that you can get a more comprehensive view of the vehicle from the Database option described further in this manual.

7.2 Settings - Configuring VaxALPR On-Camera

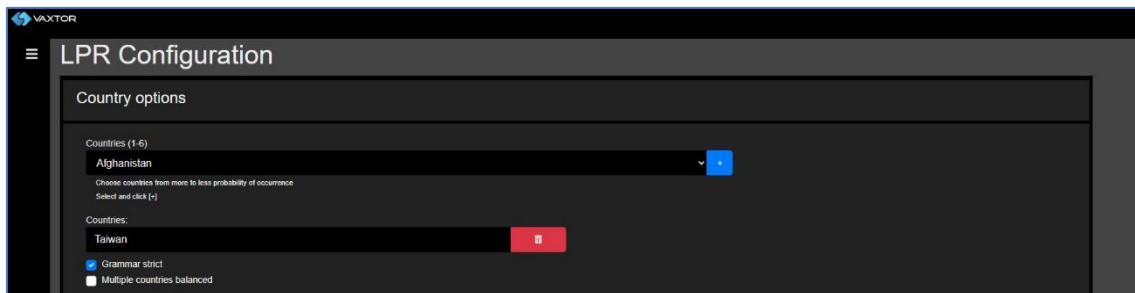
VaxALPR On-Camera user interface

Select the **Settings** button to display the LPR Configuration window. This is a scrollable window comprising several sections allowing you to configure and tune the main recognition parameters.


Sections include:

Country options	Define country of use and grammar rules
Plate	Define the types of plate seen and set the resolution
Environment	Specify how long to spend analysing each plate etc.
OCR	Filter on confidence and set engine OCR level
Reporting	Activate re-sending option for bad communication sites
Log level	System log options

7.2.1 Country options



Countries (1-6)

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. Repeat to add multiple countries and these 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.

Required State (1-6)

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 to force the Engine to only use the syntax from countries or states that you have selected. Plates that do not match these rules will **not** be reported. This is the recommended option for using ALPR for access control where exact matches are required.

Do not select this checkbox when you want to report ALL valid license plates. This is the recommended option for ALPR in triggered mode. (see Working Mode later)
In the USA, plates are often seen from multiple States – and so the recommended setting is **OFF**.

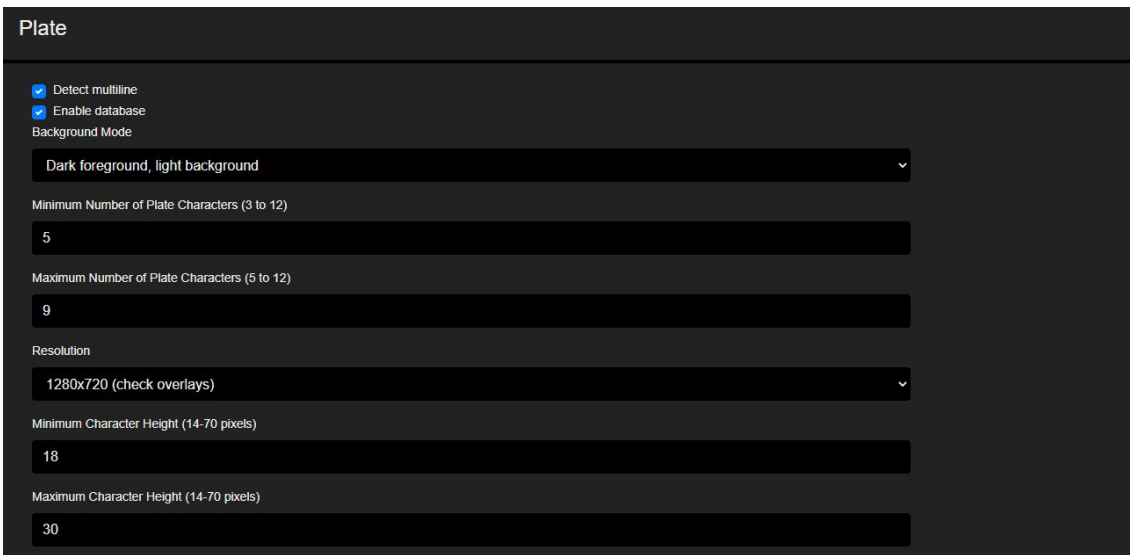
NOTE: False triggering may occur when this checkbox is not selected.

Multi country balanced

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

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

7.2.2 Plate



Plate

- ☒ Detect multiline
- ☒ Enable database
- Background Mode
 - Dark foreground, light background
- Minimum Number of Plate Characters (3 to 12)
 - 5
- Maximum Number of Plate Characters (5 to 12)
 - 9
- Resolution
 - 1280x720 (check overlays)
- Minimum Character Height (14-70 pixels)
 - 18
- Maximum Character Height (14-70 pixels)
 - 30

Detect multiline

Select to enable multiline plate recognition.

Enable database

Select to enable the onboard recording of the Plate results

Note: an SD card is required regardless of this setting.

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.

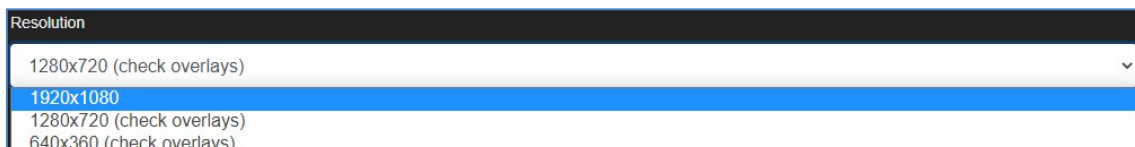
Minimum number of Plate Characters (3-12)

Set the minimum number of characters expected in your region

Maximum number of Plate Characters (5-12)

Set the maximum number of characters expected in your region

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 1280x960 is recommended. When the camera is setup to read plates in wide or multiple lanes, a resolution of 1600x1200 or 1920x1080 is recommended.

Note that some of the available resolutions are followed by the words: 'check overlays'

This varies from model to model and is dependent on firmware releases. If the words appear then you should check if you have selected a text overlay or watermark to be written into the saved image files. (See REPORTS, Overlay later in this manual).

If so then there is a danger of the OCR software reading this overlay text and trying to interpret it as a license plate. You can prevent the software from doing this by creating a suitable 'Region of Interest' or ROI. Multiple areas of the image can be included or excluded from the recognition process. See **Region of Interest** section later.

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.

Maximum Character Height (14-70 pixels)

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

NOTE:

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

7.2.3 Environment

Environment

Same Plate Delay (seconds)

10

Same Plate Max Chars Distance

2

Maximum Slope Angle (0-40 degrees)

20

Mutiplate frame

First capture

Mutiplate minimum number of occurrences (1-10)

1

Mutiplate maximum number of occurrences (1-10)

5

Mutiplate recognition timeout (0-10000 milliseconds)

750

Same Plate Delay (seconds)

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

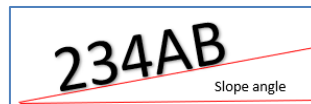
NOTE: When using signalled (triggered) mode, it is recommended that you set this delay to 0 seconds.

Same Plate Max Chars Distance

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

Maximum Slope Angle (0-40 degrees)

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.

Multiplate Frame

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.

Multiplate minimum number of occurrences (1-10)

Set the minimum number of times that a plate should be read within the Timeout period to be considered a valid plate. Set this to 1 or 2 for most scenarios.

Multiplate maximum number of occurrences (1-10)

Set the maximum number of times that a plate should be read before being reported (this may happen before the timeout). Set this to about 5 for most scenarios.

Multiplate recognition timeout (0-10000 milliseconds)

Set the number of milliseconds that the engine should spend analysing a plate.

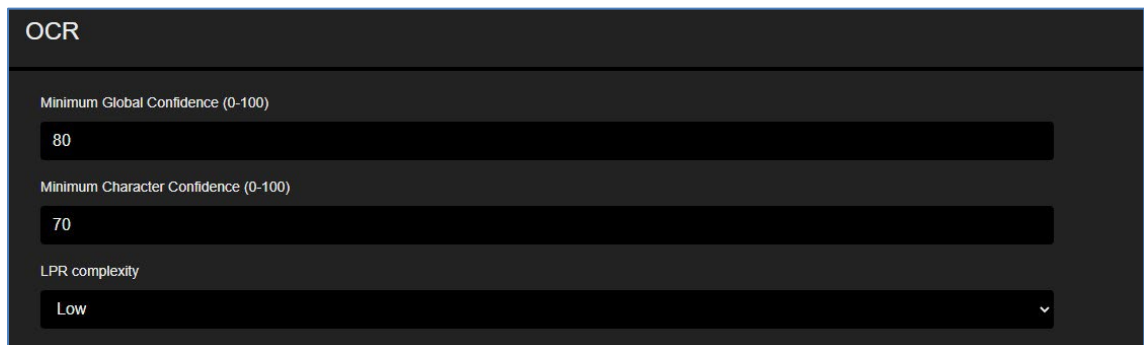
(1000 milliseconds = 1 second)

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 1500ms (1.5 seconds) so that the engine continues to look for the same plate to read again for as long as possible. Note that if a new plate is spotted, the old one will be reported and a new plate-trace started.

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

7.2.4 OCR

The screenshot shows a dark-themed configuration window titled "OCR". It contains three settings: "Minimum Global Confidence (0-100)" with a value of 80, "Minimum Character Confidence (0-100)" with a value of 70, and "LPR complexity" set to "Low" with a dropdown arrow.

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.)

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.

LPR complexity

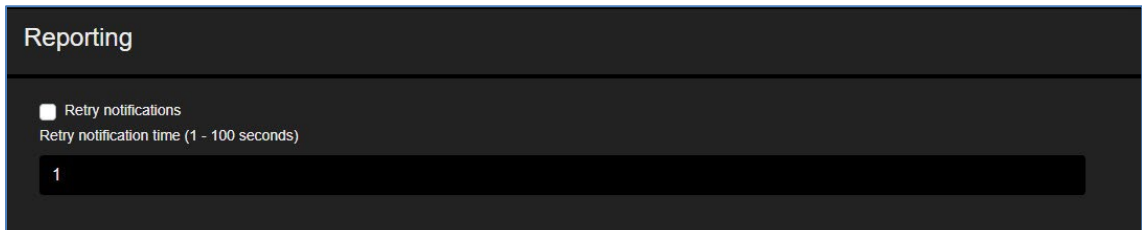
This is the complexity of the analytics to be applied during the ALPR Engine's stage of plate reading. Set this according to the OCR mode and type of traffic expected.

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 signalled (triggered.)

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

7.2.5 Reporting



The screenshot shows a configuration window titled "Reporting". It contains a checkbox labeled "Retry notifications" which is currently unchecked. Below the checkbox is a label "Retry notification time (1 - 100 seconds)" and a text input field containing the value "1".

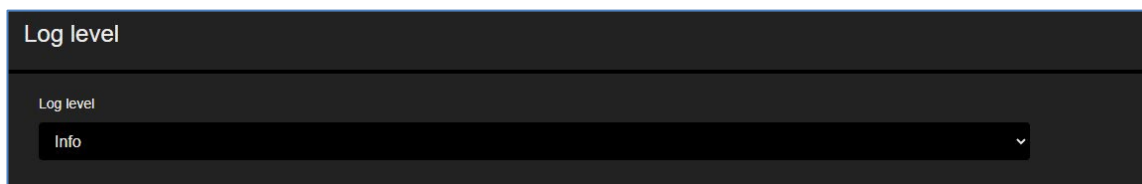
Retry notifications

Select this to retry the sending of any notifications if any fail, for example due to a comms problem.

Retry notification time (1 - 100 seconds)

Select this to specify the retry period in seconds.

7.2.6 Log Level



The screenshot shows a configuration window titled "Log level". It contains a dropdown menu labeled "Log level" with "Info" selected. A small downward arrow is visible on the right side of the dropdown.

Log Level

Select the required level of logging.

- Info
- Trace

- Debug

After configuring all of the OCR settings select the Disk icon (bottom right) to save them to the camera.

The refresh symbol (bottom left) resets all the values to factory defaults.



Close the Settings window to return to the Main Menu.

7.3 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.

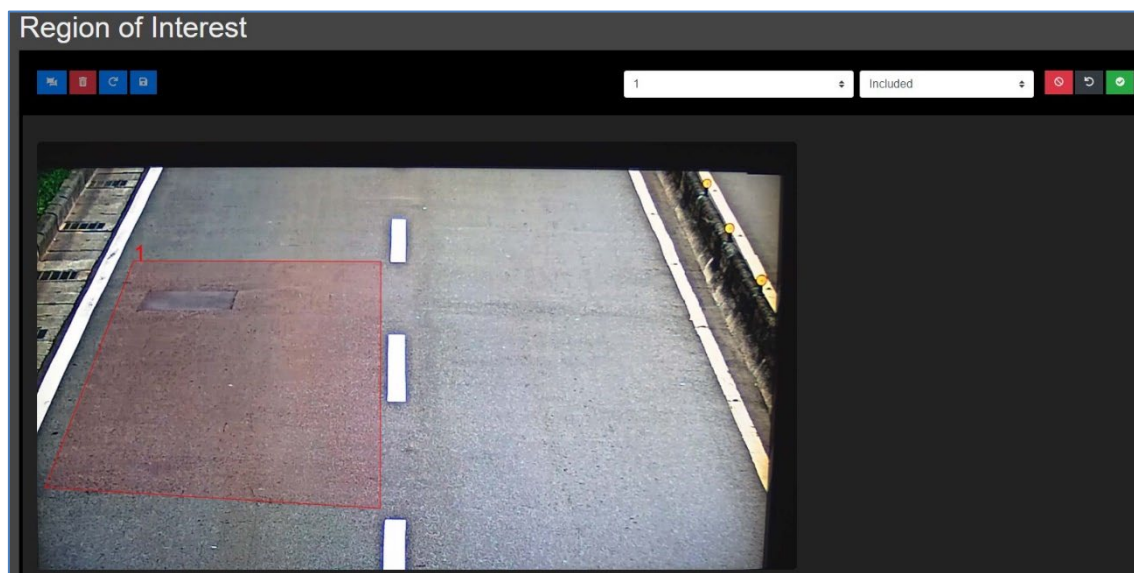
Using an ROI can decrease OCR processing time and also reduce false positives.

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 an area of interest 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.

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

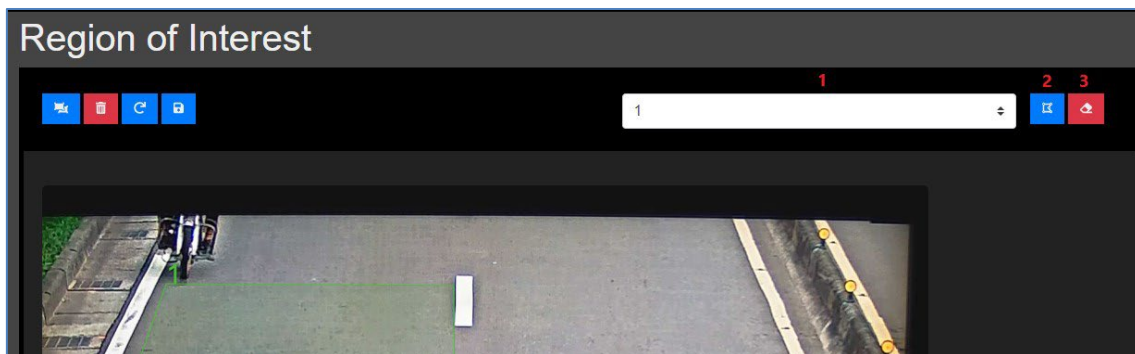


IMPORTANT: ROIs can be configured to either include the areas defined from the OCR – or exclude them. If multiple ROIs are added they must all be of the same type.



1. Add a new ROI: Select to add a new ROI. Use the mouse to define one or more complex shapes.
2. Remove all ROIs: Select to delete all ROIs
3. Reload ROIs: Select to reload all ROI's from the camera's memory
4. Submit ROI's: Select to save and submit ROI's to the camera memory
5. Select ROI ID: Select the ROI unique Identifier
6. Decide whether the area defines is to be included or excluded from the OCR
7. Cancel the ROI editing
8. Clear all the points defined on the current ROI
9. Confirm the ROI and save to the camera's memory

Once one or more ROIs have been defined, you can edit or delete each one individually:



1. Select an ROI number to edit or remove
2. Click to edit the individual points
3. Click to delete the currently selected ROI

Note that it often faster to delete the whole ROI and redefine it.

7.4 Reports

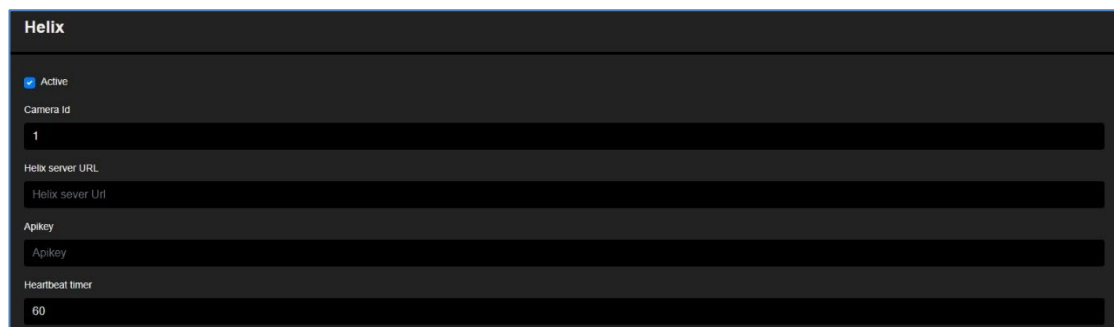
VaxALPR is able to output all plate reads in real time using a variety of standard protocols so that the plate reads can be accepted remotely by a variety of programs including Vaxtor's powerful Back Office - Helix, which can accept and store plate reads in real time from hundreds of i-PRO cameras.



The screenshot shows a 'Reporting' menu with the following options: Helix, JSON, Overlay, XML, ONVIF, and TEST. The 'TEST' option is highlighted with a blue bar. There is a small icon to the right of the 'TEST' option and a lock icon on the blue bar.

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

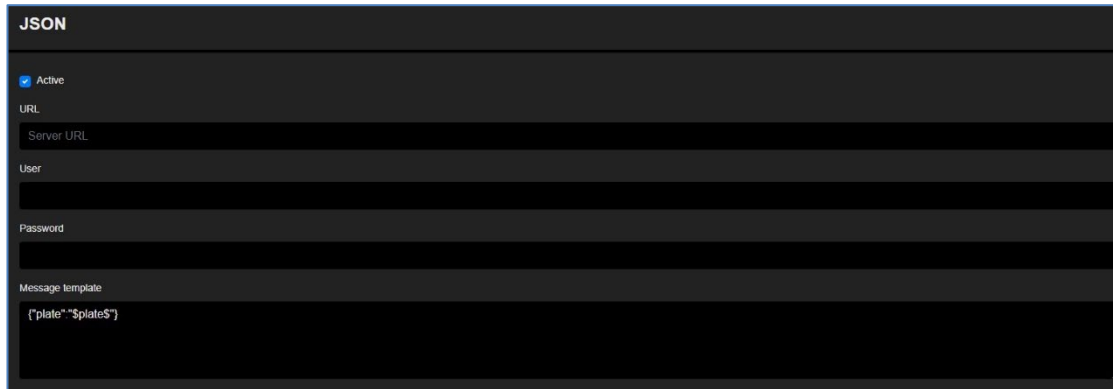
7.4.1 Helix



The screenshot shows the 'Helix' configuration menu with the following fields: Active (checked), Camera Id (1), Helix server URL (Helix server URL), Apikey (Apikey), and Heartbeat timer (60).

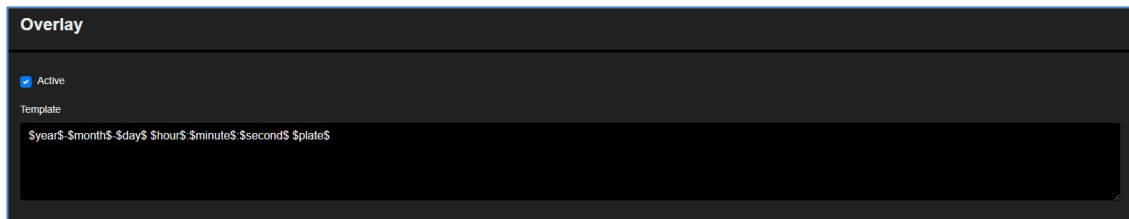
1. Active: Select to activate Helix Reporting
2. Camera Id: Enter the Camera ID as defined on Helix
3. Helix server URL: Enter the IP address (URL) of the receiving PC
4. Apikey: Enter the APIKEY with the required permission levels
5. Heartbeat timer (seconds): Set this to send heartbeat and diagnostic information to Helix

7.4.2 JSON



1. Active: Select to activate JSON Reporting
2. Server URL: Enter the IP address (URL) of the receiving PC
3. User / Password: Set if needed on a receiving HTTPS server
4. Message template: Enter the required message template

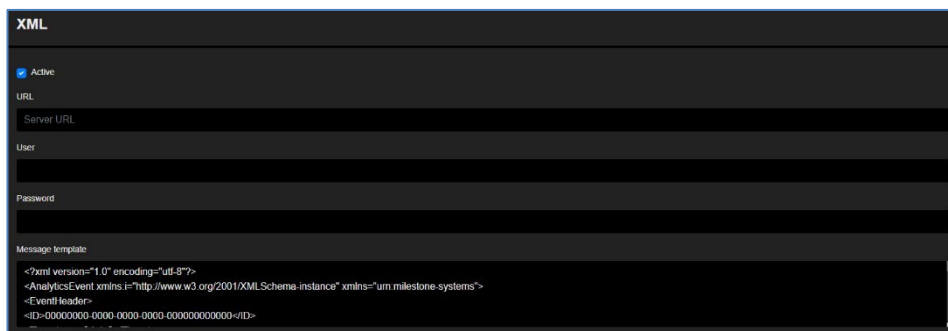
7.4.3 Overlay



1. Active: Select to activate watermarking. This overlays user defined text onto the saved images.
2. Template: Define free-form text together with dynamic text (delineated by \$... \$) as shown.

A complete list of reserved words is included at the end of this manual.

7.4.4 XML



1. Active: Select to activate XML Reporting
2. URL: Enter the IP address (URL) of the receiving PC
3. User / Password: Set if needed on a receiving server
4. Message template: Enter the required Message template

This method can be used to send plate reads to Milestone. [See Milestone chapter later in this manual.](#)

This reporting option will cause VaxALPR On Camera to send each plate event in an XML packet via an HTTP POST.

The target URL should be a 'well-formed' URL such as: <http://myserver.com/> or <https://myserver.com:port/destination/mypage.php>

For Milestone connections the URL should be: <http://milestoneserver:9090/>

Both domain names or IP address can be used.

Modify the message as needed. By default, the message is a valid Analytic Event for Milestone. A copy of the XML schema file (.xsd) for Milestone is listed [here](#).

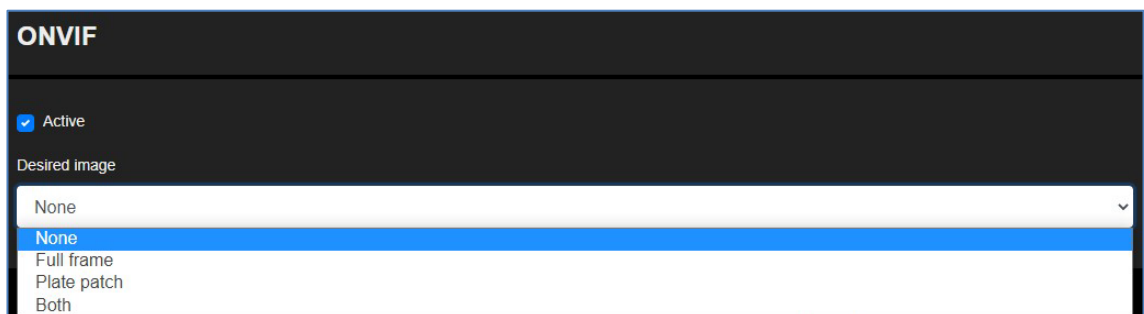
NOTE: You can use *dynamic text replacement* to match the current plate's information:

See separate doc "Complete List of Dynamic Replacement Reserved Words" for the latest additions.

- **\$image\$:** Full JPEG image encoded in base64.
- **\$jpegsize\$:** JPEG size in bytes.
- **\$date\$:** Timestamp in ISO8601 format
- **\$plate\$:** Plate number
- **Etc.....**


7.4.5 ONVIF

ONVIF camera protocol is used to send data to i-PRO's VMS software, 'Video Insight'.



1. Active: Select to activate ONVIF Reporting
2. Desired Image: Select which images (or combination) should be reported

7.4.6 Test Plate

TEST 

1. Plate number to test: Enter the test plate number

ABC123 

2. Submit Reporting: Select to send the test plate to all configured reporting options
You can then check the Log file for and transmission problems.

7.4.7 Save all Reporting Options











192.168.0.10 says
Are you sure to save configuration?

OK Cancel

After configuring and testing all reporting options, remember to save them to the camera's memory. Select the blue disk icon – bottom right.

TEST  

7.5 Database

Capture	Image	Plate	Country	Direction	Make	Model	Color
14/01/2022, 11:28:39		1553G6	TWN	Getting closer			
14/01/2022, 11:28:36		AKM2213	TWN	Unknown			
14/01/2022, 11:28:26		ANU9768	TWN	Getting closer			
14/01/2022, 11:28:09		2738YS	TWN	Getting closer			
14/01/2022, 11:28:04		TAM917	TWN	Getting closer			
14/01/2022, 11:28:01		5336YK	TWN	Getting closer			
14/01/2022, 11:27:58		AKG2668	TWN	Getting closer			
14/01/2022, 11:27:57		585N7	TWN	Getting closer			
14/01/2022, 11:27:47		9317D1	TWN	Getting closer			
14/01/2022, 11:27:43		AGD0291	TWN	Getting closer			

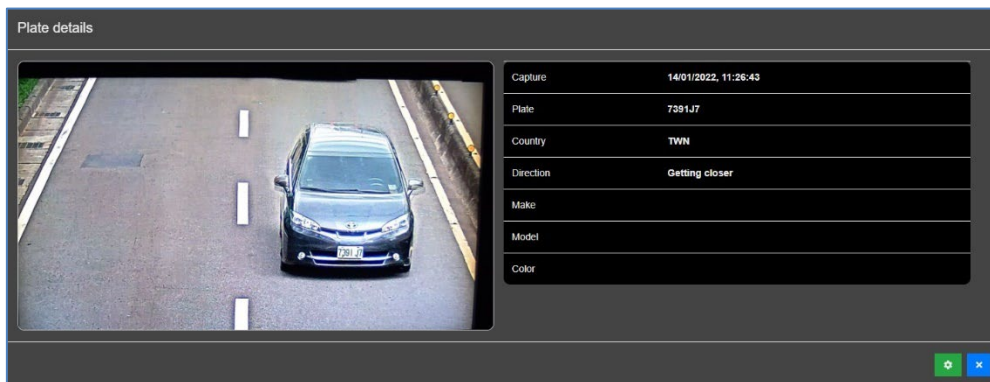
The program will store up to 10,000 plate reads in a local database on the camera. Once this limit is reached, new plate reads will replace the oldest ones.

The Database screen comprises:

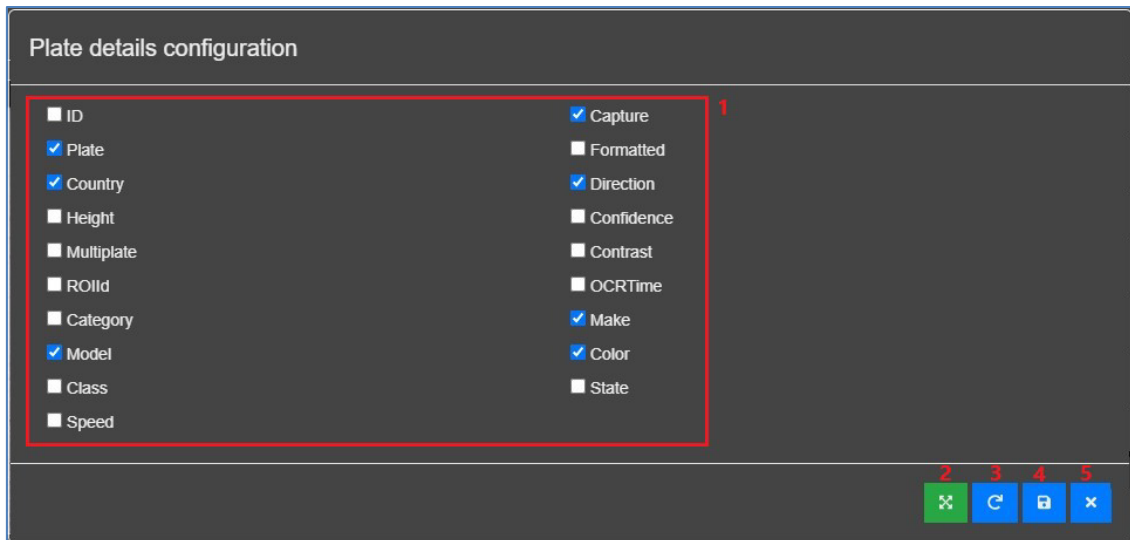
- (1) Search and Load area
- (2) Page display control
- (3) Column Configuration
- (4) Play / Pause updating the database with new reads
- (5) Total items stored
- (6) CSV download
- (7) Main plate list

Plate details

To show item details, click on a plate record, a new window appears with the vehicle details:



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



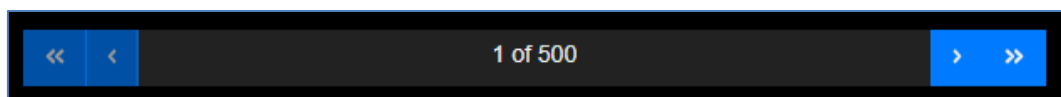
When setting up a system the most useful to display include the Height (average character height), OCR (processing time), Confidence, Multiplate (how many reads were processed) etc.

1. This area is where you can control which fields are displayed when you click on a plate
2. Selecting this icon enables ALL the fields
3. This resets the fields displayed to their default settings
4. Select the disk icon to save your current display settings
5. Select the X icon to close the menu and return to the main plates screen

Page Display Control


If there are more than 20 stored plate reads, the camera will paginate the results.

Use the Page Control box to navigate through the pages



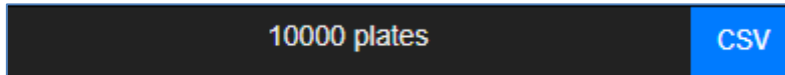
Use the < and > icons to scroll 20 plates at a time.

Load Plates

1. To load all the detected plates stored in camera, click the  reload button
This will refresh the list with the latest captures.


Download the Plate list

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



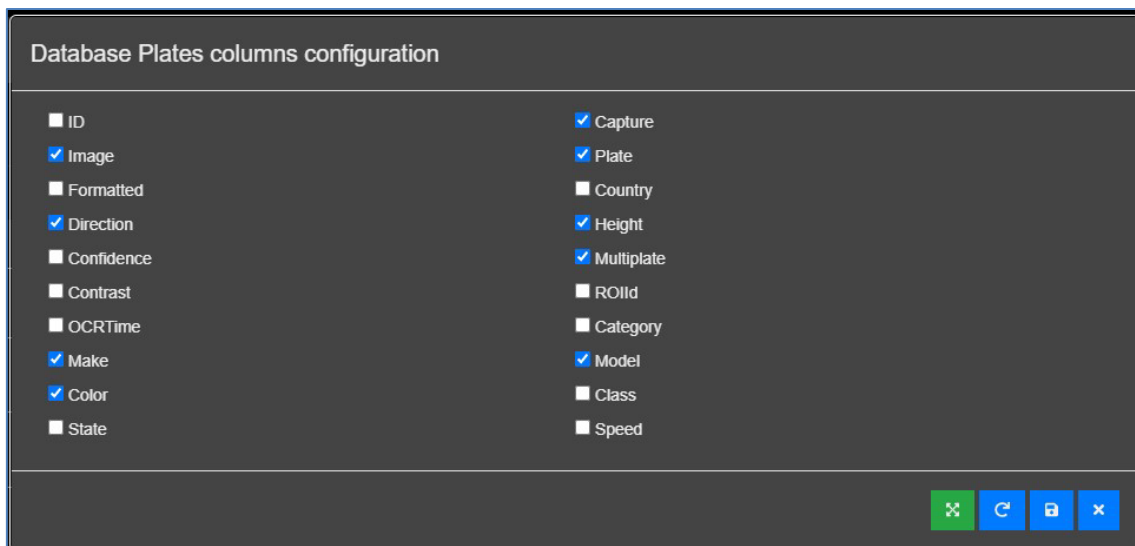
The resulting .csv file will be saved in your downloads folder.

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





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

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

Column Configuration

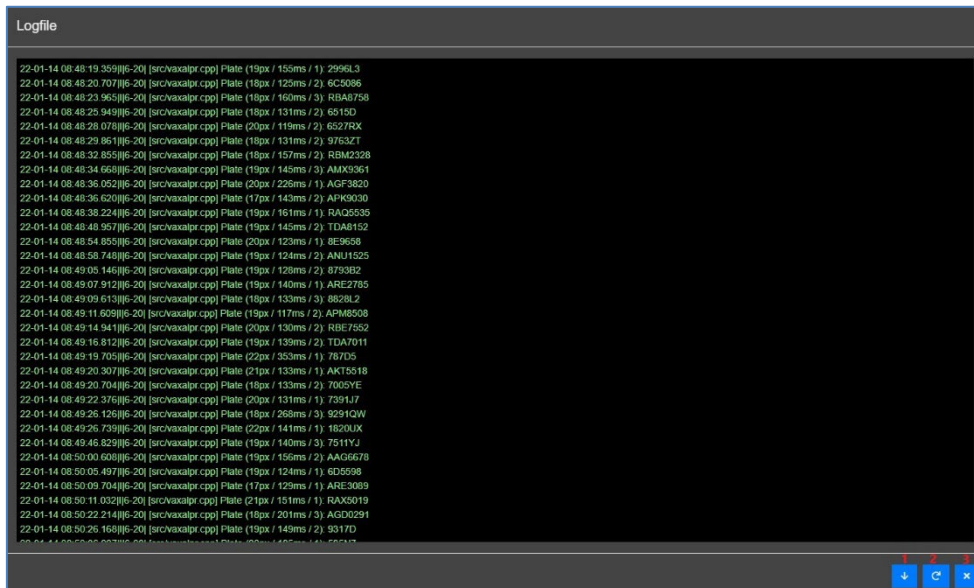


This works in exactly the same way as plate details configuration. Select what columns should be displayed and save your settings. The new columns will be displayed:

Capture	Image	Plate	Direction	Height	Multiplate	Make	Model	Color
14/01/2022, 11:27:43		AGD0291	Getting closer	18	3			
14/01/2022, 11:27:32		RAX5019	Unknown	20	1			
14/01/2022, 11:27:30		ARE3089	Getting closer	18	3			
14/01/2022, 11:27:26		6D5598	Getting closer	18	2			

7.6 Log file

Clicking this displays the Log file showing the programs activity.



1. Bottom: Select to move to the bottom of the logfile (most recent)
2. Refresh: Select to refresh the view of the logfile
3. Close: Select to close the logfile

7.7 Upload Config

Select and browse to a previously exported configuration file to import all settings.

7.8 Download Config

Selecting will create and download the current configuration file in .json format

8. Sending data to Milestone

Use the XML reporting option to send plate reads to Milestone. This will send each plate event in an XML packet via an HTTP POST.

The target URL should be a something like: <http://milestoneserver:9090/>

Both domain names or IP address can be used. Modify the message as needed. By default, the message is a valid Analytic Event for Milestone.

The Milestone XML Schema should be:

```
<?xml version="1.0" encoding="utf-8"?>
<AnalyticsEvent xmlns:i="http://www.w3.org/2001/XMLSchema-instance" xmlns="urn:milestone-systems">
  <EventHeader>
    <ID>00000000-0000-0000-0000-000000000000</ID>
    <Timestamp>$date$</Timestamp>
    <Type>License Plate Recognition</Type>
    <Message>VaxALPR On Camera Event</Message>
    <CustomTag>$plate$</CustomTag>
    <Source>
      <Name>INSERT THE CAMERA'S IP ADDRESS</Name>
    </Source>
  </EventHeader>
  <Description>$plate$</Description>
  <ObjectList>
    <Object>
      <Name>Plate</Name>
      <Confidence>$confidence$</Confidence>
      <Value>$plate$</Value>
      <AlarmTrigger>true</AlarmTrigger>
      <Size>$charheight$</Size>
      <BoundingBox>
        <Top>$absolutetop$</Top>
        <Left>$absoluteleft$</Left>
        <Bottom>$absolutebottom$</Bottom>
        <Right>$absoluteright$</Right>
      </BoundingBox>
    </Object>
  </ObjectList>
  <SnapshotList>
    <Snapshot>
      <TimeOffset>0</TimeOffset>
      <Width>$width$</Width>
      <Height>$height$</Height>
      <SizeInBytes>$imagesize$</SizeInBytes>
      <Image>$image$</Image>
    </Snapshot>
  </SnapshotList>
  <Vendor>
    <Name>Vaxtor Technologies</Name>
  </Vendor>
</AnalyticsEvent>
```

The URL for the milestone event server is (by default):

<http://192.168.0.182:9090/>

Replace this with the IP address of your server

9. 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.

9.1 The VaxALPR On-Camera software starts and then stops suddenly.

Solution:

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

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

Solution:

Check that the date and time is set correctly.

9.3 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 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:

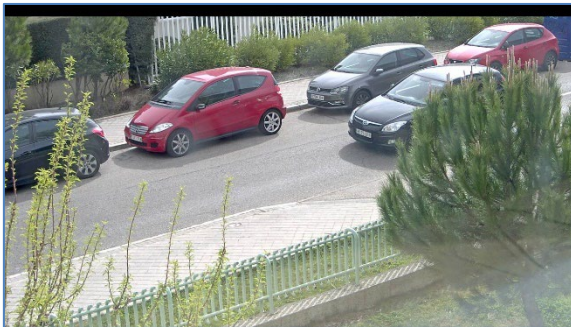
1. In the Country options, do not select the **Grammar Strict** checkbox.
2. In the Video options, change the **Minimum Character Height** to 14 pixels.
3. In the Video options, change the **Maximum Character Height** to 60 pixels.
4. In the OCR options, change the **Minimum Global Confidence** to 50.

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.

9.4 Examples of incorrect camera setup

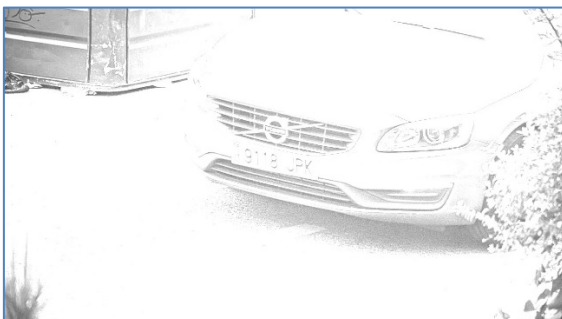
The camera is zoomed out too much and the plates are too small to be read properly. The angle is also too acute for an accurate read:



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



The license plates appear over exposed:



Solution:

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

The license plates appear blurred:**Solution:**

Try adjusting the focus or shutter speed of the camera.

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

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

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

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

The plate images are of low contrast at night:



Solution:

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

9.5 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 i-PRO setup.

9.6 Licencing Error -78

You have re-installed a previously used software license

9.7 Licensing Error -64

You have installed a software license that was allocated top another i-PRO camera

10. Dynamic Text Replacement Reserved Words

- "\$datehour\$" YYYY-MM-DD HH:MM:SS.mmm
- "\$year\$" year
- "\$month\$" month
- "\$day\$" day
- "\$hour\$" hour
- "\$minute\$" minute
- "\$second\$" second
- "\$uuid\$" unique ID
- "\$plate\$" plate ASCII
- "\$code\$" plate ASCII
- "\$multiplate\$" multiplate rate
- "\$plateutf8\$" plate UTF8
- "\$state\$" state
- "\$category\$" category
- "\$roid\$" roi ID
- "\$direction\$" direction
- "\$whitelist\$" whitelist description
- "\$blacklist\$" blacklist description
- "\$date\$" date
- "\$utcdate\$" UTC date
- "\$timestamp\$" timestamp
- "\$processingtime\$" processing time
- "\$charheight\$" char height
- "\$left\$" left of the plate
- "\$top\$" top of the plate
- "\$right\$" right of the plate
- "\$bottom\$" bottom of the plate
- "\$absoluteleft\$" left of the plate with precision
- "\$absolutetop\$" top of the plate with precision
- "\$absoluteright\$" right of the plate with precision
- "\$absolutebottom\$" bottom of the plate with precision
- "\$country\$" country name
- "\$countrycode\$" 3 letters country
- "\$countrycode2\$" until 2 letters country
- "\$confidence\$" plate confidence
- "\$confidenceprecision\$" plate confidence with 2 decimals
- "\$width\$" image width
- "\$height\$" image height
- "\$imagesize\$" image size
- "\$plateimagesize\$" plate image size

- "\$signalid\$" signal ID
- "\$make\$" vehicle make
- "\$model\$" vehicle model
- "\$color\$" vehicle color
- "\$class\$" vehicle class
- "\$stx\$" Start transmission character (02)
- "\$etx\$" End transmission character (03)
- "\$formatted\$" plate utf8 formatted
- "\$plateimage\$" plate image base 64 encode
- "\$image\$" image base 64 encode
- "\$tag\$" 24-bit hash of the plate number ascii
- "\$mac\$" mac address
- "\$signaled\$" "true" or "false"
- "\$sensorid\$" sensor ID
- "\$patchwidth\$" patch image width
- "\$patchheight\$" patch image height

Conditionals

"\$ifwhitelist\$" If the plate is on the whitelist, the text in the 'if clause' will be displayed.

- "\$ifblacklist\$" If the plate is on the blacklist, the text in the 'if clause' will be displayed.
- "\$ifnotwhitelist\$" If the plate is not on the whitelist, the text in the 'if clause' will be displayed.
- "\$ifnotblacklist\$" If the plate is on not on the blacklist, the text in the 'if clause' will be displayed.
- "\$iflist\$" If the plate is on a list, the test in the 'if clause' will be displayed.
- "\$nolist\$" If the plate is not on a list, the test in the 'if clause' will be displayed.

example: \$ifblacklist\$blacklist\$ifblacklist\$\$ifwhitelist\$whitelist\$ifwhitelist\$\$ifnolist\$not in list\$ifnolist\$

10.1 Note on UTC time format:

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

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

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

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

Ends.